

Professional and Practice-based Learning

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Research Approaches on Workplace Learning

Insights from a Growing Field

 Springer

Professional and Practice-based Learning

Volume 31

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Research Approaches on Workplace Learning

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ISSN 2210-5549 ISSN 2210-5557 (electronic)
Professional and Practice-based Learning
ISBN 978-3-030-89581-5 ISBN 978-3-030-89582-2 (eBook)
<https://doi.org/10.1007/978-3-030-89582-2>

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Series Editors' Foreword

Research on workplace learning is a steadily growing field of educational inquiry, and this volume provides an overview of current research approaches that seek to explore and understand daily working life as a source for learning in and for the initial or ongoing development of occupational practice. Enterprises have to respond effectively to a range of kinds and qualities of challenges to their viability, for example digitalization, climate change, and globalization of markets. Employees, therefore, need to adapt to the changing requirements of their workplaces, which can be addressed through activities and interactions at the individual, work team, organizational and societal levels. So, there is a need to understand how best these activities and interactions can support, guide and extend working-age adults' working knowledge.

As the development of employment is difficult to predict and requirements of workplaces may widely differ, vocational education and training can only provide a solid basis for employability, including being adaptable within occupational pathways. Given the workplace-specific and dynamic requirements for occupational performance, it follows that learning associated with those requirements needs to include effective workplace experiences, and these have become the crucial means to enable employees as well as enterprises to adapt to the developments of working life.

So far, there is no singular and clear pattern of workplace learning research. Instead, there is a range of different paradigms, theories, methods and procedures to be aligned with the specific questions or goals to be found.

This volume introduces such a range of approaches, paradigms and procedures to provide insights into current research goals and practices, and across a range of occupations. The alignments of these contributions are relevant for educational, psychological, sociological and economic disciplines, and the focus of this volume

is clearly on educational research. They comprise contributions that offer quite distinct views on workplace learning, but also encompass a range of aspects and approaches to this growing field of inquiry.

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Preface

Workplace learning has become an important field of educational research, it has developed in an impressive but also quite heterogeneous way. Additionally, it has developed to become one of the major topics of public discourses, as technological and economic developments transform the workplaces continuously and partly dramatically. Of course, workplaces have always been subject to changes and required workers to actualize their knowledge and skills (Billett, 2009). However, the speed of changes and the extent of transformation has increased. Thus, formal vocational education and training can only provide a solid foundation to prepare workers to cope with future changes in a self-directed way, because formal training formats that cover up-to-date cutting-edge developments mostly do not exist. Workplace learning, thus, is a major resource for workers on the one hand to maintain their expertise and employability. On the other hand, it is a major resource for companies to maintain their economic competitiveness.

In educational research, the first interest in workplaces arose with criticism of formal education at schools, which was believed often to end up in inert knowledge. It was Resnick (1987) who emphasized the (supposed) advantage of learning outside schools (i.e. mainly at work) that supports the development of knowledge that enables us to solve practical problems. In that perspective, educational research focused on workplaces in order to improve formal learning settings, e.g. at schools. However, in the 1990s, the concepts of business management transformed from an emphasis on formal structures (i.e. division of labour in the sense of scientific management) towards an emphasis on informal structure that increased workers' degrees of freedom and (permanent) change of work demands. With this development, educational research started to consider workplaces themselves as learning environments (e.g., Billett, 2001). From this time on, educational research on workplace learning started to evolve. It can be considered, thus, as quite a young field of research that is steadily growing (Gruber & Harteis, 2011).

This book started from the observation by the editors that while an overview of the theoretical and practical developments in the field has been documented earlier (cfr. Dochy et al., 2011; Malloch et al., 2011) a book with a focus on the state-of-the-art of the *research* on workplace learning seemed to be lacking so far. However,

such a book should be of interest for researchers in the field as well as for teaching educational university programs aside from the area of schoolteacher preparation.

Since all of the editors of this book have been (or still are) coordinators of the special interest group on learning and professional development of the European Association for Research on Learning and Instruction, we started to invite researchers in this research community with the Proposal to write a chapter in which they would develop their view on the state of the art of the research on their specific topic. In order to end up with a broad overview and to reflect workplace reality, we made a distinction between three 'levels' that shape preconditions and practices of workplace learning: research with a focus on the individual learner, research with a focus on team learning and research with a focus on the organization or even beyond. For each 'level' we invited on the one hand a range of junior and mid-career researchers in the field to write a chapter on their particular area of research. On the other hand, we invited senior researchers whom we asked to write a chapter that could reflect the past, present and future of workplace learning from the perspective of the individual, team or (cross)organisational level. By that, the book aims at reflecting the well-established discussion on the interferences between individual, social and material contributions to workplace learning.

In detail, this book comprises the following contributions: Part I focuses on the individual level and presents research on very different, specific individual contributions to workplace learning:

- Michael Goller and Susanna Paloniemi discuss the construct of agency that is often the object of workplace learning research. They provide an overview of conceptual discussions and empirical research on (work) agency.
- Katja Vähäsantanen focuses on professional identity as a crucial personal characteristic that is permanently negotiated through work practices but is necessary for individual contribution to cope with changes at workplaces.
- Andreas Rausch, Johannes Bauer and Michael Graf review research on learning from errors at work. They provide an overview of empirical studies and provide a distinction of different incidents that can be called errors.
- Nané Kochoian, Isabel Raemdonck and Mariane Frenay present a review of the literature based on 47 articles in which they discuss how learning motivation and training motivation in workplace settings are conceptualized and measured.
- Irene T. Skuballa and Halszka Jarodzka focus on the applied contributions of eye tracking research to expertise development in the domain of teaching.
- Laura Pylväs, Junmin Li and Petri Nokelainen discuss research on personal growth which is considered as a construct that describes individual development over lifespan and integrates different psychological and sociological approaches.
- Stephen Billett's chapter provides a broader overview of research on the individual contributions on workplace learning.

Part II concentrates on the team level and reflects on different particular perspectives of analysing team related workplace learning processes:

- Sara Van Waes and Kaisa Hytönen interpret teams as a set of social relations and introduce social network analysis as a tool for the investigation of learning at work within teams.
- Piet van den Bossche, Catherine Gabelica and Mieke Koeslag-Kreunen introduce a model of team learning and explore processes and states, in order to suggest curial issues for further research.
- Maaïke D. Endedijk and Katrien Cuyvers study the issue of self-regulation in the social context of workplaces. They develop three avenues for future research that refer to the dynamic situation at workplaces.
- Dominik Froehlich and Katerina Bohle Carbonell discuss theoretical notions of team learning on the level of embeddedness of teams, the team itself and its members. Additionally, they explore methodological issues of analysing team learning on these levels.
- Regina H. Mulder discusses wider issues of team-learning research that aims at covering the complex setting of team learning between individual, social and material circumstances.

Part III covers chapters that refer to the level of organizations or even beyond, e.g. educational systems:

- Viola Deutscher and Esther Winther explore the assessment of vocational competences and argue the importance of valid and reliable measurement instruments.
- Allison Littlejohn and Viktoria Pammer-Schindler describe trends and challenges of technology-enhanced professional learning, e.g. approaches of augmented reality and virtual learning environments.
- Stefanie Zutavern and Jürgen Seifried discuss opportunities and challenges of vocational education and training. They consider VET as important preparation for learning at workplaces that underlie rapid changes.
- Eva Vermeire, Nele De Cuyper and Eva Kyndt conducted a systematic review of 36 papers investigating the transition from school to work and reveal deficits in the preparation of students for this transition.
- Karl-Heinz Gerholz and Bernd Gössling focus on the apprenticeship system in Germany and discuss the recognition of work experience within the context of vocational education and training.
- Christian Harteis explores the digital transformation of workplaces and discusses challenges for work-related learning processes.
- Päivi Tynjälä, finally, introduces concepts of organizational learning and emphasizes the importance of a supporting learning culture within enterprises.

As the different contributions to this book reveal, there is so far neither a consensus on the most important theoretical concepts nor does a dominating approach of investigating workplace learning exist. The area is still a growing field, and due to the development of software and hardware, there is also a growing field of research methodologies as well as a growing area of workplace learning support. Consensus

seems to be, however, that formal education and training cannot fully anticipate future development and challenges. Depending on the employment section (e.g., industry, service, trade), different developments have to be observed: There is the continued progress of technology and competition which lead to changes at the three levels discussed in the chapters of this book. Additionally, there is no common level of maturation to be observed in enterprises. The state of development depends on many influences and differs between company A in country X and company B in country Y, even if both companies work in the same economic area. Hence, research on workplace learning may analyse traditional work activities as well as activities that are enhanced by new technological devices. The foci of workplace learning research, thus, are quite different.

Considering the chapters in this book, it also becomes clear that there are quite different conceptualizations and operationalizations of (workplace) learning. Firstly, the chapters differ in the considerations of presages, processes or products of workplace learning – s.f the PPP-model of workplace learning (Tynjälä, 2013) or the integrated iPPP-model of workplace learning (Gruber & Harteis, 2018). Some of them choose quite a near focus and a very selective operationalization, some of them choose a broader focus on a variety of work activities, some of them analyse work practices, some of them aim at improving the assessment of learning outcomes, and some of them discuss the broader frame of the system of vocational education. Additionally, the chapters apply different methods of gathering and analysing data.

Hence, the major contribution of this book is that it sketches the current state of development in the area of educational research on workplace learning, and in doing so reveals the rich variety of insights in the area. As such, as editors, we hope that it provides prospects and inspiration for future research.

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References

- Billett, S. (2001). *Learning in the workplace: Strategies for effective practice*. Allen & Unwin.
- Billett, S. (2009). Changing work, work practice: The consequences for vocational education. In R. Maclean & D. Wilson (Eds.), *International handbook of education for the changing world of work: Bridging academic and vocational learning* (pp. 175–187). Springer.
- Dochy, F., Gijbels, D., Segers, M., & Van den Bossche, P. (2011). *Theories of learning for the workplace. Building blocks for training and development programs*. Routledge.

- Gruber, H., & Harteis, C. (2011). Researching workplace learning in Europe. In M. Malloch, L. Cairns, K. Evans, & B. O'Connor (Eds.), *The SAGE handbook of workplace learning* (pp. 224–235). Sage.
- Gruber, H., & Harteis, C. (2018). *Individual and social influences on professional learning. Supporting the acquisition and maintenance of expertise*. Springer.
- Malloch, M., Cairns, L., Evans, K., & O'Connor, B. N. (Eds.). (2011). *The SAGE handbook of workplace learning*. Sage. <https://doi.org/10.4135/9781446200940>
- Resnick, L. (1987). Learning in school and out. *Educational Researcher*, 16(9), 13–20.
- Tynjälä, P. (2013). Towards a 3-P model of workplace learning. A literature review. *Vocations and Learning. Studies in Vocational and Professional Education*, 39, 251–267.

Contents

Part I Individual Level

- 1 **Agency: Taking Stock of Workplace Learning Research** 3
Michael Goller and Susanna Paloniemi
- 2 **Professional Identity in Changing Workplaces: Why It Matters, When It Becomes Emotionally Imbued, and How to Support Its Agentic Negotiations** 29
Katja Vähäsantanen
- 3 **Research on Individual Learning from Errors in the Workplace – A Literature Review and Citation Analysis**. 47
Andreas Rausch, Johannes Bauer, and Michael Graf
- 4 **Pointing Out Conceptual and Measurement Issues in Studies on ‘Learning Motivation’ and ‘Training Motivation’ in Workplace Settings. A Literature Review** 77
Nané Kochoian, Isabel Raemdonck, and Mariane Frenay
- 5 **Professional Vision at the Workplace Illustrated by the Example of Teachers: An Overview of Most Recent Research Methods and Findings** 117
Irene T. Skuballa and Halszka Jarodzka
- 6 **Professional Growth and Workplace Learning** 137
Laura Pylväs, Junmin Li, and Petri Nokelainen
- 7 **Learning in and Through Work: Positioning the Individual** 157
Stephen Billett

Part II Team Level

- 8 **Looking Back and Ahead: A Social Network Perspective on Workplace Learning and Professional Development** 179
Sara Van Waes and Kaisa Hytönen

9	Team Learning	201
	Piet Van den Bossche, Catherine Gabelica, and Mieke Koeslag-Kreunen	
10	Self-Regulation of Professional Learning: Towards a New Era of Research	219
	Maaïke D. Endedijk and Katrien Cuyvers	
11	Social Influences on Team Learning	239
	Dominik Froehlich and Katerina Bohle Carbonell	
12	Knowledge Creation in Teacher Teams	257
	Crina Damşa	
13	Advancing Research on Team Learning by Taking into Account Complexity, Dynamics and Context	281
	Regina H. Mulder	
 Part III Organizational Level and Beyond		
14	Assessment of Vocational Competences – Definitions, Issues and Quality Criteria	305
	Viola Deutscher and Esther Winther	
15	Technologies for Professional Learning	321
	Allison Littlejohn and Viktoria Pammer-Schindler	
16	Vocational Education and Training in Germany: Benefits and Drawbacks of the Dual Approach as Preparation for Professional Employment	347
	Stefanie Zutavern and Jürgen Seifried	
17	Preparing Students for the School-to-Work Transition: A Systematic Review of Research on Secondary School-Based Vocational Education	367
	Eva Vermeire, Nele De Cuyper, and Eva Kyndt	
18	Changing Appreciation of Vocational Learning During Work – The Case of the German Apprenticeship System	399
	Karl-Heinz Gerholz and Bernd Gössling	
19	Research on Workplace Learning in Times of Digitalisation	415
	Christian Harteis	
20	Workplace Learning from the Organizational Point of View	429
	Päivi Tynjälä	
	Correction to: Changing Appreciation of Vocational Learning During Work – The Case of the German Apprenticeship System	C1
	Index	451

Part I
Individual Level

Chapter 1

Agency: Taking Stock of Workplace Learning Research



Michael Goller and Susanna Paloniemi

Abstract This chapter presents a discussion of the concept of agency. Agency is understood as a multifaceted construct describing the idea that human beings make choices, act on these choices, and thereby exercise influence on their own lives as well as their environment. We argue that the concept is discussed from three different perspectives in the literature—transformational, dispositional, and relational—that are each related to learning and development in work contexts. These perspectives do not reflect incompatible positions but rather different aspects of the same phenomena. The chapter also offers an avenue of insight into empirical studies that employ agency as a central concept as well as discussions about concepts that closely overlap with ideas of human beings as agents of power and influence.

Keywords Agency · Workplace learning · Professional development · Proactivity · Self-direction

1.1 Introduction

In a rather broad and general sense, the concept of agency refers to something or someone having the capacity and the willingness to cause something else (Schlosser, 2015; Shanahan & Hood, 2000). The causing entity is referred to as an *agent*, and, within the social and educational sciences, this agent is usually a human being. In other words, within these scholarly fields, the concept of agency subsumes the notion that “human beings are agents of influence and power who are able to cause things and to bring about change” (Goller, 2017, p. 1). Based on this working definition, agency is related to the making of decisions and choices of human beings as

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C. Harteis et al. (eds.), *Research Approaches on Workplace Learning*,

Professional and Practice-based Learning 31,

https://doi.org/10.1007/978-3-030-89582-2_1

well as their attempts to exercise control over their own lives, along with their physical and social contexts (Emirbayer & Mische, 1998; Eteläpelto et al., 2013).

Within discourses about workplace learning and professional development, notions of agency have been quite prevalent in the last few years (Goller & Paloniemi, 2017; Tynjälä, 2013). The concept has been assumed to have explanatory power to further our understanding of how and why individuals learn within or for purposes related to professional contexts. On the one hand, agency is used to explain how individuals affect their own learning and developmental processes by, for instance, purposefully directing their attention or by actively creating opportunities for professional advancement. On the other hand, the concept describes more a relational factor that mediates between the individual and the environment. From this perspective, human agency shapes how individuals interact and engage with the affordances provided by the environment. Taken together, it might not be surprising that the concept appeals to many scholars. In a certain sense, the notion of agency seems to explain and shed light on the individual's role within learning and developmental processes in relation to more structural factors of the environment, including workplace characteristics or the nature of the work as such.

Most of the agency-related discussions are theoretical and frequently quite abstract. In addition, many authors use the concept in different ways; therefore, the idea of agency has not stood uncontested. Some scholars have questioned its explanatory power because of vague descriptions. Moreover, whether the concept of agency can be meaningfully and usefully employed in empirical research has been challenged (Goller, 2017; Mulder, 2014). Nevertheless, ideas related to agency have inspired a range of scholars to conduct empirical studies. So far, the majority of these efforts have been qualitative in nature (e.g., Bryson et al., 2006; Smith, 2006; Wall et al., 2017). However, in recent years, a range of authors have also attempted to operationalise the concept and subsequently conducted further studies that employ hypothesis-testing methods (e.g., Goller, 2017; Vähäsantanen et al., 2019b). These relatively recent developments offer new insights into the place of empirical research within discussions about agency and workplace learning.

In this chapter, we aim to present a short overview and reflection on the recent discussions about agency¹ in relation to workplace learning and professional development. In the next section, the different meanings of agency within this body of literature are explored. There follows a section illustrating relevant examples of empirical studies that explicitly use agency as a central concept in researching workplace learning and development. Next, other concepts and constructs that are

¹In this chapter, we use the term *agency* to subsume all ideas that have been discussed elsewhere under the labels of *professional agency*, *work agency*, *personal agency*, *human agency*, *individual agency*, or *epistemological agency* (see Billett, 2006; Edwards, 2005; Eteläpelto et al., 2013; Goller, 2017; Harteis & Goller, 2014; Smith, 2017). In this way, we can discuss the whole range of literature pertaining to agency in the context of learning and development at and for work without being too narrow or exclusive. At the same time, however, we decided to focus our discussion only on agency as an individual-level phenomenon, meaning that studies describing agency primarily from a collective perspective have been excluded (see also Edwards, 2005, 2009, 2010; Edwards & Mackenzie, 2005).

used in researching notions of agentic individuals and behaviours in working-life contexts are discussed in relation to agency. The chapter closes with a summary pointing out open questions and research gaps that are still to be tackled.

1.2 Agency as an Abstract and Multifaceted Concept

As foreshadowed above, the concept of agency has been used in a multitude of different ways. While some authors use agency to describe actors' choices and actions as well as the consequences of these activities, others use the concept to express the underlying dispositions and features that allow individuals to make such choices and to engage in actions based on these choices (see, e.g., Goller & Harteis, 2017). Thus, within the educational field, agency has mainly been understood as an individual feature (i.e., something people have) or as behavioural action (i.e., something people do) (Paloniemi & Goller, 2017). Consequently, some authors conceptualise agency as a mainly individual-level phenomenon, while others use it to describe collective and collaborative actions. This diversity of meanings attached to the concept of agency can mainly be traced back to the diverse theoretical frameworks different authors have adopted (e.g., sociocultural vs. cognitive; see Eteläpelto, 2017).

The aim of this section is to structure the agency discussion around three main perspectives that include and expand on the aforementioned distinction between agency as an individual feature and a behavioural action: (a) agency as a transformational phenomenon, (b) agency as a disposition, and (c) agency as a relational phenomenon. We herein draw heavily both on our own ideas published elsewhere as well as on prior writings of other authors (Damşa et al., 2017; Eteläpelto et al., 2013; Paloniemi & Goller, 2017).

The three perspectives on agency are illustrated in Fig. 1.1. The perspectives are to be understood as analytical accounts that must be interpreted as neither mutually exclusive nor incompatible. Instead, we perceive them as variations of the same main idea which are conceptualised from different perspectives and which can be well integrated (see also Damşa et al., 2017; Goller, 2017; Goller & Harteis, 2017). Both the relational as well as the dispositional perspectives answer the questions of why and how intensively individuals engage in agentic efforts that are discussed within the transformational perspective. The relational perspective emphasises more strongly that agency is deeply embedded and rooted in sociocultural practices. The dispositional perspective, while acknowledging the high relevance of contextual factors, places a more intense focus on individual factors that explain both the intentionality and the intensity of human agency. After a more detailed conceptual description of these three perspectives in Sects. 1.2.1 through 1.2.3, there follows a combined discussion on how agency is related to professional learning and development in Sect. 1.2.4.

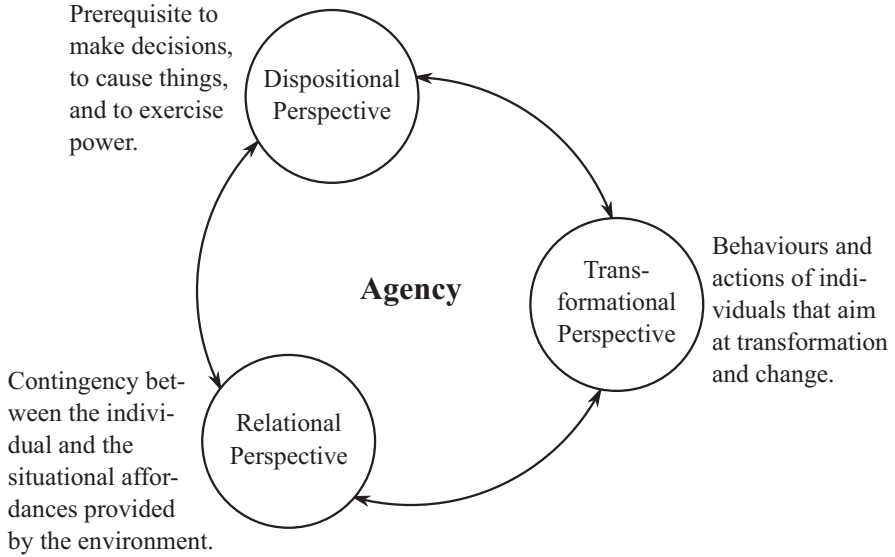


Fig. 1.1 Three perspectives of agency

1.2.1 Transformational Perspective

From this perspective, agency is directly related to change initiated by an actor. Individuals that exercise agency try to make a difference by actively shaping their life circumstances, by making a difference in the status quo, or by taking stances against undesirable conditions. As noted by Damşa et al. (2017), such efforts are strongly future-oriented since they aim to change a current state to bring about some anticipated future situation. Emirbayer and Mische (1998) describe this transformational perspective in their projective dimension of agency, as do Hitlin and Elder (2007b) in their life-course agency construction.

Transformational efforts initiated by an actor can either be directed towards the individual her/himself or the individual's environment, including other external actors (Harteis & Goller, 2014). Agency that is directed towards the individual subsumes all activities in which the actor attempts to purposefully shape her/his own career, deliberately pursue her/his own learning activities, or actively negotiate her/his own identity. Typical examples are workers who actively seek feedback on their job performance to further their development (e.g., Harwood & Froehlich, 2017) or incumbents who negotiate with their supervisors about potential training opportunities (e.g., Evans & Kersh, 2006). Another example is a worker's active reflection about her/his work attitudes or beliefs that might result in a change of work behaviour in the future. However, workers might also engage in active reflection that strengthens their identity in the future. Instead, agency that is directed towards the environment includes all efforts in which individuals actively aim to change the situational or social circumstances of their work. For instance, incumbents might

develop or transform current work practices or address social tensions at work. At the same time, this facet of agency might manifest itself when individuals deliberately assume responsibility for others.

Discussions relating to the transformational perspective always conceptualise agency as something that an individual does, either overtly, as visible behaviour, or latently, in the sense of mental actions (Goller & Harteis, 2017). In any case, transformational agency requires individuals to invest effort and to make choices in favour of the activity in question. In addition, individuals need to exhibit perseverance in the face of problems and difficulties. Such obstacles may be a direct consequence of situational and contextual constraints. This emphasises that workplaces are not uncontested settings; it would be too simplistic to assume that individuals are effortlessly able to change existing circumstances or to create as yet non-existent learning opportunities. In other words, transformational agency stands independent of neither sociocultural nor material context factors. While some of these factors act as constraints that hinder individuals from taking charge of their lives, others actively support individuals' transformational efforts. For instance, work environments that are characterised by an organisational culture that is open to suggestions for change are much more likely to support any type of transformational agency compared to work environments that are less flexible and more conservative. Such organisational cultures are the product of not only leadership that signals to employees that agentic behaviour is accepted or even desired but also collegial support and trust that ensure the safety to engage in agentic actions that might somehow be risk related.

1.2.2 Dispositional Perspective

Scholars that adopt a dispositional perspective conceptualise agency as a disposition (e.g., Bryson et al., 2006; Eraut, 2007; Harteis & Goller, 2014). Dispositions, in this context, are understood as personal features that determine the likelihood that an individual will adopt particular goals and engage in certain behavioural patterns (Dweck & Leggett, 1988). In other words, agency as dispositional concept subsumes all varieties of individual-level characteristics that explain why some individuals exercise more agency than others. Agency is not characterised as something individuals do but rather something they are able to employ. Inherent in this perspective is that some individuals are able to utilise their agency to a greater extent than others (Hitlin & Elder, 2007a).

Harteis and Goller (2014) illustrate this notion of agency with an analytical continuum between two theoretical extrema: agentic and non-agentic individuals (see, for a similar conceptualisation, Little et al., 2004; see also the early writings of DeCharms, 1968). While agentic individuals frequently take charge of their lives and attempt to control their environments, non-agentic individuals would rather comply with given situations. Non-agentic individuals perceive themselves first as a product of external forces to which they tend to react instead of taking the

initiative as agentic individuals would do. Along this continuum, agentic individuals more often engage in transformational efforts that are related to learning and development at work than do their non-agentic counterparts.

Dispositional agency is firmly rooted in psychological theories as well as research on life-course development (e.g., Bandura, 2001, 2006; Fay & Frese, 2001; Parker et al., 2010; Shanahan & Elder, 2002). For instance, influenced by these discourses, Goller (2017) introduced three facets of agency that explain why some individuals tend to utilise their agency more than others: (a) agency competence, (b) agency beliefs, and (c) agency personality. *Agency competence* describes the ability to come up with goals, make decisions in favour of or against these goals, translate these decisions into action plans, implement these action plans in actual behaviour, constantly evaluate one's own progress regarding goal achievement, and persist in the face of challenges and obstacles. *Agency beliefs* are subjective perceptions of the extent to which one has the abilities just described or not. Finally, *agency personality* is a trait-like component that can be defined as a stable and relatively situation-unspecific inclination to take control over one's life and environment. Within this model, Goller assumes that individuals who are agentially competent, believe in their agency competences, and feature a strong agency personality tend to exercise more transformational agency than individuals without these characteristics (see also Goller & Harteis, 2017). Another example is the work of Raemdonck (2006), who introduced the notion of self-directedness and self-directed learning orientation (see also Raemdonck et al., 2014, 2017). Raemdonck assumes that some individuals differ in their inclination "to take an active and self-starting approach to learning activities and situations and to persist in overcoming barriers and setbacks to learning" (Raemdonck et al., 2014, p. 192) in the context of work. In her model, it is individuals with a strong self-directed learning orientation that tend to engage more often in agentic behaviours related to learning and development than less self-directed actors. Both Goller and Raemdonck present empirical findings in their studies that speak in favour of their theoretical presumptions.

At first glance, the dispositional perspective of agency might seem to deny the relevance of social, cultural, historical, and physical factors in explaining human behaviour. Dispositions alone seem to determine how individuals act. However, dispositions are not understood as having a deterministic influence on behaviour (Goller & Harteis, 2017). Instead, contextual factors are able to change the a priori probability of whether individuals exercise agency or not (Dweck & Leggett, 1988). While some situational contextual factors encourage individuals to take charge and take control, others actually discourage and prevent them from doing so. In other words, the situation can either afford or constrain human agency to a certain extent (see Sect. 1.2.1 as well as Elder & Shanahan, 2007; Shanahan & Hood, 2000). For instance, work environments that provide sufficient discretion make it much easier for agentic individuals to act out their agency dispositions, while situations that do not afford much autonomy may hinder even the most agentic individuals from exercising their agency traits. In a similar vein, social support and an atmosphere of trust can be perceived as moderators that help individuals to actualise their agentic

dispositions. For a more detailed discussion of possible context factors that influence individuals to act agentially, see Goller (2017) as well as Goller and Harteis (2017).

1.2.3 Relational Perspective

From this perspective, agency is conceptualised as an analytical tool that helps in further understanding the interaction between individuals and their contexts. To be more concrete, agency is understood as a mediator that bridges the realm of the person and the domain of the context it is embedded in (Damşa et al., 2017). The concept thereby facilitates further understanding of how individuals interact with their environment and how the environment is perceived by individuals.

An important assumption of the relational perspective is that individuals differ in the unique experiences they undergo during their lives. As a result of different life-courses and their cognitive legacies, each individual develops idiosyncratic values, goals, interests, beliefs, ideologies, and attitudes that manifest themselves in their personal identity as well as their sense of self (Billett, 2001, 2006; Billett & Smith, 2006; see also Vähäsantanen, Chap. 2, in this volume). It is exactly this personal identity or sense of self that determines how individuals construe external stimuli (i.e., how they make sense out of them) and how they engage with (i.e., how they react to) social suggestions they encounter (Billett & Smith, 2006). However, this mediation is by no means a passive process. Individuals are active agents that have the power to determine the degree to which they interact with their environment and with what level of intensity. At the same time, Billett and colleagues still acknowledge the role of social experiences in explaining individuals' behaviour. While conceding that the social sphere does, indeed, affect individuals, they emphasise that "social suggestions are never complete or comprehensive enough" (Billett & Smith, 2006, p. 145) to fully determine how individuals engage with their environment and that agency always plays a role. It follows that in writings that adopt a relational agency perspective, individual and social accounts are considered to be intricately intertwined and never fully separable.

This kind of thinking has been thoroughly incorporated into Eteläpelto et al.' (2013) *subject-centred sociocultural approach* to professional agency. This approach conceptualises professional agency as "practised when individuals exert influence, make choices and take stances that affect their work and their professional identity" (p. 61). Agency is strongly intertwined with professional identity, and individuals' experience, knowledge, and competencies are understood as resources for exercising agency in the context of sociocultural resources and circumstances at work. This implies the relational nature of agency in that individuals are interacting with and within specific contexts (see also Imants & Van der Wal, 2019). Although the authors conceptualise agency and social contexts as analytically separate entities, they understand them as mutually constitutive in the sense employed by Billett (2006). Overall, the relational approach to agency

acknowledges the intertwined relation between the (agentic) individual and the social (structures), which shapes its discussion of this core relationship in learning and professional development.

1.2.4 Agency and its Relationship to Workplace Learning and Professional Development

It remains to explain how agency is related to workplace learning and professional development. For this purpose, Billett's (2001, 2006) co-participation model is appropriate and useful. The model explores the interdependence of work practices as well as individuals' participation in these practices. Billett assumes that opportunities for learning and development at work arise when employees engage in goal-directed work activities such as problem-solving and social interactions that are constituent of a certain workplace (see also Hager, 2013). Such activities are powerful means of learning and development because they have the potential to lead to cognitive adaptations (see, e.g., Anderson, 1982, 1993; Boshuizen & Schmidt, 1992, 2008; Gruber, 1999; Kolb, 1984; Kolodner, 1983). Other opportunities to construct knowledge and skills relevant for work can arise through employees' engagement in more formal learning activities such as training (see also Goller, 2017). However, it is not only opportunities afforded by the work environment that explain learning and development. In Billett's model, employees are not understood as passive entities that are subjugated by their social context and, therefore, just reactively engage with what is afforded to them at work. Instead, Billett suggests that employees, through exercising agency, actively decide how to interact with their environment. They are, at least in a certain sense, able to select the opportunities they want to use as well as how to mentally and overtly engage with the demands of their work.

On a quite fundamental level, employees decide—based on their values, goals, interests, beliefs, ideologies, and attitudes—how much attention they will direct towards certain work phenomena and how they will respond to them (Billett, 2004, 2006, 2011). Responses might vary from completely ignoring or even rejecting what is suggested by the workplace to fully engaging in the activities that are afforded to them. For instance, Gustavsson (2007) found that paper mill operators actively decided whether they wanted to participate in certain problem situations at work or not. In Gustavsson's interviews, some of the operators argued that they could indeed solve certain problems but instead chose not to do so since they saw them as part of neither their job definition nor their work identity. In other words, through the exercise of agency, these workers determined how they engaged with their work and what experiences they could create and learn by. Similarly, Billett (2000) found evidence that a young recruit refused to take part in a mentoring scheme offered by his organisation because he did not appreciate the mentor's guidance. Again, it was the recruit's values and beliefs that led to the active denial of the

help and advice afforded by his more senior colleague. Consequently, it can be argued that the exercise of agency determined the degree of proximal guidance the novice had access to and, therefore, the learning opportunities connected to it. In yet another study, Goller (2017) interviewed geriatric care nurses and found evidence that while some nurses tried actively to avoid taking part in training opportunities offered by their employer, others were keen participants in seminars or workshops since they perceived them as opportunities to develop expertise or to progress within the nursing home hierarchy. The latter were especially identified as employees that actively wanted to take charge of their professional advancement. All three examples can be explained using either the relational perspective of agency (i.e., choices regarding how to react to social suggestions based on their sense of self or work identity) or the dispositional perspective (i.e., some individuals have a stronger disposition to take charge of their professional lives).

Individuals, however, are capable of not only actively dealing with social suggestions from their workplace but also agentially creating opportunities for learning and development that otherwise would not have been afforded to them (Goller & Billett, 2014). On the one hand, such efforts can explicitly focus on learning and development. For instance, employees that seek feedback and information to improve themselves actively create stimuli for reflection about their own performance levels, deficits, or even their work identity, including current beliefs or attitudes that would not have existed without their effort. It is these reflections that act as triggers for informal learning in work contexts, including the acquisition of new knowledge or the differentiation of existing knowledge structures (Kolb, 1984; Schley & van Woerkom, 2014). Similarly, individuals who succeed in negotiating additional training courses actively secure themselves new formal learning opportunities. On the other hand, transformational agency might lead to workplace learning and professional development only as a by-product. For instance, workers that manage to craft their job actively by seeking out more interesting tasks may not actively pursue learning. However, they create new experiences that might result in important insights and new knowledge. Also, individuals who attempt to change structures and processes at work create opportunities for learning and development, although this may not be an explicit goal of their agentic behaviour (see also Sect. 1.4.3). Such efforts require the individual to reflect actively on work practices and to come up with potential solutions that address the issues perceived. It is often the changes that take place in work structures, tasks, and/or practices that evoke the (re) construction and possible transformation of professional identity (e.g., Eteläpelto et al., 2014). Taken together, all these examples are illustrations of agency that are discussed from the transformational perspective.

To sum up, the concept of agency can indeed be used to explain how and why employees learn and develop in work contexts. Moreover, it conceptualises how and why employees engage with the social suggestions as well as the contextual constraints of their workplace. The transformational perspective describes how employees take charge of their lives and how this exercise of agency leads to cognitive changes that are the basis of learning and development. Both the dispositional and the relational perspectives explain why employees do or do not engage in such

transformational efforts. Despite the differences in theoretical understandings and approaches to agency, the scholars who employ these different perspectives all seem to acknowledge the relevance of agency for explaining workplace learning and professional development processes.

1.3 Illustrations of Empirical Research on Agency and Workplace Learning

This section illustrates examples of current empirical studies that have used agency as a central concept in workplace learning research. The studies presented represent different conceptual as well as methodological choices with regard to investigating agency. One should note, however, that the studies included here are not meant to offer a comprehensive review of empirical research on work-related agency. Instead, they are selected to illustrate the current state of the research explicitly on agency within the workplace learning literature that has not been covered in earlier reviews on agency (e.g., Eteläpelto et al., 2013; Goller, 2017). These studies highlight the different methodological approaches adopted in research on agency as well as the different content arenas covered. Section 1.3.1 will concentrate on qualitative studies, while Sect. 1.3.2 will focus on quantitative studies. This separation is relevant since each research approach is concerned with different conceptual aims.

1.3.1 Qualitative Studies on Agency Intertwined with Professional Identity and Workplace Participation

The research on agency to date has mostly been qualitative in nature. This is understandable because of the multiple and even contesting conceptualisations of the phenomenon. Within these studies, agency has been investigated in different work domains and different settings, which has led to further compartmentalisation of the concept into various sub-categories that have been respectively developed and discussed. Examples of these sub-categories include identity agency, creative agency, and dialogical agency (Paloniemi & Goller, 2017). In many of the related studies, the focus is on exploring the resources for and/or the obstacles to agency—either individual or social—in certain work environments and conditions.

Qualitative research on agency at work has mostly approached agency from relational and transformational perspectives, focusing on individual actions within or in relation to work communities. As illustrated in the compilation *Agency at Work* (Goller & Paloniemi, 2017), these studies have contributed to an understanding of agentic work and/or learning practices in specific circumstances in the professional lives of individuals. Emphasis is further placed on the interplay between individual factors (e.g., professional competence, identity) and sociocultural affordances in the

workplace (e.g., leadership practices, the nature of work). In investigating agentic actions embedded in social circumstances at work, recent research has highlighted and utilised active participation in work practices and the relational nature of agency to explain learning and development (Paloniemi & Goller, 2017). Consequently, many of the studies have concentrated on examining the process of learning via professional identity construction or participation in work community practices in specific circumstances. Thus, agency is enacted within organisational work practices and in social relationships, which have a close connection to professional identity construction.

So far, the majority of the research on agency and professional learning has been conducted among white-collar employees, such as teachers and health care professionals. An exception is a study by Fuller and Unwin (2017), which focused on low-grade workers in health care. They examined the agentic dimension of workplace participation by exploring the various ways that hospital porters developed and used their expertise at work to create positive occupational identities and crafted their jobs. The interview data revealed that the porters had become knowledgeable practitioners not only in their formal role of moving patients and materials but also when engaging in patient care work. The hospital porters conceived of caring and identification with the healthcare workforce as primary functions and sources of satisfaction in their job. Overall, the study by Fuller and Unwin (2017) illustrates the meaning of agency for (re)constructing identity through active job crafting, thus representing both relational and transformational perspectives on agency (see Sect. 1.4.1 for a short discussion of the concept of job crafting in the context of the proactivity literature).

Similar to Fuller and Unwin, Pappa et al. (2017a, b) highlighted the connection between professional identity and agency. In their studies on content and language integrated learning (CLIL) teachers' agency, the researchers adopted a holistic and dynamic theoretical conceptualisation of agency, placing particular emphasis on the professional relationships and socio-cultural environment of classrooms and schools. Their findings showed that teachers exercised identity agency in terms of both pedagogical agency (e.g., pedagogical choices) and relational agency (e.g., shared collegiality). Thus, identity agency was enacted as not only implementing autonomous and reflective actions in the classroom but also attending to one's own opportunities for participation and membership in a teacher community. Without acknowledging the individual nature of identity (e.g., prior experience, pedagogical values), the researchers underlined the meaning of shared collegial practices in a work community, through which teacher agency was exercised. Further, autonomy, openness to change, teacher versatility, and collegial community were found to support teacher agency (Pappa et al., 2017a).

Adopting a relational perspective on agency, Wall et al.'s (2017) study showed how international students exercised agency to resist and overcome discrimination and deskilling during their work-integrated vocational learning. In doing so, building social networks, utilising relationships, and accessing their social capital were means the students used in practicing agency at their workplaces. This study emphasises the role of localised knowledge in helping individuals to navigate particular

workplace settings and structures and, thereby, to secure workplace learning opportunities.

Both relational and transformational perspectives can be identified in a recent study by Hökkä et al. (2019b). The research focused in investigating leaders' agency in terms of identity agency, relationship agency, and organisation agency. The identity agency aspect focused on the ways the leaders actualised and reshaped their core commitments, values, ethical standards, and competencies at work. The relationship agency of the leaders was manifested in the ways they led and supported the work, interaction, and learning of their staff. In response to administrative issues and strategic instructions from the upper management, the leaders were faced with the need to exercise organisation agency, for example, in terms of raising productivity levels. Overall, the enactment of leaders' agency turned out to be a multifaceted and emotional endeavour that was by no means solely a matter of rational considerations.

So far, the research on agency in working-life contexts has focused mainly on rational and goal-orientated actions, whereas less attention has been paid to the role of emotions in individuals' agentic actions at work and in learning. The studies by Hökkä and colleagues (2017; 2019b) have contested the purely rational nature of work-related agency and emphasised a need to include emotional aspects in the discussion of agency at work and in learning. Hökkä and colleagues (2007; 2019b).

The above-described qualitative studies on agency and learning in work contexts share an understanding of agency as a relational (and partly as a transformational) phenomenon. Individual characteristics (i.e., experiences, values, and competences) have their say in the manifestations of agency at work. This is most clearly visible in the descriptions and discussions of identity agency. Further, the interplay between the individual and the social is elaborated, especially in participation in work communities and the resources offered by the structural and cultural affordances of the workplace. In addition, the studies seem to approach workplace learning more from a process-orientated rather than a learning-outcome approach.

1.3.2 Quantitative Studies Exploring the Structure and Resources of Agency

As most studies to date have been qualitative in nature, some scholars have called for more quantitative research that examines how agency relates to learning and development using larger samples and hypothesis-testing methods (e.g., Goller, 2017; Paloniemi & Goller, 2017). Currently, only a few studies have taken on this challenge in the context of workplace learning and professional development. On the one hand, some of them have started to develop and test measurement instruments that allow the operationalisation of agency in various contexts. On the other, some have already tested various hypotheses partially derived from prior qualitative work on the relationship between agency and workplace learning.

Vähäsantanen et al. (2019b) developed and validated the Professional Agency Measurement (PAM), which comprises 17 items. Professional agency was found to consist of three separate dimensions: (a) influencing at work (e.g., participation in the preparation of matters in one's work unit), (b) developing work practices (e.g., active collaboration with others in one's work unit), and (c) negotiating professional identity (e.g., realising professional goals in one's work). Empirically, it was possible to show that agency indeed comprises individual actions targeting either the actors' self—that is, her/his identity—or the work as such (see Sect. 1.2.1). The study also showed that the three dimensions of agency were closely linked to learning at work. Another study, utilising the PAM, examined how agency is related to employees' hierarchical and occupational position in an organisation (Vähäsantanen et al., 2019a). A multi-method study (utilising questionnaire data and semi-structured interviews) investigated the professional agency of academics in a Finnish university context. The findings showed that academics working in a leadership position reported stronger professional agency, especially in terms of influencing at work, than did the participating teachers and researchers. This was especially the case concerning decision-making and preparation for decisions in the work community (i.e., a university department). On the contrary, the teachers and researchers assessed their possibilities of influence at work as being as good as the leaders' only where limited to their own work.

Similarly, via adopting a multi-dimensional perspective on professional agency, Pyhältö et al. (2015) studied teachers' professional agency and learning in school communities. The findings of their survey study showed that teachers' professional agency as an integrative concept included five interrelated elements: (a) transforming the teaching practices, (b) collective efficacy, (c) positive interdependency, (d) mutual agreement, and (e) active help-seeking. Teacher agency was found to be a central determinant in the successful transformation of a school into an active community (see also Imants & Van der Wal, 2019). However, this kind of successful transformation requires the construction of a collaborative learning environment and offering learning opportunities to individual teachers, specifically in co-regulating stress. The meaning of agency-supportive leadership practices has also been underlined in qualitative studies focusing on the meaning of leadership in enhancing agency and learning at work (e.g., Collin et al., 2017; Hökkä et al., 2017, 2019a). It seems that leadership is an especially important resource in enabling transformational agency in work contexts.

Goller (2017) included both the dispositional and transformational perspectives in his study on the relationship between agency, workplace learning, and expertise development in the domain of geriatric care nursing. On the dispositional level, work agency was conceptualised via the three individual facets of agency competence, agency beliefs, and agency personality already described in Sect. 1.2.2. Further, agentic actions and choices (e.g., job enrichment, participation in institutionalised learning activities) were seen as a result of this agency disposition and reflecting the transformational perspective of the concept. The study aimed to empirically examine a model of impact relationships between work agency, agentic actions, and, ultimately, professional development (i.e., expertise) using

hypothesis-testing methods. The findings of his study confirmed that agency as a dispositional phenomenon is indeed a positive predictor of transformational agentic actions at work. In other words, individuals that could be characterised as agentic engaged more often in agentic actions at work than did less agentic ones. In addition, those nurses who deliberately aimed at job enrichment and participation in institutionalised learning activities exhibited higher expertise compared to the nurses who engaged less often in deliberate agentic actions. Based on his study, Goller (2017) concludes that work agency as an individual feature is a predictor of engagement in agentic actions at work and, thus, impacts on workplace learning and professional development (see also Goller & Harteis, 2017).

Overall, the research examples described above indicate that agency can be studied as a multidimensional phenomenon via quantitative measurement instruments across professional domains and industries. In addition, the instruments provide promising potential to explore in greater detail the relationship between agency and learning at work as well as the differences in agency between individuals, professional groups, work industries, and countries. In addition, the empirical studies to come will provide important knowledge with practical implications aimed at fostering professional learning in work contexts by supporting the agency of employees in various work environments.

1.4 Widening the Field: Constructs Investigating Similar Notions

Thus far, only literature that uses agency as an explicit and distinct concept has been discussed in this chapter. At the same time, however, ideas about agents that take control of their lives and environments are also summarised under labels other than agency. Indeed, within the literature, a range of concepts can be identified that conceptualise similar notions. In the paragraph below, we will focus on three that are explicitly related to professional learning and development: (a) proactivity, (b) self-regulation and self-regulated learning, and (c) entrepreneurship and intrapreneurship. Each of the concepts will be briefly introduced in relation to the ideas of agency described earlier in the chapter.

1.4.1 Proactivity

Within the organisational behaviour literature, notions of agency are discussed mainly under the label of proactivity at work (e.g., Crant, 2000; Grant & Ashford, 2008; Parker & Collins, 2010; Tornau & Frese, 2013). Proactivity describes all kinds of behaviours of employees that are self-initiated, future-oriented, and aim to change either the individual her/himself or her/his situational context (Bindl &

Parker, 2011). A part of the proactivity literature is concerned with the identification and conceptualisation of different phenomena in which employees (attempt to) initiate some kind of change. For instance, *voice* describes the idea of employees actively making constructive suggestions for change at work (Van Dyne & LePine, 1998), and *job crafting* subsumes all activities in which employees attempt to deliberately change the tasks and relational boundaries of their jobs (Wrzesniewski & Dutton, 2001). Other discussed phenomena are employees *taking charge* to initiate constructive change at work (Morrison & Phelps, 1999), making others aware of certain problems through *issue-selling* (Dutton & Ashford, 1993), actively *seeking feedback* about work performance or information about how to tackle work problems (Ashford & Cummings, 1983; Morrison, 1993), and deliberately engaging in active career planning (Parker & Collins, 2010). It follows that these ideas of proactive behaviour largely overlap with the transformational perspective of agency described above (see Sect. 1.2.1). At the same time, however, proactivity has also been discussed as a personality trait (*proactive personality*: Bateman & Crant, 1993; *personal initiative personality*: Fay & Frese, 2001), which explains why some individuals engage more often in proactive behaviours than others. In this sense, proactivity is also closely connected to the dispositional perspective of agency (see Sect. 1.2.2).

Besides this phenomenon-driven research, scholars interested in proactivity have also invested substantial effort in explaining the psychological mechanism behind proactive behaviours at work. Grant and Ashford (2008) proposed that all kinds of proactive behaviours follow a course of three phases that are related to certain cognitive processes. In the first phase, individuals have to anticipate and mentally represent possible future states that are (a) different from the status quo and (b) desirable to bring about. These possible futures can be related to oneself (i.e., a possible future self; see also Cross & Markus, 1991) or one's circumstances (i.e., the work environment). In the second phase, these mental representations of desired futures need to be translated into concrete goals as well as action plans that link those goals with actions and outcomes (Parker et al., 2010). In other words, planning is needed to come up with feasible ways to realise the desired future states. The last phase includes all actions that help to meet the goals envisioned in the planning phase and bring about the envisioned change. During these phases, individuals need to monitor their own progress continually to understand the potential requirements of regulating one's own action strategies (Parker et al., 2010). In this context, reflection is a necessary requisite.

Ideas about proactivity have stimulated a range of empirical studies. These studies have focused mainly on the identification of individual and situational antecedents of proactive behaviour as well as the consequences that result from employees' exercise of proactivity (see, e.g., Goller, 2017; for an overview of this empirical work, see Fuller & Marler, 2009; Tornau & Frese, 2013). Most studies about the consequences of proactivity have investigated some measure of individual-level or organisational performance. Such studies suggest that the relationship between proactivity and performance can be theoretically explained by employees developing knowledge and competences due to their proactive behaviour (e.g., through

feedback-seeking or intensive engagement with work problems; see Frese & Fay, 2001; Thomas et al., 2010). However, learning has not often been the focus of analysis in empirical studies investigating proactivity (see, however, Hornung et al., 2008).

1.4.2 Self-Regulation and Self-Regulated Learning

Theories of self-regulation are concerned with questions of how individuals set, follow, and reach their own goals (Zeidner et al., 2005). In addition, attention is given to how “people resist temptations, effortfully persist, and carefully weigh options to choose the optimal course of action to reach their goals” (Baumeister & Vohs, 2012, p. 180) in a range of different domains (e.g., health, education, sexual behaviour). Agency within such theories is understood as the executive function of the self—that is, the facet of the self that originates and controls all actions that are intentional and deliberate. However, self-regulation also subsumes processes in which individuals agentically resist urges, delay certain gratifications, or interrupt habitual responses that could prevent them from meeting pre-set goals (Baumeister & Vohs, 2012). This is an important aspect since human beings constantly face conflicting goals that have to be dealt with (e.g., having a relaxing weekend vs. writing a chapter for a book that is due soon). Self-regulation is also required when individuals are confronted with obstacles and barriers that prevent them from reaching their goals. In such instances, individuals need to either persist in the face of upcoming challenges or find new strategies that are adequate to deal with new problems encountered (Pintrich, 2005). In this sense, ideas of self-regulation strongly reflect the discussions regarding relational agency summarised in Sect. 1.2.3. Self-regulation explains how individuals deal with external stimuli in their environment and how they engage with it.

Research on self-regulation has brought forward a multitude of theories, models, and empirical studies (see, for an overview, e.g., Vohs & Baumeister, 2016). For instance, some scholars (e.g., Carver & Scheier, 1998, 2016) are interested in how individuals constantly adjust their actions to meet certain goals on different hierarchical levels. This process can be modelled using feedback loops in which an agent evaluates the current state of affairs in light of a desired one and adjusts her/his behaviour for as long as the standard of the end state is not reached (test-operate-test-exit model, see also Miller et al., 1960). In some models, such regulation processes are assumed to consume physiological as well as psychological resources and can only be maintained as long as those resources are available (e.g., Baumeister & Heatherton, 1996). Exercising self-regulation (i.e., making choices, monitoring progress to reach a goal, and finding new strategies to bypass obstacles) can lead to depletion effects that impair subsequent self-regulatory efforts until the required resources are re-established (Maranges & Baumeister, 2016). In other words, self-regulation is exhausting and cannot be continued indefinitely. This might explain why employees intensively exercise agency in one domain but not another. Apart

from this resource view, differences in individuals' self-regulation have also been explained by trait characteristics. Evidence exists that some people are more inclined to engage in self-regulation than others and that this tendency can be traced back to certain personality aspects (e.g., Hoyle, 2006). This facet of self-regulation overlaps with the dispositional perspective of agency described in Sect. 1.2.2.

Besides these general theories, self-regulation has also been explicitly discussed in reference to learning and development. In fact, quite a few different models have been developed to explain how learners regulate their learning to reach certain learning goals (e.g., Boekaerts, 1999, 2011; Winne & Hadwin, 1998; Zimmerman, 2005). A unifying element of these models is that they all explicitly incorporate not only cognitive processes but also motivational, emotional, as well as meta-cognitive ones. A detailed discussion of these models, including corresponding empirical evidence, is beyond the scope of the current work and can be found elsewhere (Panadero, 2017; Puustinen & Pulkkinen, 2001; Schunk & Greene, 2018).

1.4.3 *Entrepreneurship and Intrapreneurship*

Entrepreneurship and intrapreneurship are also two concepts closely related to the notion of agency (see, for discussions of the link between these concepts, e.g., Kreuzer et al., 2017; Obschonka et al., 2018). According to a rather broad definition, entrepreneurship describes the phenomenon of an individual investing time and effort to establish a new organisation that serves a certain purpose, such as offering products or services (Frese, 2009). The new organisation is thus not perforce profit-oriented and could also be non-profit. Much more relevant is that entrepreneurship is necessarily connected to the idea that an entrepreneur creates something new and therefore changes existing market conditions by detecting and seizing opportunities (Shane & Venkataraman, 2000). In other words, entrepreneurship is about value creation (Bruyat & Julien, 2001). The concept of intrapreneurship is used to describe any type of entrepreneurial effort conducted by employees within an existing organisation (Antoncic & Hisrich, 2001; Kreuzer et al., 2017). Constituent of intrapreneurship is that employees generate, promote, and realise ideas that lead to changes and innovations of organisational practices, routines, or structures (for a discussion of issues of intrapreneurship under the label of *innovative work behaviour*, see also Messmann & Mulder, 2017). Both entrepreneurship and intrapreneurship require actors to engage in agentic performance that includes active goal setting, exploration, execution and monitoring of action plans, as well as being persistent in the face of obstacles and challenges (Frese, 2009). Since entrepreneurship and intrapreneurship always aim at the creation of something new and, therefore, often the transformation of existing circumstances, both concepts are strongly related to the transformational perspective of agency discussed in Sect. 1.2.1.

Entrepreneurial and intrapreneurial actions bridge the gap between organisational and individual development. Although the focus of these actions is to bring about change in the actors' environments, they are also connected to individual

learning. On the one hand, it is the new experiences that entrepreneurs and intrapreneurs are exposed to during their actions, along with reflection on those experiences, that open up opportunities for learning and development (Goller & Billett, 2014; Messmann & Mulder, 2017). On the other hand, learning might be much more intentional. To establish new work practices within an organisation or even to create a novel organisation, individuals are required to understand, a priori, how a specific organisation or market, including all relevant stakeholders, works. In other words, entrepreneurs and intrapreneurs need to acquire knowledge actively that informs them how to initiate the intended change to be successful. Whether such subjective theories are helpful and correct can then be determined through experience and reflection (Frese, 2009; Messmann & Mulder, 2017).

1.4.4 Identifying the Common Theme and Explaining the Differences

All three concepts introduced above share a similar idea: human beings are active agents that take control over their selves and their environments by coming up with goals, weighing available options, making choices, transforming plans into action strategies, acting deliberately, being persistent in the face of challenges, and reflecting on their own performance in the world. In other words, the three concepts exhibit a strong conceptual overlap with the three perspectives of agency discussed in Sect. 1.2. Besides proactivity, self-regulation, and entrepreneurship or intrapreneurship, this is also true for other concepts, such as creativity (e.g., Karwowski & Beghetto, 2019) or self-determination (e.g., Little et al., 2004). Differences exist mainly based on which phenomena these concepts are intended to explain, the contexts in which the phenomena are usually embedded, and the vocabulary used to describe the processes behind the phenomena of interest.

Unfortunately, these concepts are only very seldom discussed under the same umbrella (see, however, Goller, 2017; Goller & Paloniemi, 2017). It instead seems that the different research branches remain largely disconnected and infrequently refer to one another. Of course, this is not specific to the idea of agency; rather, it often happens when scholars with different backgrounds are interested in similar phenomena (e.g., Billett et al., 2018; Bruner, 1990). Various researchers use their own theories and descriptors to discuss and explain the phenomena of interest to them (see also Eteläpelto, 2017). Such theoretical as well as terminological differences, however, then make it difficult for other scholars to find existing research and to relate their own ideas to it. In the worst case, this can lead to redundant research and a loss of potential synergy effects. It is therefore desirable that scholars engaged in discussions about agency-related phenomena take note of one another and try to integrate their different approaches into their respective work.

1.5 Summary

To sum up, one can argue that agency is a meaningful and helpful construct in understanding professional learning and development in workplace contexts. Despite the various conceptualisations and theoretical standpoints (i.e., transformational, dispositional, and relational perspectives), the growing body of empirical research within workplace learning studies emphasises the meaning of human agency in furthering one's professional development in workplace contexts. Instead of seeing the different conceptualisations as opposing each other, they offer a rich ground to understand agency at work comprehensively (Eteläpelto, 2017). At the same time, we urge scholars interested in researching agency to render transparent the conceptualisation(s) they adopt. Otherwise, the discussion of agency will remain abstract and vague, especially for scholars who are unfamiliar with the discourse in its entire breadth. In general, we believe that greater clarity in regard to discussions of agency is helpful to understand how agency relates to workplace learning and professional development.

Seeing employees as responsible actors in relation to their work communities and organisations affords possibilities for human resource development practices in the changing world of work. The explicit goal of enabling individuals to learn and work with organisations to develop simultaneously towards shared targets can be elaborated via agency-promoting practices. Empirical studies elaborating our understanding of what work-related agency is about and how to examine this multifaceted phenomenon in the future are well underway to fulfil the growing learning demands of individuals and work organisations. At the same time, we would recommend studies focus on how to support employees in exercising agency in work contexts. Such studies could either focus on the further identification of sociocultural factors that foster or hinder engagement in agentic actions as well as the individual factors that explain why individuals differ in how and the extent to which they exercise agency. In addition, scholars within the field of workplace learning and professional development could find it helpful to integrate research conducted in other scientific domains that tackle similar issues but do not use the term *agency*. Especially, research on proactivity and self-direction seems to be promising in this context (see also Goller, 2017). Further, in order to elaborate on how to support the agency and learning of employees at work, an integrated perspective taking into account both the individuals and the social circumstances is called for. The research referred to and described in this chapter offers promising examples of both theoretical as well as methodological developments in this field.

Workplace learning has been understood and studied from various perspectives. At its best, an agency perspective offers a comprehensive understanding of work practices, social relationships, and identity negotiations in studying professional learning and development in individuals' lives. What is worthy of notice here is that most of the studies have been conducted within the professional domains of education (especially the teaching profession), health care, or other knowledge-intensive work domains (such as information technology). One could argue that due to the

nature of the work of these professions, autonomy, proactivity, and self-initiated actions are expected from the practitioners. So far, only a few studies have focused on low-level professions or blue-collar work (e.g., Fuller & Unwin, 2017). Thus, there is a need to broaden the scope of work domains and the types of work communities studied in order to elaborate work-related agency more deeply. Studies of domains that have not been investigated yet in agency research can help us to understand further the mechanisms of how agency interrelates with structure and how the exercise of agency affects professional development.

In this chapter, we have focused on agency as an individual phenomenon. This has also been the focus and the level of analysis in most of the research conducted in the area. One should, however, keep in mind that the notion of agency at work is also a collective-level phenomenon. Of the three approaches described in this chapter (Sect. 1.2), the relational and transformational perspectives offer premises for studying collective work-related agency. To date, a few empirical studies have approached work-related agency in terms of collective manifestations in the workplace (e.g., Hökkä et al., 2019a). However, new elaborations of group-level (collective) agency and professional learning at work have recently been suggested and called for by Hager and Beckett (2019). In the changing context of work, the learning demands, processes, and practices are becoming more and more complex. This complexity presents new challenges for the conceptual and methodological understanding of both agency and learning at work. Further, it underlines the importance of researching the many meanings of agency in relation to the learning processes in work contexts, instead of merely concentrating on learning outcomes.

Until recently, most of the empirical studies utilising agency as a central concept in studying workplace learning have been qualitative in nature. Taking into account the suggested contextual nature of the phenomenon (e.g., Eteläpelto, 2017; Paloniemi & Goller, 2017), such an approach is understandable and reasonable. However, as Damşa et al. (2017) argue, this can lead towards multiple variations of the concept, raising questions regarding the separateness of these sub-concepts of agency as such. In avoiding this, the quantitative examinations focusing on the structure and maintenance of work-related agency have given us new insights for operationalising the concept. While more such examinations are needed, there is also room for methodological approaches utilising multi-method designs (see Damşa et al., 2017) as well as longitudinal designs for the elaboration of the phenomenon. Further, theoretical and methodological elaborations have the potential to obtain further understanding of agency, for example, in the dynamics of change in working life (Imants & Van der Wal, 2019).

In conclusion, the concept of agency is highly relevant to explaining learning and development in and for work, in our opinion. Therefore, although both the conceptualisation of agency and its empirical investigation have made much progress in recent years, we want to urge both up-and-coming as well as established scholars to continue their efforts to research work-related learning and development processes using, among others, an agency perspective in their academic endeavours.

References

- Anderson, J. R. (1982). Acquisition of cognitive skill. *Psychological Review*, 89(4), 369–406. <https://doi.org/10.1037/0033-295X.89.4.369>
- Anderson, J. R. (1993). Problem solving and learning. *American Psychologist*, 48(1), 35–44. <https://doi.org/10.1037/0003-066X.48.1.35>
- Antonicic, B., & Hisrich, R. D. (2001). Intrapreneurship: Construct refinement and cross-cultural validation. *Journal of Business Venturing*, 16(5), 495–527. [https://doi.org/10.1016/S0883-9026\(99\)00054-3](https://doi.org/10.1016/S0883-9026(99)00054-3)
- Ashford, S. J., & Cummings, L. L. (1983). Feedback as an individual resource: Personal strategies of creating information. *Organizational Behavior and Human Performance*, 32(3), 370–398. [https://doi.org/10.1016/0030-5073\(83\)90156-3](https://doi.org/10.1016/0030-5073(83)90156-3)
- Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, 52(1), 1–26. <https://doi.org/10.1146/annurev.psych.52.1.1>
- Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science*, 1(2), 164–180. <https://doi.org/10.1111/j.1745-6916.2006.00011.x>
- Bateman, T. S., & Crant, J. M. (1993). The proactive component of organizational behavior: A measure and correlates. *Journal of Organizational Behavior*, 14(2), 103–118. <https://doi.org/10.1002/job.4030140202>
- Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry*, 7(1), 1–15. https://doi.org/10.1207/s15327965pli0701_1
- Baumeister, R. F., & Vohs, K. D. (2012). Self-regulation and the executive function of the self. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (2nd ed., pp. 180–197). Guilford.
- Billett, S. (2000). Guided learning at work. *Journal of Workplace Learning*, 12(7), 272–285. <https://doi.org/10.1108/13665620010353351>
- Billett, S. (2001). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning*, 13(5), 209–214. <https://doi.org/10.1108/EUM0000000005548>
- Billett, S. (2004). Workplace participatory practices: Conceptualising workplaces as learning environments. *Journal of Workplace Learning*, 16(6), 312–324. <https://doi.org/10.1108/13665620410550295>
- Billett, S. (2006). Relational interdependence between social and individual agency in work and working life. *Mind, Culture, and Activity*, 13(1), 53–69. https://doi.org/10.1207/s15327884mca1301_5
- Billett, S. (2011). Subjectivity, self and personal agency in learning through and for work. In M. Malloch, L. Cairns, K. Evans, & B. O’Conner (Eds.), *The international handbook of workplace learning* (pp. 60–72). Sage.
- Billett, S., & Smith, R. (2006). Personal agency and epistemology at work. In S. Billett, T. Fenwick, & M. Somerville (Eds.), *Work, subjectivity and learning* (pp. 141–156). Springer.
- Billett, S., Harteis, C., & Gruber, H. (2018). Developing occupational expertise through work activities and interactions. In K. A. Ericsson et al. (Eds.), *The Cambridge handbook on expertise* (pp. 105–126). Cambridge University Press.
- Bindl, U. K., & Parker, S. K. (2011). Proactive work behavior: Forward-thinking and change-oriented action in organizations. In S. Zedeck (Ed.), *APA handbook of industrial and organizational psychology* (Selecting and developing members for the organization) (Vol. 2, pp. 567–598). American Psychological Association.
- Boekaerts, M. (1999). Self-regulated learning: Where we are today. *International Journal of Educational Research*, 31(6), 445–457. [https://doi.org/10.1016/S0883-0355\(99\)00014-2](https://doi.org/10.1016/S0883-0355(99)00014-2)
- Boekaerts, M. (2011). Emotions, emotion regulation, and self-regulation of learning. In B. J. Zimmerman & D. H. Schunk (Eds.), *Handbook of self-regulation of learning and performance* (pp. 408–425). Routledge.

- Boshuizen, H. P. A., & Schmidt, H. G. (1992). On the role of biomedical knowledge in clinical reasoning by experts, intermediates and novices. *Cognitive Science*, *16*(2), 153–184. https://doi.org/10.1207/s15516709cog1602_1
- Boshuizen, H. P. A., & Schmidt, H. G. (2008). The development of clinical reasoning expertise. In J. Higgs (Ed.), *Clinical reasoning in the health professions* (pp. 113–121). Elsevier.
- Bruner, J. (1990). *Acts of meaning*. Harvard University Press.
- Bruyat, C., & Julien, P.-A. (2001). Defining the field of research in entrepreneurship. *Journal of Business Venturing*, *16*(2), 165–180. [https://doi.org/10.1016/S0883-9026\(99\)00043-9](https://doi.org/10.1016/S0883-9026(99)00043-9)
- Bryson, J., Pajo, K., Ward, R., & Mallon, M. (2006). Learning at work: Organisational affordances and individual engagement. *Journal of Workplace Learning*, *18*(5), 279–297. <https://doi.org/10.1108/13665620610674962>
- Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. Cambridge UP.
- Carver, C. S., & Scheier, M. F. (2016). Self-regulation of action and affect. In K. D. Vohs & R. F. Baumeister (Eds.), *Handbook of self-regulation: Research, theory, and applications* (3rd ed., pp. 3–23). The Guilford Press.
- Collin, K., Lemmetty, S., Herranen, S., Paloniemi, S., Auvinen, T., & Riivari, E. (2017). Professional agency and creativity in information technology work. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 249–270). Springer.
- Crant, J. M. (2000). Proactive behavior in organizations. *Journal of Management*, *26*(3), 435–462. <https://doi.org/10.1177/014920630002600304>
- Cross, S., & Markus, H. (1991). Possible selves across the life span. *Human Development*, *34*(4), 230–255. <https://doi.org/10.1159/000277058>
- Damşa, C. I., Froehlich, D. E., & Gegenfurtner, A. (2017). Reflections on empirical and methodological accounts of agency at work. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 445–461). Springer.
- DeCharms, R. (1968). *Personal causation: The internal affective determinants of behavior*. Academic.
- Dutton, J. E., & Ashford, S. J. (1993). Selling issues to top management. *Academy of Management Review*, *18*(3), 397–428. <https://doi.org/10.5465/AMR.1993.9309035145>
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, *95*(2), 256–273. <https://doi.org/10.1037/0033-295X.95.2.256>
- Edwards, A. (2005). Relational agency: Learning to be a resourceful practitioner. *International Journal of Educational Research*, *43*(3), 168–182. <https://doi.org/10.1016/j.ijer.2006.06.010>
- Edwards, A. (2009). Relational agency in collaborations for the well-being of children and young people. *Journal of Children's Services*, *4*(1), 33–43. <https://doi.org/10.1108/17466660200900004>
- Edwards, A. (2010). *Being an expert professional practitioner: The relational turn in expertise*. Springer.
- Edwards, A., & Mackenzie, L. (2005). Steps towards participation: The social support of learning trajectories. *International Journal of Lifelong Education*, *24*(4), 287–302. <https://doi.org/10.1080/02601370500169178>
- Elder, G. H., & Shanahan, M. J. (2007). The life course and human development. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology* (pp. 665–715). John Wiley.
- Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology*, *103*(4), 962–1023. <https://doi.org/10.1086/231294>
- Eraut, M. (2007). Learning from other people in the workplace. *Oxford Review of Education*, *33*(4), 403–422. <https://doi.org/10.1080/03054980701425706>
- Eteläpelto, A. (2017). Emerging conceptualisations on professional agency and learning. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 183–201). Springer.
- Eteläpelto, A., Vähäsantanen, K., Hökkä, P., & Paloniemi, S. (2013). What is agency? Conceptualizing professional agency at work. *Educational Research Review*, *10*, 45–65. <https://doi.org/10.1016/j.edurev.2013.05.001>

- Eteläpelto, A., Vähäsantanen, K., Hökkä, P., & Paloniemi, S. (2014). Identity and agency in professional learning. In S. Billett, C. Harteis, & H. Gruber (Eds.), *International handbook of research in professional and practice-based learning* (pp. 645–672). Springer.
- Evans, K., & Kersh, N. (2006). Learner biographies, workplace practices, and learning. In H. Rainbird, P. Hodgkinson, A. Munro, & K. Evans (Eds.), *Improving workplace learning* (pp. 68–94). Routledge.
- Fay, D., & Frese, M. (2001). The concept of personal initiative: An overview of validity studies. *Human Performance, 14*(1), 97–124. https://doi.org/10.1207/S15327043HUP1401_06
- Frese, M. (2009). Towards a psychology of entrepreneurship: An action theory perspective. *Foundations and Trends in Entrepreneurship, 5*(6), 437–496. <https://doi.org/10.1561/03000000028>
- Frese, M., & Fay, D. (2001). Personal initiative: An active performance concept for work in the 21st century. *Research in Organizational Behavior, 23*, 133–187. [https://doi.org/10.1016/S0191-3085\(01\)23005-6](https://doi.org/10.1016/S0191-3085(01)23005-6)
- Fuller, B., & Marler, L. E. (2009). Change driven by nature: A meta-analytic review of the proactive personality literature. *Journal of Vocational Behavior, 75*(3), 329–345. <https://doi.org/10.1016/j.jvb.2009.05.008>
- Fuller, A., & Unwin, L. (2017). Job crafting and identity in low-grade work: How hospital porters redefine the value of their work and expertise. *Vocations and Learning, 10*, 307–324. <https://doi.org/10.1007/s12186-017-9173-z>
- Goller, M. (2017). *Human agency at work: An active approach towards expertise development*. Springer VS.
- Goller, M., & Billett, S. (2014). Agentic behaviour at work: Crafting learning experiences. In C. Harteis, A. Rausch, & J. Seifried (Eds.), *Discourses on professional learning: On the boundary between learning and working* (pp. 25–44). Springer.
- Goller, M., & Harteis, C. (2017). Human agency at work: Towards a clarification and operationalisation of the concept. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 85–103). Springer.
- Goller, M., & Paloniemi, S. (2017). *Agency at work: An agentic perspective on professional learning and development*. Springer.
- Grant, A. M., & Ashford, S. J. (2008). The dynamics of proactivity at work. *Research in Organizational Behavior, 28*, 3–34. <https://doi.org/10.1016/j.riob.2008.04.002>
- Gruber, H. (1999). *Erfahrung als Grundlage kompetenten Handelns* [Experience as foundation of competent action]. Huber.
- Gustavsson, M. (2007). The potential for learning in industrial work. *Journal of Workplace Learning, 19*(7), 453–463. <https://doi.org/10.1108/13665620710819393>
- Hager, P. (2013). Theories of workplace learning. In M. Malloch, L. Cairns, K. Evans, & B. O’Conner (Eds.), *The SAGE handbook of workplace learning* (pp. 17–31). Sage.
- Hager, P., & Beckett, D. (2019). Fresh approaches to agency and learning. In P. Hager & D. Beckett (Eds.), *The emergency of complexity. Perspectives on rethinking and reforming education* (pp. 221–247). Springer.
- Harteis, C., & Goller, M. (2014). New skills for new jobs: Work agency as a necessary condition for successful lifelong learning. In S. Billett, T. Halttunen, & M. Koivisto (Eds.), *Promoting, assessing, recognizing and certifying lifelong learning: International perspectives and practices* (pp. 37–56). Springer.
- Harwood, J., & Froehlich, D. E. (2017). Proactive feedback-seeking, teaching performance, and flourishing amongst teachers in an international primary school. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 425–444). Springer.
- Hitlin, S., & Elder, G. H. (2007a). Agency: An empirical model of an abstract concept. *Advances in Life Course Research, 11*, 33–67. [https://doi.org/10.1016/S1040-2608\(06\)11002-3](https://doi.org/10.1016/S1040-2608(06)11002-3)
- Hitlin, S., & Elder, G. H. (2007b). Time, self, and the curiously abstract concept of agency. *Sociological Theory, 25*(2), 170–191. <https://doi.org/10.1111/j.1467-9558.2007.00303.x>

- Hökkä, P., Vähäsantanen, K., Paloniemi, S., & Eteläpelto, A. (2017). The reciprocal relationship between emotions and agency in the workplace. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 161–182). Springer.
- Hökkä, P., Rautiainen, M., Silander, T., & Eteläpelto, A. (2019a). Collective agency-promoting leadership in Finnish teacher education. In J. Murray, A. Swennen, & C. Kosnik (Eds.), *International research, policy and practice in teacher education: Insider perspectives* (pp. 15–29). Springer.
- Hökkä, P., Vähäsantanen, K., Paloniemi, S., Herranen, S., & Eteläpelto, A. (2019b). Emotions in leaders' enactment of professional agency. *Journal of Workplace Learning*, 31(2), 143–165. <https://doi.org/10.1108/JWL-07-2018-0086>
- Hornung, S., Rousseau, D. M., & Glaser, J. (2008). Creating flexible work arrangements through idiosyncratic deals. *Journal of Applied Psychology*, 93(3), 655–664. <https://doi.org/10.1037/0021-9010.93.3.655>
- Hoyle, R. H. (2006). Personality and self-regulation: Trait and information-processing perspectives. *Journal of Personality*, 74(6), 1507–1526. <https://doi.org/10.1111/j.1467-6494.2006.00418.x>
- Imants, J., & Van der Wal, M. (2019). A model of teacher agency in professional development and school reform. *Journal of Curriculum Studies*. <https://doi.org/10.1080/00220272.2019.1604809>. Online First.
- Karwowski, M., & Beghetto, R. A. (2019). Creative behavior as agentic action. *Psychology of Aesthetics, Creativity, and the Arts*. <https://doi.org/10.1037/aca0000190>. Online First.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
- Kolodner, J. L. (1983). Towards an understanding of the role of experience in the evaluation from novice to expert. *International Journal of Man-Machine Studies*, 19(5), 497–518. [https://doi.org/10.1016/S0020-7373\(83\)80068-6](https://doi.org/10.1016/S0020-7373(83)80068-6)
- Kreuzer, C., Weber, S., Bley, S., & Wiethe-Körprich, M. (2017). Measuring intrapreneurship competence as a manifestation of work agency in different educational settings. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 373–399). Springer.
- Little, T. D., Hawley, P. H., Henrich, C. C., & Marsland, K. W. (2004). Three views of the agentic self: A developmental synthesis. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 389–404). The University of Rochester Press.
- Maranges, H. M., & Baumeister, R. F. (2016). Self-control and ego depletion. In K. D. Vohs & R. F. Baumeister (Eds.), *Handbook of self-regulation: Research, theory, and applications* (3rd ed., pp. 42–61). The Guilford Press.
- Messmann, G., & Mulder, R. H. (2017). Proactive employees: The relationship between work-related reflection and innovative work behaviour. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development agency at work* (Vol. 20, pp. 141–159). Springer.
- Miller, G. A., Galanter, E., & Pribram, K. H. (1960). *Plans and the structure of behavior*. Henry Holt and Co.
- Morrison, E. W. (1993). Newcomer information seeking: Exploring types, modes, sources, and outcomes. *Academy of Management Journal*, 36(3), 557–589. <https://doi.org/10.2307/256592>
- Morrison, E. W., & Phelps, C. C. (1999). Taking charge at work: Extrarole efforts to initiate workplace change. *Academy of Management Journal*, 42(4), 403–419. <https://doi.org/10.2307/257011>
- Mulder, R. (2014). *Discussion of the symposium "Theorising and modelling professional agency"*. Presentation presented at EARI SIG 14 conference, Oslo.
- Obschonka, M., Hahn, E., & ul Habib Bajwa, N. (2018). Personal agency in newly arrived refugees: The role of personality, entrepreneurial cognitions and intentions, and career adaptability. *Journal of Vocational Behavior*, 105, 173–184. <https://doi.org/10.1016/j.jvb.2018.01.003>

- Paloniemi, S., & Goller, M. (2017). The multifaceted nature of agency and professional learning. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 465–478). Springer.
- Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, 8, 422. <https://doi.org/10.3389/fpsyg.2017.00422>
- Pappa, S., Moate, J., Ruohotie-Lyhty, M., & Eteläpelto, A. (2017a). Teacher agency within the Finnish CLIL context: Tensions and resources. *International Journal of Bilingual Education and Bilingualism*, 1–21. <https://doi.org/10.1080/13670050.2017.1286292>
- Pappa, S., Moate, J., Ruohotie-Lyhty, M., & Eteläpelto, A. (2017b). Teachers' pedagogical and relational identity negotiation in the Finnish CLIL context. *Teaching and Teacher Education*, 65, 61–70. <https://doi.org/10.1016/j.tate.2017.03.008>
- Parker, S. K., & Collins, C. G. (2010). Taking stock: Integrating and differentiating multiple proactive behaviors. *Journal of Management*, 36(3), 633–662. <https://doi.org/10.1177/0149206308321554>
- Parker, S. K., Bindl, U. K., & Strauss, K. (2010). Making things happen: A model of proactive motivation. *Journal of Management*, 36(4), 827–856. <https://doi.org/10.1177/0149206310363732>
- Pintrich, P. R. (2005). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 452–502). Academic.
- Puustinen, M., & Pulkkinen, L. (2001). Models of self-regulated learning: A review. *Scandinavian Journal of Educational Research*, 45, 269–282. <https://doi.org/10.1080/00313830120074206>
- Pyhältö, K., Pietarinen, J., & Soini, T. (2015). Teachers' professional agency and learning – From adaption to active modification in the teacher community. *Teachers and Teaching*, 21(7), 811–830. <https://doi.org/10.1080/13540602.2014.995483>
- Raemdonck, I. (2006). *Self-directedness in learning and career processes. A study in lower-qualified employees in Flanders*. Doctoral dissertation. Universiteit Gent.
- Raemdonck, I., Gijbels, D., & van Groen, W. (2014). The influence of job characteristics and self-directed learning orientation on workplace learning: Job characteristics and self-directed learning orientation. *International Journal of Training and Development*, 18(3), 188–203. <https://doi.org/10.1111/ijtd.12028>
- Raemdonck, I., Thijssen, J., & de Greef, M. (2017). Self-directedness in work-related learning processes: Theoretical perspectives and development of a measurement instrument. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 401–423). Springer.
- Schley, T., & van Woerkom, M. (2014). Reflection and reflective behaviour in work teams. In C. Harteis, A. Rausch, & J. Seifried (Eds.), *Discourses on professional learning* (pp. 113–139). Springer.
- Schlosser, M. (2015). Agency. In E. N. Zalta (Ed.), *The stanford encyclopedia of philosophy* (Vol. Fall 2015). Stanford University.
- Schunk, D. H., & Greene, J. A. (Eds.). (2018). *Handbook of self-regulation of learning and performance* (2nd ed.). Routledge.
- Shanahan, M. J., & Elder, G. H. (2002). History, agency, and the life course. In L. J. Crockett (Ed.), *Agency, motivation, and the life course: Volume 48 of the Nebraska symposium on motivation* (pp. 145–186). University of Nebraska Press.
- Shanahan, M. J., & Hood, K. E. (2000). Adolescents in changing social structures: Bounded agency in life course perspective. In L. J. Crockett & R. K. Silbereisen (Eds.), *Negotiating adolescence in times of social change* (pp. 123–134). Cambridge University Press.
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1), 217–226. <https://doi.org/10.5465/amr.2000.2791611>
- Smith, R. (2006). Epistemological agency in the workplace. *Journal of Workplace Learning*, 18(3), 157–170. <https://doi.org/10.1108/13665620610654586>
- Smith, R. (2017). Three aspects of epistemological agency: The socio-personal construction of work-learning. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 67–84). Springer.

- Thomas, J. P., Whitman, D. S., & Viswesvaran, C. (2010). Employee proactivity in organizations: A comparative meta-analysis of emergent proactive constructs. *Journal of Occupational and Organizational Psychology*, 83(2), 275–300. <https://doi.org/10.1348/096317910X502359>
- Tornau, K., & Frese, M. (2013). Construct clean-up in proactivity research: A meta-analysis on the nomological net of work-related proactivity concepts and their incremental validities. *Applied Psychology*, 62(1), 44–96. <https://doi.org/10.1111/j.1464-0597.2012.00514.x>
- Tynjälä, P. (2013). Toward a 3-P model of workplace learning: A literature review. *Vocations and Learning*, 6(1), 11–36. <https://doi.org/10.1007/s12186-012-9091-z>
- Vähäsantanen, K., Paloniemi, S., Räikkönen, E., & Hökkä, P. (2019a). Professional agency in a university context: Academic freedom and fetters. *Teaching and Teacher Education*, 89, 12 pages. <https://doi.org/10.1016/j.tate.2019.103000>
- Vähäsantanen, K., Räikkönen, E., Paloniemi, S., Hökkä, P., & Eteläpelto, A. (2019b). A novel instrument to measure the multidimensional structure of professional agency. *Vocations and Learning*, 12, 267–295. <https://doi.org/10.1007/s12186-018-9210-6>
- Van Dyne, L., & LePine, J. A. (1998). Helping and voice extra-role behaviors: Evidence of construct and predictive validity. *Academy of Management Journal*, 41(1), 108–119. <https://doi.org/10.2307/256902>
- Vohs, K. D., & Baumeister, R. F. (Eds.). (2016). *Handbook of self-regulation: Research, theory, and applications* (3rd ed.). The Guilford Press.
- Wall, T., Tran, L. T., & Soejatminah, S. (2017). Inequalities and agencies in workplace learning experiences: International student perspectives. *Vocations and Learning*, 10(2), 141–156. <https://doi.org/10.1007/s12186-016-9167-2>
- Winne, P. H., & Hadwin, A. F. (1998). Studying as self-regulated engagement in learning. In D. Hacker, J. Dunlosky, & A. Graesser (Eds.), *Metacognition in educational theory and practice* (pp. 277–304). Erlbaum.
- Wrzesniewski, A., & Dutton, J. E. (2001). Crafting a job: Revisioning employees as active crafters of their work. *Academy of Management Review*, 26(2), 179–201. <https://doi.org/10.5465/AMR.2001.4378011>
- Zeidner, M., Boekaerts, M., & Pintrich, P. R. (2005). Self-regulation. Directions and challenges for future research. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 749–768). Academic Press.
- Zimmerman, B. J. (2005). Attaining self-regulation. A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Academic Press.

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Chapter 2

Professional Identity in Changing Workplaces: Why It Matters, When It Becomes Emotionally Imbued, and How to Support Its Agentic Negotiations



Katja Vähäsantanen

Abstract This chapter addresses professional identity in the workplace. The relevance of the topic derives from current trends in working life, in which constant changes require continuous professional identity negotiations. In addition, employees are increasingly obliged to recognise and make visible their professional identity in order to navigate and survive in the complexities of working life. This chapter provides an overview of the conceptual frameworks, topics, and empirical evidence pertaining to professional identity, as presented in workplace learning literature. From this, it provides suggestions for researching and elaborating professional identity, with particular attention to relational, agentic, and emotional perspectives over time. It further opens up discussion on the kinds of workplace pedagogies and practices that might support individuals' professional identity negotiations amid chaotic working life situations. Overall, this chapter has relevance for scholars and practitioners who seek to research and/or foster professional identity negotiations in the workplace.

Keywords Emotions · Professional agency · Professional identity negotiation · Sociocultural approach · Work · Workplace pedagogy

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2.1 Introduction

Professional identity is generally understood as individuals' understanding of themselves as professionals – including their professional interests, values, identifications, and ambitions (Brown et al., 2007; Kira & Balkin, 2014; Vähäsantanen et al., 2017). The topic is of particular relevance in contemporary working life, given the economic, managerial, societal, and technological changes that are taking place in the twenty-first century, with work organisations being increasingly expected to develop not only their work practices, but also their organisational cultures and structures (Billett, 2010; Haapakorpi & Alasoini, 2018; Harteis, 2018; Tynjälä, 2013). Consequently, the daily work in a range of professions has changed in such a way that individuals face many simultaneous requirements. In particular, they encounter requirements to cross traditional (professional and organisational) boundaries, to share their expertise within social relationships, to negotiate their career pathways continuously, to be innovative, to be flexible in their work communities and employment relationships, and to develop their professional competencies (Billett et al., 2014; Chappell et al., 2007). In addition, professionals face pressures to learn about themselves, via a cultivated understanding of who they are as professionals in relation to changed work (Kira & Balkin, 2014; Molleman & Rink, 2015). In other words, individuals need to engage in continuous professional identity negotiations if they are to plot a course through complex work environments (Buch & Andersen, 2013; Vähäsantanen et al., 2017). The needs for continuous identity negotiations also emerge from breaks and discontinuities in careers (e.g. from a period of unemployment), and from a general increase in short-term work contracts.

Going beyond this, the portrayal and branding of professional identities has today become an important aspect of working (Buch & Andersen, 2013; Eteläpelto, 2008). In particular, recent trends in working life (e.g. boundaryless careers and increased project work) require that individuals should become aware of, make visible, and market their professional identity, for example via social media. It is also crucial for individuals to recognise and demonstrate their professional strengths, values, and ambitions in their portfolios and CVs, in situations involving competition for new posts and contracts (e.g. Fenwick, 2004).

The relevance of professional identity is further underlined by several phenomena that are of crucial importance for working and learning in the workplace (Billett, 2018; Collin, 2009). Professional identities mediate what people (want to) learn, how they make choices and decisions at work, and how they influence work-related matters (Brown, 2015; Eteläpelto et al., 2014). Professional identity is also connected to employees' behaviour and motivation, their interaction with other people, their commitment to work, and their sense of meaningfulness in the work (Brown et al., 2007; Kira & Balkin, 2014; Molleman & Rink, 2015). Consequently, professional identity can be seen as a key to understanding and explaining almost everything that happens at work, and in the vicinity of the workplace.

Professional identity is undoubtedly at the core of working and learning in the workplace (Eteläpelto, 2008; Tynjälä, 2013), yet (at least as applied to workplace

learning) it remains surprisingly under-explored. This chapter (which broadly follows a socio-cultural approach¹) considers the research that has so far been conducted on professional identity in the domain of workplace learning, and provides avenues for its further investigation. In addition, it encompasses research in education, management, and organisational studies, since professional identity has been viewed as crucial in these areas. Note, however, that the focus of this chapter is restricted to persons who are actually employed as professionals. Thus, it does not address, for example, the potential professional identity of students in vocational and higher education.

Below, various conceptualisations of professional identity are presented, followed by sections on how professional identity can be approached from relational, emotional, and agentic perspectives. Thereafter, identity is elaborated from temporal and pragmatic viewpoints. The final section gives an overview of the implications for research and practice in professional identity, including some reflections on research methodology. Overall, this chapter is intended to offer a comprehensive perspective for conducting professional identity research in the field of workplace learning, and to benefit practitioners with an interest in supporting professional identity negotiations in the workplace.

2.2 Conceptualising Professional Identity

Although professional identity is viewed as a crucial topic in working life, research on professional identity has so far been conducted with no shared theoretical understanding of the construct. Yet even if the concept remains vague, one can say that on a general level, professional identity refers to individuals' subjectively constructed conceptions of themselves as professional subjects at work (Billett, 2010, 2018; Eteläpelto et al., 2014). This means that professional identity encompasses a range of aspects pertaining to work and professional lives, but does not really extend to areas and activities outside the work. It should be noted that the term 'professional' here implies an identity constructed within a spectrum of work-related matters; hence, it does not refer to 'the professions' in the traditional sense, as in the work of lawyers or doctors.

In particular, professional identity can be theorised as a construct covering different core aspects of one's work, considered in terms of the individual's *past*, *present*, and *future*. In the first place, this encompasses the notion that professional identity

¹The socio-cultural approach emphasises that professional identity is negotiated in mutual interactions between individual and social settings. Furthermore, professional identity is often theorised with reference to psychological, sociological, and postmodern viewpoints (see e.g. Billett, 2010; Brown, 2015; Kira & Balkin, 2014). In contrast with these approaches, this chapter emphasises the role of the *reciprocal* relationships between the individual and the social context (rather than uniquely the individual *or* social context). Moreover, professional identity is not viewed as necessarily a stable phenomenon on the one hand, or as a mutating phenomenon on the other.

is based on individuals' previous experiences and life-history. It also captures individuals' current professional interests, goals, values, and ambitions, extending further to their ethical standards and beliefs, their perceptions of the meaningful responsibilities at work, and their professional commitments and identifications at work (Eteläpelto et al., 2014; Pratt et al., 2006). Beyond this, some scholars look at professional identity in terms of professional competencies. In this sense, identity would include employees' current understanding of their own professional knowledge, skills, and expertise, plus their understanding of their strengths and weaknesses in these areas (e.g. Chappell et al., 2007; van Veen & Slegers, 2009).

Going beyond retrospective and current perspectives, professional identity includes also professionals' future prospects, orientations, career plans, and notions of the kind of professional that they desire to be (Beijaard et al., 2004; Ruohotie-Lyhty & Moate, 2016). All this means that professional identity should be understood in the context of the entire life course of an individual. One could also say that it is bound up with answers to three questions, namely 'How have I become a professional?', 'Who am I as a professional at the moment?', 'Who do I want to become as a professional in the future?' (Beijaard et al., 2004; Brown, 2015; Kira & Balkin, 2014).

Quite recently, a fairly comprehensive definition of professional identity has been proposed by Davey (2013). In this definition, professional identity is conceptualised as a combination of *becoming* (including motivations and initial reasons for choosing a specific profession, professional biography, career plans), *being* (including professional values, personae), *knowing* (e.g. in the form of professional knowledge and skills), and *doing* (e.g. professional activities, key tasks). This conceptualisation is broadly in line with the definitions provided above, differing only in the particular emphasis placed on *doing* as an element in professional identity.

Although professional identity has mainly been addressed as an individual-level phenomenon, it should be noted that this perspective has limitations (Miscenko & Day, 2016). In fact, there also exists the phenomenon of collective professional identity, which encompasses answers to the question, 'Who are we together as professionals, or as a group at work?' Collective identity can thus refer to the memberships, mutual identifications and attachments, group affinities, and engagements that bind individuals as a professional group; it extends to the affinities they feel, and to their shared professional commitments, values, and priorities (Davey, 2013; Hökkä et al., 2017). Davey (2013) has further emphasised the importance of 'belonging' with regard to the collective identity of professionals. The aspect of belonging, or of simple membership, is related to the communities that the professionals feel part of, and to the shared community affiliations that they hold (see also Barbour & Lammers, 2015). Such a notion of collective identity further emphasises the significance of the ways in which professionals see themselves as a valued professional group.

Collective professional identity is a topical research area, since there is an increasing need for employees to collaborate with others, working in a wide range of multidisciplinary groups and professional communities. The existence of a

jointly-built and shared collective identity makes collaboration easier, and it creates a foundation for shared influencing and developmental activities. Moreover, it has significance in terms of effectiveness and team performance (e.g. Miscenko & Day, 2016; Vähäsantanen et al., 2017).

With the definitions presented above in mind, this chapter suggests that professional identity could usefully be elaborated as a *multidimensional* phenomenon, covering the following aspects from *different time perspectives*, and taking into account the *collective* aspect of professional identity:

- Initial motivations towards one's profession; professional experiences and biography (the *retrospective view*).
- Professional goals, missions, and interests; professional values and ethics; professional commitments and identifications; an understanding of professional competencies (the *current view*).
- Future prospects, orientations, and goals; future aspirations and desires; career plans (the *prospective view*).
- Mutual identification and belonging; group affinities and engagement; shared professional commitments and values (the *collective view*).

Considering these aspects as a whole, it seems reasonable to suppose that empirical investigations could approach professional identity from one or more of the perspectives mentioned above.

The conceptualisation of professional identity presented above seems reasonably comprehensive. However, it may be observed that the definition does not capture work descriptions and tasks (i.e. the *doing* element) as part of professional identity (Davey, 2013). In fact, within the present chapter, work and professional identity are considered to be distinct phenomena, even if they are closely related to each other. This being so, the following section seeks to address in more detail the relationship between professional identity and work. The perspective applied highlights the *relational* nature of professional identity, without ignoring *individual* and *emotional* perspectives on identity.

2.3 The Individual and Emotional Relationship Between Professional Identity and Work

One way to approach professional identity is to focus on the relationship between professional identity and work (Barbour & Lammers, 2015; Kira & Balkin, 2014; Miscenko & Day, 2016; Vähäsantanen & Hämäläinen, 2019). For its part, work is understood as covering professional tasks, duties, and responsibilities. It encompasses also other people (e.g. colleagues and clients), the work culture and power relations, organisational order and logics, and the social suggestions, norms, and expectations that apply to individuals' work in their work environments. The relational approach to professional identity can be applied in a range of ways.

The relationship between professional identity and work has generally been recognised as challenging and complex, since employees' professional aspirations and values often confront competing and tensioned expectations deriving from changing social settings (Beijaard et al., 2004; Pratt et al., 2006). Several scholars have thus been led to investigate this relationship in terms of tensions (Arvaja, 2018; Pillen et al., 2013; van der Wal et al., 2019), strains, (Buch & Andersen, 2013), and threats (Miscenko & Day, 2016).

Looking at the matter more precisely, the conceptual model of Kira and Balkin (2014) suggests that the relationships between work and identity can vary in such a way that both alignments and misalignments can emerge from work–identity encounters. Empirical studies, too, have addressed this relationship (e.g. Paloniemi & Collin, 2010). For example, a study by Vähäsantanen and Hämäläinen (2019) revealed the harmonious – but also tensioned – relationships between the various characteristics of the work and vocational teachers' identities. Their study also shed light on the individual nature of this relationship, indicating that even within the same profession and organisation, teachers had different experiences of the relationship between their professional identities and their changing work. Hence, in order to understand the complex and nuanced nature of working life and professional identity, it may be preferable to consider both positive and negative types of identity–work encounters.

An appreciation of the nuanced nature of the identity–work relationship can enhance awareness of what makes work meaningful for employees, and what influences their wellbeing, organisational commitment, work performance, and learning at work (Akkerman & Meijer, 2011; Billett, 2018; Kira & Balkin, 2014). Where a balanced relationship exists, employees and organisations will tend to thrive and develop. In the opposite case, individuals may well become discouraged or apathetic, seeking to leave their work organisation in order to find a more meaningful professional home for their identities (Vähäsantanen & Eteläpelto, 2015).

It is also important to notice the range of emotions that can emerge from professional identity–work relationships (Kira & Balkin, 2014). While a tensioned relationship elicits emotions such as frustration, confusion, and inadequacy, a balanced relationship gives rise to emotions such as joy, enthusiasm, and satisfaction (Pillen et al., 2013; Ursin et al., 2020; Vähäsantanen & Hämäläinen, 2019). For example, these studies have showed that positive emotions emerged when individuals were able to work according to their core professional interests and commitments, and to utilise their professional competencies.

In addition to the emotions associated with the relationship between professional identity and work, it is important to consider the kinds of (agentive) activities that people enact in such relationships. The conceptual model of Kira and Balkin (2014) suggests that when there is a balance between professional identity and work, employees may tend to maintain their existing identities and work practices. Alternatively, in the case of an imbalance, people may adapt or actively seek to modify their work tasks, practices, and environments, in order to achieve a better correspondence with their professional goals and interests (see also Fuller & Unwin, 2017). Yet again, the case of an imbalanced relationship, people may actually

cultivate and renew their professional identities in such a way that they encounter their current work in a better frame of mind (Kira & Balkin, 2014). In other words, they engage in professional identity negotiations. The following section considers the professional identity–work relationship in more depth, focusing on *professional identity negotiations and agency*.

2.4 Towards an Agentic Perspective on Professional Identity Negotiations

In the domain of workplace learning, professional identity negotiation is currently a prime object of inquiry. Professional identity negotiation is particularly intense in situations where strains and tensions exist, since these tend to act as triggers for negotiations to occur. According to Vähäsantanen et al. (2017), the negotiations in question involve a mutually constitutive process whereby professionals strive to make sense of and work on their perceptions of their professional identity, and negotiate a meaningful balance between that identity and their (changing) work. Note here that in the domain of organisation and management studies, (professional) identity work can be understood almost as a synonym for professional identity negotiation (Brown, 2015; Winkler, 2018). In these studies it is conceptualised as a process of continual engagement in processing, presenting, and sustaining a coherent and distinct notion of who individuals are, and how they relate to others.

Empirical studies on employees engaged in professional identity negotiations clearly reflect scholarly debates surrounding the relationship between the social context and agency. While it is accepted that professional identity is never negotiated in a social vacuum, theoretical approaches differ in the weight they give to social aspects. In his review, Billett (2010) has shown that (professional) identity, as traditionally understood, has been seen as influenced and shaped – and even determined – by the social environment. In the field of workplace learning, too, professional identity has traditionally been approached from the perspective of the socio-cultural context (see Eteläpelto, 2008). Viewed in this light, professional identity development involves a socialisation process whereby professionals are inducted into the practices followed in work communities, with relatively little attention paid to the role of the active subject. By contrast, recent studies in the field of workplace learning have increasingly approached professional identity via a recognition of *professional agency* (Billett, 2010; Eteläpelto et al., 2014; Fuller & Unwin, 2017; Smith, 2014). Viewed in this light, professional identities are not merely influenced by the work environment and the relationships therein; rather, employees are agentic negotiators of their own professional identities. Professional identity can therefore be seen as agentially negotiated in relation to the social world of the workplace.

In elaborating professional identity negotiation as an agentic process, one is led to consider how professional identity may be enacted via a range of agentic activities and decisions in the workplace. So far, some empirical studies have been

conducted on this topic, paying attention to the tensioned relationship between professional identity and work. In such relationships, agentic efforts and activities can involve processes of maintenance, strengthening, or redefinition of professional identity, encompassing professional commitments, ambitions, values, and the most meaningful responsibilities in one's work (Fuller & Unwin, 2017; Kira & Balkin, 2014; Vähäsantanen & Eteläpelto, 2015; Vähäsantanen et al., 2017). Along similar lines, a study by Ruohotie-Lyhty and Moate (2016) suggests that agency includes activities such as questioning former beliefs, identifying new goals, taking a new direction as a professional, developing self-confidence, and orienting oneself towards future learning. In other words, agentic professional identity negotiations can produce maintained, strengthened, shaped, or transformed professional identity.

Brown (2015) has argued that there is a considerable scope for future research on how the process of working on one's identity is influenced by *emotions* within work organisations. Winkler (2018) has responded to this by demonstrating a reciprocal relationship between emotions and identity work. Her review suggests that (i) emotions (e.g. frustration, uncertainty, and confusion) can work as triggers for identity work, (ii) identity work as a process can be an emotional endeavour (involving e.g. fear, anxiety, and unhappiness), and (iii) emotions (e.g. vulnerability, frustration, shame, happiness, relief, and comfort) can emerge as outcomes of (un)successful identity work. Feelings of trust, confidence, and safety can further be seen as necessary conditions for shaping professionals' identities (Hökkä et al., 2017). A recent theoretical model by Conroy and O'Leary-Kelly (2014) describes how transitions in work roles and relationship may result in a loss of identity, triggering emotionally imbued identity negotiations. This process involves cognitive activity and emotion-processing in two domains: thus there is a loss orientation (including emotions such as anger and guilt in letting go of some parts of one's identity) and a restoration orientation, in terms of defining who I will be now within a new situation.

To conclude, a useful starting point for further examination of professional identity negotiations would be to understand it as a process that (i) occurs in social relationships and contexts, and (ii) is premised upon and mediated by professional agency and emotions. In this sense, professional identity negotiations constitute an agentic and emotional process whereby one constructs a meaningful perception of one's professional identity in relation to (changed) work (see also Buch & Andersen, 2013). Here it should again be noted that although professional identity negotiation takes places in the present, it must be understood in the context of the individual's life course. For example, the relationship between professional identity and work is not perceived and negotiated only from the perspective of one's current professional identity, but also from that of future prospects, including one's future plans and desires (Vähäsantanen & Eteläpelto, 2015). The following section will consider the *temporal perspective* on professional identity negotiations in greater depth. Thereafter, the sixth section will examine how professional identity could be supported from a *practical perspective*.

2.5 Professional Identity Negotiations Over Time Within Changing Workplaces

Professional identity negotiations are interwoven with professionals' training and education. Within this, the individual typically identifies with the values of the profession, and adopts a certain way of approaching the profession (Buch & Andersen, 2013). However, professional identity negotiations are not required only of (young) professionals-to-be; in fact, they continue for the whole of one's professional journey. For experienced professionals, various (especially large-scale) changes in work practices and organisations tend to be the most powerful triggers that impel them to renegotiate their existing professional identities (Arvaja, 2018; Brown, 2015; Collin, 2009; Smith, 2014). One should nevertheless recognise that the call for professional identity negotiations and transformations can also emerge from individual experiences, desires, and needs – and also from one's individual personality (Eteläpelto et al., 2014; Molleman & Rink, 2015) – even if these aspects have so far been given less attention in the literature on workplace learning.

All of the above suggests that it is impossible to see professional identity as something that is stable and unchangeable in contemporary work environments. Rather, it is generally conceptualised as a changeable and flexible phenomenon (Akkerman & Meijer, 2011; Brown, 2015). In line with this, a study by Collin (2009) gives empirical evidence on the fluid nature of identities in the sector of information technology. The study revealed a range of stories encompassing professionals' experiences of their learning and identity transformations over time (including a giving-up story, a success story, a survival story, and a readjustment story). However, it is important to recognise that this could be only one part of the 'true' situation regarding the nature of professional identity.

In fact, professional identity transformations are not necessarily self-evident in changing work contexts. Some of the core elements of professional identity appear to be fairly resistant to change, or at least difficult to redefine in the short term. In line with this, Illeris (2014) has argued that individuals have three layers of identity, beginning with a relatively stable core identity (which is biographically constructed). The other layers are the personality layer and the outer preference layer, with the latter (which includes certain reactions, behaviour, and routines) being more changeable than the core identity. Billett and Pavlova (2005) have also argued that the consequences of changing work practices are not necessarily negative for the sense of continuity in professional identities. In fact, changes in work environments can actually promote such continuity, and provide the means by which professionals could better enact their preferences at work, towards gaining a sense of reward (Billett & Pavlova, 2005). In this sense, work-related changes can create a foundation for a balanced relationship between professional identity and work.

For their part, Vähäsantanen and Eteläpelto (2011) found that teachers' professional identities showed varying degrees of continuity and transformation during a reform in vocational education and training. In fact, continuities in professional interests and commitments were found to emerge more often than transformations.

In addition, they found that the changes and continuities in professional identities were based on teachers' (emotional) experiences and on how they enacted their agency when they made sense of the experiences arising from the changed situation.

Although some empirical evidence exists on professional identity as a temporal phenomenon, it can be suggested that future research should focus increasingly on how and why both changes and continuities occur in professional identities over time. Since professional identity negotiation takes place in the tension between continuity and change (Tynjälä, 2013), it seems crucial to explore how employees enact their agency within such dynamics, and how their agentic activities may change over the course of professional identity negotiations.

2.6 Practices to Support Professional Identity Negotiations

Up to now, we have gained knowledge on professional identity in working life, including its nature and elements, and the negotiations it involves (in terms of emotions, agency, tensions, and relationships). Research is still needed along these lines, but one can suggest that new avenues are required. Continuous professional identity negotiations are problematic for employees amid demanding and hectic work settings. If professionals do not have sufficient individual and social resources to work on their identities, they are at risk of losing their way, struggling at work, or drowning in a stream of continuous work-related changes (Conroy & O'Leary-Kelly, 2014; Kirpal, 2004; Vähäsantanen & Eteläpelto, 2011). This being so, there is a need to adopt a practical perspective, seeking to determine the kinds of practices and pedagogies that would provide the best (evidence-based) support for professional identity negotiations. In the best case, one will arrive at scaffoldings that empower people to be agentic in negotiating their professional identities, supporting them so that they face up to and proactively address the challenges in their professional lives.

Although there is at present only limited empirical evidence on practices and methods to support professional identity negotiations, some promising initiatives have been undertaken. Most of them involve narrative and arts-based methods. Within the teaching domain, Leitch (2006, 2010) has explored the use of *masks* as a means to become aware of, elaborate on, and transform personal/professional identity, in conjunction with the emotional aspects of professional lives. The use of masks at an individual and collective level includes (i) the explorative and creative development of masks, and (ii) improvisation and storytelling about these masks.

Following a somewhat different approach, Vähäsantanen et al. (2017) have explored an arts-based method called the *Professional Body*. This also combines individual and collective processes pertaining to professional identity negotiations. The *individual* phase includes (i) drawing an outline of one's body on paper, and (ii) personalising this body figure by setting out the various aspects of one's professional identity that have arisen over time (e.g. one's professional history, one's current professional mission and skills, and future goals and dreams). These themes

can be illustrated via a variety of materials (e.g. painting, pictures, clippings, and drawings). Going beyond this, the *collective* phase encompasses, for example, (i) presenting the outlined body to other people, and (ii) receiving comments and questions from other people via drama methods, either with or without words. This method seems to provide a fruitful arena for identity negotiations. It should be noted that the processes in question are also emotional, such that, on the one hand, the emotions boost the identity work, or on the other hand, the emotions emerge out of the identity processes (Vähäsantanen et al., 2020). Overall, both methods (i.e. the mask and the Professional Body) provide opportunities to reflect on and cultivate – or even strengthen and shape – one’s professional identity, both on one’s own and with the help of other people.

For her part, Kosonen (2018) has designed a *visual narrative* method as a means of inquiry, seeking to study and promote professional identity in the field of design. This method combines narrative and creative processes that encourage people to reflect on the most meaningful experiences in their life, and to create a visual narrative to describe their identity, touching on previous experiences, current values, and future wishes. The method can be summarised as (i) creating a visual narrative about oneself alone, and (ii) expressing and sharing it verbally with other people (see Kosonen, 2018). A number of other methods, such as creative and narrative writing in a group (Martin et al., 2018), portfolio work (e.g. Eliot & Turns, 2011), and group mentoring (Geeraerts et al., 2014) have also been reported as effective means for comprehensive learning at work, including professional identity negotiations.

Overall, it appears that different kinds of social affordances and practices have potential for enabling employees to reflect on their work environment, and to achieve resources for working on their professional identities. However, although the practices and tools used for identity work are closely connected to professionals’ identity, and to authentic work, up to now they have mostly been organised within separate or independent training sessions and work-related interventions. In the future, it will be necessary to look at how professional identity work can be undertaken as a part of authentic work and in the everyday life of work communities. This will not necessarily demand intensive resources or innovative tricks. Sometimes it is enough if people are able to reflect on, share experiences, and discuss their own life and work in a confidential environment. However, in times of hectic work practices, there may be very few naturally-occurring opportunities for the forms of informal and formal social interaction that would encourage learning and identity work (e.g. Kira, 2010); hence, extra efforts will be needed to orchestrate such arenas.

As indicated above, narrative and arts-based methods and pedagogies can be powerful means to promote professionals’ identity work. It has been observed that the arts activate individual and collective reflection. In particular, they make it possible to approach life situations and identities from a range of perspectives, including those that not rely on words or cognitive processes alone (see also McKay & Sappa, 2019). It should be noted that at the same time, different practical methods offer possibilities to collect research data, including visualisations and narratives of professional identity. These kinds of datasets may well be fruitful in efforts to gain

a deep understanding of professionals' identity. Nevertheless, in using such research methods, scholars will need to understand that they are not merely researchers; they are at the same time facilitators of professional identity negotiations, and must themselves have the resources and competencies to promote challenging and fragile identity work (see e.g. Kosonen, 2018).

2.7 Conclusions for Professional Identity Research

2.7.1 *Theoretical Research Avenues*

This chapter has argued that a focus on professional identity has the capacity to broaden our ways of understanding the complexity of professionals' work and learning (see also Billett, 2018). As a theoretical conclusion, it is suggested that professional identity should be conceptualised as a multidimensional phenomenon that is temporally imbued. In particular, taking a temporal perspective, there is a need to strive towards new understandings on the continuities and changes that can occur in professional identity in the course of fluid working life. We also need more information on which core aspects of identity are more susceptible to change, and which are more resistant to change over time. So far, the evidence appears to indicate that a strong professional identity is beneficial for employees' performance, commitment, learning, and wellbeing at work (e.g. Kira & Balkin, 2014; Molleman & Rink, 2015). However, it would be interesting to know whether a strong or unchangeable professional identity could actually have negative consequences in working life, in situations where employees are required to be flexible, proactive, and innovative – to be in effect 'nomads', working across professional and organisational boundaries.

This chapter has described professional identity as being relational, and imbued with professional agency. This implies that in seeking to understand and promote professional identity negotiations, one should recognise the nuanced nature of professional identity in relation to work, and the outcomes of this relationship. Current discussion has indeed emphasised the reciprocal relationship between work and identity (Kira & Balkin, 2014; Miscenko & Day, 2016), but more research is needed on the precise ways in which professional identity and work interact and shape one another. Furthermore, it seems crucial to recognise the extent to which professional agency is at the heart of professional identity negotiations. If one accepts that this is the case, research will touch on, for example, the kinds of choices, activities, and strategies that are manifested when individual employees negotiate their professional identity in relation to changing work, and also the purposes for which such agentic activities are used.

As emphasised in the sections above, one must not ignore the emotional perspective on professional identity. Some research evidence is already available on this topic. Professional identity and its negotiations seem in fact to be imbued with

emotions in several ways. Emotions emerge from the relationship between professional identity and the work environment (Kira & Balkin, 2014; Ursin et al., 2020). Such emotions can boost employees so that they engage in shaping their professional identities or professional practices. Emotions can also emerge as an outcome of (un)successful identity work (Vähäsantanen et al., 2020; Winkler, 2018). However, a greater focus is needed on emotions in and for learning at work, and overall, there is a need for more empirical evidence on the underlying emotional processes and outcomes of professional identity negotiations. Future studies could reveal, for example, the kinds of emotions that initiate, promote, and inhibit professionals' identity negotiations, via examination of different interactions, training sessions, and simulations.

Recently, several scholars have investigated emotions, seeking to develop new methodologies for exploring the emotions connected to learning in the workplace (e.g. Rausch et al., 2017; Watzek & Mulder, 2019). Of particular interest are methods that measure, for example, electrodermal activity (EDA) and heart rate variability (HRV), and thus reveal the intensity of emotions. (Eteläpelto et al., 2018) However, they are unable to indicate the actual nature of the emotion in question. By contrast, research methods such as interviews may be capable of indicating the precise emotion (or combination of emotions) present in a specific situation. Overall, a combination of different methods would seem to be optimal for exploring emotions in and for professional identity negotiations.

2.7.2 Methodological Aspects and Practical Prospects

This chapter has sought to offer standpoints for developing professional identity research in the domain of workplace learning, with particular attention to relational, agentic, and emotional aspects as they evolve over time. So far, professional identity and its relationship with work has mostly been explored via interviews (e.g. Fuller & Unwin, 2017; Vähäsantanen & Hämäläinen, 2019). The limitation of interviews often lies in the retrospective view they offer; this being so, diaries could function either as an alternative or as an additional research method, in conjunction with interviews. Such methods could collect more authentic datasets, relating to different time slots (e.g. Arvaja, 2018). Also in conjunction with interviews, some scholars have utilised observations as additional data, conducted within an ethnographic framework (Paloniemi & Collin, 2010; Smith, 2014). In this way it is possible to gain contextual information on professional identity in specific socio-cultural contexts.

With these considerations in mind, one can see a particular need to engage in longitudinal research, with possibilities to reach a more sophisticated understanding of professional identity as a temporal phenomenon. Narrative methods (which might or might not form part of an arts-based approach) would be particularly well-suited to longitudinal studies. Narrative data collection methods can shed light on how subjects reveal, make sense of, construct, and impart meanings concerning

themselves and their identities, giving insights into the role of their actions, experiences, and feelings in the course of the work they do, and the events that take place in their lives (e.g. Goodson et al., 2010). In addition, narrative analysis methods make it possible to examine what has happened to people over a series of time points. The processes revealed are likely to encompass both continuities and discontinuities over time, in relation to professional lives and identities (Arvaja, 2018; Collin, 2009; Goodson et al., 2010; Vähäsantanen & Eteläpelto, 2011).

Scholars have recently developed a number of quantitative instruments to explore professional identity. These are able to measure identity tensions (e.g. Pillen et al., 2013), and identity in relation to organisational order and logics (Barbour & Lammers, 2015). It is true that such quantitative instruments are unable to provide as deep an understanding of subjectively constructed constructs as can be achieved via interviews; nevertheless, they give possibilities for the gathering of extensive datasets, with the potential for comparative research on variations in professional identity between different socio-cultural and national work environments. Overall, one can expect that multimethod approaches will in future be needed for extensive explorations of professional identity.

It is worth noting that much of the empirical research mentioned in this chapter was conducted on professionals working in the fields of healthcare and education. More attention will have to be paid to professional identity in new kinds of work environments and organisations, for example, among those that have adopted less hierarchical management strategies. Here one should bear in mind that new forms of working and work employment are becoming increasingly prevalent, including freelance and project work. It would also be interesting to explore the professional identities of immigrants, who face requirements to renegotiate and market their professional identities in new socio-cultural work environments. Furthermore, contemporary working life is becoming increasingly technologised and digitalised (Haapakorpi & Alasoini, 2018; Harteis, 2018). Such trends seem likely to challenge familiar work practices, roles, patterns, and professional identities, with a concomitant need to generate new ways of working, collaborating, and leading in a wide range of professional contexts. The investigation of professional identities in technologised environments would seem to be a particularly pressing issue, given that employees are required to engage in novel, technologised ways of conducting their work.

Professional identity should be seen as central to workplace pedagogies and human resource development (Billett, 2018; Kira & Balkin, 2014). This chapter introduced some narrative and arts-based methods that have been found to be supportive for agentic professionals' identity negotiations in social interaction, but these are merely a starting point. The challenge now is for practitioners to orchestrate novel ways of encouraging individuals to reflect on and reshape their professional identities – possibly through shared experiences – and to create new directions for their professional lives. Nevertheless, this issue is not merely one of creating new kinds of pedagogical practices and workplace pedagogies. In fact, there is also a need for discussion of leadership in relation to professional identities. Leaders should be able to support the identity renegotiations of their staff (Hökkä et al.,

2019) in terms of creating social arenas for reflecting on and working with their professional identities, within the authentic settings of work organisations. In addition, leaders should design work-related tasks that are aligned with employees' preferred identities and unique competencies, without ignoring organisational goals and values (see also Kira & Balkin, 2014). In the ideal case, there will be a balance between employees' professional identities and the work environment, such as will allow sustainable and successful organisational development.

This review of theoretical perspectives and methodological approaches has been compiled in order to give persons working in the field of workplace learning a more structured understanding of the most relevant theoretical perspectives, methodological opportunities, and pragmatic practices applicable to professional identity. It will hopefully function as a launching pad for more intensive study of the issues pertaining to professional identity, and for orchestrating identity-focused learning avenues and leadership practices.

Acknowledgements This work was supported by the Academy of Finland under Grant number 288925 [The Role of Emotions in Agentic Learning at Work].

References

- Akkerman, S. F., & Meijer, P. C. (2011). A dialogical approach to conceptualizing teacher identity. *Teaching and Teacher Education, 27*(2), 308–319.
- Arvaja, M. (2018). Tensions and striving for coherence in an academic's professional identity work. *Teaching in Higher Education, 23*(3), 291–306.
- Barbour, J. B., & Lammers, J. C. (2015). Measuring professional identity: A review of the literature and a multilevel confirmatory factor analysis of professional identity constructs. *Journal of Professions and Organization, 2*, 38–60.
- Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education, 20*(2), 107–128.
- Billett, S. (2010). Lifelong learning and self: Work, subjectivity and learning. *Studies in Continuing Education, 32*(1), 1–16.
- Billett, S. (2018). Subjectivity and human resource development: A quest for intersubjectivity. In K. Black, R. Warhurst, & S. Corlett (Eds.), *Identity as a foundation for human resource development* (pp. 39–52). Routledge.
- Billett, S., & Pavlova, M. (2005). Learning through working life: Self and individuals' agentic action. *International Journal of Lifelong Education, 24*(3), 195–211.
- Billett, S., Harteis, C., & Gruber, H. (Eds.). (2014). *International handbook on research in professional and practice-based learning*. Springer.
- Brown, A. D. (2015). Identities and identity work in organizations. *International Journal of Management Reviews, 17*, 20–40.
- Brown, A., Kirpal, S., & Rauner, F. (Eds.). (2007). *Identities at work*. Springer.
- Buch, A., & Andersen, V. (2013). (De)stabilizing self-identities in professional work. *Nordic Journal of Working Life Studies, 3*(3), 155–173.
- Chappell, C., Scheeres, H., & Solomon, N. (2007). Working on identities. In L. Farrell & T. Fenwick (Eds.), *World yearbook of education 2007. Educating the global workforce: Knowledge, knowledge work and knowledge workers* (pp. 167–177). Routledge.

- Collin, K. (2009). Work-related identity in individual and social learning at work. *The Journal of Workplace Learning*, 21(1), 23–35.
- Conroy, S. A., & O’Leary-Kelly, A. M. (2014). Letting go and moving on: Work-related identity loss and recovery. *Academy of Management Review*, 39(1), 67–87.
- Davey, R. (2013). *The professional identity of teacher educators: Career on the cusp?* Routledge.
- Eliot, M., & Turns, J. (2011). Constructing professional portfolios: Sense-making and professional identity development for engineering undergraduates. *Journal of Engineering Education*, 100(4), 630–654.
- Eteläpelto, A. (2008). Perspectives, prospects and progress in work-related learning. In S. Billett, C. Harteis, & A. Eteläpelto (Eds.), *Emerging perspectives on workplace learning* (pp. 236–259). Sense.
- Eteläpelto, A., Vähäsantanen, K., Hökkä, P., & Paloniemi, S. (2014). Identity and agency in professional learning. In S. Billett, C. Harteis, & H. Gruber (Eds.), *International handbook of research in professional and practice-based learning* (pp. 645–672). Springer.
- Eteläpelto, A., Kykyri, V.-L., Penttonen, M., Hökkä, P., Paloniemi, S., Vähäsantanen, K., Eteläpelto, T., & Lappalainen, V. (2018). A multi-componential methodology for exploring emotions in learning: Using self-reports, behaviour registration, and physiological indicators as complementary data. *Frontline Learning Research*, 6(3), 6–36.
- Fenwick, T. J. (2004). Learning in portfolio work: Anchored innovation and mobile identity. *Studies in Continuing Education*, 26(2), 229–245.
- Fuller, A., & Unwin, L. (2017). Job crafting and identity in low-grade work: How hospital porters redefine the value of their work and expertise. *Vocations and Learning*, 10(3), 307–324.
- Geeraerts, K., Tynjälä, P., Heikkinen, H., Markkanen, I., Pennanen, M., & Gijbels, D. (2014). Peer-group mentoring as a tool for teacher development. *European Journal of Teacher Education*, 38, 1–20.
- Goodson, I. F., Biesta, G., Tedder, M., & Adair, N. (2010). *Narrative learning*. Routledge.
- Haapakorpi, A., & Alasoini, T. (2018). Work organization and technology: Introduction to the theme of the special issue. *Nordic Journal of Working Life Studies*, 8(S3), 1–6.
- Harteis, C. (Ed.). (2018). *The impact of digitalization in the workplace – An educational view*. Springer.
- Hökkä, P., Vähäsantanen, K., & Mahlakaarto, S. (2017). Teacher educators’ collective professional agency and identity: Transforming marginality to strength. *Teaching and Teacher Education*, 63, 36–46.
- Hökkä, P., Rautiainen, M., Silander, T., & Eteläpelto, A. (2019). Collective agency-promoting leadership in Finnish teacher education. In J. Murray, A. Swennen, & C. Kosnik (Eds.), *International research, policy and practice in teacher education: Insider perspectives* (pp. 15–29). Springer.
- Illeris, K. (2014). *Transformative learning and identity*. Routledge.
- Kira, M. (2010). Routine-generating and regenerative workplace learning. *Vocations and Learning*, 3(1), 71–90.
- Kira, M., & Balkin, D. B. (2014). Interactions between work and identities: Thriving, withering, or redefining the self? *Human Resource Management Review*, 24(2), 131–143.
- Kirpal, S. (2004). Researching work identities in a European context. *Career Development International*, 9(3), 199–221.
- Kosonen, K. (2018). *Finding one’s own way in design. Reflections on narrative professional identity*. Aalto University publication series Doctoral dissertations. Aalto University.
- Leitch, R. (2006). Limitations of language: Developing arts-based creative narrative in stories of teachers’ identities. *Teaching and Teachers: Theory and Practice*, 12(5), 549–569.
- Leitch, R. (2010). Masks as self-study. Challenging and sustaining teachers’ personal and professional personae in early–mid career life phases. *Teachers and Teaching: Theory and Practice*, 16(3), 329–352.
- Martin, A., Tarnanen, M., & Tynjälä, P. (2018). Exploring teachers’ stories of writing: A narrative perspective. *Teachers and Teaching: Theory and Practice*, 24(6), 690–705.

- McKay, L., & Sappa, V. (2019). Harnessing creativity through arts-based research to support teachers' identity development. *Journal of Adult and Continuing Education*. <https://doi.org/10.1177/1477971419841068>. Online first.
- Miscenko, D., & Day, D. (2016). Identity and identification at work. *Organizational Psychology Review*, 6(3), 215–247.
- Molleman, E., & Rink, F. (2015). The antecedents and consequences of a strong professional identity among medical specialties. *Social Theory & Health*, 13(1), 46–61.
- Paloniemi, S., & Collin, K. (2010). *Workplace learning and work-related identity constructions in a clinical setting*. In M. Caltone (Ed.), *Handbook of lifelong learning developments* (pp. 141–161). Nova.
- Pillen, M., Beijaard, D., & den Brok, P. (2013). Tensions in beginning teachers' professional identity development, accompanying feelings and coping strategies. *European Journal of Teacher Education*, 36(2), 240–260.
- Pratt, M. G., Rockmann, K. W., & Kaufmann, J. B. (2006). Constructing professional identity: The role of work and identity learning cycles in the customization of identity among medical residents. *Academy of Management Journal*, 49(2), 235–262.
- Rausch, A., Seifried, J., & Harteis, C. (2017). Emotions, coping and learning in error situations in the workplace. *Journal of Workplace Learning*, 29(5), 374–393.
- Ruohotie-Lyhty, M., & Moate, J. (2016). Who and how? Preservice teachers as active agents developing professional identities. *Teaching and Teacher Education*, 55, 318–327.
- Smith, R. (2014). Conceptualising the socio-personal practice of learning in work as negotiation. *Vocations and learning*, 7(2), 127–143.
- Tynjälä, P. (2013). Toward a 3-P model of workplace learning: A literature review. *Vocations and learning*, 6(1), 11–36.
- Ursin, J., Vähäsantanen, K., McAlpine, L., & Hökkä, P. (2020). Emotionally loaded identity and agency in Finnish academic work. *Journal of Further and Higher Education*, 44(3), 311–325.
- Vähäsantanen, K., & Eteläpelto, A. (2011). Vocational teachers' pathways in the course of a curriculum reform. *Journal of Curriculum Studies*, 43(3), 291–312.
- Vähäsantanen, K., & Eteläpelto, A. (2015). Professional agency, identity, and emotions while leaving one's work organization. *Professions and Professionalism*, 5(3), 1–16.
- Vähäsantanen, K., & Hämäläinen, R. (2019). Professional identity in relation to vocational teachers' work – An identity-centred approach to professional development. *Learning: Research and Practice*, 5(1), 48–66.
- Vähäsantanen, K., Hökkä, P., Paloniemi, S., Herranen, S., & Eteläpelto, A. (2017). Professional learning and agency in an identity coaching programme. *Professional Development in Education*, 43(4), 514–536.
- Vähäsantanen, K., Hökkä, P., & Paloniemi, S. (2020). University teachers' professional identity work and emotions in the context of an arts-based identity coaching program. In L. McKay, G. Barton, G. Georgina, & V. Sappa (Eds.), *Arts-based research, resilience and well-being across the lifespan* (pp. 233–256). Palgrave Macmillan.
- van der Wal, M. M., Oolbekkink-Marchand, H. W., Schaap, H., & Meijer, P. C. (2019). Impact of early career teachers' professional identity tensions. *Teaching and Teacher Education*, 80(4), 59–70.
- van Veen, K., & Slegers, P. (2009). Teachers' emotions in a context of reforms: To a deeper understanding of teachers and reform. In P. Schutz & M. Zembylas (Eds.), *Advances in teacher emotion research: The impact on teachers' lives* (pp. 233–252). Springer.
- Watzek, V., & Mulder, R. H. (2019). Team learning behaviours and team affective reactions: An empirical study on interdisciplinary work teams. *Vocations and Learning*, 12(1), 1–22.
- Winkler, I. (2018). Identity work and emotions: A review. *International Journal of Management Reviews*, 20, 120–133.

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Chapter 3

Research on Individual Learning from Errors in the Workplace – A Literature Review and Citation Analysis



Andreas Rausch, Johannes Bauer, and Michael Graf

Abstract In the scientific community of research on workplace learning, there is a growing interest in learning from errors in the workplace, including learning from mistakes, incidents, near-misses and so forth. In this chapter, we provide an overview of theoretical approaches to individual learning from errors at work and we present results from a systematic review of publications on individual learning from errors in the workplace, which included 29 relevant publications from 2007 through 2018. Of these, 20 articles reported on empirical research, five articles are theoretical and four articles are literature reviews. Nine of the empirical studies relied on quantitative data, while in six studies only qualitative data was collected and five studies relied on mixed methods. Interviews and questionnaires were the most common methods of data collection. Most studies were conducted in the context of nursing, followed by a variety of commercial contexts. The majority of the articles focus on presage (input factors) and the process of learning from errors, while research on outcomes of learning from errors is scarce. Furthermore, we conducted a citation analysis of the selected publications that revealed the continuing influence of the research group at the University of Regensburg (Germany). The most cited journals in our sample are published in the United States and have broad focuses on either psychology or management, while only two of the top ten cited journals are focused on workplace learning. In summary, research on workplace learning in general and on learning from errors at work in particular seems to be widespread over a multitude of disciplines, and thus over many different journals, while a group of German researchers appears to be particularly active in the field. Differentiated measures of outcomes, domain-specificity, multiple data sources and replication studies are discussed as future directions of research on learning from errors in the workplace.

Keywords Learning from errors · Workplace learning · Literature review · Citation analysis

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3.1 Introduction

In the last decades there has been growing interest in learning from errors as a facet of informal learning in the workplace. In his seminal book *Human Error*, James Reason (1990) points out that for many tasks there are only a few correct ways of performing but numerous ways to bungle them. Though errors in the workplace usually increase costs, generate negative publicity, decrease customer satisfaction, or even cause fatal accidents (Zhao & Olivera, 2006), one hundred percent error avoidance seems impossible (Goodman et al., 2011; Reason, 2000). Therefore, learning from errors that occur despite prevention efforts is fundamental to avoid their reoccurrence (Goodman et al., 2011). In line with Reason (1990), we refer to error as a broad term that includes mistakes and near-misses (see below).

Learning from errors plays different roles on the different levels of workplace learning (Goodman et al., 2011; Harteis et al., 2012). Lei et al. (2016, p. 1318) classify errors at the organizational (or system) level, team level and individual level (see also Harteis & Bauer, 2014). Error-related research on the organizational level usually focuses on error management (Goodman et al., 2011), and error culture (Harteis et al., 2008) in organisations. Research on the team level focuses on team climate and psychological safety as parameters of handling errors (Edmondson, 1999; Edmondson & Lei, 2014) or on effects of error management training (Keith & Frese, 2008), for instance. Finally, the individual level of learning from errors addresses individual learning gain through experiential learning from errors, as well as related reactions and attitudes toward errors (Harteis et al., 2012). Following Tulis et al. (2016), the individual perspective on learning from errors can be further classified into research on general differences in how individuals react to success and failure (attribution styles), research on error-specific dispositions such as error orientation (Rybowiak et al., 1999), and research on individual state reactions to errors such as emotions and coping (Brown et al., 2005; Zhao et al., 2014; Rausch et al., 2017).

In the present chapter, we aim to provide a systematic review of individual learning from errors in the workplace. Hence, organizational factors such as error culture or error management are considered as influencing individual learning, but they are not at the core of this review; general studies of accidents, incidents, reliability, or safety are also excluded. Narrowing the focus on individual learning from errors corresponds with the structure of this handbook and allows us to go more into detail. We draw upon and extend prior literature reviews in this field. Bauer and Mulder (2008), Bauer et al. (2012), Harteis et al. (2012), Harteis and Bauer (2014), and Lei et al. (2016), have already provided elaborate overviews of the field, though from different perspectives. According to these reviews, research on individual learning from errors varies greatly in its theoretical foundations and in empirical approaches (Bauer & Mulder, 2010, p. 111). Moreover, there still seem to be different schools of research on the topic that hardly recognize each other because they come from different disciplines. Hence, in the present review, we aim to extend these previous studies by pursuing three goals. (1) In our narrative review we aim to provide an

overview of outcomes, drivers and barriers of learning from errors based on prior research. (2) Furthermore, since there is a growing body of publications in the past decade, a second aim is to provide a systematic overview of these publications and applied methods for researching learning from errors in the workplace. (3) Finally, a third aim of our review is to identify influential researchers by means of a citation analysis. By providing a differentiated overview of theoretical approaches, empirical findings, and influential researchers, we aim to facilitate further research and theory development.

3.2 Research on Errors and Learning from Errors in the Workplace

In the theoretical section, we define errors from different perspectives, discuss the processes and outcomes of learning from errors in the workplace as well as individual and contextual factors. Finally, we give an overview of Methods and issues in researching learning from errors in the workplace as the basis of our literature review.

3.2.1 *Perspectives on Errors in the Workplace*

From the perspectives of action theory and self-regulation, errors occur within goal-directed behaviour. In the workplace, the goals which are pursued are work goals, for instance, processing sales orders, mounting a syphon, or driving a bus. Errors are observable as a deviation of an actual state of goal achievement from the expected one. In addition, a critical component of errors is that the non-achievement of a goal could have been avoided. This means the error is not due to intentional experimentation (“trial and error”), intentional violation of norms and standards or uncontrollable circumstances (Frese & Zapf, 1994; Ramanujam & Goodman, 2011; Reason, 1995; Zhao, 2011; Zapf & Reason, 1994; Zhao & Olivera, 2006). This also helps to distinguish individual errors from broader constructs such as accidents or incidents that could also be due to reasons other than individual errors (Goodman et al., 2011). Almost-mistakes, nearby-mistakes or near-misses are labels for action sequences in which an initial error occurred (Reason, 1990) but the consequences are just foreseen and prevented, and the goal is still achieved (Oser et al., 2012, p. 55). While the deviation of actual state and goal state is the manifest (observable or foreseeable) result of an error, the error itself remains latent,¹ i.e. ‘non-observable’. That means,

¹In this context, ‘latent’ does not entail the concept of ‘latent errors’ as referred to by Ramanjun and Goodman et al. (2011). They define ‘latent errors’ as deviations from standards, rules or routines that can *potentially* generate undesired outcomes but have not yet resulted in these negative outcomes.

various errors in perception, thinking or action can be the reason for the non-achievement of the goal (Weingardt, 2004).

From a cognitive perspective, errors can be attributed to different levels of information processing. The most prevalent classification of error types is based on Reason (1990). Errors which result from some failure in the execution of a planned action sequence are referred to as *slips* and errors due to a failure in the storage of an action sequence are referred to as *lapses*. In contrast, *mistakes* are defined as judgmental or inferential failures in selecting goals or planning action sequences. Reason (1990) states that mistakes are more complex because there might be different opinions on desirable goals and adequate plans. Furthermore, even a promising plan can turn out to be deficient once it is put into action. Mistakes can further be divided into failures of expertise, which are located on Rasmussen's (1983) rule-based level or processing, and lack of expertise located on Rasmussen's knowledge-based level of processing. However, in empirical studies, it proved to be difficult to distinguish between knowledge-based errors and rule-based errors. The same holds true for the empirical distinction between slips and lapses. Hence, these subtypes are often merged and only two types of errors—mistakes on the one hand, and slips and lapses on the other hand—are contrasted (Bauer & Mulder, 2007; Gartmeier et al., 2010a; Rausch et al., 2017). These generic distinctions often need to be differentiated further when applied to specific domains. For example, Gartmeier et al. (2010a, p. 11) list the following categories of knowledge-based and rule-based errors in the domain of elder care nursing: inadequate interpretation of a situation, non-application of a new or up-to-date method (i.e. non-application of a good rule), application of out-of-date 'rituals' and methods (i.e. application of a bad rule), lack of knowledge about current guidelines or standards (i.e. deficient knowledge), wrong application of a method because of lack of knowledge (i.e. wrong application of a good rule), not asking someone experienced when uncertain, not challenging orders from a supervisor, errors in interpersonal relationships (i.e. inappropriate communication) (see Bauer & Mulder, 2007 for similar distinctions in hospital nursing).

From an emotional or motivational perspective, errors can be interpreted as a negative feedback within motivated (i. e. goal-directed) behaviour. Thus, errors usually provoke negative emotions because they indicate the avoidable non-achievement of a goal (Rausch, 2012a; Oser et al., 2012; Zhao, 2011). These negative emotions may trigger reflections (Oser, 2007), given that "... the individual is concerned about the incident" (Harteis et al., 2008, p. 225). The absence of any negative emotions after error detection would even challenge the definition of an error because one could question whether there was any goal commitment directing the action (Rausch, 2012a). At least, these goals must have been of very low significance. However, too strong negative emotions may also limit the cognitive capacity to elaborate on an error and its sources (problem-focused coping) but instead result in ego-defences and emotion-focused coping (Brown et al., 2005; Rausch et al., 2017;

Zhao et al., 2014). Furthermore, strong negative emotions may also decrease the motivation to engage in the respective work activity (Schwarz & Bless, 1991; Zhao et al., 2014). Negative emotions as a consequence of one's error also depend on one's role (expert vs. novice) and how others react to the error (supporting vs. blaming), which both point to the social context.

The social perspective on learning from errors refers to who defines errors, who commits errors and how others react to errors. Errors are defined as a deviation from social norms or formal standards (Harteis et al., 2008), which are supposed to be known, shared and accepted in a particular work community (Billett, 2012). This means that any community member is supposed to adopt these more or less observable rules and he or she has little scope for divergent interpretation of what an error is. This is a strong assumption because there might be different reasonable opinions on desirable goals and adequate plans (see above). One might argue whether an unorthodox plan that has led to a deviation from a desired goal constitutes a mistake or whether the actor took a calculated risk. In the latter case, the non-achievement of the goal would be due to intentional trial and error or uncontrollable circumstances. However, depending on the significance of the goal, the work context, and the severity of the consequences, it might have already been a mistake to implement a risky plan (see concept of 'latent errors' by Ramanujam & Goodman, 2011). Hence, for the social perspective of errors, it is important to consider shared values, work practices, norms and so forth within the respective community of practitioners. Concepts such as communities of practice by Lave and Wenger (1991) and Wenger (Wenger, 2008), activity theory (Engeström, 2001) or practice curriculum and pedagogies by Billett (2014) offer frameworks for analysing the development and acquisition of shared practices. Referring to handling errors and learning from errors, a community's error culture and team psychological safety are important factors (Cannon & Edmondson, 2005; Edmondson & Lei, 2014; Harteis et al., 2008; van Dyck et al., 2005). Furthermore, it is important who commits an error. It might be more tolerable if new members of a community commit errors because they are not supposed to have already internalized the prevailing norms and standards of practice. Consequently, critical tasks are usually not assigned to newcomers but instead newcomers are in a position of legitimate peripheral participation (Billett, 2014; Lave & Wenger, 1991). For instance, Zhao et al. (2018) investigated the effects of trainers' reactions to errors in the workplace on trainees' learning from errors. While in formal education, classrooms (should) provide a safe environment for free exploration and learning from errors (see "productive failures"; Kapur, 2014), applying trial and error is not a common approach to solving problems in the workplace because work goals have to be achieved and, thus, errors are usually to be avoided (Rausch et al., 2015). Trial and error and free exploration at work might be tolerated to some extent when applied by newcomers as long as no severe consequences can result from these errors. Again, this error tolerance is subject to negotiation in the respective community.

3.2.2 *Learning from Errors in the Workplace*

Learning from an error in a particular work task becomes manifest in a modified disposition for behavior in similar subsequent work tasks, enabling the person not to commit the respective error again. The process of learning from errors usually involves a conscious reflection and elaboration on what went wrong and why it went wrong. After the detection of an error (and maybe after emotion-focused coping), effortful cognitive and metacognitive activities within a problem-focused coping approach are supposed to facilitate learning (Boekaerts, 2011; Gross, 1998; Lazarus & Folkman, 1987; Tulis et al., 2016). Based on models of experiential learning (Kolb, 1984), learning from errors involves (1) reflecting on the causes of an error, (2) improving one's action strategies and (3) experimenting with and implementing these revised strategies (Bauer & Mulder, 2007; Harteis et al., 2012). However, learning from errors may also occur unnoticed in terms of implicit learning as a consequence of sequences of many small errors without severe consequences, for instance when improving one's touch typing. Particularly in the case of slips and lapses, the knowledge of how to complete the task successfully was available beforehand but only the storage of the intention, the retrieval of knowledge or the execution failed. Thus, learning outcomes often refer to metacognitive monitoring and may be as basic as one's intention to be more focused and attentive the next time.

In case of mistakes, the learning outcome is what Oser et al. (2012) define as *negative knowledge* that "... refers to memories related to events, things, procedures or strategies that are experienced as false, inadequate or ineffective" (Oser et al., 2012, p. 54). This knowledge is also connected to memories of the negative consequences, such as being blamed, and the negative feelings such as shame and guilt that were experienced in the error episode. In similar subsequent situations, this negative knowledge serves as an alert system that helps avoid errors or near-misses (Oser et al., 2012). However, knowing how something does *not* work does not necessarily imply knowing how it works. Hence, negative knowledge has only a supportive function for positive knowledge. To learn from mistakes (i.e. the failure or lack of expertise) often requires further information that may be retrieved from codified sources of information (manuals, guidelines, Internet research etc.) or from others (colleagues, supervisors, customers, mentors etc.). In a diary study on learning from problem solving in the workplace Rausch et al. (2015) found that social interaction such as help seeking and feedback is most important for learning, especially for newcomers.

Outcomes of learning from errors can further be conceptualized on a more fine-grained level following Eraut's (2004a, p. 265; 2004b, p. 207) taxonomy of what is being learned in the workplace. He distinguishes (1) task performance (speed, fluency, complexity of tasks, etc.), (2) awareness and understanding (other people, contexts, situations, problems, risks etc.), (3) personal development (self-evaluation, handling emotions, ability to learn from experiences, etc.) (4) teamwork (collaboration, facilitating social relations, joint planning etc.), (5) role performance (prioritisation, responsibilities, leadership, delegation etc.), (6) academic knowledge and

skills (use of evidence and argument, accessing formal knowledge, theoretical thinking, etc.), (7) decision making and problem solving (when to seek expert help, dealing with complexity, problem analysis, etc.), and (8) judgement (quality of performance, priorities, levels of risk, etc.). Apparently, learning from errors can contribute to all of the above learning outcomes. Zhao et al. (2014) emphasize the effect of error attribution on what is being learned. If an error is attributed to poor task monitoring, then additional resources will be dedicated to monitoring; if an error is attributed to incorrect task rules, then an individual will try to improve his or her action scripts; if an error is attributed to a failure on the global level of the self, individuals will often engage in off-task, self-directed thoughts and ego-defenses that impede one's self-regulation (Zhao et al., 2014; see emotional perspective on errors). However, as is typical in informal learning, learning is often not even recognized as such and "the resultant knowledge is either tacit or regarded as part of a person's general capability, rather than something that has been learned" (Eraut, 2004a, p. 249). In general, research on the very outcomes of workplace learning is scarce (Rintala et al., 2019).

3.2.3 Individual and Contextual Factors of Learning from Errors in the Workplace

According to Tynjälä's (2008, 2013) 3-P-model of workplace learning, individual factors ('learner factors') and contextual factors ('learning context') as well as their interpretation by the learning subject play important roles in workplace learning. Both, individual factors such as domain-specific competences or general personality traits like attribution style and contextual factors such as the organization of work or the perceived work climate are considered to be relatively stable over time. Regarding individual factors, the concept of error orientation comprises several attitudes towards and behaviors in error situations. (1) Error competence refers to one's capability to deal with errors immediately when they occur. (2) Learning from errors refers to the long-term effects of reflecting on errors after they have occurred. (3) Error risk-taking refers to a general openness towards and acceptance of errors in order to achieve higher work goals. (4) Error strain means that someone is afraid of making errors and tends to react to errors with strong negative emotions. (5) Error anticipation comprises the realistic view that even in one's field of expertise errors may occur and also a general negative attitude to errors. (6) Covering up errors describes a tendency to consider errors as a threat and to avoid accusations by not admitting one's errors (Rybowiak et al., 1999). Regarding contextual factors, socio-cultural constructs such as psychological safety (Edmondson, 1999; Edmondson & Lei, 2014), team climate (Naveh et al., 2005), learning culture (Littlejohn et al., 2014) or error culture (Harteis et al., 2008) are considered to exert an influence on individual learning from errors. Error culture refers to the extent that social contexts allow for admitting errors, reflecting on errors, discussing their causes and learning

from them, rather than covering up errors and blaming each other (van Dyck et al., 2005; Harteis et al., 2008, Oser, 2007; for an elaborate overview of the influences of an organization's learning culture. Organizational interventions and practices like error management (Goodman et al., 2011) and error management training (Keith & Frese, 2008) aim at an intentional modification of dealing with errors in an organization. The above individual and contextual factors are just a selection of influences which are discussed and investigated in research on learning from errors.

3.2.4 Methods and Issues in Researching Learning from Errors in the Workplace

In their review of methodological practices in on-the-job learning research, Berings et al. (2006) distinguished between research according to the classical paradigm which aims to explain and predict learning and mainly uses quantitative methods and research according to what they referred to as the new paradigm, which seeks to describe and explore learning contexts mainly by the use of qualitative instruments. The authors analyzed six questionnaire studies and eight interview studies to illustrate the variety of implementations. Only one of these studies, van Woerkom's (2003) questionnaire study on critical reflective work behavior, explicitly referred to errors as a source of learning. In his overview of contemporary methods in research on informal learning, Sawchuk (2009) concludes that "case study, ethnographic and interview research are by far the most prevalent forms of research carried out on informal learning and work" (Sawchuk, 2009, p. 326) because inductive and exploratory methods are common in young fields of research such as research on informal learning. However, the number of questionnaires on workplace learning has grown rapidly over the last decade (Böhn & Deutscher, 2019; Park & Lee, 2018). In the context of learning from errors, the error orientation questionnaire (EOQ) by Rybowski et al. (1999) has been applied and adapted in many studies (Farnese et al., 2020), despite some criticism of its conceptual clarity (Bauer et al., 2004; Bauer, 2008; Böhnke & Thiel, 2016). Bauer and Mulder (2010) developed a questionnaire on learning from errors in the field of nursing that was used in several studies. Based on a domain analysis, the authors developed authentic case descriptions of typical error situations in nursing in which the misjudging of situations leads to the wrong decisions. Engagement in social learning activities (ESLA) after an error were then operationalized by two scales, 'joint cause analysis' and 'joint development of new action strategies', which are rooted in the theory of experiential learning (Kolb, 1984). In contrast to the former studies, Rausch (2014) emphasizes the advantages of a process-oriented data collection by means of diaries, since diary data and data from retrospective self-report questionnaires can differ enormously (Rausch, 2012b). However, in a recent review of research on workplace learning in general, Sutherland Olsen and Tikkanen (2018) found that descriptive studies with qualitative retrospective methods are still prevalent. Furthermore, Fejes and Nylander (2019,

p. 123) analyzed the 57 most-cited articles of three journals in the field of adult education and learning (*Adult Education Quarterly*, USA; *International Journal of Lifelong Education*, UK; and *Studies in Continuing Education*, Australia) between 2005 and 2012. Only 7% of the articles reported quantitative and 5.3% reported mixed methods, while in the vast majority of articles qualitative methods were applied. In our literature review, we investigate whether this preference for qualitative methods such as interview studies, case studies, ethnographic studies is also visible in research on learning from errors in the workplace or whether there is a trend towards more quantitative methods as questionnaires or structured diaries.

Nylander et al. (2018) also conducted a citation analysis based on 151,261 citation links between more than 33,000 different authors to identify ‘dominating players’ (Nylander et al., 2018, p. 114). The citation analysis revealed that E. Wenger, S. Billett, J. Lave, Y. Engeström, J. Mezirow, S. B. Merriam, D. Boud, P. Hodkinson, L. Unwin, and P. Bourdieu are the ten most cited authors in the field. In our citation analysis, we investigate whether the different theoretical and methodological stances in research on learning from errors are partly due to the influence of prominent researchers in the field of workplace learning.

3.3 Literature Review and Citation Analysis

We have conducted a literature review followed by a citation analysis. In our literature review, we analyzed articles on learning from errors regarding content areas and, if applicable, empirical methods and samples. In our citation analysis, we investigated the attention that the articles received in terms of citations, which kind of publications were cited in the articles, articles from which journal were cited most frequently, which authors were cited most frequently and whether there were noticeable patterns of citation. Moreover, we wanted to find out whether some of the most cited authors in the studies on learning from errors in the workplace are among the 50 most cited authors in Nylander’s et al. (Nylander et al., 2018, p. 128f.) study.

3.3.1 Literature Review

3.3.1.1 Sampling

For the review, we conducted extensive research in relevant databases (PsycARTICLES, Web of Science, ProQuest, ERIC) and internet search engines (GoogleScholar) and applied the snow-ball-method to identify articles dealing with learning from errors in the workplace. The articles had to meet the following selection criteria: (1) Title, abstract, and/or keywords had to match the following search terms and their synonyms: a) learn, learning etc., b) error, mistake, near-miss, etc., and c) work, workplace, job, etc. (2) Furthermore, the main focus of the theoretical

or empirical articles had to be on individual learning from errors at work. That means that articles were to be excluded if they mainly focused on further (formal) education and guidance, organizational learning, error culture, etc. without considering individual learning. If, for instance, an article investigated error culture as an influencing factor of individual learning from errors at work, the article was included. (3) We limited our review of articles to those published since 2007 (until late 2018, when this manuscript was prepared). (4) The articles had to be published in the English or German language. This procedure resulted in 29 articles on learning from errors in the workplace that were further analyzed with regard to their basic approach (empirical vs. theoretical), and in case of empirical articles regarding methods and samples as well as their main focus by distinguishing input/presage factors, processes, and outcomes according to Tynjälä's (2013) 3-P-model.

3.3.1.2 Results

Table 3.1 provides an overview of the 29 articles on learning from errors in the workplace. We distinguish between three types of articles; empirical study, theoretical concepts, and literature review. Referring to Tynjälä's (2013) 3-P-model, the focus of a study can be presage (i.e. input factors such as individual dispositions or contextual influences), process (i.e. learning activities, emotional states, coping etc.), product (i.e. what is being learned from errors) or a combination thereof. In addition, the focus can also be methodological if the article elaborates on different ways of measuring learning from errors. In case of literature reviews, no such distinction is made because literature reviews usually comprise all of these four issues. Finally, the number of citations in other publications was investigated in Google Scholar.

There were 20 articles that reported on empirical research, five articles are theoretical and four articles are literature reviews. Nine of the empirical studies relied on quantitative data, in six studies only qualitative data was collected and five studies relied on mixed methods. Interviews and questionnaires were the most common, while critical incident techniques and more or less standardized diaries were applied less frequently. Most studies were conducted in the context of nursing, followed by a variety of commercial contexts. The majority of the articles focuses on presage (input factors) and the process of learning from errors. Only a few articles focused on the product of what is being learned from errors.

Regarding authors, in total, the analyzed 29 articles were published by 31 researchers. Ten authors contributed to more than one article. Table 3.2 lists these ten authors with country, affiliation, research discipline, Researchgate (RG) score (if available; as a rough indicator for one's overall impact), ordered by the number of articles in our sample, to which they contributed (authorships). Remarkably, nine out of ten authors are from Germany and most of them are related to a research group at the University of Regensburg (see discussion). Regarding the RG scores, many of the frequent authors in our sample of articles have a quite high impact in general.

Table 3.1 Overview of the 29 analyzed articles in our literature review

No.	Authors	Year	Title	Type	Focus (presage, process, product and/or methodological)	Method of empirical study	Sample of empirical study	Citations (Google Scholar)
1	Bauer, Johannes Mulder, Regina H.	2007	Modelling learning from errors in daily work	Empirical study	Process	Semi-structured interviews (qualitative)	10 experts in hospital nursing from three German hospitals	103
2	Harteis, Christian Bauer, Johannes Haltia, Petri	2007	Learning from errors at the workplace – Insights from two studies in Germany and Finland	Empirical study (two studies)	Presage Process	Questionnaires and semi-structured telephone interviews (mixed method)	28 white-collar and blue-collar workers from several German companies 14 white-collar and blue-collar workers from the Finnish shipyard industry	21
3	Harteis, Christian Bauer, Johannes Gruber, Hans	2008	The culture of learning from mistakes: How employees handle mistakes in everyday work	Empirical study (two studies)	Presage Process	Questionnaire and semi-structured interviews (mixed method)	160 white-collar and blue-collar workers 28 white-collar and blue-collar workers in Germany	106
4	Gartmeier, Martin Bauer, Johannes Gruber, Hans Heid, Helmut	2008	Negative knowledge: Understanding professional learning and expertise	Theoretical concepts	Process Product	–	–	133

(continued)

Table 3.1 (continued)

No.	Authors	Year	Title	Type	Focus (presage, process, product and/or methodological)	Method of empirical study	Sample of empirical study	Citations (Google Scholar)
5	Seifried, Jürgen Baumgartner, Alexander	2009	Lernen aus Fehlern in der betrieblichen Ausbildung – Problemfeld und möglicher Forschungszugang (learning from errors in in-firm vocational training – Challenges and empirical approaches)	Theoretical concepts	Presage Process	–	–	12
6	Bauer, Johannes Mulder, Regina H.	2010	In search of a good method for measuring learning from errors at work	Literature review	Methodological	–	–	10
7	Gartmeier, Martin Bauer, Johannes Gruber, Hans Heid, Helmut.	2010a	Workplace errors and negative knowledge in elder care nursing	Empirical study (two studies)	Presage Process	Questionnaire including either the report of critical incidents or the situational judgment of error vignettes (mixed methods)	55 German nurses 276 German nurses	26
8	Gartmeier, Martin Gruber, Hans Heid, Helmut	2010b	Tracing error-related knowledge in interview data: Negative knowledge in elder care nursing	Empirical study	Product	Case study with (1) prompting task technique and (2) semi-structured interviews (qualitative)	4 German elder care nurses 3 German elder care experts	17

9	Zhao, Bin	2011	Learning from errors: The role of context, emotion, and personality	Empirical study	Presage Process Product	Quasi-experimental simulation with variations in managerial intolerance of errors; questionnaire and performance assessment (quantitative)	127 Canadian undergraduate students	123
10	Hetzner, Stefanie Gartmeier, Martin Heid, Helmut Gruber, Hans	2011	Error orientation and reflection at work	Empirical study	Presage Process	Questionnaire (quantitative)	84 German client advisors from retail banking departments	30
11	Billet, Stephen	2012	Errors and learning from errors at work	Theoretical concepts	Presage	–	–	16
12	Gartmeier, Martin Schüttelkoopf, Elke	2012	Tracing outcomes of learning from errors on the level of knowledge	Theoretical concepts	Product	–	–	20
13	Bauer, Johannes Gartmeier, Martin Harteis, Christian	2012	Human fallibility and learning from errors at work	Literature review	–	–	–	18

(continued)

Table 3.1 (continued)

No.	Authors	Year	Title	Type	Focus (presage, process, product and/or methodological)	Method of empirical study	Sample of empirical study	Citations (Google Scholar)
14	Rausch, Andreas	2012a	Errors, emotions, and learning in the workplace – Findings from a diary study within VET	Empirical study	Presage Process Methodological	Questionnaire and semi-standardised diary (quantitative)	21 German trainees in a three-year apprenticeship program to become industrial managers	15
15	Leichter, Veronika Mulder, Regina H. Bauer, Johannes	2013	Learning from errors at work: A replication study in elder care nursing	Empirical study	Presage Process	Questionnaire including error vignettes (quantitative)	180 German elder care nurses	28
16	Bauer, Johannes Mulder, Regina H.	2013	Engagement in learning after errors at work: Enabling conditions and types of engagement	Empirical study	Presage Process	Questionnaire including error vignettes (quantitative)	276 German nurses from nine hospitals	37
17	Seifried, Jürgen Höpfer, Eva	2013	The perception of error in production plants of a chemical organisation	Empirical study	Presage Process	Problem-centred interviews (qualitative)	10 German safety representatives and executives from chemical production plants	9

18	Catino, Maurizio Patriotta, Gerardo	2013	Learning from errors: Cognition, Emotions and safety culture in the Italian air force	Empirical study	Presage Process	Interviews, analysis of flight mishap cases, and observation of (de)briefings (qualitative)	37 pilots and other stakeholders at an Italian air base	122
19	Strasser, Josef	2014	Reflexion von Erfahrungen und Fehlern. Eine Voraussetzung für die berufliche Wissensentwicklung von Beraterinnen und Beratern (Reflections of experiences and errors. A requirement for the development of professional knowledge in consultants)	Empirical study	Presage Process Product	Interviews (qualitative)	20 German consultants in the field of social psychiatry	5
20	Yan, Qing Bligh, Michelle C. Kohles, Jeffrey C.	2014	Absence makes the errors go longer – How leaders inhibit learning from errors	Empirical study	Presage	Questionnaire (quantitative)	268 Californian undergraduate and graduate students	20
21	Harteis, Christian Bauer, Johannes	2014	Learning from errors at work	Literature review	–	–	–	13
22	Zhao, Bin Olivera, Fernando Edmondson, Amy C.	2014	Learning from errors in organizations: The effects of negative emotions on motivation and cognition	Theoretical concepts	Presage Process Product	–	–	2

(continued)

Table 3.1 (continued)

No.	Authors	Year	Title	Type	Focus (presage, process, product and/or methodological)	Method of empirical study	Sample of empirical study	Citations (Google Scholar)
23	Hascher, Tina Kaiser, Christine	2015	The acquisition of negative knowledge during field experience in teacher education	Empirical study	Process Product	Structured diary (qualitative)	46 German student teachers in teaching practice internships	5
24	Leitcher, Veronika Mulder, Regina H.	2016	Individual and contextual factors influencing engagement in learning activities after errors at work: A replication study in a German retail bank	Empirical study	Presage Process	Questionnaire (quantitative)	178 German retail bankers	9
25	Bauer, Johannes Leitcher, Veronika Mulder, Regina H.	2016	On nurses' learning from errors at work	Literature review	–	–	–	4
26	Rausch, Andreas Seifried, Jürgen Harteis, Christian	2017	Emotions, coping and learning in error situations in the workplace	Empirical study	Presage Process	Semi-standardised diary (quantitative)	22 young employees from a German sportswear manufacturer	12

27	Gartmeier, Martin Ottl, Eva Bauer, Johannes Berberat, Pascal O.	2017	Learning from errors: Critical incident reporting in nursing	Empirical study	Presage Process	Questionnaire including error vignettes (quantitative)	73 German hospital nurses (in t1; n = 65 in t2)	4
28	Ye, Qingyan Wang, Duanxu Li, Xi	2018	Promoting employees' learning from errors by inclusive leadership: Do positive mood and gender matter?	Empirical study	Presage	Questionnaire (quantitative)	202 full-time employees from different Chinese companies	4
29	Anselmann, Veronika Mulder, Regina H.	2018	Learning from errors in insurance companies	Empirical study	Presage Process	Critical incident technique (CIT) and questionnaire (mixed method)	206 qualified insurance agents from different German insurance companies	0

Note. Number of citations obtained January 2020 from Google Scholar (including self-citations)

Table 3.2 Most frequent authors in our sample of 29 articles on learning from errors at work

Author	Country	Affiliation	Discipline	RG score	Authorships
Bauer, Johannes	Germany	University of Erfurt (formerly Regensburg)	Education	25.7	12
Mulder; Regina H.	Germany	University of Regensburg	Education	n/a	8
Gartmeier, Martin	Germany	Technical university of Munich (formerly Regensburg)	Medical education	20.0	6
Harteis, Christian	Germany	University of Paderborn (formerly Regensburg)	Education	19.9	5
Anselmann (née Leicher), Veronika	Germany	University of Regensburg	Nursing science/ education	4.5	4
Gruber, Hans	Germany	University of Regensburg	Education	n/a	4
Heid, Helmut	Germany	University of Regensburg	Education	17.3	3
Seifried, Jürgen	Germany	University of Mannheim	Business education	18.1	3
Rausch, Andreas	Germany	University of Mannheim	Business education	14.6	2
Zhao, Bin	Canada	Simon Fraser university	Management and organization studies	n/a	2

Notes. ResearchGate Scores were retrieved in December 2019

3.3.2 Citation Analysis 1: Citations of the Analyzed Articles

The articles in our sample differ in the attention they have received from other researchers in terms of citations (Table 3.1). From panel (A) of Fig. 3.1 it is visible that there is a set of five highly influential papers, each of which has been cited more than 100 times. Because the number of citations depends on the time since publication, among other things, panel (B) plots citation numbers by publication age and type. It is interesting to see that the top cited paper is a theoretical piece (no. 4: Gartmeier et al. (2008)). In this paper, Gartmeier et al. (2008) adapted negative knowledge theory to the field of learning from errors in the workplace. This conception seems to have inspired many other researchers. Of the other frequently cited articles, Zhao (2011) and Catino and Patriotta (2013) are relatively recent empirical studies. They have been published in leading organizational research journals that are of interest to a broad range of disciplines and have high impact factors (*Organizational Studies*, *Journal of Organizational Behavior*; see section below). Finally, Harteis et al. (2008) and Bauer and Mulder (2007) are empirical studies published in more specialized educational journals. They are among the earliest

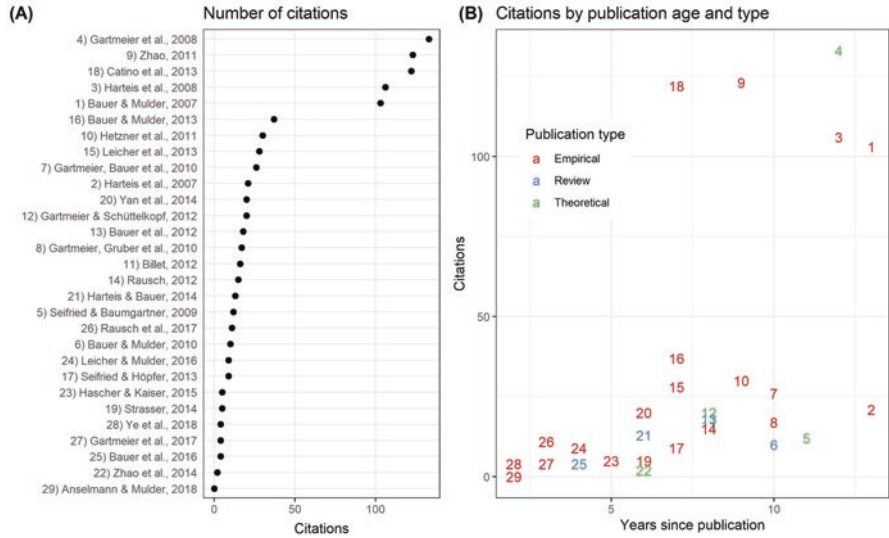


Fig. 3.1 Citations of the analyzed articles on Google Scholar

studies on learning from errors in the workplace and have been seminal to the further development of the field. The existing reviews did not receive as much attention in terms of citations as one might expect. A potential reason may be that all of them were published as chapters in edited volumes rather than journal articles.

3.3.3 Citation Analysis 2: Citations in the Analyzed Articles

In this section, we analyze the citations to other work within our sample of 29 articles on learning from errors at work. Overall, articles from 262 different journals were cited; 174 journals were only cited once. Table 3.3 lists the ten most cited journals in our sample, the number of articles cited, the category of the journal according to Social Sciences Citation Index (SSCI), the country, and the journal impact factor according to SSCI. Regarding the category, only two of the top-ten-cited journals are focused on workplace learning (*Journal of Workplace Learning* and *Vocations and Learning*). These two journals have the lowest impact factors and are the only European journals, while the high-impact journals have broad focuses on either psychology or management and are all published in the United States.

Throughout the 29 analyzed articles, a total of 1494 authors were cited, of which 1233 authors were only cited once. Forty authors were cited at least in ten out of 29 analyzed articles. Table 3.4 lists these 40 most cited authors, the number of articles in which at least one of their publications was cited, the total number of different publications that were cited in our sample, and the number of authorships in our sample.

Table 3.3 Ten most frequently cited journals in the sample of 30 articles on learning from errors at work

Journal	Number of articles cited	Category (SSCI)	Country	Impact Factor (SSCI 2018)
Journal of applied psychology	37	Psychology, applied; management	United States	5.1
Journal of Personality and social psychology	26	Psychology, social	United States	5.9
Psychological bulletin	19	Psychology, multidisciplinary	United States	16.4
Journal of workplace learning	17	Social sciences; organizational behavior and human Resource management; psychology, social	England	–
Academy of Management journal	16	Business; management	United States	7.2
Journal of organizational behavior	12	Business; management; psychology, applied	England/ United States	5.0
Psychological review	11	Psychology, multidisciplinary	United States	6.3
Vocations and learning	9	Education & Educational Research	Netherlands	1,3
Administrative science quarterly	9	Business; management	United States	8.0
Organization science	9	Management	United States	3.3

Notes. Impact factors were retrieved from Web of Science and updated in December 2019

The first ten authors were cited in 20 and more out of 29 analyzed articles, that means in at least two thirds of our sample. However, there are great differences regarding the number of different publications that were cited. For instance, the article ‘Error Orientation Questionnaire (EOQ): reliability, validity, and different language equivalence’ by Rybowski et al. (1999) was cited in 25 of 29 articles. But, compared to his co-authors, Michael Frese’s contribution to the field is much broader because 18 of his publications were cited at least once throughout the 29 articles. In contrast, his co-authors only appeared in that particular publication. High numbers of cited publications were found in particular for researchers who were also frequent authors in our sample of analyzed articles (e.g., Johannes Bauer, Hans Gruber, Christian Harteis). The results will be discussed further in the next section.

Table 3.4 Forty most frequently cited authors in the sample of 29 articles on learning from errors at work

Name	Number of articles cited in (max = 29)	Number of different publications	Number of authorships in analyzed sample
Frese, Michael	25	18	0
Edmondson, Amy C.	25	16	0
Batinic, Bernard	25	1	0
Garst, Harry	25	1	0
Rybowiak, Volker	25	1	0
Bauer, Johannes	24	30	12
Gruber, Hans	24	26	4
Reason, James T.	23	7	0
Sonnentag, Sabine	22	3	0
Van Dyck, Cathy	21	2	0
Harteis, Christian	19	18	5
Heid, Helmut	19	16	3
Keith, Nina	18	7	0
Zhao, Bin	18	3	2
Baer, Markus	18	2	0
Gartmeier, Martin	17	11	6
Mulder, Regina	16	10	8
Billett, Stephen	15	12	1
Zapf, Dieter	15	9	0
Oser, Fritz	15	5	0
Kolb, David	15	2	0
Cannon, Mark D.	15	2	0
Olivera, Fernando	15	2	1
Tucker, Anita	13	2	0
Ellström, Per-Erik	12	3	0
Bromme, Rainer	12	3	0
Boshuizen, Henny	12	3	0
Spychiger, Maria	12	2	0
van Woerkom, Marianne	11	5	0
Eraut, Michael	11	4	0
Kolodner, Janet	11	3	0
Hui, Chun	11	1	0
Tjosvold, Dean	11	1	0
Yu, Zi-You	11	1	0
Ericsson, K. Anders	10	7	0
Rasmussen, Jens	10	6	0
Schön, Donald	10	3	0

(continued)

Table 3.4 (continued)

Name	Number of articles cited in (max = 29)	Number of different publications	Number of authorships in analyzed sample
Moray, Neville P.	10	2	0
Senders, John W.	10	2	0
Clarke, Sharon G.	10	2	0

3.4 Discussion and Future Directions of Research

Interest in learning from errors as a facet of informal learning in the workplace has grown in the last decades. Research on learning from errors can be classified by differentiating between an organizational (or system) perspective, a team-level perspective and individual level (Lei et al., 2016). In our review, we focused on individual learning from errors in the workplace. Following Tynjälä's (2008, 2013) 3-P-model of workplace learning, individual factors and contextual factors exert influence on learning processes which lead to various learning outcomes. In the case of learning from errors, factors such as an individual's error orientation or an organizational error culture influence one's individual engagement in learning activities such as reflection and social interaction. Negative knowledge is often discussed as an individual outcome of learning from errors. Research on workplace learning usually relies on retrospective self-reports by means of interviews or questionnaires.

To provide a systematic overview of research on learning from errors at work, we conducted a literature review and citation analysis of articles between 2007 and 2018. In total, 29 articles were identified based on the following criteria: (1) keyword matches in title, abstract and/or keywords, (2) main focus on individual learning from errors at work, (3) published from 2007 until late 2018 (when this manuscript was prepared). (4) English or German language.

Regarding the types of articles, 20 of the 29 articles report on empirical research, five articles are theoretical and four articles are literature reviews. Focusing on the empirical studies, in nine studies only quantitative data was collected, in six studies only qualitative data was collected and five studies relied on mixed methods. Interviews and questionnaires were most common, in particular the presentation and evaluation of authentic error vignettes was used in the context of nursing (Bauer & Mulder, 2010). Moreover, the collection of critical incidents and more or less standardized diaries were also applied. Nylander et al. (2018) found that the majority of empirical studies on adult education and learning were limited to qualitative data, while our analysis of research on learning from errors revealed that the most cited studies applied quantitative methods. Most studies were conducted in the context of nursing, followed by a variety of commercial contexts. The majority of the articles focuses on presage (input factors) and the process of learning from errors. Error orientation is often considered an individual prerequisite and measured by the EOQ (Rybowiak et al., 1999). Processes of learning from errors were measured by questionnaires such as Engagement in Social Learning Activities (ESLA) by Bauer

and Mulder (2010). Most studies applied retrospective methods of data collection such as questionnaires. In only a few studies was data collected close to the processes, for instance by means of diaries (Hascher & Kaiser, 2015; Rausch, 2012a; Rausch et al., 2017). Moreover, only a few articles focused on the product of what is being learned from errors. These works often refer to the concept of negative knowledge. The empirical approaches range from the analysis of interview data over the classification of diary data to the measurement of performance improvements as indicators of learning.

In total, the 29 analyzed articles were published by 31 researchers. Most researchers work in general or adult education, while only a few are related to medicine and nursing or business education and management. Ten of these authors contributed to more than one article. First and foremost, it is remarkable that nine out of these ten authors are from Germany. The authors of this review are not aware of any bias towards German contributions in their review except for including two German-language articles. There seems to be a vibrant community of researchers in this field in Germany. On closer inspection, most of these researchers are related to the University of Regensburg or collaborated with researchers from that community. Helmut Heid, Hans Gruber and Regina Mulder had a long-term influence on this strand of research and Johannes Bauer, Martin Gartmeier and Christian Harteis represent a ‘second generation’ of researchers in this tradition, all three of them had formerly worked at the University of Regensburg.

In our sample of 29 articles on learning from errors at work, articles from 262 different journals were cited; 174 journals were only cited once. Only two of the top-ten-cited journals are focused on workplace learning (*Journal of Workplace Learning* and *Vocations and Learning*). These two journals have the lowest impact factors and are the only European journals, while the high-impact journals have broad focuses on either psychology or management and are all published in the United States. Thus, when choosing an appropriate journal to submit to, a conflict arises between journals of particular relevance to the scientific community of workplace learning and journals of high impact in general.

Within the 29 analyzed articles, a total of 1494 authors were cited, of which 1233 authors were cited only once. The ten most-cited authors were cited in 20 and more out of 29 analyzed articles, that means in at least two thirds of the analyzed articles. High numbers of cited publications were found in particular for researchers who were also frequent authors in our sample (e.g., Johannes Bauer, Hans Gruber, Christian Harteis). This may in part be due to self-citation, which is not unusual because the authors know their own work and how it contributes to their particular line of argument. As Harzing (2011) points out, self-citation should not be seen as biasing a citation analysis because it is often “a legitimate way to acknowledge the academic’s previous research in the same field” (p. 4). It is more of a problem, if there is a lack of citations from other researchers. As shown above, the number of articles in which the mentioned authors were cited at least once clearly exceeds their number of authorships. Thus, many well-respected authors in the field were also authors in our sample. Some influential researchers

in the field are not authors in our sample because they were not active anymore (e.g., James T. Reason, K. Anders Ericsson) or because their focus is not on the individual level of learning from errors at work but more on the organizational level (e.g., Michael Frese, Amy C. Edmondson).

Regarding Nylander et al.'s (2018) list of the 50 most cited authors in adult learning research between 2006 and 2014, there are only five authors who are in both lists: Stephen Billett (2nd position at Nylander et al.), Michael Eraut (13th position), Donald Schön (14th position), David A. Kolb (34th position) and Per-Erik Ellström (36th position). Hence, one may conclude that the communities of adult learning research in general and research on learning from errors at work are quite distinct, though learning from errors is undoubtedly a rich source of informal learning in the workplace (Tynjälä, 2008, 2013). Nylander et al. (2018) based their analysis on only five selected journals (*Adult Education Quarterly*, *International Journal of Lifelong Education*, *Studies in Continuing Education*, *Journal of Education and Work* and *Journal of Workplace Learning*), of which only the *Journal of Workplace Learning* is among the ten most cited journals in our review. This may be seen as a limitation of comparability or as another indicator of quite scattered research communities. There is no consensus on a narrow list of relevant journals like it is common in other disciplines as, for instance, in business. Indeed, research on workplace learning in general and on learning from errors at work in particular, seems to be widespread over a multitude of disciplines and thus over many different journals.

Our literature review has some limitations. Despite due diligence, we might have overseen relevant work. For instance, chapters in edited books are not always found in databases. Furthermore, we had limited our literature review to individual learning from errors and thus, excluded publications that focused mainly on the organizational level of learning from errors, error management, error culture or more generally on safety and reliability. Hence, our review represents only one part of this topic and this, of course, influenced our findings. Our citation analysis has limitations, too. As a matter of fact, counting citations is only a vague indicator of an author's impact in the field and we are fully aware that the resulting picture might be biased for several reasons. Nevertheless, we hope we have provided an interesting new overview of our field of research.

Based on our review and our own experiences, we would like to highlight three recommendations for future research: (1) Research on learning from errors should put a stronger emphasis on the measurement of the outcomes of learning from errors. This outcome constitutes arguably the crucial dependent variable, but it has hardly been investigated in detail. One possible reason may be that the range of what is potentially learned from errors is very broad and bound to the specific error situation. Nevertheless, objective measures of one's in-role performance at work would be an informative criterium of work-related learning. (2) Future research should be domain-specific and incorporate the collection of process data, for instance by means of diaries, observational (video) studies or log file analyses where appropriate, instead of solely relying on retrospective self-report measures such as questionnaires and interviews. A combination of various data sources such as subjective diary data, objective behavioural data and objective performance would also

help to avoid common method bias which is clearly an issue if, for instance, attitudes towards errors, coping with errors and learning from errors are all measured by self-report questionnaires. (3) Replication studies on learning from errors at work are still scarce. Leicher and Mulder (2016), Leicher et al. (2013) as well as Rausch et al. (2017) replicated findings from earlier studies to some extent. Further replication studies over various contexts are needed to distinguish general mechanisms of learning from errors from domain-specific patterns.

References

- Anselmann, V., & Mulder, R. H. (2018). Learning from errors in insurance companies. *Journal of Management Development*, 37(2), 138–148. <https://doi.org/10.1108/JMD-06-2017-0211>
- Bauer, J. (2008). *Learning from errors at work – Studies on nurses' engagement in error-related learning activities* [University of Regensburg]. https://pub.uni-regensburg.de/10748/1/diss_veroeff_endversion.pdf
- Bauer, J., & Mulder, R. H. (2007). Modelling learning from errors in daily work. *Learning in Health and Social Care*, 6(3), 121–133. <https://doi.org/10.1111/j.1473-6861.2007.00150.x>
- Bauer, J., & Mulder, R. H. (2008). Conceptualisation of learning through errors at work. In S. Billett, C. Harteis, & A. Eteläpelto (Hrsg.), *Emerging perspectives of workplace learning*. Brill | Sense. https://doi.org/10.1163/9789087906450_009
- Bauer, J., & Mulder, R. H. (2010). In search of a good method for measuring learning from errors at work. In M. Van Woerkom & R. F. Poell (Hrsg.), *Workplace learning: Concepts, measurement and application* (S. 111–127). Routledge.
- Bauer, J., & Mulder, R. H. (2013). Engagement in learning after errors at work: Enabling conditions and types of engagement. *Journal of Education and Work*, 26(1), 99–119. <https://doi.org/10.1080/13639080.2011.573776>
- Bauer, J., Festner, D., Harteis, C., Heid, H., & Gruber, H. (2004). Fehlerorientierung im betrieblichen Arbeitsalltag. Ein Vergleich zwischen Führungskräften und Beschäftigten ohne Führungsfunktion. *Zeitschrift für Berufs- und Wirtschaftspädagogik*, 100, 65–82.
- Bauer, J., Gartmeier, M., & Harteis, C. (2012). Human fallibility and learning from errors at work. In J. Bauer & C. Harteis (Hrsg.), *Human fallibility* (Bd. 6, S. 155–169). Springer. https://doi.org/10.1007/978-90-481-3941-5_10
- Bauer, J., Leicher, V., & Mulder, R. H. (2016). On nurses' learning from errors at work. In S. Billett, D. Dymock, & S. Choy (Hrsg.), *Supporting learning across working life* (Bd. 16, S. 129–145). Springer. https://doi.org/10.1007/978-3-319-29019-5_7
- Berings, M. G. M. C., Doornbos, A. J., & Simons, P. R.-J. (2006). Methodological practices in on-the-job learning research. *Human Resource Development International*, 9(3), 333–363. <https://doi.org/10.1080/13678860600893557>
- Billett, S. (2012). Errors and learning from errors at work. In J. Bauer & C. Harteis (Hrsg.), *Human fallibility* (Bd. 6, S. 17–32). Springer. https://doi.org/10.1007/978-90-481-3941-5_2
- Billett, S. (2014). Mimetic learning at work: Learning through and across professional working lives. In S. Billett, C. Harteis, & H. Gruber (Hrsg.), *International handbook of research in professional and practice-based learning* (S. 887–909). Springer. https://doi.org/10.1007/978-94-017-8902-8_33
- Boekaerts, M. (2011). Emotions, emotion regulation, and self-regulation of learning. In B. J. Zimmermann & D. H. Schunk (Hrsg.), *Handbook of self-regulation of learning and performance* (S. 408–425). Routledge.
- Böhn, S., & Deutscher, V. (2019). Betriebliche Ausbildungsbedingungen im dualen System – Eine qualitative Meta-Analyse zur Operationalisierung in Auszubildendenbefragungen. *Zeitschrift für Pädagogische Psychologie*, 33(1), 49–70. <https://doi.org/10.1024/1010-0652/a000234>

- Böhnke, A., & Thiel, F. (2016). Unterrichtsbezogene Fehlerorientierung von Lehrkräften – Adaption und Validierung eines Fragebogens. *Zeitschrift für Pädagogische Psychologie*, *30*(1), 57–67. <https://doi.org/10.1024/1010-0652/a000168>
- Brown, S. P., Westbrook, R. A., & Challagalla, G. (2005). Good cope, bad cope: Adaptive and maladaptive coping strategies following a critical negative work event. *Journal of Applied Psychology*, *90*(4), 792–798. <https://doi.org/10.1037/0021-9010.90.4.792>
- Cannon, M. D., & Edmondson, A. C. (2005). Failing to learn and learning to fail (intelligently). *Long Range Planning*, *38*(3), 299–319. <https://doi.org/10.1016/j.lrp.2005.04.005>
- Catino, M., & Patriotta, G. (2013). Learning from errors: Cognition, emotions and safety culture in the Italian air force. *Organization Studies*, *34*(4), 437–467. <https://doi.org/10.1177/0170840612467156>
- Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, *44*(2), 350. <https://doi.org/10.2307/2666999>
- Edmondson, A. C., & Lei, Z. (2014). Psychological safety: The history, renaissance, and future of an interpersonal construct. *Annual Review of Organizational Psychology and Organizational Behavior*, *1*(1), 23–43. <https://doi.org/10.1146/annurev-orgpsych-031413-091305>
- Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of Education and Work*, *14*(1), 133–156. <https://doi.org/10.1080/13639080020028747>
- Eraut, M. (2004a). Transfer of knowledge between education and workplace settings. In H. Rainbird, A. Fuller, & A. Munro (Hrsg.), *Workplace learning in context* (S. 201–221). Routledge.
- Eraut, M. (2004b). Informal learning in the workplace. *Studies in Continuing Education*, *26*(2), 247–273. <https://doi.org/10.1080/158037042000225245>
- Farnese, M. L., Fida, R., & Picoco, M. (2020). Error orientation at work: Dimensionality and relationships with errors and organizational cultural factors. *Current Psychology*. <https://doi.org/10.1007/s12144-020-00639-x>
- Fejes, A., & Nylander, E. (2019). Adult education and learning: A pluralistic research field? In A. Fejes & E. Nylander (Hrsg.), *Mapping out the research field of adult education and learning* (S. 119–137). Springer. https://doi.org/10.1007/978-3-030-10946-2_7
- Frese, M., & Zapf, D. (1994). Action as the core of work psychology: A German approach. In H. C. Triandis, M. D. Dunnette, & L. M. Hough (Hrsg.), *Handbook of industrial and organizational psychology* (S. 271–340). Consulting Psychologists Press.
- Gartmeier, M., & Schüttelkopf, E. M. (2012). Tracing outcomes of learning from errors on the level of knowledge. In J. Bauer & C. Harteis (Hrsg.), *Human Fallibility* (Bd. 6, S. 33–51). Springer. https://doi.org/10.1007/978-90-481-3941-5_3
- Gartmeier, M., Bauer, J., Gruber, H., & Heid, H. (2008). Negative knowledge: Understanding professional learning and expertise. *Vocations and Learning*, *1*(2), 87–103. <https://doi.org/10.1007/s12186-008-9006-1>
- Gartmeier, M., Bauer, J., Gruber, H., & Heid, H. (2010a). Workplace errors and negative knowledge in elder care nursing. *Human Resource Development International*, *13*(1), 5–25. <https://doi.org/10.1080/13678861003589057>
- Gartmeier, M., Gruber, H., & Heid, H. (2010b). Tracing error-related knowledge in interview data: Negative knowledge in elder care nursing. *Educational Gerontology*, *36*(9), 733–752. <https://doi.org/10.1080/03601271003680588>
- Gartmeier, M., Ottl, E., Bauer, J., & Berberat, P. O. (2017). Learning from errors: Critical incident reporting in nursing. *Journal of Workplace Learning*, *29*(5), 343–356. <https://doi.org/10.1108/JWL-01-2017-0011>
- Goodman, P. S., Ramanujam, R., Carroll, J. S., Edmondson, A. C., Hofmann, D. A., & Sutcliffe, K. M. (2011). Organizational errors: Directions for future research. *Research in Organizational Behavior*, *31*, 151–176. <https://doi.org/10.1016/j.riob.2011.09.003>
- Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, *2*(3), 271–299. <https://doi.org/10.1037/1089-2680.2.3.271>
- Harteis, C., & Bauer, J. (2014). Learning from errors at work. In S. Billett, C. Harteis, & H. Gruber (Hrsg.), *International handbook of research in professional and practice-based learning* (S. 699–732). Springer. https://doi.org/10.1007/978-94-017-8902-8_26

- Harteis, C., Bauer, J., & Haltia, P. (2007). Learning from errors in the workplace – Insights from two studies in Germany and Finland. In *Learning in the workplace – New developments* (S. 119–138). Finnish Educational Research Association (FERA).. https://www.researchgate.net/profile/Johannes_Bauer4/publication/258447271_Learning_from_errors_at_the_workplace_-_insights_from_two_studies_in_Germany_and_Finland/links/56d3f67a08ae059e3761883f.pdf
- Harteis, C., Bauer, J., & Gruber, H. (2008). The culture of learning from mistakes: How employees handle mistakes in everyday work. *International Journal of Educational Research*, 47(4), 223–231. <https://doi.org/10.1016/j.ijer.2008.07.003>
- Harteis, C., Bauer, J., & Heid, H. (2012). Research on human fallibility and learning from errors at work: Challenges for theory, research, and practice. In J. Bauer & C. Harteis (Hrsg.), *Human fallibility* (Bd. 6, S. 255–265). Springer. https://doi.org/10.1007/978-90-481-3941-5_15
- Harzing, A.-W. (2011). *The publish or perish book: Your guide to effective and responsible citation analysis* (1st ed.). Tarma Software Research Pty Ltd..
- Hascher, T., & Kaiser, C. (2015). The acquisition of negative knowledge during field experience in teacher education. In M. Gartmeier, H. Gruber, T. Hascher, & H. Heid (Hrsg.), *Fehler: Ihre Funktionen im Kontext individueller und gesellschaftlicher Entwicklung* (S. 227–244). Waxmann.
- Hetzner, S., Gartmeier, M., Heid, H., & Gruber, H. (2011). Error orientation and reflection at work. *Vocations and Learning*, 4(1), 25–39. <https://doi.org/10.1007/s12186-010-9047-0>
- Kapur, M. (2014). Productive failure in learning math. *Cognitive Science*, 38(5), 1008–1022. <https://doi.org/10.1111/cogs.12107>
- Keith, N., & Frese, M. (2008). Effectiveness of error management training: A meta-analysis. *Journal of Applied Psychology*, 93(1), 59–69. <https://doi.org/10.1037/0021-9010.93.1.59>
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.
- Lazarus, R. S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal of Personality*, 1(3), 141–169. <https://doi.org/10.1002/per.2410010304>
- Lei, Z., Naveh, E., & Novikov, Z. (2016). Errors in organizations: An integrative review via level of analysis, temporal dynamism, and priority lenses. *Journal of Management*, 42(5), 1315–1343. <https://doi.org/10.1177/0149206316633745>
- Leicher, V., & Mulder, R. H. (2016). Individual and contextual factors influencing engagement in learning activities after errors at work: A replication study in a German retail Bank. *Journal of Workplace Learning*, 28(2), 66–80. <https://doi.org/10.1108/JWL-03-2015-0022>
- Leicher, V., Mulder, R. H., & Bauer, J. (2013). Learning from errors at work: A replication study in elder care nursing. *Vocations and Learning*, 6(2), 207–220. <https://doi.org/10.1007/s12186-012-9090-0>
- Littlejohn, A., Lukic, D., & Margaryan, A. (2014). Comparing safety culture and learning culture. *Risk Management*, 16(4), 272–293. <https://doi.org/10.1057/rm.2015.2>
- Naveh, E., Katz-Navon, T., & Stern, Z. (2005). Treatment errors in healthcare: A safety climate approach. *Management Science*, 51(6), 948–960. <https://doi.org/10.1287/mnsc.1050.0372>
- Nylander, E., Österlund, L., & Fejes, A. (2018). Exploring the adult learning research field by analysing who cites whom. *Vocations and Learning*, 11(1), 113–131. <https://doi.org/10.1007/s12186-017-9181-z>
- Olsen, D. S., & Tikkanen, T. (2018). The developing field of workplace learning and the contribution of PIAAC. *International Journal of Lifelong Education*, 37(5), 546–559. <https://doi.org/10.1080/02601370.2018.1497720>
- Oser, F. (2007). Aus Fehlern lernen. In M. Göhlich, C. Wulf, & J. Zirfas (Hrsg.), *Pädagogische Theorien des Lernens* (S. 203–212). Beltz.
- Oser, F. K., Näpflin, C., Hofer, C., & Aerni, P. (2012). Towards a theory of negative knowledge (NK): Almost-mistakes as drivers of episodic memory amplification. In J. Bauer & C. Harteis (Hrsg.), *Human fallibility* (Bd. 6, S. 53–70). Springer. https://doi.org/10.1007/978-90-481-3941-5_4

- Park, S., & Lee, J. Y. (2018). Workplace learning measures for human resource development: Review and summary. *Industrial and Commercial Training*, 50(7/8), 420–431. <https://doi.org/10.1108/ICT-08-2018-0068>
- Ramanujam, R., & Goodman, P. S. (2011). The link between organizational errors and adverse consequences: The role of error-correcting and error-amplifying feedback processes. In D. A. Hofmann & M. Frese (Hrsg.), *Errors in organizations* (S. 245–272). Routledge.
- Rasmussen, J. (1983). Skills, rules, and knowledge; signals, signs, and symbols, and other distinctions in human performance models. *IEEE Transactions on Systems, Man, and Cybernetics, SMC-13*(3), 257–266. <https://doi.org/10.1109/TSMC.1983.6313160>
- Rausch, A. (2012a). Errors, emotions, and learning in the workplace – Findings from a diary study within VET. In E. Wuttke & J. Seifried (Hrsg.), *Learning from errors at school and at work* (S. 111–126). Barbara Budrich.
- Rausch, A. (2012b). Prozessnahe und retrospektive Erhebungsmethoden der Arbeitsanalyse in der betrieblichen Ausbildung. *Empirische Pädagogik*, 26(2), 247–270.
- Rausch, A. (2014). Using diaries in research on work and learning. In C. Harteis, A. Rausch, & J. Seifried (Hrsg.), *Discourses on professional learning* (Bd. 9, S. 341–366). Springer. https://doi.org/10.1007/978-94-007-7012-6_17
- Rausch, A., Schley, T., & Warwas, J. (2015). Problem solving in everyday office work—A diary study on differences between experts and novices. *International Journal of Lifelong Education*, 34(4), 448–467. <https://doi.org/10.1080/02601370.2015.1060023>
- Rausch, A., Seifried, J., & Harteis, C. (2017). Emotions, coping and learning in error situations in the workplace. *Journal of Workplace Learning*, 29(5), 374–393. <https://doi.org/10.1108/JWL-01-2017-0004>
- Reason, J. T. (1990). *Human error*. Cambridge University Press.
- Reason, J. (1995). Understanding adverse events: Human factors. *Quality and Safety in Health Care*, 4(2), 80–89. <https://doi.org/10.1136/qshc.4.2.80>
- Reason, J. (2000). Human error: Models and management. *BMJ*, 320(7237), 768–770. <https://doi.org/10.1136/bmj.320.7237.768>
- Rintala, H., Nokelainen, P., & Pylväs, L. (2019). Informal workplace learning: Turning the workplace into a learning site. In S. McGrath, M. Mulder, J. Papier, & R. Suart (Hrsg.), *Handbook of vocational education and training* (S. 1–14). Springer. https://doi.org/10.1007/978-3-319-49789-1_97-1
- Rybowiak, V., Garst, H., Frese, M., & Batinic, B. (1999). Error orientation questionnaire (EOQ): Reliability, validity, and different language equivalence. *Journal of Organizational Behavior*, 20(4), 527–547. [https://doi.org/10.1002/\(SICI\)1099-1379\(199907\)20:4<527::AID-JOB886>3.0.CO;2-G](https://doi.org/10.1002/(SICI)1099-1379(199907)20:4<527::AID-JOB886>3.0.CO;2-G)
- Sawchuk, P. H. (2009). Informal learning and work: From genealogy and definitions to contemporary methods and findings. In R. Maclean & D. Wilson (Hrsg.), *International handbook of education for the changing world of work* (S. 319–331). Springer. https://doi.org/10.1007/978-1-4020-5281-1_21
- Schwarz, N., & Bless, H. (1991). Happy and mindless, but sad and smart? The impact of affective states on analytic reasoning. In J. P. Forgas (Hrsg.), *Emotion and social judgment* (S. 55–72). Pergamon.
- Seifried, J., & Baumgartner, A. (2009). Lernen aus Fehlern in der betrieblichen Ausbildung – Problemfeld und möglicher Forschungszugang. *Berufs- und Wirtschaftspädagogik – online*, 17, 1–20.
- Seifried, J., & Höpfer, E. (2013). The perception of error in production plants of a chemical organisation. *Vocations and Learning*, 6(2), 159–185. <https://doi.org/10.1007/s12186-012-9081-1>
- Strasser, J. (2014). Reflexion von Erfahrungen und Fehlern. Eine Voraussetzung für die berufliche Wissensentwicklung von Beraterinnen und Beratern. In P. Bauer & M. Weinhardt (Hrsg.), *Perspektiven sozialpädagogischer Beratung. Empirische Befunde und aktuelle Entwicklungen* (S. 196–213). Beltz Juventa.

- Tulis, M., Steuer, G., & Dresel, M. (2016). Learning from errors: A model of individual processes. *Frontline Learning Research*, 4(4), 12–26. <https://doi.org/10.14786/flr.v4i2.168>
- Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review*, 3(2), 130–154. <https://doi.org/10.1016/j.edurev.2007.12.001>
- Tynjälä, P. (2013). Toward a 3-P model of workplace learning: A literature review. *Vocations and Learning*, 6(1), 11–36. <https://doi.org/10.1007/s12186-012-9091-z>
- van Dyck, C., Frese, M., Baer, M., & Sonnentag, S. (2005). Organizational error management culture and its impact on performance: A two-study replication. *Journal of Applied Psychology*, 90(6), 1228–1240. <https://doi.org/10.1037/0021-9010.90.6.1228>
- Van Woerkom, M. (2003). *Critical reflection at work: Bridging individual and organisational learning*. Twente University.
- Weingardt, M. (2004). *Fehler Zeichnen uns aus – Transdisziplinäre Grundlagen zur Theorie und Produktivität des Fehlers in Schule und Arbeitswelt*. Klinkhardt.
- Wenger, E. (2008). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.
- Yan, Q., Bligh, M. C., & Kohles, J. C. (2014). Absence makes the errors go longer: How leaders inhibit learning from errors. *Zeitschrift für Psychologie*, 222(4), 233–245. <https://doi.org/10.1027/2151-2604/a000190>
- Ye, Q., Wang, D., & Li, X. (2018). Promoting employees' learning from errors by inclusive leadership: Do positive mood and gender matter? *Baltic Journal of Management*, 13(1), 125–142. <https://doi.org/10.1108/BJM-05-2017-0160>
- Zapf, D., & Reason, J. T. (1994). Introduction: Human errors and error handling. *Applied Psychology: An International Review*, 43(4), 427–432.
- Zhao, B. (2011). Learning from errors: The role of context, emotion, and personality. *Journal of Organizational Behavior*, 32(3), 435–463. <https://doi.org/10.1002/job.696>
- Zhao, B., & Olivera, F. (2006). Error reporting in organizations. *Academy of Management Review*, 31(4), 1012–1030. <https://doi.org/10.5465/amr.2006.22528167>
- Zhao, B., Olivera, F., & Edmondson, A. C. (2014). Learning from errors in organizations: The effects of negative emotions on motivation and cognition. In J. A. Miles (Hrsg.), *New directions in management and organization theory* (S. 23–61). Cambridge Scholars Publishing.
- Zhao, B., Seifried, J., & Sieweke, J. (2018). Trainers' responses to errors matter in trainees' learning from errors: Evidence from two studies. *Journal of Managerial Psychology*, 33(3), 279–296. <https://doi.org/10.1108/JMP-10-2017-0364>

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Chapter 4

Pointing Out Conceptual and Measurement Issues in Studies on ‘Learning Motivation’ and ‘Training Motivation’ in Workplace Settings. A Literature Review



Nané Kochoian, Isabel Raemdonck, and Mariane Frenay

Abstract Today’s workplace presents rapid changes highlighting the importance for workers to engage in continuous learning. Given the central role of motivation in learning process, it is important to start with developing a good understanding of the way it is defined and measured in the literature. In the present study, we focus specifically on ‘learning motivation’ and ‘training motivation’, as constructs describing motivation for workplace learning in empirical studies. We analyze the way these both constructs are conceptualised, measured and relate to other variables studied in the selected articles. Inclusion criteria capture empirical studies on training and learning motivation in the context of work. Based on a total of 47 articles, our results suggest that there is no clear distinction between the examined constructs. Moreover, there is a lack of reference to motivational and learning theories in the way ‘learning motivation’ and ‘training motivation’ are, both, defined and measured. The article discusses results and brings suggestions that might clarify and overcome the issues related to the use of various terminology with no clear conceptual difference.

Keywords Workplace · Motivation · Learning motivation · Training motivation · Review

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© Springer Nature Switzerland AG 2022
C. Harteis et al. (eds.), *Research Approaches on Workplace Learning*,
Professional and Practice-based Learning 31,
https://doi.org/10.1007/978-3-030-89582-2_4

4.1 Introduction

During the last decade, continuous workplace learning has become an essential tool to maintain employees' employability as well as organizations' competitiveness (Fenwick, 2006, 2008; Marsick & Volpe, 1999a, b). As workplace learning has been linked to improvements in productivity and performance (Ashton & Sung, 2002), there is much interest in investigating the determinants of workplace learning. Employees' motivation for learning is considered to be one of the most important predictors of participation in learning activities (Colquitt et al., 2000; Noe, 1986; Stipek, 1996; Tannenbaum & Yukl, 1992; Walberg & Uguroglu, 1980; Wlodkowski, 2008; Zull, 2002) and training outcomes (Colquitt et al., 2000; Quinones, 1995). The centrality of motivation to workplace learning is rarely debated given the robust findings that motivation is positively related to an array of personal and organizational outcomes.

In literature there is no single definition or unified approach to refer to motivation for workplace learning. Moreover, there is also a problem in the use of terminology. Different terms might be employed to describe the same phenomena or the same terms might be used when meaning something different. Given the central role of motivation in workplace learning outcomes, it is important to develop a good understanding of the meaning behind the terms that are used in the literature. In the present review we focused specifically on « learning motivation » and « training motivation » as terminology to describe motivation for workplace learning. We are interested to know how both terms are conceptualised and measured and to compare their nomological networks.

4.2 Theoretical Framework

Motivation for workplace learning consists of two components: 'workplace learning' and 'motivation'. We will first describe the concept of workplace learning. Then, the concept of motivation is discussed as it occurs in workplace settings. Finally, we present the three research questions leading this review.

4.2.1 *Workplace Learning*

Workplace learning has been investigated in a variety of study fields and disciplines, such as higher education, adult education, vocational education and organizational theories (Boud & Garrick, 1999, 2001; Hager, 1999, 2004a, b; Manuti et al., 2015). Consequently, it has generated numerous definitions and understandings of workplace learning and the meaning of workplace learning is still subject to debate. Following Jacobs and Park (2009, p. 134), workplace learning is "the process used by individuals when engaged in training programs, education and development

courses, or some type of experiential learning activity for the purpose of acquiring the competence necessary to meet current and future work requirements”. According to this definition, workplace learning is an inclusive term for different learning activities relevant for work-related tasks executed in different types of learning contexts. Literature on workplace learning proposes two major types of learning contexts: formal and informal learning. Formal learning is defined as structured learning that takes place ‘off-the-job’ (e.g., lectures, conferences, trainings) or outside the work environment, typically in classroom-based formal educational settings (Marsick & Volpe, 1999a, b; Marsick & Watkins, 2001; Marsick et al., 2006). Eraut (2000) describes several characteristics of formal learning: a prescribed learning framework, an organized learning event or package, the presence of a designated teacher or trainer, the award of a qualification or credit and the external specification of outcomes. Informal learning is conceptually rooted in experiential learning theory and was differentiated from formal learning by Watkins and Marsick (1992) in their theory of learning in organizations. Following, Marsick and Watkins (1999, 2001) informal learning takes place “wherever people have the need, motivation, and opportunity for learning” (2001, p. 28) and that it “is usually intentional but not highly structured and includes self-directed learning, networking, coaching, mentoring, and performance planning that includes opportunities to review learning needs” (2001, pp. 25–26). Informal learning is described as being less pre-structured and more in control of the learner than formal learning (Watkins & Marsick, 1992). It is also reported to be embedded in daily work activities of the employee and therefore is often a by-product of some other activity occurred in an implicit, reactive, or deliberate way (Eraut, 2007; Livingstone, 2001, 2006; Lohman, 2006). Despite these two types of learning contexts, the distinction of formal and informal learning remains an object of debate in the workplace learning literature. Several authors (e.g., Billett, 2001a, b; Colley et al., 2002) point out that informal learning has often been defined in opposition to formal learning (any learning that is not formal) and lacks a clear definition.

In the present article, we examine whether researchers refer to different contexts when using « learning motivation » and « training motivation » as terminology to describe motivation for workplace learning. More specifically, we expect that « training motivation » might refer to employees’ motivation to learn from formal workplace learning settings only whereas « learning motivation », which is much more broad-based, refers to employees’ motivation to learn from formal and informal workplace learning settings.

4.2.2 Motivation as It Occurs in Workplace Settings

Literature on work motivation considers the complexity of motivation by taking into account the interactions between cognition, affect and behavior (Latham & Pinder, 2005). Work motivation is commonly described as “the set of internal and external forces that initiate work-related behavior, and determine its form, direction, intensity, and duration” (Pinder, 2008, p. 11). This definition brings several important

insights. First, it admits the influence of contextual (e.g., job characteristics) as well as individual (e.g., needs) factors on work-related behavior. Work motivation refers then to the psychological mechanisms and processes that connects the individual and the environment. Second, this definition highlights that work motivation triggers work-related behavior. Third, motivation is also reported in this definition as regulatory for the quantity of displayed efforts and their duration and therefore affecting persistence. It is this distributional aspect of motivation in the allocation of resources that accounts mostly for behavioral change (Kanfer et al., 2008). Kanfer (1990) points out that most contemporary theories recognize the dynamic nature of motivation, even though these theories differ as to the kind of processes they refer to. Motivation has been theorized by many different disciplinary backgrounds and this has generated a number of different interpretations about the underlying processes it constitutes (Self-determination theory, Expectancy theories, Goal orientation theories etc.) and led, especially in educational psychology to insights on motivation in the context of education. In this review we will not focus on the application of these different theoretical perspectives in the workplace context and will exclusively orient our search upon the use of “learning motivation” and “training motivation” in organizational literature. Since workplace learning is considered to be a work-related behavior, we examine in the present article if definitions of “learning motivation” and “training motivation” are described like work motivation is commonly defined (cfr. Pinder, 2008) and thus refer to ‘psychological processes that connect internal and external forces that initiate learning behavior or training behavior and determine its form, direction, intensity, and duration’.

The present review aims to examine through a systematic approach the terms “learning motivation” and “training motivation”. More specifically, this review focuses on the following research questions:

RQ1: How are training and learning motivation conceptualized?

RQ2: How are training and learning motivation measured?

RQ3: Do training and learning motivation present different nomological networks?

4.3 Method

In order to ensure the transparency of the methodology and to enhance the reproducibility of the study, different stages were followed as suggested by Fink (2014). First, inclusion and exclusion criteria were formulated. Then, searching terms were formulated and pretested in order to attain the optimal balance between the external and internal validity. Finally, we proceeded to the identification of relevant publications. In the following paragraphs, the different stages are described in more details.

4.3.1 Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were defined before conducting the search process. First, to provide an insight into recent scientific literature, the time span was restricted to publications from 1990 through 2019. To ensure a high quality of productions, only peer-reviewed articles were retained. Then, in accordance with one of our research goals related to the analysis of measurement instruments used in the operationalization of workplace learning motivation, only quantitative empirical studies were retained. Finally, we only included articles exclusively focusing on a workers population. Therefore, articles reporting on trainees were not taken into account as the sample could include students as well.

4.3.2 Literature Search and Selection Process

Several trials were performed in order to define an optimal combination of keywords (Fink, 2013, 2014) in terms of sensitivity (capacity of integrating a high number of relevant studies) and specificity (capacity to present a low number of irrelevant studies). We also noticed that “pre-training” was often used as a synonym of “training motivation” and/or of “learning motivation” in the title, key-words and/or abstract. Therefore “pre-training” was also included in our search terms. The final keywords combination (all*(motivation) AND all*(learn* OR train* OR pre-train* OR pre-train*) AND all*(work* OR employ*))¹ was entered in three data-sources (PsycINFO, PsycARTICLES, ERIC) available in the authors’ institution, by using the Proquest interface. The duplicates were not allowed from the initial search. Finally, irrelevant topics and classifications, detailed in the Table 4.1, were excluded from the search analyses at an early stage. The initial search resulted in a total number of 807 articles (PsycINFO = 517; PsycARTICLES = 86; ERIC = 204). Articles were first screened on basis of their titles and abstracts. This first selection resulted in a total of 121 articles which was reduced to 47 articles after text reading. The important difference between the first and the second selection is mainly due to the sample that was mostly composed of students or trainees without specifying whether these trainees were also working at the same time.

4.3.3 Sample Analysis

Definitions of pre-training, training and learning motivation in our sample of articles presented two types of definitions. A conceptual definition refers to a clearly stated definition describing the nature of the concept, whereas an operational definition refers to a definition given through the measurement instrument. Each type of

¹ all* = title, abstract and keywords

Table 4.1 List of excluded topics and classifications from research process on ProQuest interface

Excluded topics
Student motivation, student attitudes, college students, rats, higher education, academic achievement motivation, high school students, animal learning, elementary school students, adolescent development, undergraduate students, college faculty, classroom environment, student characteristics, teacher student relationship
Excluded classifications
Drug & Alcohol Rehabilitation, sports, Psychotherapy & Psychotherapeutic Counseling, Substance Abuse & Addiction, Classroom Dynamics & Student Adjustment & Attitudes, Neuropsychology & Neurology, Physical & Somatoform & Psychogenic Disorders, Childrearing & Child Care, Psychoanalytic Theory, Cognitive & Perceptual Development, Human Factors Engineering, Behavior Disorders & Antisocial Behavior, Psychoanalytic Therapy, Developmental Disorders & Autism, Group & Family Therapy, Psychological Disorders, Schizophrenia & Psychotic States, Rehabilitation, Medical Treatment of Physical Illness, Neurological Disorders & Brain Damage, Affective Disorders, Criminal Rehabilitation & Penology, Marriage & Family, Physiological Psychology & Neuroscience, Religion, Consumer Attitudes & Behavior, Educational/Vocational Counseling & Student Services, Linguistics & Language & Speech, Home Care & Hospice, Sexual Behavior & Sexual Orientation, Architectural Engineering, Structural Design, and Properties (General) (CE), Clinical Psychological Testing, Design Principles (MT), Behavior Therapy & Behavior Modification, Cognitive Therapy, Immunological Disorders, Literature & Fine Arts, Behavioral and Cognitive Neuroscience, Eating Disorders.

Table 4.2 Summary of categorization of training and learning motivation conceptualization

	Not defined	Defined				Total
		Theory-based (12)		Not theory-based (21)		
		Conceptual (5)	Operational (7)	Conceptual (20)	Operational (1)	
Training motivation	8	2	6	6	1	23
Learning motivation	6	3	1	14	–	24
Total	14	33				47

definition is theory-based if it was defined based on at least one motivational theoretical framework. A definition was categorized as not theory-based in case it was self-defined or adopted from another article without referring to a theoretical framework. Consequently, four types of definitions were distinguished: *conceptual theory-based*, *conceptual not theory-based*, *operational theory-based* and *operational not theory-based*. A count was established in Table 4.2. Moreover, the categorization for each article is reported in Table 4.3.

Table 4.3 Conceptualization and operationalization of training and learning motivation

Author (Year)	Reported definition (Reference/s)	Type of definition				Measurement instrument		
		C	C-TB	O	O-TB	N dim	N items	Content of reported items (Reference/s)
<i>Training Motivation</i>								
1. Bartlett and Klein (2001)	Level of motivation toward participation in training and development activities (n.r.)	x	-	-	-	1	11	n.r. (Noe & Schmitt, 1986)
2. Bertolino et al. (2011)	Tendency to engage in training and development activities, to learn training content, and to embrace the training experience (Carlson et al., 2000; Noe, 1986)	x	-	-	-	1	2	(1) I will be able to apply on my job what I learn in the training activities (2) Gaining the skills provided by training activities will positively affect my performance (Truxillo & Weather, 2005, adapted).
3. Cannon-Bowers et al. (1995)	n.r.	-	-	-	-	3	12	(1) If I am successful in recruit training it will better enable me to perform my job in the Navy (Lawler, 1973; Vroom, 1964)
4. Carlson et al. (2000)	Degree to which an individual perceive training as a useful and important opportunity (n.r.).	-	-	x	-	1	17	(1) I am willing to invest effort to improve skills and competencies related to my job (Noe & Wilk, 1993).
5. Chiaburu and Marinova (2005)	n.r.	-	-	-	-	1	10	(1) I try to learn as much as I can from training programs (Noe & Schmitt, 1986).
6. Chung et al. (2017)	Pre-training motivation to learn refers to the trainees' desire to learn the content of training programs before participating in a training program (n.r.)	x	-	-	-	1	4	(1) I am willing to exert considerable effort in diversity programs in order to improve my skills and knowledge (Noe & Schmitt, 1986).
7. Clark et al. (1993)	n.r.	-	-	-	-	1	9	n.r. (Noe & Schmitt, 1986)
8. Fecteau et al. (1995)	n.r.	-	-	-	-	1	9	(1) I try to learn as much as I can from training courses (Baldwin & Karl, 1987; Hicks, 1983; Noe and Schmitt, 1986).

(continued)

Table 4.3 (continued)

Author (Year)	Reported definition (Reference/s)	Type of definition					Measurement instrument	
		C	C-TB	O	O-TB	N dim	N items	Content of reported items (Reference/s)
9. Guerrero and Sire (2001)	Multidimensional construct: self-efficacy and instrumentality (Bandura, 1986; Sire, 1993).	-	-	-	x	2	17	Content of reported items (Reference/s) (1) I have good learning abilities It takes me time to assimilate the content of training (2) It takes me times to assimilate the contents of training (3) I find it hard to understand theoretical explanations (4) If the course is too abstract, I easily get lost (5) I find writing easy (6) I can easily memorize the course materials (7) I am able to follow even if the trainer goes quickly (8)-(17) Importance of training results for personal satisfaction, autonomy at work, personal knowledge, acquisition of skills, self-confidence at work, efficiency at work, adaptation at work, salary increase, personal advancement, my future (Guthrie & Schwoerer, 1994; Quinones, 1995; Baldwin & Karl, 1987).
10. Hassan et al. (2010)	Goal directed inspiration derived from trainees' personal needs and the decision processes they use to satisfy those needs. (Blanchard & Thacker, 2004)	-	x	-	-	1	6	n.r. (Noe & Wilk, 1993).

11. Kim et al. (2016)	n.r.		-	-	-	-	1	8	(1) I try to learn as much as I can from education/training programs (2) I am willing to make efforts to improve my skills and competencies for learning purposes (Bartlett, 2001; Noe & Schmitt, 1986).
12. Machin and Fogarty (2004)	Trainees' intensity of desire to acquire new skills and their intentions to acquire new skills during training.	x	-	-	-	-	1	9	(1) I aim to master all of the required skills during training (self-developed).
13. Naquin and Holton (2002)	Training motivation and transfer motivation are components of motivation to improve work through learning (Baldwin et al., 2000; Naquin & Holton, 2002).	-	-	-	-	x	1	7	n.r. (Weinstein et al., 1994).
14. Patrick et al. (2012)	Motivation to train consists in, instrumentality and motivation to learn (n.r.).	-	-	-	-	x	3	11	(1) It is desirable for me to do well during this course. (<i>valence</i>) (2) I expect this course to help me to develop coaching skills that are useful for my career as an instructor. (<i>instrumentality</i>) (3) I will try to learn as much as I can during this course. (<i>motivation to learn</i>) (Colquitt & Simmering, 1998; Mathieu et al., 1992; Noe & Schmitt, 1986, adapted)
15. Scaduto et al. (2008)	Intensity and persistence of efforts that trainees apply in learning-oriented improvement activities before, during, and after training (Burke & Hutchins, 2007)	x	-	-	-	-	1	15	(1) I try to learn as much as I can from training programs (Noe & Schmitt, 1986).

(continued)

Table 4.3 (continued)

Author (Year)	Reported definition (Reference/s)	Type of definition				Measurement instrument	
		C	C-TB	O	O-TB	N dim	N items
16. Setti et al. (2015)	The direction, intensity and persistence of learning-directed behaviors in training contexts (Kanfer & Ackerman, 2004) and the tendency to engage in training and development activities, to learn training content and to embrace the training experience (Carlson et al., 2000)	x	-	-	-	1	3
17. Smith et al. (2008)	Process that determines how energy is used to satisfy needs (Latham & Pinder, 2005)	-	x	-	-	1	3
18. Switzer et al. (2005)	n.r.	-	-	-	-	1	9
19. Tannenbaum et al. (1991)	Training motivation includes expectancy, instrumentality and valence (n.r.)	-	-	-	x	3	18

Content of reported items (Reference/s)

(1) I believe the training activity is useful for workers who occupy a job position similar to mine (Truxillo & Weathers, 2005)

(1) I will expend effort to learn the material presented in this training program.
 (2) I am planning to focus during the training program.
 (3) I intend to work consistently during this program (Perugini & Bagozzi, 2001)

(1) I look forward to actively participating in training.
 (2) I try to learn as much as I can from training.
 (3) I use my own time to prepare for training courses by practicing and completing assignments. (Fecteau et al., 1995).

(1) If I am successful in recruit training it will better enable me to perform my job in the Navy (*expectancy*)
 (2) Getting good duty stations and assignments (*instrumentality and valence*)

<p>20. Tharenou (2001)</p>	<p>Training motivation consists in motivation through expectation (expectancy, instrumentality, valence) and motivation to learn (n.r.)</p>	<p>-</p>	<p>-</p>	<p>x</p>	<p>4</p>	<p>26</p>	<p>(1) attending T&D gives me good ideas (2) Believe can improve my K&S by participation in T&D (3) Can understand most material in T&D programs I attend (4) Use information & behaviors learnt in T&D programs on job (5) Think T&D programs help me improve my skills <i>Instrumentality for</i> (1) reaching career goals (2) obtaining a pay increase (3) increasing my job security (4) Introducing change to my workplace (5) Gaining promotion or advancement (6) Gaining opportunities to pursue different career paths (7) Obtaining praise from supervisor. <i>Importance for</i> (1) Reaching career goals (2) Pay increase (3) Job security (4) Change to my workplace (5) Promotion or advancement (6) Opportunities for different career paths (7) Supervisor praise.</p>
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(continued)

Table 4.3 (continued)

Author (Year)	Reported definition (Reference/s)	Type of definition					Measurement instrument	
		C	C-TB	O	O-TB	N dim	N items	Content of reported items (Reference/s)
								<p><i>Motivation to learn</i></p> <p>(1) Try to learn as much as can from T&D</p> <p>(2) Believe tend to learn more T&D program than others</p> <p>(3) Usually motivated to learn skills emphasized in T&D programs</p> <p>(4) Would like to improve my skills</p> <p>(5) Willing exert effort in T&D programs to improve skills</p> <p>(6) Taking T&D courses not high priority for me</p> <p>(7) Willing to invest effort to improve job skills & competencies (Noe & Schmitt, 1986; Burke & Day, 1986; Gritz, 1993; Tharenou, 1997; Maurer & Tarulli, 1994; Noe & Wilk, 1993; Tannenbaum et al., 1991).</p>
21. Tracey et al. (2001)	n.r.	-	-	-	-	1	9	(1) If I can't understand some part of (title of training program), I will try harder (Vroom, 1964)
22. Tsai and Tai (2003)	n.r.	-	-	-	-	1	16	(1) I try to learn as much as I can from training program. (2) Taking training courses and seminars is not a high priority for me. (3) I'm willing to exert considerable effort in the training program in order to prove my skills (Noe & Wilk, 1993)

23. Zamiboni et al. (2011)	Training motivation is function of three variables: expectancy, instrumentality and valence (Vroom, 1964)	-	-	-	x	3	9	<p>(1) Attending training activities, I want to improve technical/practical knowledge in my job.</p> <p>(2) I feel that it is important to take part in training programs in order to strengthen my problem-solving skill.</p> <p>(3) I think it's important to learn new things from training activities.</p> <p>(4) I believe the training activity is useful for workers who occupy a job position similar to mine.</p> <p>(5) Usually I am able to apply to my job what I learn in training activities.</p>
								<p>(6) Acquiring new skills thanks to training activities, positively influences my performances.</p> <p>(7) If I am involved in training activities, I am confident I can master aspects of my job.</p> <p>(8) If I am involved in training activities, I am confident to learn the new knowledge taught in the training activities.</p> <p>(9) If I am involved in training activities, I am confident I can improve my ability of initiative (Truxillo and Weathers, 2005)</p>
Learning Motivation								
24. Alvelos et al. (2015)	Motivation to learn is defined as trainee's determination to learn the training contents (Noe & Schmitt, 1986)	x	-	-	-	1	3	<p>(1) I try to give my best in the training program, even if I don't like it. (Weinstein et al., 1994).</p>

(continued)

Table 4.3 (continued)

Author (Year)	Reported definition (Reference/s)	Type of definition				N dim	Measurement instrument	
		C	C-TB	O	O-TB		N items	Content of reported items (Reference/s)
25. Al-Eisa et al. (2009)	Specific desire of a trainee to learn the content of the training program and to fully embrace the training experience (Noe & Schmitt, 1986; Carlson et al., 2000)	x	-	-	-	1	4	(1) I am very much excited about attending this program. (2) I am interested in learning the training material that will be covered in this program. (3) I will try to learn as much as I can from this program (4) I am motivated to learn the training material that will be emphasized in this program (Yi & Davis, 2003, adapted)
26. Cheng & Ho (2001)	Specific desire of a learner to learn the content of a training program (Noe, 1986; Noe & Schmitt, 1986)	x	-	-	-	1	4	(1) I tried to learn as much as I could from the MBA program (n.r.)
27. Chiaburu and Lindsay (2008)	n.r.	-	-	-	-	1	n.r.	(1) I am willing to exert considerable effort in training programs in order to increase my skills (Noe & Schmitt, 1986)
28. De Lange et al. (2010)	Degree to which workers report that their job motivates them to learn new behavior patterns and skills on their job, or that they have to solve problems at their job (Taris & Kompier, 2004)	-	x	-	-	1	7	(1) In my work, I feel challenged by new problems. (2) I look for solutions for problems of colleagues. (3) I continue to work on a problem until it is resolved (Van Mierlo et al., 2001)
29. Garavan, Carbery, O'Malley and O'Donnell (2010)	Degree to which an employee desires to participate in, and learn from, a training activity (Noe, 1986)	x	-	-	-	1	16	(1) I try to learn as much as I can from training programs. (2) I would like to improve my skills

30. Govaerts et al. (2018)	Trainees' desire to learn the content of the training programme (Noe & Schmitt, 1986)	x	-	-	-	1	4	(1) I am motivated to learn the training material that will be emphasised in this program. (Al-Eisa et al., 2009)
31. Harris and Cole (2007)	Willingness for personal change	-	x	-	-	3	6	(1) My leadership skills need improving (perceived need to change) (2) If I try, I can become a better leader (efficacy for change) (3) Becoming a better leader is important to me (valence of change) (Armenakis et al., 1993)
32. Kochoian et al. (2017)	Learning motivational beliefs : learning self-efficacy and learning value (Bandura, 1992; Eccles & Wigfield, 2000, 2002)	-	x	-	-	2	7	(1) I am confident in my ability to learn complex skills (Armstrong-Stassen, 2008) (2) Relative score of work-related goals' prioritization (Zacher & Frese 2009)
33. Kontoghiorghes (2002)	n.r.	-	-	-	-	n.r.	n.r.	n.r.
34. Kyndt et al. (2016)	Willingness and the desire to participate in training and development and to take on experiences to learn (Major et al., 2006)	x	-	-	-	1	n.r.	(1) Sometimes I'm afraid that I may not understand the content of an activity as thoroughly as I'd like (Elliot & McGregor, 2001)
35. Major et al. (2006)	Desire to engage in training and development activities, to learn training content, and to embrace the training experience. (Carlson et al., 2000; Noe, 1986)	x	-	-	-	1	17	(1) I am willing to exert considerable effort in training programs in order to improve my skills (Noe & Wilk, 1993)
36. Ng (2015)	Individual's desire to attend, participate and learn the content of a training program (Colquitt et al., 2000; Fecteau et al., 1995)	x	-	-	-	1	7	(1) I am interested to attend training programs. (adopted from Chiaburu & Tekleab 2005; Fecteau et al. 1995; Switzer et al., 2005)

(continued)

Table 4.3 (continued)

Author (Year)	Reported definition (Reference/s)	Type of definition					Measurement instrument	
		C	C-TB	O	O-TB	N dim	N items	Content of reported items (Reference/s)
37. Ng and Ahmad (2018)	Trainee's desire to attend, participate, and learn in training programs (Colquitt et al., 2000; Machin & Treloar, 2004; Noe, 1986)	x	-	-	-	1	n.r.	n.r. (based on Naquin & Holton, 2002; Weinstein et al., 1994)
38. Noe and Wilk (1993)	Employees' desire to learn the content of training and development activities (Noe, 1986)	x	-	-	-	1	8	(1) I try to learn as much as I can from training programs (Noe & Schmitt, 1986)
39. Park et al. (2018)	One's desire to learn the content of training and development activities (Noe, 1986)	x	-	-	-	1	4	n.r. (Noe & Schmitt, 1986)
40. Roberts et al. (2018)	The extent to which trainees are motivated to acquire knowledge and understand the training material (Noe & Schmitt, 1986)	x	-	-	-	1	7	(1) I would like to improve my skills (Noe & Schmitt, 1986)
41. Rowold (2007)	Trainee's specific desire to learn the content of the training program (Noe, 1986)	x	-	-	-	1	5	(1) I will try to learn as much as I can from the training program. (Noe & Schmitt, 1986 (adapted))
42. Smy et al. (2016)	n.r.	-	-	-	-	1	3	(1) I am keen to make use of the learning and development opportunities during this course (2) I will try to learn as much as I can during this course (3) I am motivated to learn the material during this course (Noe & Schmitt, 1986).

43. Vanthourmout et al. (2014)	Motivation to participate in learning : autonomous motivation controlled motivation, a-motivation (Deci & Ryan, 2000)	-	-	-	x	3	20	(1) I am motivated to learn at work because that's what others (supervisors, colleagues, customers, family, friends, etc.) expect me to do (Vansteenkiste et al., 2009, adapted)
44. Vignoli and Depolo (2019)	n.r.	-	-	-	-	1	4	(1) I am interested in learning the training material that will be covered in this program (Al-Eisa et al., 2009).
45. Walsh et al. (2013)	Specific desire on the part of the trainee to learn the content of the training program (Noe & Schmitt, 1986)	x	-	-	-	1	4	(1) I would be motivated to learn the skills emphasized in sexual harassment training (2) I would try to learn as much as I could from sexual harassment training. Noe & Schmitt, 1986
46. Warr et al. (1999)	n.r.	-	-	-	-	1	6	(1) Generally, I am enthusiastic about learning new things (Warr & Bunce, 1995).
47. Warr and Birdi (1998)	n.r.	-	-	-	-	1	5	(1) I am keen to make use of the learning and development activities (2) I want to take up a course of my own choice this year (3) I am very enthusiastic about learning new things (4) I am willing to attend work-related courses during my own time (5) I would participate in learning and development knowing there was no guarantee of promotion or a pay increase (n.r.)

Note: n.r. not reported, C conceptual definition, C-TB conceptual theory-based definition, O operational definition, O-TB operational theory-based definition

4.4 Results

Table 4.4 describes the selected articles, in terms of sample characteristics and number of measurement points. In 68% (32/47) of cases, researchers used a sample higher to 200 participants. A total of 49% (23/47) of articles do not communicate participants' age, gender and/or their educational level. Most of articles realized one unique point of measurement (66%), 26% have realized 2 measurement points and 8% measured their variables 3 times.

The number of articles on training motivation (23/47) was almost equivalent to the articles using the term learning motivation (24/47, see Table 4.2).

4.4.1 *How Are Training and Learning Motivation Conceptualized?*

As reported in Table 4.2 (summary, see details in Table 4.3), in total 33 articles on 47 (68%) provide a definition of the used concept (training or learning motivation). Among these articles, 12 articles providing a theory-based definition (26% of the total sample) of which more studies with an operational definition (7/12, defined through a measurement instrument) than a conceptual definition (5/12, based on one or several concepts). When the provided definition is not based on any theoretical background, the definition tends to be however more conceptual (20/21, self-defined, or referring to self-defined definitions of other authors) than operational (1/21, self-defined, based on the used measurement instrument). It also appears that training motivation counts more theory-based definitions (8/12) than learning motivation (4/12). When learning motivation is used, the majority of provided definitions are self-defined (14/24), with no reference to any theoretical background.

Based on Table 4.3, we observe that theory-based definitions refer, at least partly, to the Expectancy-Value Theory (see articles n°14; 19; 20; 23; 32), Goal Theory (10; 17), Self-Efficacy Theory (9; 32), Work Improvement Theory (13), Active Problem Solving Theory (28), Change Theory (31) and Self-Determination Theory (43).

In terms of content, self-defined conceptual definitions of training motivation refer to *motivation to participate in training* (1), *desire to learn training content* (2; 12; 16), *desire to learn before training* (6), *persistence and intensity of efforts for learning before, during and after training* (15; 16), and *perceiving training as useful and important* (4). Self-defined definitions of learning motivation refer to notions of *trainees' desire and/or determination to learn training content* (24; 25; 26; 29; 30; 35; 36; 37; 38; 39; 40; 41; 45), *desire to participate in a training activity* (29; 34; 35; 36; 37). Therefore, based on the content of definitions not referring to any theoretical background, we observe that training and learning motivation are used as synonyms. Indeed, in this case, training and learning motivation refer both to training contexts, without taking into account the diversity of learning contexts.

Table 4.4 Description of studies included in the literature review

Author (Year)	Sample characteristics						N of measurements
	N	Country	Sector, Profession	Age	Gender (majority)	Education	
1. Alvelos et al. (2015)	202	Portugal	Private, Insurance employees	20–30 years old (36%)	Female (59.9%)	Diploma holder (47%)	1
2. Al-Eisa et al. (2009)	287	Saudi Arabia	Public, Managers	65% < 40	Male (68.3%)	Diploma holder (60%)	2
3. Bartlett (2001)	337	U.S.A.	Public, Nurses	n.r.	Female (94.7%)	At least a 4-year college degree (49.6%)	1
4. Bertolino et al. (2011)	252	Italy.	Public, Administration employees	M = 40.60 SD = 8.30	Female (64%)	High school diploma (72.5%)	1
5. Cannon-Bowers et al. (1995)	666	U.S.A.	Public, Militaries	M = 19.84 SD = 2.43	Male (55%)	n.r.	1
6. Carlson et al. (2000)	158	U.S.A.	Warehouses	M = 44.4	Male (58%)	n.r.	1
7. Chiaburu and Lindsay (2008)	254	U.S.A.	n.r., service organization	n.r.	n.r.	n.r.	1
8. Chiaburu and Marinova (2005)	186	U.S.A.	n.r., Employees	n.r.	n.r.	n.r.	1
9. Chung et al. (2017)	160	U.S.A.	Mixed	n.r.	Female (60.3%)	n.r.	1
10. Clark et al. (1993)	245	U.S.A.	Mixed	n.r.	Female (51%)	n.r.	1
11. De Lange et al. (2010)	1237	Netherlands	Mixed	48.5% > 45 year	Male (69.5%)	Lower vocational (40.5%)	1
12. Facticeau et al. (1995)	967	U.S.A.	Public, state government supervisors and managers	M = 45.4 SD = 8.7	n.r.	At least 4-year college degree (50%)	1
13. Garavan et al. (2010)	557	Ireland	Mixed	*	Female (57%)	*	1
14. Govaerts et al. (2018)	111	Belgium	Mixed	M = 40.6 SD = 10.3		Post-secondary degree (71.2%)	1
15. Guerrero and Sire (2001)	335	France	Machinery and nuclear, employees	M = 36	Male (100%)	At most BP or CAP	1

Table 4.4 (continued)

Author (Year)	Sample characteristics					N of measurements	
	N	Country	Sector, Profession	Age	Gender (majority)		Education
16. Harris and Cole (2007)	74	U.S.A.	Private, employees	n.c.	n.c.	n.c.	2
17. Hassan et al. (2010)	24	Pakistan	Private health company, area managers	n.r.	Male (87.5%)	n.r.	2
18. Cheng & Ho (2001)	81	China	Mixed	30–40 (70.4%)	Male (77.8%)	Higher education	1
19. Kim et al. (2016)	389	Korea	Mixed	M = 33.11 SD = 6.67	Male (68.6%)	Higher education (79.8%)	1
20. Kochoian et al. (2017)	560	Belgium	Mixed	M = 40.2 SD = 12.6	Male (58%)	Higher education (77%)	1
21. Kyndt et al. (2016)		Belgium	Healthcare Institutions	M = 40.64 SD = 12.02	Female (80.79%)	Higher education (71.7%)	1
22. Kontoghiorghes (2002)	192	U.S.A.	Public, health care insurance	n.r.	Female (86.4%)	Bachelor degree (39.5%)	
23. Machin and Fogarty (2004)	T1 : 89 T2 : 104	Australia	Public, police	n.r.	n.r.	n.r.	2
24. Major et al. (2006)	368	U.S.A.	Financial service organization	88% < 55	n.r.	46% 4-year college degree	2
25. Naquin and Holton (2002)	239	U.S.A.	Private, health insurance company	M = 35.5 SD = 10.52	Female (71.5%)	n.r.	1
26. Ng (2015)		Malaysia	Government agency (administrative and technical employees)	20–29 years old (29.7%)	Balanced	Malaysian Certificate of Education (45.4%)	1
27. Ng and Ahmad (2018)	131	Malaysia	Public Administration	30–39 years old (51.1%)	Female (67.9%)	Malaysian Certificate of Education (38.2%)	1

28. Noe and Wilk (1993)	1008	U.S.A.	Health care providers, bank respondents public engineering firm	*	*	*	1
29. Park et al. (2018)	216	U.S.A.	Employees in educational institutions	>50 years old (46.8) M = 33.84	Female (70.8%)	n.r.	1
30. Patrick et al. (2012)	232	U.K.	Public, military instructors	M = 33.84	Male (87%)	n.r.	2
31. Roberts et al. (2018)		Multinationa	Energy industry (engineers)	<35 years old (65%)	Male (78%)	At least bachelor degree	1
32. Rowold (2007)	84	Germany	Call center agents	M = 27.8 SD = 6.61	Balanced	High school (60.7%)	3
33. Scaduto et al. (2008)	495	U.S.A.	n.r., employee	>40 (49%)	Male (76%)	College education (47%)	2
34. Setti et al. (2015)	2215	Italy	Financial institution	55-60 (87.7%)	Male (76.3%)	n.r. (mostly managers)	1
35. Smith et al. (2008)	90	Australia	Non-profit charity organization, employees	M = 41	Female (66%)	n.r.	2
36. Smy et al. (2016)	578	U.K.	Public, Militaries	M = 20.35 SD = 2.87	Male (86%)	n.r.	1
37. Switzer et al. (2005)	68	U.S.A.	Nationwide insurance Firm	n.r.	Female (57%)	n.r.	2
38. Tannenbaum et al. (1991)	666	U.S.A.	Public, Militaries	M = 19.84 SD = 2.43	Male (55%)	n.r.	2
39. Tharenou (2001)	1705	Australia	Mixed, white collars	25-54 (53%)	Male (52%)	At least under-graduated (56%)	2
40. Tracey et al. (2001)	420	U.S.A.	Private, hotel managers	M = 31	Female (51%)	n.r.	1

(continued)

Table 4.4 (continued)

Author (Year)	Sample characteristics						N of measurements
	N	Country	Sector, Profession	Age	Gender (majority)	Education	
41. Tsai and Tai (2003)	T1 : 184 T2 : 149	Taiwan	Private, bank employees	M = 31.70 SD = 8.43	M = 0.34 SD = 0.48	n.r.	2
42. Vanthourmout et al. (2014)	202	Belgium	Non-academic knowledge-intensive Organization, employees	41–50 (32%)	Male (75%)	Higher education (72%)	1
43. Vignoli and Depolo (2019)	566	Italy	School principals' evaluators	n.r.	Female (69,6%)	n.r.	3
44. Walsh et al. (2013)	119	U.S.A.	Mixed	M = 41.9 SD = 10.7	Female (69.7%)	Undergraduate or graduate degree (52.5%)	3
45. Warr and Birdi (1998)	123	U.K.	Motor-vehicle dealership, technicians	n.r.	Male (100%)	n.r.	1
46. Warr et al. (1999)	T1 : 163 T2 : 163 T3 : 123	U.K.	Motor-vehicle dealership, technicians	n.r.	Male (100%)	n.r.	1
47. Zamiboni et al. (2011)	268	Italy	Administration, technical bureau, accounting office	M = 40.10; SD = 8.30	Female (64%)	n.r.	1

Note: n.r. not reported, BP Brevet Professionnel, CAP Certificat D' aptitude Professionnelle, n.c. not collected to assure anonymity, * data presented as depending on other variables

Finally, overall, articles presenting a theory-based definition tend to have an adequacy between the conceptualization and the operationalization of motivation. For non theory-based operational definitions, we also observe correspondence between conceptualisation and operationalisation as the definition refers to the dimensions used in the measurement instrument. However, 40% of the articles (19/47) in our sample do not report a definition and/or items' examples. Consequently, the adequacy between the definition and the measurement instrument is difficult to evaluate.

4.4.2 How Are Training and Learning Motivation Measured?

In order to examine how training motivation and learning motivation are operationalized, we analyse which measurement instrument has been used and the number of items selected.

Based on Table 4.3, 21 articles on 47 report to use directly or indirectly (via a second source) and at least partially the scale of Noe and Schmitt (1986). This represents 45% of the total sample. More specifically, this scale is used in 12 out of 23 articles (1; 4; 5; 6; 7; 8; 10; 11; 14; 15; 20; 22) for training motivation. It is the case of learning motivation in 9 articles out of 24 (27; 29; 35; 38; 39; 40; 41; 42; 45).

Although the scale is mostly taken from Noe and Schmitt (1986), the length of the scale differs from one study to another. Three of these articles (14, 20; 25) report a mixed scale combining the scale from Noe and Schmitt (1986) with another one. Other studies do not report any reference (12; 26; 47).

Then, for what concerns the scale dimensionality, most scales (80%) present a unidimensional structure. Among the articles, using several dimensions (between 2 and 4), 6 concern training motivation and include the following dimensions: *instrumentality* (9; 14; 19; 20; 23), *expectancy* (19; 20; 23), *motivation to learn* (14; 20), *valence* (23), and *self-efficacy* (9). One article counts 3 dimensions but does not report which dimensions are used (3). Concerning learning motivation, only 3 articles report a multidimensional questionnaire, referring to *perceived need to change* (31), *efficacy to change* (31), *valence of change* (31), *learning value* (32), *learning self-efficacy* (32), *autonomous motivation* (43), *controlled motivation* (43), and *a-motivation* (43).

Finally, 43 out 47 studies report the number of items they used to measure training and learning motivation and which varies between 2 to 26 items. Training motivation is reported to be measured with at least 10 items in 45% (9/23) of studies. This is the case for only 12.5% (3/24) of the studies for learning motivation. Most of studies also provide at least one example of the used items (85%).

4.4.3 Do Training and Learning Motivation Present Different Nomological Networks?

Table 4.5 summarizes antecedents and consequences of training and learning motivation examined in the selected studies.

Table 4.5 Antecedents and consequences of training and learning motivation

Study	Role of motivation	Antecedents	Consequences
<i>Training motivation</i>			
1. Bartlett (2001)	Correlation	Organizational commitment	
2. Bertolino et al. (2011)	Dependent	Proactive Personality Age (moderator)	–
3. Cannon-Bowers et al. (1995)	Mediator	Cognitive ability Attitudes Organizational commitment Intent to remain Self-efficacy Academic self-efficacy Physical self-efficacy Demographics Gender Age Family history	Training performance
4. Carlson et al. (2000)	Dependent	Organizational commitment Training self-efficacy Self-esteem Achievement motivation Flexibility Attitudes toward training	–
5. Chiaburu and Marinova (2005)	Mediator	Supervisor support Peer Support Performance approach goal orientation Performance avoid goal orientation Mastery approach goal orientation Mastery avoid goal orientation Training Self-Efficacy	Skill Transfer
6. Chung et al. (2017)	Dependent	Perceived Ethnic Discrimination Ethnic Dyadic Dissimilarity	–
7. Clark et al. (1993)	Dependent	Career utility Job utility	
8. Fecteau et al. (1995)	Mediator	Training Reputation Intrinsic Incentives Compliance Extrinsic Incentives Career Exploration Career Planning Organizational Commitment Subordinate Support Peer Support Supervisor Support Top Management Support Task Constraints	Perceived training transfer

(continued)

Table 4.5 (continued)

Study	Role of motivation	Antecedents	Consequences
9. Guerrero and Sire (2001)	Mediator	Voluntary participation Information on training programme Supervisor support Age Seniority	Satisfaction with training Learning from training (knowledge)
10. Hassan et al. (2010)	Independent	–	Training effectiveness
11. Kim et al. (2016)	Dependent	Career Commitment Ethical behavior Perception of organizational politics	–
12. Machin and Fogarty (2004)	Dependent	Positive affect Negative Affect Climate for transfer : Goal cues Social cues Task cues Positive reinforcement Negative reinforcement Extinction Pre-training self-efficacy	–
13. Naquin and Holton (2002)	Dependent	Neuroticism Conscientiousness Agreeableness Positive affect Negative affect Extraversion Openness Work commitment	–
14. Patrick et al. (2012)	Mediator	Being on one’s chosen job	Motivation to transfer Post-training self-efficacy Knowledge acquisition
15. Scaduto et al. (2008)	Mediator	Leader member exchange	Training transfer Training maintenance Training generalization
16. Setti et al. (2015)	Dependent	Learning goal orientation Performance goal orientation Proactive personality	–
17. Smith et al. (2008)	Mediator	Performance goal orientation Learning goal orientation Self-efficacy Valence Expectancy	Affective reaction Utility reaction Intention to transfer
18. Switzer et al. (2005)	Mediator	Training reputation Self-efficacy Managerial support	Perceived training transfer

(continued)

Table 4.5 (continued)

Study	Role of motivation	Antecedents	Consequences
19. Tannenbaum Mathieu et al. (1991)	Independent	–	Post-training attitudes Organizational commitment Academic self-efficacy Training Motivation
20. Tharenou (2001)	Independent Mediator Moderator	– Supervisor support Work environment Job challenge Supervisor support Employer support Lack of barriers	Participation in training and development
21. Tracey et al. (2001)	Mediator	Job involvement Organizational commitment Work environment (supervisor, management and organizational support) Pre-training self-efficacy	Affective reactions Utility reactions Declarative knowledge Application-based knowledge
22. Tsai and Tai (2003)	Dependent	Training assignment Perceived importance	–
23. Zaniboni et al. (2011)	Mediator	Performance goal orientation Learning goal orientation Job support	Intention to transfer
<i>Learning motivation</i>			
24. Alvelos et al. (2015)	Mediator	Perceived Content Validity Transfer Design Social Support	Positive Transfer
25. Al-Eisa et al. (2009)	Independent Mediator	– Self-efficacy Supervisor support	Transfer intention
26. Cheng & Ho (2001)	Mediator	Job involvement Career commitment	Learning transfer
27. Chiaburu and Lindsay (2008)	Mediator	Training instrumentality Training self-efficacy	Motivation to transfer Training transfer
28. De Lange et al. (2010)	Dependent	Job demands Job control Supervisor Support Active problem solving	Positive Transfer
29. Garavan et al. (2010)	Mediator	Perceived barriers and enablers Self-Efficacy	Participation in e-learning
30. Govaerts et al. (2018)	Control variable	–	Training retention Transfer
31. Harris and Cole (2007)	Independent	–	Stage of changes
32. Kochoian et al. (2017)	Dependent	Chronological age Occupational future time perspective	–

(continued)

Table 4.5 (continued)

Study	Role of motivation	Antecedents	Consequences
33. Kontoghiorghes (2002)	Dependent Independent	Learning environment Job design Quality management Organization commitment and satisfaction	Training transfer
34. Kyndt et al. (2016)	Independent	–	Generic learning outcomes Organisational level learning outcomes Job-specific learning outcomes
35. Major et al. (2006)	Mediator	Proactive personality Neuroticism Extraversion Openness Agreeableness Conscientiousness	Development activity
36. Ng (2015)	Mediator	Supervisory practices	Training transfer
37. Ng and Ahmad (2018)	Mediator	Conscientiousness Extraversion Agreeableness Perceived organizational support Supervisor support Peer support	Training transfer
38. Noe and Wilk (1993)	Mediator	Organizational membership characteristics Self-Efficacy Social support Situational constraints	Development activities
39. Park, Kang, and Kim (2018)	Mediator	Supervisor support Developmental needs awareness	Training readiness Motivation to transfer Job performance
40. Roberts et al. (2018)	Mediator	Proactive Personality Conscientiousness	Transfer intentions
41. Rowold (2007)	Independent	–	Declarative knowledge
42. Smy et al. (2016)	Dependent	Perceptions of transformational instructor behavior Valence Instrumentality	–
43. Vanthournout et al. (2014)	Mediator	Workplace climate factors Supervision Independence choice	Approaches to learn at the workplace Deep approach to learning Surface-rational approach to learning Surface-disorganized approach to learning

(continued)

Table 4.5 (continued)

Study	Role of motivation	Antecedents	Consequences
44. Vignoli and Depolo (2019)	Mediator	Proactive personality Gender Role	Motivation to transfer Transfer of training
45. Walsh et al. (2013)	Correlation	Sexual harassment myth endorsement Pessimism about sexual harassment change	
46. Warr et al. (1999)	Independent	–	Gains in knowledge Reported competence Perceived value
47. Warr and Birdi (1998)	Correlation	Individual factors Age Gender Education level Job grade Learning confidence Environment factors Management support Co-worker support Non-work support Shift working Time constraints	

First, we observe that training motivation (11/23) and learning motivation (12/24) are considered as mediators in 49% of studies. Training motivation presents a various range of antecedents, including social support (5; 8; 9; 18; 20; 21; 23) and self-efficacy (3; 4; 5; 12; 17; 18; 21) as the most studied antecedents. Other frequent reported antecedents were personality factors (2; 3; 13; 16; 35; 37; 40; 44) and goal orientation (5; 17; 23). Concerning learning motivation, scholars focus mostly on social support (24; 25; 28; 37; 38; 39), personality-related factors (35; 37; 40; 44), self-efficacy (27; 29; 38) and job-related variables (26; 28; 33) as antecedents.

In terms of consequences, training motivation is studied mostly in relation to training transfer and training effectiveness-related variables (3; 5; 8; 10; 15; 17; 18; 23), as well as to knowledge-related variables (9; 14; 21). For learning motivation, scholars focused also on variables related to transfer (24; 25; 26; 27; 30; 33; 36; 37; 39; 40; 44), as well as to variables related to knowledge acquisition and development (30; 34; 35; 38; 41; 46).

Following these observations training motivation and learning motivation cannot be clearly distinguished on basis of their nomological network as their most frequently reported antecedents and consequences overlap substantially (Fig. 4.1).

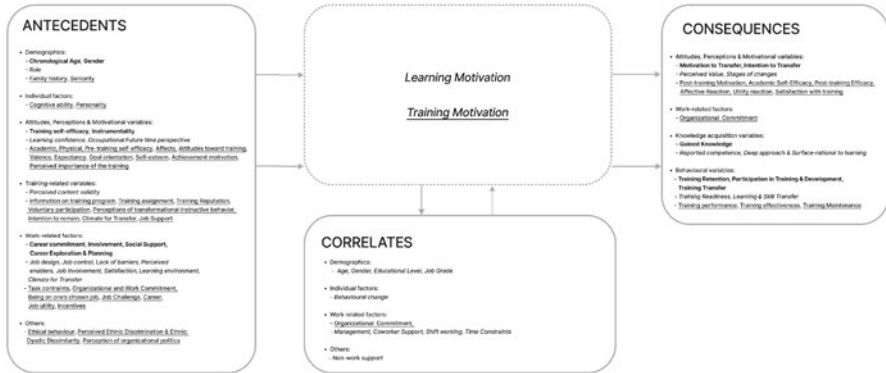


Fig. 4.1 Nomological network of learning motivation and training motivation

4.5 Discussion

The present literature review investigated workplace learning motivation as reported in empirical peer-reviewed studies examined in working populations. We focused our search specifically on the use of « learning motivation » and « training motivation » as terminology to describe motivation for workplace learning. Our main interest was to know how both terms are conceptualised and measured and to compare their nomological networks. Through the analyses of their conceptualisation and operationalisation, conclusions can be made as to what extent these terms, as used in organizational literature, actually refer to ‘workplace learning’ (i.e. include a variety of learning contexts) and ‘motivation’ (i.e. refer to the psychological mechanisms and processes that connects the individual and the environment and its regulatory character in the distribution of effort)

4.5.1 Workplace Learning as Reflected in Workplace Learning Motivation

First, our results show that the study of workplace learning motivation refers to workplace learning in formal learning contexts (e.g., training) irrespective of whether “learning motivation” or “training motivation” is used in the study. Therefore, the studies within our sample do not explore motivation in relation to both formal and informal learning activities in a variety of workplace learning contexts. We recommend to consider workers’ motivation in relation to informal learning contexts in conceptualising and operationalizing workplace learning motivation. A broader reflection is needed in organizational literature on the conceptualization of learning by integrating insights from the workplace learning literature. For

instance, Lee et al. (2004, p. 5) present the categorization of Stern and Sommerlad of different approaches on 'workplace learning' based on the degree to which 'learning' and 'work' are separated: the workplace as a site for learning; the workplace as a learning environment; and learning through work. The first approach involves the spatial separation of learning from work with structured learning activities organised off the job (in-company training). In the second approach, learning is also planned and organised but takes place within the work environment and is largely 'on the job'. Following the third approach, learning is inextricably linked to working and occurs through task execution and social interaction with colleagues in the workplace. These different approaches should be reflected in future organisational literature on workplace learning motivation. We invite scholars studying workplace learning motivation to clarify their approach on learning in general and workplace learning in particular.

4.5.2 Motivation as Reflected in Workplace Learning Motivation

The concept of motivation has also different definitions depending on the discipline and research approach applied by scholars. Scientists commonly agree that motivation represents a complex process that connects the individual and the environment and that directs energy toward the accomplishment of a goal (Pinder, 2008). Also, independently of its object (e.g. general human motivation, work motivation, learning motivation), motivation is a hypothetical construct (Fenouillet, 2011; Kanfer et al., 2008; Pinder, 2008; Vallerand & Thill, 1993). A hypothetical construct is "any concept referring to a process or phenomenon, the existence of which cannot be empirically demonstrated but which nevertheless seems to be required on theoretical grounds or for pragmatic descriptive purposes" (Richards, 2009, p. 99). In other words, hypothetical constructs refer to labels that are used to express processes or entities which are actually presumed to exist but that we are unable to observe or measure directly (Kunz & Pfaff, 2002). The necessity to conceptualize and operationalize motivation through motivational constructs has been well recognized in the larger literature on work motivation as well as in educational research with the existence of numerous theories focusing on different motivational components rather than on motivation as a global concept.

In the present article, we examined whether the organizational literature in specific has taken into account the complexity of motivation through the way workplace learning motivation has been conceptualized and operationalized up to now. We found that only few studies referred to existing motivational theories when defining motivation. Some studies do not provide a definition or define training or learning motivation through the measurement instrument they use. In that case, it is often challenging to assess whether the complex motivational process is accounted for. In educational psychology there is a well-developed literature stream regarding motivation. Insight from this research domain, could be

applied and integrated in research on workplace learning motivation in organizational literature. For instance, the Expectancy-Value Theory of Eccles and Wigfield (1998, 2000) conceptualizes learning motivation through motivational beliefs and is applied in studies on adult learners (Bourgeois et al., 2009) but also more recently in workers (Kochoian et al., 2017). As these motivational theories are, up to now, mostly used in scholarly context where formal learning takes place, the informal learning should also be taken in to account when transferring motivational theories to the workplace context.

4.5.3 Training Motivation or Learning Motivation? Toward the Use of One Generic Concept: Workplace Learning Motivation

Our results did not allow us to differentiate training and learning motivation from the conceptual and operational level or on basis of their nomological network. Many studies (45%) in organisational literature on training motivation and learning motivation are based on the work of Noe and Schmitt (1986). These authors developed a general scale on ‘trainees’ attitudes’ of which eight items assess trainees’ motivation to learn. In the different reported studies, there is no reference to any motivational theory at all which provides us with little background upon the development of the scale. Moreover, authors report only one item as example item. Other terms such as “pre-training” are used as synonyms for learning and training motivation.

In future studies, we suggest to use workplace learning motivation as an umbrella construct that encompass learning motivation, training motivation, as well as all variations of training motivation, such as pre-training and post-training motivation. Currently, several terms are employed to describe the same concept. We suggest to refer to workplace learning motivation when it concerns both formal and informal learning and to refer to pre-training and training motivation for formal (training) contexts. Then, pre-training should be used in (quasi) experimental designs to indicate the first measurement of training motivation while post-training motivation to the measurement of training motivation at the end of a training. Post-training motivation should also be differentiated from transfer motivation. A review on this differentiation may be of added value.

4.5.4 Limitations

This study has several limitations. First, our research terms included only “learning motivation” and “training motivation” and did not target other terms used in the organisational literature, such as “motivation to participate in training” or “motivation for learning and development activities”. For workplace learning in

more informal contexts specific types of learning such as reflection, experimenting, mentoring might be relevant especially when extending the review to other domains. In the same line, we focused on articles mentioning the generic term “motivation”. A review integrating research that use key components of learning motivation as conceptualized in the well-established theoretical frameworks, such as learning goals or learning self-efficacy might be added. Second, as the search terms were defined only in English, the present literature review is limited to English-speaking literature. It is therefore not clear whether the issues outlined in this review appear in other-speaking literature. In this case, other databases should be considered (e.g., Francis for French-speaking literature). Third, we focused on the literature linked to workers. Therefore, more general literature on adult learners was not taken into account. Also, studies conducted in samples composed of students (e.g., Klein et al., 2006) or trainees, when it was not specified if these trainees were workers, were not included. The same happened with articles mixing students and workers in their sample (e.g., Baldwin et al., 1991). Fourth, quantitative studies only were taken into account in this review. Qualitative studies should be included in future reviews.

In conclusion, the traditional way to conceive workplace learning in organisational literature still tends to be associated with learning in formal training courses. It is then not surprising that the term “learning motivation” is associated with formal learning contexts. We would like to point out the importance to bring a more refined conceptual understanding of workplace learning in organisational studies on workplace learning motivation. We also suggest that future research systematically adopts an established motivational theoretical framework so to clearly conceptualize workplace learning motivation, which at the same time serves as a guideline for a more fine-grained measurement of the concept. This avoids inconsistencies between the conceptualization and operationalization of the concept. Finally, we would advise to use the terms “pre-training” and “training motivation” for specific training contexts, whereas “learning motivation” as a general term that includes motivation in all different learning contexts.

References

- *Al-Eisa, A. S., Furayyan, M. A. & Alhemoud, A. M. (2009). An empirical examination of the effects of self-efficacy, supervisor support and motivation to learn on transfer intention. *Management Decision*, 47(8), 1221–1244. <https://doi.org/10.1108/00251740910984514>
- *Alvelos, R., Ferreira, A. I., & Bates, R. (2015). The mediating role of social support in the evaluation of training effectiveness. *European Journal of Training and Development*, 39(6), 484–503. <https://doi.org/10.1108/EJTD-12-2014-0081>
- Armenakis, A. A., Harris, S. G., & Mossholder, K. W. (1993). Creating readiness for organizational change. *Human Relations*, 46(6), 681–703.
- Armstrong-Stassen, M. (2008). Organisational practices and the post-retirement employment experience of older workers. *Human Resource Management Journal*, 18(1), 36–53.

- Ashton, D., & Sung, J. (2002). *Supporting workplace learning for high-performance working*. International Labour Organization.
- Baldwin, T. T., & Karl, K. A. (1987, August). The development and empirical test of a measure for assessing motivation to learn in management education. In *Academy of Management Proceedings* (Vol. 1987, No. 1, pp. 117–121). Academy of Management.
- Baldwin, T. T., Ford, J. K., & Naquin, S. S. (2000). Managing transfer before learning begins: Enhancing the motivation to improve work through learning. *Advances in Developing Human Resources*, 8, 23–35.
- Baldwin, T. T., Magjuka, R. J., & Loher, B. T. (1991). The perils of participation: Effects of choice of training on trainee motivation and learning. *Personnel Psychology*, 44(1), 51–65. <https://doi.org/10.1111/j.1744-6570.1991.tb00690.x>
- Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of social and clinical psychology*, 4(3), 359–373.
- Bandura, A. (1992). Exercise of personal agency through the self-efficacy mechanism. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 3–38). Hemisphere Publishing Corp.
- *Bartlett, K. R. (2001). The relationship between training and organizational commitment: A study in the health care field. *Human Resource Development Quarterly*, 12(4), 335–352. <https://doi.org/10.1002/hrdq.1001>
- *Bertolino, M., Truxillo, D. M., & Fraccaroli, F. (2011). Age as moderator of the relationship of proactive personality with training motivation, perceived career development from training, and training behavioral intentions. *Journal of Organizational Behavior*, 32(2), 248–263. <https://doi.org/10.1002/job.670>
- Billett, S. (2001a). Learning through working life: Interdependencies at work. *Studies in Continuing Education*, 23(1), 19–35. <https://doi.org/10.1080/01580370120043222>
- Billett, S. (2001b). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning*, 13(5), 209–214. <https://doi.org/10.1108/EUM000000005548>
- Blanchard, P. N., & Thacker, J. W. (2004). Training design. *Effective training: systems, strategies, and practices*, 179–231.
- Blais, M. R., Brière, N. M., & Pelletier, L. G. (1989). Construction et validation de l'échelle de motivation en éducation (EME). *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, 21(3), 323–349.
- Boud, D., & Garrick, J. (1999). *Understanding learning at work*. Routledge.
- Boud, D., & Garrick, J. (2001). Understandings of workplace learning. In D. Boud & J. Garrick (Eds.), *Understanding learning at work* (pp. 1–12). Routledge.
- Bourgeois, É., de Viron, F., Nils, F., Traversa, J., & Vertongen, G. (2009). Valeur, espérance de réussite, et formation d'adultes : pertinence du modèle d'expectancy-value en contexte de formation universitaire pour adultes. *Savoirs*, 20(2), 119–133. <https://doi.org/10.3917/savo.020.0119>
- Burke, M. J., & Day, R. R. (1986). A cumulative study of the effectiveness of managerial training. *Journal of Applied Psychology*, 71(2), 232.
- Burke, L. A., & Hutchins, H. M. (2007). Training transfer: An integrative literature review. *Human Resource Development Review*, 6(3), 263–296. <https://doi.org/10.1177/1534484307303035>
- *Cannon-Bowers, J. A., Salas, E., Tannenbaum, S. I., & Mathieu, J. E. (1995). Toward theoretically based principles of training effectiveness: A Model and initial empirical investigation. *Military Psychology*, 7(3), 141–164. https://doi.org/10.1207/s15327876mp0703_1
- *Carlson, D. S., Bozeman, D. P., Kacmar, K. M., Wright, P. M., & McMahan, G. C. (2000). Training motivation in organizations: An analysis of individual-level antecedents. *Journal of Managerial Issues*, 271–287. Retrieved from <http://www.jstor.org/stable/40604311>
- *Cheng, E. W. L., & Ho, D. C. K. (2001). The influence of job and career attitudes on learning motivation and transfer. *Career Development International*, 6(1), 20–28. <https://doi.org/10.1108/13620430110381007>
- *Chiaburu, D. S., & Lindsay, D. R. (2008). Can do or will do? The importance of self-efficacy and instrumentality for training transfer. *Human Resource Development International*, 11(2), 199–206. <https://doi.org/10.1080/13678860801933004>

- *Chiaburu, D. S., & Marinova, S. V. (2005). What predicts skill transfer? An exploratory study of goal orientation, training self-efficacy and organizational supports. *International Journal of Training and Development*, 9(2), 110–123. <https://doi.org/10.1111/j.1468-2419.2005.00225.x>
- Chiaburu, D. S., & Tekleab, A. G. (2005). Individual and contextual influences on multiple dimensions of training effectiveness. *Journal of European Industrial Training*, 29(8), 604–626.
- *Chung, Y., Gully, S. M., & Lovelace, K. J. (2017). Predicting readiness for diversity training: The influence of perceived ethnic discrimination and dyadic dissimilarity. *Journal of Personnel Psychology*, 16, 25–35. <https://doi.org/10.1027/1866-5888/a000170>
- *Clark, C. S., Dobbins, G. H., & Ladd, R. T. (1993). Exploratory field study of training motivation: Influence of involvement, credibility, and transfer climate. *Group & Organization Management*, 18(3), 292–307. <https://doi.org/10.1177/1059601193183003>
- Colley, H., Hodkinson, P., & Malcolm, J. (2002). *Non-formal learning: Mapping the conceptual terrain, a consultation report*. Other. University of Leeds. Retrieved from http://www.infed.org/archives/e-texts/colley_informal_learning.htm
- Colquitt, J. A., & Simmering, (1998). Conscientiousness, goal orientation, and motivation to learn during the learning process: A longitudinal study. *Journal of Applied Psychology*, 83(4), 654–665.
- Colquitt, J. A., LePine, J. A., & Noe, R. A. (2000). Toward an integrative theory of training motivation: A meta-analytic path analysis of 20 years of research. *Journal of Applied Psychology*, 85(5), 678–707. <https://doi.org/10.1037//0021-9010.85.5.678>
- *De Lange, A. H., Taris, T. W., Jansen, P., Kompier, M. A. J., Houtman, I. L. D., & Bongers, P. M. (2010). On the relationships among work characteristics and learning-related behavior: Does age matter? *Journal of Organizational Behavior*, 31(7), 925–950. <https://doi.org/10.1002/job.649>
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227–268.
- Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, 53(1), 109–132. <https://doi.org/10.1146/annurev.psych.53.100901.135153>
- Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed.
- Elliot, A. J., & McGregor, H. A. (2001). A 2 X 2 Achievement Goal Framework. *Journal of Personality and Social Psychology*, 80(3), 501–519.
- Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work. *British Journal of Educational Psychology*, 70(1), 113–136. <https://doi.org/10.1348/000709900158001>
- Eraut, M. (2007). Learning from other people in the workplace. *Oxford Review of Education*, 33(4), 403–422.
- *Facteau, J. D., Dobbins, G. H., Russell, J. E., Ladd, R. T., & Kudisch, J. D. (1995). The influence of general perceptions of the training environment on pretraining motivation and perceived training transfer. *Journal of Management*, 21(1), 1–25. <https://doi.org/10.1177/014920639502100101>
- Fenouillet, F. (2011). La place du concept de motivation en formation pour adulte. *Savoirs*, 25(1), 9–46. <https://doi.org/10.3917/savo.025.0009>
- Fenwick, T. (2006). Tidying the territory: Questioning terms and purposes in work-learning research. *Journal of Workplace Learning*, 18(5), 265–278. <https://doi.org/10.1108/13665620610674953>
- Fenwick, T. (2008). Understanding relations of individual – Collective learning in work: A review of research. *Management Learning*, 39(3), 227–243. <https://doi.org/10.1177/1350507608090875>
- Fink, A. (2013). *Conducting research literature reviews: From the Internet to paper*. Sage.
- Fink, A. (2014). *Conducting research literature reviews: From the Internet to the paper*. Sage.
- *Garavan, T. N., Carbery, R., O'Malley, G., & O'Donnell, D. (2010). Understanding participation in e-learning in organizations: A large-scale empirical study of employees. *International Journal of Training and Development*, 14(3), 155–168. <https://doi.org/10.1111/j.1468-2419.2010.00349.x>
- *Govaerts, N., Kyndt, E., & Dochy, F. (2018). The influence of specific supervisor support types on transfer of training: Examining the mediating effect of training retention. *Vocations and Learning*, 11(2), 1–24. <https://doi.org/10.1007/s12186-017-9190-y>

- Gritz, R. M. (1993). The impact of training on the frequency and duration of employment. *Journal of Econometrics*, 57(1–3), 21–51.
- *Guerrero, S., & Sire, B. (2001). Motivation to train from the workers' perspective: Example of French companies. *The International Journal of Human Resource Management*, 12(6), 988–1004. <https://doi.org/10.1080/713769684>
- Guthrie, J. P., & Schwoerer, C. E. (1994). Individual and contextual influences on self-assessed training needs. *Journal of Organizational Behavior*, 15(5), 405–422.
- Hager, P. (1999). Finding a good theory of workplace learning. Understanding learning at work. In D. Boud & J. Garrick (Eds.), *Understanding learning at work* (pp. 65–82). Routledge.
- Hager, P. (2004a). Lifelong learning in the workplace? Challenges and issues. *Journal of Workplace Learning*, 16(1/2), 22–32. <https://doi.org/10.1108/13665620410521486>
- Hager, P. (2004b). The competence affair, or why vocational education and training urgently needs a new understanding of learning. *Journal of Vocational Education and Training*, 56(3), 409–433. <https://doi.org/10.1080/13636820400200262>
- *Harris, S. G., & Cole, M. S. (2007). A stages of change perspective on managers' motivation to learn in a leadership development context. *Journal of Organizational Change Management*, 20(6), 774–793. <https://doi.org/10.1108/09534810710831019>
- *Hassan, R. A., Fuwad, B. A., & Rauf, A. I. (2010). Pre-training motivation and the effectiveness of transformational leadership training: An experiment. *Academy of Strategic Management Journal*, 9(2), 123–131. Retrieved from <http://search.proquest.com/docview/763161598?accountid=12156>
- Hicks, W. D. (1983). *The process of entering training programs and its effects on training outcomes*. The Ohio State University.
- Jacobs, R. L., & Park, Y. (2009). A proposed conceptual framework of workplace learning: Implications for theory development and research in human resource development. *Human Resource Development Review*, 8(2), 133–150. <https://doi.org/10.1177/1534484309334269>
- Kanfer, R. (1990). Motivation theory and industrial/organizational psychology. In M. D. Dunette & L. Hough (Eds.), *Handbook of industrial and organizational psychology* (pp. 75–130). Consulting Psychologists Press.
- Kanfer, R., & Ackerman, P. L. (2004). Aging, adult development, and work motivation. *Academy of Management Review*, 29(3), 440–458.
- Kanfer, R., Chen, G., & Pritchard, R. D. (2008). The three C's of work motivation: Content, context, and change. In *The organizational frontiers series. Work motivation: Past, present, and future* (pp. 1–16). Routledge/Taylor & Francis Group.
- *Kim, H., Kang, D., Lee, S., & McLean, G. (2016). Career commitment as a mediator between organization-related variables and motivation for training and turnover intentions. *Journal of Career Development*, 43(2), 130–144. <https://doi.org/10.1177/0894845315584160>
- Klein, H. J., Noe, R. A., & Wang, C. (2006). Motivation to learn and course outcomes: The impact of delivery mode, learning goal orientation, and perceived barriers and enablers. *Personnel psychology*, 59(3), 665–702. <https://doi.org/10.1111/j.1744-6570.2006.00050.x>
- *Kochoian, N., Raemdonck, I., Frenay, M., & Zacher, H. (2017). The role of age and occupational future time perspective in workers' motivation to learn. *Vocations and Learning*, 10(1), 27–45. <https://doi.org/10.1007/s12186-016-9160-9>
- *Kontoghiorghes, C. (2002). Predicting motivation to learn and motivation to transfer learning back to the job in a service organization: A new systemic model for training effectiveness. *Performance Improvement Quarterly*, 15(3), 114–129. <https://doi.org/10.1111/j.1937-8327.2002.tb00259.x>
- Kunz, A. H., & Pfaff, D. (2002). Agency theory, performance evaluation, and the hypothetical construct of intrinsic motivation. *Accounting, organizations and society*, 27(3), 275–295. [https://doi.org/10.1016/S0361-3682\(01\)00031-9](https://doi.org/10.1016/S0361-3682(01)00031-9)
- *Kyndt, E., Vermeire, E., & Cabus, S. (2016). Informal workplace learning among nurses: Organisational learning conditions and personal characteristics that predict learning outcomes. *Journal of Workplace Learning*, 28(7), 435–450. <https://doi.org/10.1108/JWL-06-2015-0052>

- Latham, G. P., & Pinder, C. C. (2005). Work motivation theory and research at the dawn of the twenty-first century. *Annual Review of Psychology*, *56*, 485–516. <https://doi.org/10.1146/annurev.psych.55.090902.142105>
- Lawler, E. E. (1973). *Motivation and work organization*. Brooks-Cole.
- Lee, T., Fuller, A., Ashton, D., Butler, P., Felstead, A., Unwin, L., & Walters, S. (2004). *Workplace learning: Main themes and perspectives*. Unpublished Manuscript. University of Leicester. Retrieved from http://learningaswork.cf.ac.uk/outputs/Workplace_Learning_Final.pdf
- Livingstone, D. W. (2001). *Adults' informal learning: Definitions, findings, gaps and future research* (NALL Working Paper No.21). OISE/UT. Retrieved from <http://files.eric.ed.gov/full-text/ED452390.pdf>
- Livingstone, D. W. (2006). Informal learning: Conceptual distinctions and preliminary findings. *Counterpoints*, *249*, 203–227. Retrieved from <http://www.jstor.org/stable/42979596>
- Lohman, M. C. (2006). Factors influencing teachers' engagement in informal learning activities. *Journal of Workplace Learning*, *18*, 141–156. <https://doi.org/10.1108/136565620610654577>
- *Machin, M. A., & Fogarty, G. J. (2004). Assessing the antecedents of transfer intentions in a training context. *International Journal of Training and Development*, *8*(3), 222–236. <https://doi.org/10.1111/j.1360-3736.2004.00210.x>
- Machin, M. A., & Treloar, C. A. (2004). Predictors of motivation to learn when training is mandatory. In *Proceedings of the 39th Australian Psychological Society annual conference: Psychological science in action* (pp. 157–161). Australian Psychological Society.
- *Major, D., Turner, J., & Fletcher, T. (2006). Linking proactive personality and the Big Five to motivation to learn and development activity. *The Journal of applied psychology*, *91*(4), 927–935. <https://doi.org/10.1037/0021-9010.91.4.927>
- Manuti, A., Pastore, S., Scardigno, A. F., Giancaspro, M. L., & Morciano, D. (2015). Formal and informal learning in the workplace: A research review. *International Journal of Training and Development*, *19*(1), 1–17. <https://doi.org/10.1111/ijtd.12044>
- Marsick, V. J., & Volpe, M. (1999a). The nature and need for informal learning. *Advances in Developing Human Resources*, *1*(3), 1–9. <https://doi.org/10.1177/152342239900100302>
- Marsick, V. J., & Volpe, M. (1999b). The nature of and need for informal learning. In V. J. Marsick & M. Volpe (Eds.), *Informal learning on the job advances in developing human resources* (No. 3). Berrett Koehler.
- Marsick, V. J., & Watkins, K. E. (1999). Looking again at learning in the learning organization: A tool that can turn into a weapon! *The Learning Organization*, *6*(5), 207–211. <https://doi.org/10.1108/09696479910299820>
- Marsick, V. J., & Watkins, K. E. (2001). Informal and incidental learning. *New Directions for Adult and Continuing Education*, *89*, 25–34. <https://doi.org/10.1002/ace.5>
- Marsick, V. J., Watkins, K. E., Callahan, M. W., & Volpe, M. (2006). *Reviewing theory and research on informal and incidental learning*. Retrieved from <https://eric.ed.gov/?id=ED492754>
- Maurer, T. J., & Tarulli, B. A. (1994). Investigation of perceived environment, perceived outcome, and person variables in relationship to voluntary development activity by employees. *The Journal of Applied Psychology*, *79*(1), 3–14.
- *Naquin, S. S., & Holton, E. F., III. (2002). The effects of personality, affectivity, and work commitment on motivation to improve work through learning. *Human Resource Development Quarterly*, *13*(4), 357–376.
- *Ng, K. H. (2015). Supervisory practices and training transfer: Lessons from Malaysia. *Asia Pacific Journal of Human Resources*, *53*(2), 221–240. <https://doi.org/10.1111/1744-7941.12044>
- *Ng, K. H., & Ahmad, R. (2018). Personality traits, social support, and training transfer: The mediating mechanism of motivation to improve work through learning. *Personnel Review*, *47*(1), 39–59. <https://doi.org/10.1108/PR-08-2016-0210>
- Noe, R. A. (1986). Trainees' attributes and attitudes: Neglected influences on training effectiveness. *Academy of Management Review*, *11*(4), 736–749. Retrieved from <http://www.jstor.org/stable/258393>

- Noe, R. A., & Schmitt, N. (1986). The influence of trainee attitudes on training effectiveness: Test of a model. *Personnel Psychology*, 39(3), 497–523. <https://doi.org/10.1111/j.1744-6570.1986.tb00950.x>
- *Noe, R. A., & Wilk, S. L. (1993). Investigation of the factors that influence employees' participation in development activities. *Journal of Applied Psychology*, 78(2), 291–302. <https://doi.org/10.1037/0021-9010.78.2.291>
- *Park, S., Kang, H. S., & Kim, E. J. (2018). The role of supervisor support on employees' training and job performance: An empirical study. *European Journal of Training and Development*, 42(1/2), 57–74. <https://doi.org/10.1108/EJTD-06-2017-0054>
- *Patrick, J., Smy, V., Tombs, M., & Shelton, K. (2012). Being in one's chosen job determines pre-training attitudes and training outcomes. *Journal of Occupational and Organizational Psychology*, 85, 245–257. <https://doi.org/10.1111/j.2044-8325.2011.02027.x>
- Perugini, M., & Bagozzi, R. P. (2001). The role of desires and anticipated emotions in goal-directed behaviours: Broadening and deepening the theory of planned behaviour. *British Journal of Social Psychology*, 40(1), 79–98.
- Pinder, C. C. (2008). *Work motivation in organizational behavior*. Psychology Press.
- Quiñones, M. A. (1995). Pretraining context effects: Training assignment as feedback. *Journal of Applied Psychology*, 80(2), 226–238. Retrieved from <http://search.proquest.com/docview/614330779?accountid=12156>
- Richards, L. (2009). *Handling qualitative data: A practical guide* (2nd ed.). Sage Publications, Inc..
- *Roberts, Z., Rogers, A., Thomas, C. L., & Spitzmueller, C. (2018). Effects of proactive personality and conscientiousness on training motivation. *International Journal of Training and Development*, 22, 126–143. <https://doi.org/10.1111/ijtd.12122>
- *Rowold, J. (2007). The impact of personality on training-related aspects of motivation: Test of a longitudinal model. *Human Resource Development Quarterly*, 18, 9–31. <https://doi.org/10.1002/hrdq.1190>
- *Scaduto, A., Lindsay, D., & Chiaburu, D. S. (2008). Leader influences on training effectiveness: Motivation and outcome expectation processes. *International Journal of Training and Development*, 12(3), 158–170. <https://doi.org/10.1111/j.1468-2419.2008.00303.x>
- *Setti, I., Dordoni, P., Piccoli, B., Bellotto, M., & Argentero, P. (2015). Proactive personality and training motivation among older workers: A mediational model of goal orientation. *European Journal of Training and Development*, 39(8), 681–699. <https://doi.org/10.1108/EJTD-03-2015-0018>
- Sire, B. (1993). Gestion strate'gique des re'mun'erations, e'ditions liaisons, .
- *Smith, R., Jayasuriya, R., Caputi, P. & Hammer, D. (2008). Exploring the role of goal theory in understanding training motivation. *International Journal of Training and Development*, 12, 54–72. <https://doi.org/10.1111/j.1468-2419.2007.00295.x>
- *Smy, V., Shelton, K., Tombs, M., & Patrick, J. (2016). Perceived transformational leadership, instructor behaviors, and motivation to learn: A mediated model. *Le travail humain*, 79(2), 169–185. <https://doi.org/10.3917/th.792.0169>
- Stipek, D. J. (1996). Motivation and instruction. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 85–113). Macmillan Library Reference USA/Prentice Hall International.
- Switzer, K. C., Nagy, M. S., & Mullins, M. E. (2005). The influence of training reputation, managerial support, and self-efficacy on pre-training motivation and perceived training transfer. *Applied HRM Research*, 10(1), 21–34. Retrieved from <http://search.proquest.com/docview/621146807?accountid=12156>
- Tannenbaum, S., Mathieu, J., Salas, E., & Cannon-Bowers, J. (1991). Meeting Trainees' Expectations: The Influence of Training Fulfillment on the Development of Commitment, Self-Efficacy, and Motivation. *Journal of Applied Psychology*, 76(6), 759–769.
- Tannenbaum, S. I., & Yukl, G. (1992). Training and development in work organizations. *Annual Review of Psychology*, 43, 399–441. <https://doi.org/10.1146/annurev.ps.43.020192.002151>

- Taris, T. W., & Kompier, M. A. J. (2004). Job characteristics and learning behavior. Research in occupational stress and well being: vol 4, exploring interpersonal dynamics, 127–166.
- Tharenou, P. (1997). Explanations of managerial career advancement. *Australian psychologist*, 32(1), 19–28.
- Tharenou, P. (2001). The relationship of training motivation to participation in training and development. *Journal of Occupational and Organizational Psychology*, 74(5), 599–621.
- Tracey, J. B., Hinkin, T. R., Tannenbaum, S., & Mathieu, J. E. (2001). The influence of individual characteristics and the work environment on varying levels of training outcomes. *Human Resource Development Quarterly*, 12(1), 5–23. [https://doi.org/10.1002/1532-1096\(200101/02\)12:1<5::AID-HRDQ2>3.0.CO;2-J](https://doi.org/10.1002/1532-1096(200101/02)12:1<5::AID-HRDQ2>3.0.CO;2-J)
- Truxillo, D. M., & Weathers, V. M. (2005). *Evaluation of a substance abuse training program for supervisors: Some preliminary findings*. Oregon Nurses Association.
- Tsai, W.-C., Tai, W.-T. (2003). Perceived importance as a mediator of the relationship between training assignment and training motivation. *Personnel Review*, 32(2), 51–163. <https://doi.org/10.1108/00483480310460199>
- Vallerand, R. J., & Thill, E. E. (1993). *Introduction à la psychologie de la motivation*. Éditions Études Vivantes.
- Van Mierlo, H., Rutte, C. G., Seinen, B., & Kompier, M. (2001). Autonomous teamwork and psychological well-being. *European Journal of work and organizational psychology*, 10(3), 291–301.
- Vansteenkiste, M., Soenens, B., Sierens, E., Luyckx, K., & Lens, W. (2009). Motivational profiles from a self-determination perspective: The quality of motivation matters. *Journal of educational psychology*, 101(3), 671–688.
- Vanthournout, G., Noyens, D., Gijbels, D., & Van den Bossche, P. (2014). The relationship between workplace climate, motivation and learning approaches for knowledge workers *Vocations and Learning*, 7(2), 191–214. <https://doi.org/10.1007/s12186-014-9112-1>
- Vignoli, M., & Depolo, M. (2019). Transfer of training process. When proactive personality matters? A three-wave investigation of proactive personality as a trigger of the transfer of training process. *Personality and Individual Differences*, 141, 62–67. <https://doi.org/10.1016/j.paid.2018.12.027>
- Vroom, V. H. (1964). Work and motivation.
- Walberg, H. J., & Uguroglu, M. (1980). Motivation and educational productivity: Theories, results, and implications. In L. J. Fyans (Ed.), *Achievement motivation: Recent trends in theory and research* (pp. 114–134). Plenum.
- Walsh, B. M., Bauerle, T. J., & Magley, V. J. (2013). Individual and contextual inhibitors of sexual harassment training motivation. *Human Resource Development Quarterly*, 24, 215–237. <https://doi.org/10.1002/hrdq.21158>
- *Warr, P., & Birdi, K. (1998). Employee age and voluntary development activity. *International Journal of Training and Development*, 2(3), 190–204. <https://doi.org/10.1111/1468-2419.00047>
- Warr, P., & Bunce, D. (1995). Trainee characteristics and the outcomes of open learning. *Personnel psychology*, 48(2), 347–375.
- *Warr, P., Allan, C., & Birdi, K. (1999). Predicting three levels of training outcome. *Journal of Occupational and Organizational Psychology*, 72, 351–375. <https://doi.org/10.1348/096317999166725>
- Watkins, K. E., & Marsick, V. J. (1992). Towards a theory of informal and incidental learning in organizations. *International Journal of Lifelong Education*, 11(4), 287–300. <https://doi.org/10.1080/0260137920110403>
- Weinstein, C. E., Palmer, D. R., Hanson, G. R., Dierking, D. R., McCann, E., Soper, M., & Nath, I. (1994). *Design and development of an assessment of readiness for training: the START program*. Paper presented at the annual conference of the academy of human resources development, San Antonio, TX, March.
- Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology*, 25(1), 68–81.

- Wlodkowski, R. J. (2008). *Enhancing adult motivation to learn: A comprehensive guide for teaching all adults* (3rd ed.). Jossey-Bass.
- Yi, M. Y., & Davis, F. D. (2003). Developing and validating an observational learning model of computer software training and skill acquisition. *Information systems research*, 14(2), 146–169.
- Zacher, H., & Frese, M. (2009). Remaining time and opportunities at work: Relationships between age, work characteristics, and occupational future time perspective. *Psychology and Aging*, 24(2), 487–493.
- *Zaniboni, S., Fraccaroli, F., Truxillo, D. M., Bertolino, M., & Bauer, T. N. (2011). Training valence, instrumentality, and expectancy scale (T-VIES-it). *Journal of Workplace Learning*, 23(2), 133–151.
- Zull, J. E. (2002). *The art of changing the brain: Enriching the practice of teaching by exploring the biology of learning*. Stylus.

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Chapter 5

Professional Vision at the Workplace

Illustrated by the Example of Teachers:

An Overview of Most Recent Research

Methods and Findings



Irene T. Skuballa and Halszka Jarodzka

Abstract Expertise is marked by outstanding performance of a person in a specific area or profession. In many professions, the level of expertise is also reflected in his or her professional vision. That is, a person's ability to *detect* relevant elements in the environment and *interpret* them appropriately to guide his or her actions on a task (Goodwin, *Am Anthropol* 96(3):606–633. <https://doi.org/10.1525/aa.1994.96.3.02a00100>, 1994). This is in particular true for professions with a high visual component, such as medicine, air traffic control, car driving, or teaching. Eye tracking, a method to objectively measure where a person looked at, for how long, and in which order, is a well-established method to investigate this aspect of expertise. Also, eye movements often reveal information that cannot be accessed consciously by agents and are therefore of high relevance for understanding the development of expertise. Findings from empirical research show that experts' eye movements are more knowledge-driven whereas novices are more image-driven, that means that novices' visual attention is more often attracted by salient misbehaviors. This book chapter will highlight applied contributions of eye tracking research to expertise development in the domain of teaching. As research in this specific domain is still scarce, we will transfer findings from other domains into teaching and introduce it as the new promising area where gaze behavior plays a crucial role. Finally, we will discuss the potentials of professional vision and eye tracking for trainings in the acquisition of expertise.

Keywords Expertise · Teacher · Professional vision · Eye-tracking · Methodology

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© Springer Nature Switzerland AG 2022
C. Harteis et al. (eds.), *Research Approaches on Workplace Learning*,
Professional and Practice-based Learning 31,
https://doi.org/10.1007/978-3-030-89582-2_5

5.1 Teacher Expertise and Professional Vision

Classroom environments are complex and information-rich. Managing a classroom puts high demands on teachers as multiple events happen simultaneously putting a teacher's skills to a test. In addition to ensuring learning opportunities for students and providing content-related instructions, teachers must continuously scan the classroom for potential misbehaviors in order to prevent disruptions and redirect students' attention, i.e., expert teachers possess a high level of professional vision. The current paper aims at presenting the most relevant – albeit scarce – research on teachers' professional vision to reach a better understanding of teachers' professional vision, how it develops, how it can be studied and what is still unknown.

Teachers practice for years to master the affordances of authentic teaching environments (Berliner, 2004; Glaser, 1985). It takes teachers over hundreds and thousands of hours of teaching to become successful managers of their classrooms. Effective classroom management is related to high teaching quality and comprises the actions a teacher can take to create and maintain a positive environment where students engage in meaningful learning activities (Brophy, 1988). Expert teachers take the emotional, cognitive, and affective prerequisites of students into account when teaching. Expertise is specific to a domain and requires the acquisition of domain-specific knowledge through deliberate practice (Berliner, 2004). Teaching expertise is practical knowledge and can be labeled as “action-oriented knowledge” because teachers acquire it through active cognitive and affective engagement with teaching processes (Berliner, 2004; Blömeke et al., 2015). Workplace conditions are relevant for teacher expertise as the constraints in the teaching requirements can hamper the development of cognitive teaching skills (Berliner, 2001). And yet the number of teaching hours alone does not guarantee expertise (Palmer et al., 2005). It appears that teacher expertise is greater than the sum of its parts.

5.1.1 *Development of Teaching Expertise*

The development of teaching expertise is not considered a linear process where just more practice leads to better teaching, rather teachers might reach plateaus which can indicate a stabilizations of teaching quality (Glaser, 1985). To describe the levels of expertise development, Berliner adapted five stages of experience-based know-how acquisition by Dreyfus and Dreyfus (1986) and translated them specifically into teaching expertise (Berliner, 2001, 2004). According to Berliner, empirical findings speak for the validity of the five stages as well as a positive link between teacher expertise and students' achievements (Berliner, 2001, 2004). These five levels are according to Berliner: novice, advanced beginner, competence, proficiency, and expertise. As novice teachers are driven by the rules they want to apply, they are not able to react flexible to the teaching environment. Advanced beginners start to connect their practical knowledge to the practice of the teaching context enabling

flexibility to a certain extent, but still lacking the ability to predict events. Competent teachers can detect relevant events of the teaching situation and spontaneously prioritize them based on goals they have set beforehand. Despite the fact that the five stages of skill acquisition may suggest a linear way of expertise development, many teachers remain on the competent level and only a small number of teachers proceeds to the fourth stage of proficiency. Proficient teachers act intuitively and have a holistic understanding of the teaching situation by predicting students' behavior. Even fewer teachers make it to the last stage, the stage of expertise. Expert teachers are fluid performers who can rely on a broad archive of experience and not rely on deliberate analyses of teaching situations. Thus, expert teachers are able to critically reflect on their own teaching while it is ongoing. Teaching is thus a skill based on knowledge acquisition that develops with experience and the environment in which teachers exercise.

In an effort to delineate different categories of teaching knowledge, Shulman (1987) names at least seven knowledge categories which are intertwined during the acquisition of the teaching skill. For instance, knowledge about the content refers to the subject related information that is being taught by a teacher, whereas pedagogical content knowledge refers to the teacher's knowledge how to best provide that kind of information given a specific learner's cognitive and affective prerequisites so to foster the learner's comprehension. Shulman also lists general pedagogical knowledge, curriculum knowledge, knowledge of educational contexts, educational knowledge, and finally knowledge about the learners and their characteristics. Teachers' vision which is driven by domain-specific knowledge makes up a vital part of teacher expertise; teachers' professional vision is the cognitive aspect of teacher competence (Van Es & Sherin, 2002).

5.1.2 *The Visual Part in Teacher Expertise*

To make instructions efficient, teachers adapt instructions based on the events in the classroom environments. Teachers cannot foresee and anticipate every eventuality that might occur when preparing a lesson; they rely on their ability to see and interpret important activities and events in the classroom during the course of teaching so they can make pedagogical decisions in response to the on-going lesson. Therefore, teaching expertise draws on the visual perception and processing of the domain-specific environment. Van Es and Sherin (2002) refer to this ability as *noticing*. Successful noticing pays credit to the complex nature of teaching situations. It addresses the teacher's ability to identify what is important, the ability to connect classroom events to teaching and learning principles, and the ability to reason about the classroom situation based on the teacher's context-specific knowledge. Empirical findings support the significance of noticing and repeatedly show that teaching expertise goes along with teachers' visual expertise and further that visual expertise develops with teaching experience (van den Bogert et al., 2014; Wolff et al., 2015; Stürmer et al., 2016). Vision in professional contexts was coined as "socially

organized ways of seeing and understanding events” that draws on professional knowledge and is relevant to the work of a very specific professional group (Goodwin, 1994, p. 606). While professional vision has been well investigated in manifold domains such as chess, radiology, aviation, driving, and learning (e.g., Alemdag & Cagiltay, 2018; Duchowski, 2002; Gijp et al., 2016; Reingold & Sheridan, 2011; Sun et al., 2016; Weibel et al., 2012); attention to a systematic and empirical examination of teacher professional vision was brought only in the recent two decades. In the following, we will introduce two theoretical frameworks for professional vision in teachers and elaborate on the research approaches into teacher gaze.

5.2 First Theoretical Approaches to Teacher Professional Vision

The advent of eye tracking technologies has established professional vision as a relevant characteristic of expertise (Gegenfurtner et al., 2011; Reingold & Sheridan, 2011; Sheridan & Reingold, 2017). It is situation-specific: each profession is characterized by specific, sometimes unique, events and the ways its community, and competent practitioners in particular, see, analyze, constitute and interpret those events (Goodwin, 1994). The knowledge of the specific and relevant cues in a certain situation and how it should be interpreted is a key feature of expertise (Stürmer et al., 2016). Teaching contexts are marked by multi-layered and simultaneous events in the external environment which put high demands on teachers’ visual skills to maintain effective classroom managers. Professional vision in teaching is an important aspect in the interplay between teachers’ cognitions and teaching practices which develops over time and comes with experience (Lachner et al., 2016). Therefore, it requires top-down and bottom-up processes from teachers to act effectively in the classroom (Sherin, 2007).

So far, models on teacher expertise that make teacher vision explicit and include it as part of the professional expertise are scarce. One such model is provided by Blömeke et al. (2015) where teachers’ perception is understood as a situation-specific skill that is being developed through exposure to the classroom environment (Fig. 5.1). The authors introduce a developmental perspective on teacher competence where competence is developing over time. The model consists of three broad components: disposition, situation-specific skills, and performance. Disposition refers to a teacher’s cognitive, conative, affective, and motivational constituents that function as resources. It is expected that teachers with a high teaching quality incorporate many types of such resources, such as content and pedagogical knowledge, beliefs, motivation, and metacognition which shape teachers’ situation-specific skills. For instance, knowledge acquired through teaching experience can influence where a teacher turns her visual attention to and, thus, what she sees in a classroom situation. Perception is one situation-specific skill acquired in teaching

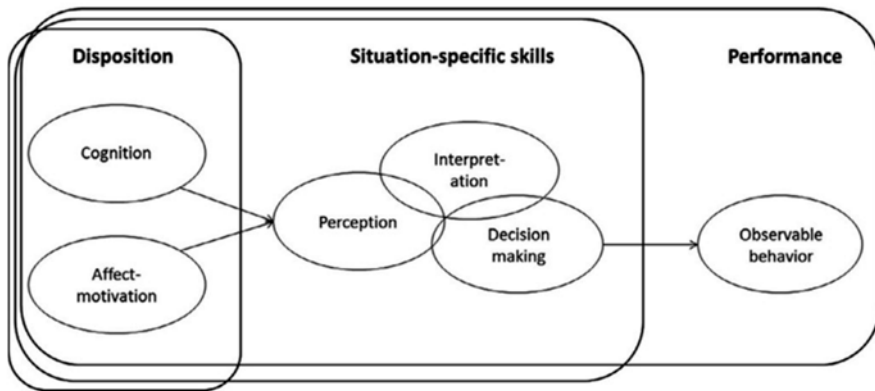


Fig. 5.1 Modeling competence as a continuum. (Blömeke et al., 2015, p. 7)

situations through practical engagement. It is closely linked to interpretation and decision-making skills in real teaching situations, all of which are shaped by the teacher's disposition. Finally, the teacher's performance is the observable behavior in a specific situation based on the acquired skill-set as a response to the affordances in the environment. According to Blömeke et al. (2015) competence is a continuum with many steps where a teacher can be more or less competent rather than just competent or incompetent. Teachers can acquire competence through deliberate practice. Professional vision is one key situation-specific skill that can be developed through teaching practice. Though the model is rather abstract, it clearly emphasizes perception as a key skill for competent teaching. However, the model falls short of explaining the contribution of how the perception skill grows with experience and how it contributes to the teaching performance. It is a first step into incorporating vision into teacher expertise, however it remains simple due to its unilateral dependencies where teacher dispositions impact situation-specific skills which, in turn, influence performance. First attempts were undertaken to define bilateral relationships between the concepts (Meschede et al., 2017) arguing that, for instance, a teacher's knowledge and memory shape perception of the classroom events and vice versa, namely that the same time perception can influence a teacher's cognitive and affective processes during teaching.

Lachner and colleagues introduce an alternative attempt to combine teachers' professional vision with pedagogical practice and they proposed a preliminary integrated model (2016). According to the model, teachers' knowledge, that is, pedagogical content knowledge, pedagogical knowledge, content knowledge, transfers with experience into curriculum scripts (Fig. 5.2). Curriculum scripts are sets of goals and actions related to specific pedagogical events and activities. The situational context determines the required curriculum scripts. Thus, teachers broaden and differentiated their curriculum scripts through teaching practice. This process requires the perceptual noticing: that is, professional vision and cues in the environment to activate the right curriculum scripts. The interplay of situational context,

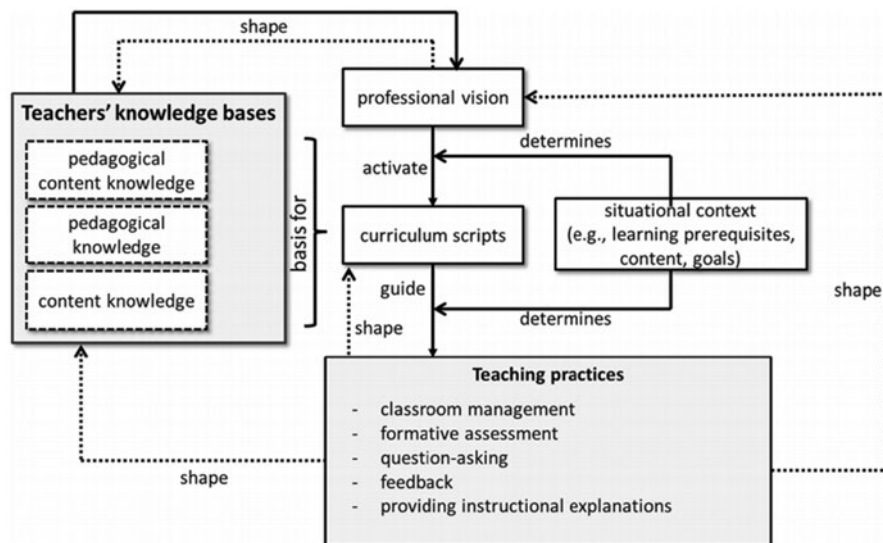


Fig. 5.2 A preliminary model of teachers' cognitions in relation to teaching practices and aspects of the situational context. (Lachner et al., 2016, p. 199)

curriculum scripts and professional vision guides the teachers' teaching practices which comprise classroom management and instructional support. It is a rather complex model with recursive and cyclic interrelations between teachers' cognitions, teaching practices and context aspects where teachers constantly re-interpret their activated curriculum scripts to adapt them to future situations and gain more expertise. The retrieval of specific curriculum scripts becomes easier with practice and experience. Professional vision, therefore, is likely to represent effective teaching.

While the appeal of the Blömeke et al. model lies in the economy and simplicity of the concepts used, the model by Lachner and colleagues is characterized by a specific and complex definition of relationships between various concepts relevant to teacher expertise. An exact empirical examination including the question of the operationalization of the concepts is still pending for both models. Therefore, investigation of eye movements in the educational context is important to identify visual attention patterns that are linked to cognitive scripts or schemata which guide practice (Jarodzka et al., 2017).

The study of eye movements in authentic environments sheds light on perceptual and cognitive processes that are usually automated and difficult to access to consciousness (Van den Bogert et al., 2014). The first generation of technology-enhanced research into professional vision was video-based. The evolution of eye tracking technology has added two further sub-branches of research on teachers' professional vision, namely, the investigation of teacher gaze when watching video and the investigation of teacher gaze while they are teaching in an authentic classroom environment. The next section will elicit these research developments.

5.2.1 Professional Vision in Teachers: Methodological Approaches

Experimental research on visual processing in teaching is driven by technological developments and advantages. The usage of videos of classroom situations and the employment of eye tracking to assess visual attention allocation are key characteristics. Eye tracking refers to the method of measuring the gaze point, that is where a person looks; it is carried out through eye tracking devices that assesses the position of the eye while it is processing external information (Holmqvist et al., 2011).

In the following, we introduce three major methodological lines: a. video-based research without eye tracking, b. video-based research with eye tracking, and c. live eye tracking while teaching. The first two approach focus on the question what teachers see when observing classroom situations, whereas the last approach targets the question what teachers see while teaching.

5.2.1.1 Video-Based Research Through Self-Report

Video-based research on professional vision largely investigate teachers' skills to notice and interpret events in a video displayed on a screen. Such video materials show teaching situations in classrooms with a camera angle on the students where the teaching person is not visible (Fig. 5.3). This way the observer is supposed to draw the attention on the events in the classroom and think in the teacher's shoes.



Fig. 5.3 Screenshot from a video showing classroom events from a front camera angle as used in a study by Wolff and colleagues (2017, p. 299)

Teachers' noticing abilities are being investigated through different means such as ratings, written comments, and interviews. An example for the video-based approach and *rating assessment* of professional vision is provided in the following.

Blomberg et al. (2011) showed video clips of classroom activities to pre-service teachers from two different fields, namely social sciences/humanities and mathematics, to compare their ability to notice key elements of classroom interactions. After watching each video clip, the teachers were asked to rate the video on 36 items which represented a combination of components of effective teaching, that is, goal clarity, teacher support, and positive learning climate, and knowledge-based reasoning, that is, description, explanation, and prediction. An example for goal clarity and description was: "The teacher explains how the students are to carry out the tasks." (Blomberg et al., 2011, p. 1134). The pre-service teachers were asked to give their responses on a 4-point Likert-scale from 1 (I agree) to 4 (I do not agree). The researchers found that the teachers' subject influenced their level of professional vision: teachers in social sciences/humanities outperformed teachers in mathematics. Moreover, self-ratings can be used to capture the effectiveness of interventions that are being implemented to foster professional vision (Stürmer et al., 2012). Stürmer et al. (2012) assessed ratings of videos from teacher candidates before and after they attended a training course on professional vision. The researchers successfully showed that specific courses targeting noticing of classroom events make teachers more competent in professional vision as compared to teachers who attended control courses that did not focus on professional vision. Follow-up studies speak for a stable effect of such interventions (Stürmer et al., 2016) when teachers are interested in professional vision and are provided opportunities to learn (Stürmer et al., 2015).

Beyond ratings, video-based research on professional vision collects *verbal data* from teachers who watched classroom videos. Teachers can give oral interviews or written comments after or during watching videos to disclose what they see. For further processing, interviews are transcribed and coded with a coding scheme to assess teachers' level of professional vision and reflection (Colestock & Sherin, 2009). This method can be also employed to investigate the differences between novice and expert teachers (Wolff et al., 2017). For instance, Wolff and colleagues recruited teachers of different expertise and asked them to watch videos of authentic classrooms. Immediately after the presentation, teachers were asked to verbalize the thoughts that came to their minds about the events and their relevance to classroom management. All verbalizations were coded with a coding scheme developed by the researchers to measure knowledge-based noticing abilities. In a final step, the coded interviews were analyzed: In their interviews on the videos, experts emphasized the role of the teachers as a facilitator for enabling learning opportunities and the importance of student learning, whereas novice teachers' reports focused on student behavior and discipline and the lack thereof. Although a large number of researchers employ the classroom videos of other teachers' teaching, few use original videos of the teacher under investigation (Cortina et al., 2018; Seidel et al., 2011). Seidel et al. (2011), for example, compared the written comments from teachers who watched themselves teaching in a video versus teachers who watched another

teacher teaching in a classroom. Even though the groups did not differ from each other with respect to professional vision, teachers who watched their own videos experienced more immersion in the teaching situation and higher motivation compared to teachers who worked with other teachers' videos.

In sum, the research base on professional vision using videos is rich in methods to assess the ability of noticing. The majority of studies had contributed to the field of expertise by establishing clear advantages in professional vision for expert teachers. However, the teacher under investigation remains an observer and is not interacting with the displayed environment. In many cases teachers watch the classroom of another teacher and, therefore, still stay in the seat of an observer. They lack prior knowledge about the students, the classroom structure, and habits. Teacher reflections remain "outside the demands of instruction" (Sherin et al., 2008, p. 29). Another constraint addresses the fixed view of the videos which does not follow the natural head movements of the teacher. It gives an overview of the whole classroom whereas the teachers in a teaching situation have to monitor their gaze constantly in order to keep track of the students.

5.2.1.2 Video-Based Research Through Gaze Recording

This approach to research on professional vision is a hybrid as it uses videos, but complementary measures participants' eye movements while they are watching videos of classroom scenarios. Similar to the previous approach, the teacher under investigation is in the observer seat. This time, however, the teacher's eye movements are being tracked while watching the video to ascertain what the teacher is paying attention to. Findings on perception are described in terms of attention duration or fixations on so called areas of interest. Areas of interest are areas in the videos pre-defined by the researchers as semantically relevant to the research question such as students, objects or events, for example, two students chatting (Fig. 5.4).

Addressing the *difference between experienced and novice teachers*, Van den Bogert et al. (2014) collected eye movement data from fourteen teachers. Their findings revealed that the videos were seen differently by experienced teachers than by student-teachers. The researchers calculated an eye movement indicator for attention distribution (cf. GINI in Van den Bogert et al., 2014) which is also associated with monitoring skills: If the teacher devotes a lot of attention on one student, less attention is left to be distributed among the other students (Van den Bogert et al., 2014). A low score represents equal attentional distribution, a high score represents high attention on few students while the rest is being ignored. Experienced teachers look for shorter times as indicated by short fixations, but they simultaneously distribute their visual attention more equally on students which is interpreted as a sign of positive monitoring behavior in more experienced teachers. Follow-up studies have added to this by providing evidence that experienced teachers' perception seems more knowledge-driven, whereas novices' perception appears more image-driven meaning that novices get easily distracted by salient events that can be irrelevant to the teaching task (Wolff et al., 2016). In addition, novices' perception of

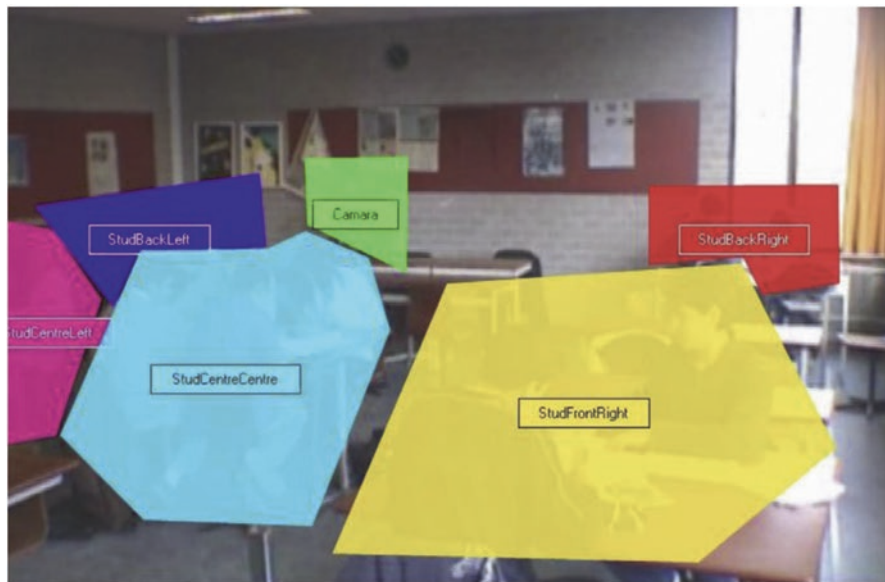


Fig. 5.4 Example of areas of interest in a video. (Van den Bogert et al., 2014, p. 4)

displayed classroom scenarios is more scattered whereas experts' perception covers more areas of the visual display.

In another study with remote eye movement measurements, the participating teachers watched a one-minute video of a first-grade classroom where students were instructed to close their books (Yamamoto & Imai-Matsumura, 2013). All elementary students followed the teacher's instruction, except for two students. The researchers investigated whether elementary teachers who watched the video would visually process these "misbehaving" students in a different way and whether they would spot the students' disobedience. The results showed that when teachers were aware of the misbehavior, they paid more attention to those students, however, the majority of teachers did not notice the misbehaving children and thus were not aware of them.

Finally, eye tracking can be used to unravel teachers' *unconscious attitudes* such as it was done to investigate early educators' expectations towards children's race (Gilliam et al., 2016). The participants watched a series of video clips displaying four children working at a round table. The teachers were asked to indicate the child who required the most their attention. None of the children displayed challenging behavior, however, the researchers used deception to elicit unconscious biases regarding sex and race. Eye tracking analyses showed that teachers gazed most on boys and the black boy in particular. Furthermore, the teachers indicated that the black boy required more of their attention, followed by the white boy and then the girls.

Taken together, this approach offers access to understanding teacher perception. Moreover, video-based eye tracking can be combined with interviews or self-ratings to capture teachers' cognitions while watching a teaching situation. This approach suffers from similar constraints as the aforementioned purely video-based approach. Often, teachers watch another teacher teaching and are not familiar with the students. They, therefore, are bound to an observing role and their heuristics. This constrain appears the more important when investigating expertise in teaching because, as Berliner (2004) stated, knowledge about the personality of students and a shared history with them is part of what makes a teacher a pedagogical agent. Even expert teachers can experience discomfort and fear when forced to teach in an alien classroom environment (Stader et al., 1990). With this in mind, one might wonder how teachers' visual perception outcomes would differ if they were watching a video of their own students. Although watching standard videos of other teachers bear the advantage of making comparisons between novices and experts easier, they simultaneously restrict the generalization of findings on professional findings with respect to expertise. Live eye tracking in authentic classrooms is an attempt to address this shortcoming.

5.2.1.3 Classroom-Based Research Through Gaze Recording

The advent of new technology brings along light and non-invasive eye tracking glasses that record teachers' eye movements resulting in a video from the teacher's perspective including all head movements required for purposes of visual attention allocation where the teacher is not in the picture. Such recordings allow us to see the classroom through a teacher's eyes in the field where actual teaching is happening, namely in the classroom.

One of the first studies on teacher gaze in authentic classroom situations reports data from 12 experienced and 12 student teachers teaching in Grades 2 to 8 (Cortina et al., 2015). Cortina and colleagues recorded eye movements from teachers with mobile eye tracking devices while they were giving a lesson for 45 min. In addition, teaching quality was rated using an objective observational manual on classroom management (Classroom Assessment Scoring System CLASS, Pianta et al., 2007). The researchers calculated an eye movement indicator for attention distribution (cf. Van den Bogert et al., 2014) to test for associations with the ten dimensions of the observational instrument. There was no effect of visual perception on the classroom management dimensions, except for the dimension feedback. Teachers who positively engage students in reflection activities through their feedback, showed a higher GINI coefficient which stands for a strong focus on a small group of students in the classroom. This effect was shown only in novice teachers meaning that they, in order to provide high quality feedback, focused on a rather small number of students. Expert teachers' quality of feedback is not reflected in their distribution of visual attention to students. Skuballa et al. (manuscript [under review](#)) on the other hand, could show that teachers who reported higher self-efficacy in teaching on a self-rating questionnaire performed more fixations on children as well as on the

instructional materials during teaching. Also, these teachers showed better classroom management as indicated by a high score on the assessment tool CLASS. This finding suggests that there is a strong link between the quality of classroom management, self-efficacy beliefs, and a teacher's professional vision. Both studies suggest that the association between gaze and teaching quality may vary with the visual affordances in the teaching environment. Cortina and colleagues opted for rather steady seating arrangements, whereas Kindergarten classrooms as investigated by Skuballa and colleagues are characterized by an active environment with constant changes of the children's spatial location in their physical environment. The latter is expected to challenge the teachers monitoring skills more.

Given that culture transfers into communication patterns and gaze, McIntyre recorded eye tracing data from teachers in UK and Hong Kong to identify how culture reflects in teaching expertise (McIntyre et al., 2017, 2019; MyIntyre & Foulsham, 2018). Analyzing teachers' eye movements, evidence supported two main effects, namely that expert teachers and UK teachers looked more at students when they asked students questions and when they lectured to students. In addition, McIntyre and colleagues have found that teachers who shared the same cultural background and expertise level had more similar visual processing sequences of what they looked at in the classroom (McIntyre & Foulsham, 2018). Lastly, expert teachers from Hong Kong and UK looked more at students whereas novices looked more at areas that were not students (McIntyre et al., 2019). An opposing gaze pattern was found in a sample with German teachers where it was shown that preservice teachers looked more at students than on other areas in the classroom (Stürmer et al., 2017). It must be noted here that the study with Hong Kong and UK teachers was conducted in an authentic classroom while the latter study used a scripted situation with four simulated persons who acted like students.

In summary, mobile eye tracking allows to investigate teachers' visual perception in real classroom situations and is thus considered to have high ecological validity (Van den Bogert et al., 2014). Compared to the other approaches, teachers are being investigated when acting in their natural habitat, that is, when they are interacting with students they are familiar with, and have to react to environmental affordances instantly guided by their current pedagogical abilities. It can be assumed that such scenarios are predestined to capture particularly authentic decision making in the full range of complexity of classroom teaching. However, pure fixation data by its own are difficult to interpret and require the combination of other information sources such as observational data, interviews or demographic information (Van Gog et al., 2005). The small number of studies using mobile eye tracking on teacher gaze can be ascribed to the novelty of the technology and the laborious coding procedure where each single fixation must be matched manually to a semantic area of interest. Authentic classrooms are complex and software to automatically recognize objects or faces is still in early stages of development, but first attempts to tackle this challenge are promising and give hope for more research into teacher perception (Sümer et al., 2018). Once the challenge of coding is met, researchers will be more willing to investigate not only secondary classrooms with steady

seating arrangement but also more unsteady and fluctuating teaching situations such as physical exercise or laboratory settings.

5.2.2 Data Triangulation to Understand Teacher Professional Vision

Gaze data provide objective information about what the teacher sees as a result of the teaching experience; gaze data per se do not tell why teachers draw their visual attention to specific children or materials nor how they interpreted classroom events to make decisions. Professional vision is understood as a cognitive component of teaching, however, it barely provides any information on its own and needs further clarification through other data sources such as interviews, observational data, or standardized questionnaires. In the previous section, we have depicted studies on professional vision where diverse methods were applied in order to support the interpretation of the outcomes related to professional vision. Such additional information can be used (a) to clarify the cognitive processes underlying the eye tracking data and (b) to externally validate the collected eye tracking data. For instance, if a teacher looked for most of the lesson at one specific student, we cannot infer whether she did so because the student had special needs requiring more attention or whether she was distracted by the student's misbehavior. In the following, we introduce three popular methods that are being employed in research on teachers' professional vision and gaze behavior.

5.2.2.1 Verbal Reports

Verbal reports are an umbrella for techniques used to obtain verbal data from the teacher externalizing the teacher's thoughts during teaching. Concurrent and retrospective reporting are two major types of direct verbalizing procedures (Ericsson & Simon, 1993). Concurrent verbal reports give insight into the goals set, information processed, and final outcomes of decision-making along the teaching process (Taylor & Dionne, 2000). In the research on teachers, this method can only be implemented when teachers are inspecting video recording of lessons and not during teaching because teachers cannot externalize their thoughts while they are simultaneously explaining the content of the lesson, discussing with students or providing instructional support to them. Therefore, when investigating authentic lessons, retrospective protocols are the means of choice. Therefore, teachers are asked to report from memory or with the help of a video recording of the situation under investigation to report what they were thinking while they were teaching. It is also possible to combine this method with some guided questions or even additional cues such as a superimposed eye movement fixation to elicit teacher's specific cognitions that seem to be relevant to the research question (Van Gog et al., 2005).

Finally, concurrent protocols can be obtained only from teaching teachers, whereas retrospective protocols can be obtained from teachers verbalizing their thoughts on another teacher's teaching video. To link the verbal protocols to professional vision, they must be transcribed and coded with a valid coding grid to identify relevant teacher cognitions and meta-cognitions (Van Gog et al., 2005).

For instance, Wolff et al. (2017) recorded and transcribed teachers' verbalizations to a classroom video. They developed an elaborate coding scheme with four major categories, twelve second-level categories and 33 code labels where each label has a code definition to investigate teachers' video-based professional vision. The major categories captured teacher's perceptions and interpretations, their themes and focus, the temporality of their comments, and their cognitive processing. Each interview was coded with the coding scheme. As part of quality assurance, a selection of the interviews was double-coded by a second rater who was blind to the first rater's coding. In a final step, the codes were quantified to run statistical analyses on expert-novice teacher comparisons. In another example, Berliner et al. (1988) created three videos of classroom teaching and showed the videos to three groups of participants representing different levels of teaching experience (high, low, no teaching experience). The participants watched the three videos simultaneously twice: first to respond to questions about the classroom management and a second time to think aloud. The analyses of the think-aloud protocols revealed that novices expressed difficulty to interpret the events in the videos and made contradictory observations. Persons with even less teaching experience were even more confused and struggled to monitor all three videos.

5.2.2.2 Self-Report Instruments

Self-report instruments are survey questionnaires, standardized tests, and checklists administered to measure a variable that is relevant to the research question. Similar to the verbal reports, such self-report instruments assess subjective information from the teacher; in contrast to verbal reports, however, data obtained with self-report instruments can be easily transformed into numbers as the answer options align to an index (Cresswell, 2012).

For example, Meschede et al. (2017) assumed that teacher beliefs and pedagogical content knowledge influenced teachers' professional vision. To investigate these relations, the researchers asked teachers to complete two scales measuring teacher beliefs. One scale assessed transmissive belief with seven items and the second scale assessed constructivist belief with nine items (Kleickmann et al., 2016). Each item was a statement requiring the teacher to indicate their level of approval on a five-point scale ranging from 1 (I do not agree) to 5 (I agree). A sample item for transmissive belief was "Elementary school students learn natural sciences best through teachers' explanations.", and a sample item for constructivist belief was "In elementary science teachers should confront students with observations that conflict with their prior assumptions about natural phenomena." (Meschede et al., 2017, p. 163). To assure quality, the authors reported the reliability for each scale. With

respect to teacher beliefs, it was shown that professional vision was negatively associated with transmissive beliefs and positively correlated with constructivist beliefs. Hence, the researchers could demonstrate that teacher beliefs underly how teachers visually process classroom situations.

5.2.2.3 Classroom Observations

Classroom observations estimate the teaching quality or effectiveness by an observer and aims to measure a teacher's behavior in a classroom situation to understand and improve teaching (Bell et al., 2019). Assessing teaching quality in the classroom can, amongst others, help evaluate teaching quality, provide feedback to teachers, train teachers in terms of professional development, and provide information to investigate how teaching is related to students' achievements. Observation protocols are documents with multiple categories or rubrics which are based on a pre-defined theoretical framework. Well trained observers use these documents to rate the quality of teaching of the observed teacher. However, observers are not required to have content expertise in the areas being observed. The ratings are assigned numbers which can be aggregated into higher level domain scores or a total score representing the teaching quality. To ensure standardized observations, it is required that raters undergo a training and a specific percentage of the observations is double coded by two raters to calculate an agreement score. Observational data can be obtained live, where a rater sits in the classroom or from video recordings where a rater watches a teacher in action (Bell et al., 2019).

For instance, Cortina et al. (2015) used the Classroom Assessment Scoring System (CLASS) (Pianta et al., 2007) to investigate the associations between teacher gaze and their teaching quality. The CLASS comprised three broad domains: emotional support, classroom organization and instructional support. Each domain is composed of several dimensions, and each dimension, on the other hand comprises few indicators. The domain instructional support, for instance, focusses on how teachers implement learning activities effectively to support students' cognitive and academic development (Pianta & Hamre, 2009). It has three dimensions, namely concept development, quality of feedback, and language modeling. The dimension quality of feedback is rated high when the teacher gives feedback loops, encourages the students to respond and expands the student's performance. As described in the section before, Cortina and colleagues found that the dimension quality of feedback was significantly associated with the teacher's ability to visually monitor the classroom: novice teachers' monitoring ability was negatively associated with their high feedback quality.

Above, we introduced three established methods targeting the underlying cognitions of teachers' professional vision. Each method bears advantages as well as disadvantages. The mixed method approach can overcome the constraints and shortcomings of research into professional vision and put it in the context of teaching to understand the teacher's cognitions, emotions, and behavior. These methods will become even more relevant when research using eye tracking gains more popularity

because the fixations and saccades of a teacher alone are difficult to interpret. Further subjective and objective information will be required to unravel the meaning of visual perception in the classroom.

5.3 Conclusion and Future Research

Each profession determines specific visual processes as a result of situation-specific cognitions related to that profession. Contrary to professional vision in chess and medicine (e.g., Reingold & Sheridan, 2011), research on teachers' professional vision can be considered a young, but promising, discipline. So far, findings show that expert and novice teachers visually process classroom events differently. However, research on teachers' professional vision is still scarce – in particular when it comes to studying this phenomenon during the actual teaching practice and not only on video recordings. Hence, more research must be conducted with mobile eye tracking of teachers during their teaching in different school types, different lessons, different pupil age groups, and different cultures, to come to a true understanding of the nature of teachers' professional vision.

Apart from understanding its nature, fostering the development of teachers' professional vision is another open research topic. First endeavors into training professional vision show that the knowledge about professional vision can be promoted in teacher trainings to sensitize teacher's awareness for their visual attention processes and their cognitions (Stürmer et al., 2012, 2016). Further, future research could build on promising findings in the field of medicine where the understanding for the domain was successfully fostered through videos of expert eye movement examples (Jarodzka et al., 2012). Videos of experts' professional vision can be combined with professional explanations to create best-practice modelling examples to promote expertise and level of performance in practice (Hoogerheide et al., 2016; Jarodzka et al., 2012; Mason et al., 2015). Such interventions harness knowledge about vision in order to increase teaching quality. They bear great potentials for diverse interventions in teacher trainings and professional developments.

Previous findings have also shown that many cognitive dispositions such as teacher's knowledge and beliefs are indicators of professional vision and it can be expected that professional vision, in turn, influences teachers' cognitive and affective dispositions. However, the models on professional vision in teaching are still scarce and in need of systematic scrutiny to be revised and further developed (Blömeke et al., 2015; Lachner et al., 2016). This demand is closely connected to few gaps that should be addressed in future research. For instance, it remains unclear how the five stages of teacher expertise adapted by Berliner can be connected to Shulman's types of teacher knowledge (Berliner, 2004; Shulman, 1987). Can the stages of expertise development be linked to the acquisition of specific teaching knowledge types, and how do they interact with teachers' professional vision? Shulman's approach suggests a final plateau of expertise once a teacher reaches stage five. However, policies, curricula, and technologies are constantly changing

and thus mark new affordances for teachers. Lifelong learning should become another key characteristic of teacher expertise (Boshuizen et al., 2004). The question arises how such changes affect teachers' expertise, teachers' ability to adjust to new challenges, and last but not least, their professional vision. Another gap relates to the, at times, small sample sizes based on which previous research findings rest. Such constraints exacerbate the generalization of findings. In addition, most findings apply to secondary classrooms, whereas elementary and kindergarten classrooms were often neglected. It is reasonable to assume that different grade levels require different pedagogical knowledge and present teachers with different challenges. A kindergarten classroom is more vibrant and marked by many transitions within a lesson as compared to a grade ten classroom where students are expected to sit at their designated desks. Finally, future research should examine in how far professional vision is related to students' achievements. It is assumed that high quality teaching increases students' academic performance (Pianta & Hamre, 2009), but the interplay between teaching quality, professional vision and students' achievements still remains undefined.

References

- Alemdag, E., & Cagiltay, K. (2018). A systematic review of eye tracking research on multimedia learning. *Computers & Education, 125*, 413–428. <https://doi.org/10.1016/j.compedu.2018.06.023>
- Bell, C. A., Dobbelaer, M. J., Klette, K., & Visscher, A. (2019). Qualities of classroom observation systems. *School Effectiveness and School Improvement, 30*(1), 3–29. <https://doi.org/10.1080/09243453.2018.1539014>
- Berliner, D. C. (2001). Learning about and learning from expert teachers. *International Journal of Educational Research, 35*(5), 463–482. [https://doi.org/10.1016/S0883-0355\(02\)00004-6](https://doi.org/10.1016/S0883-0355(02)00004-6)
- Berliner, D. C. (2004). Describing the behavior and documenting the accomplishments of expert teachers. *Bulletin of Science, Technology & Society, 24*(3), 200–212. <https://doi.org/10.1177/0270467604265535>
- Berliner, D. C., Stein, P., Sabers, D., Clarridge, P. B., Cushing, K., & Pinnegar, S. (1988). Implications of research on pedagogical expertise and experience for mathematics teaching. In D. A. Grouws & T. J. Cooney (Eds.), *Perspectives on research on effective mathematics teaching* (pp. 67–95). National Council of Teachers of Mathematics.
- Blomberg, G., Stürmer, K., & Seidel, T. (2011). How pre-service teachers observe teaching on video: Effects of viewers' teaching subjects and the subject of the video. *Teaching and Teacher Education, 27*(7), 1131–1140. <https://doi.org/10.1016/j.tate.2011.04.008>
- Blömeke, S., Gustafsson, J.-E., & Shavelson, R. J. (2015). Beyond dichotomies. Competence viewed as a continuum. *Zeitschrift Für Psychologie, 223*(1), 3–13. <https://doi.org/10.1027/2151-2604/a000194>
- Boshuizen, H. P. A., Bromme, R., & Gruber, H. (2004). On the long way from novice to expert and how travelling changes the traveler. In H. P. A. Boshuizen, R. Bromme, & H. Gruber (Eds.), *Professional learning gaps and transitions on the way from novice to expert* (pp. 3–8). Kluwer Academic Publishers.
- Brophy, J. (1988). Educating teachers about managing classrooms and students. *Teaching and Teacher Education, 4*(1), 1–18. [https://doi.org/10.1016/0742-051x\(88\)90020-0](https://doi.org/10.1016/0742-051x(88)90020-0)

- Colestock, A., & Sherin, M. G. (2009). Teachers' sense-making strategies while watching video of mathematics instruction. *Journal of Technology and Teacher Education*, 17(1), 7–29.
- Cortina, K. S., Miller, K. F., McKenzie, R., & Epstein, A. (2015). Where low and high inference data converge: Validation of CLASS assessment of mathematics instruction using mobile eye tracking with expert and novice teachers. *International Journal of Science and Mathematics Education*, 13(2), 389–403.
- Cortina, K. S., Müller, K., Häusler, J., Stürmer, K., Seidel, T., & Miller, K. F. (2018). Feedback mit eigenen Augen: Mobiles Eyetracking in der Lehrerinnen- und Lehrerbildung (in German: Feedback with your own eyes: mobile eye tracking in teacher education). *Beiträge zur Lehrerinnen und Lehrerbildung*, 36(2), 208–222.
- Cresswell, J. W. (2012). *Educational research. Planning, conducting, and evaluating quantitative and qualitative research*. Pearson Education, Inc.
- Dreyfus, H. L., & Dreyfus, S. E. (1986). *Mind over machine*. Free Press.
- Duchowski, A. T. (2002). A breadth-first survey of eye tracking applications. *Behavior Research Methods, Instruments, & Computers*, 34(4), 455–470.
- Ericsson, K. A., & Simon, H. A. (1993). *Protocol analysis: Verbal reports as data* (revised ed.). The MIT Press.
- Gegenfurtner, A., Lehtinen, E., & Säljö, R. (2011). Expertise differences in the comprehension of visualizations: A meta-analysis of eye-tracking research in professional domains. *Educational Psychology Review*, 23(4), 523–552.
- Gilliam, W. S., Maupin, A. N., Reyes, C. R., Accavitti, M., & Shic, F. (2016). *Do early educators' implicit biases regarding sex and race relate to behavior expectations and recommendations of preschool expulsions and suspensions?* (A research study brief). Yale University Child Study Center.
- Glaser, R. (1985). *Thoughts on expertise* (Technical Report No. 8). University of Pittsburgh, Learning Research and Development Center. <https://doi.org/10.21236/ada157394>
- Goodwin, C. (1994). Professional vision. *American Anthropologist*, 96(3), 606–633. <https://doi.org/10.1525/aa.1994.96.3.02a00100>
- Holmqvist, K., Nyström, M., Andersson, R., Dewhurst, R., Jarodzka, H., & Van de Weijer, J. (2011). *Eye tracking: A comprehensive guide to methods and measures*. Oxford University Press.
- Hoogerheide, V., van Wermeskerken, M., Loyens, S. M., & van Gog, T. (2016). Learning from video modeling examples: Content kept equal, adults are more effective models than peers. *Learning and Instruction*, 44, 22–30.
- Jarodzka, H., Balslev, T., Holmqvist, K., Nyström, M., Scheiter, K., Gerjets, P., & Eika, B. (2012). Conveying clinical reasoning based on visual observation via eye-movement modelling examples. *Instructional Science*, 40(5), 813–827.
- Jarodzka, H., Holmqvist, K., & Gruber, H. (2017). Eye tracking in educational science: Theoretical frameworks and research agendas. *Journal of Eye Movement Research*, 10(1), 1–18. <https://doi.org/10.16910/jemr.10.1.3>
- Kleickmann, T., Trobst, S., Jonen, A., Vehmeyer, J., & Meoller, K. (2016). The effects of expert scaffolding in elementary science professional development on teachers' beliefs and motivations, instructional practices, and student achievement. *Journal of Educational Psychology*, 108(1), 21–42.
- Lachner, A., Jarodzka, H., & Nückles, M. (2016). What makes an expert teacher? Investigating teachers' professional vision and discourse abilities. *Instructional Science*, 44(3), 197–203.
- Mason, L., Pluchino, P., & Tornatora, M. C. (2015). Eye-movement modeling of integrative reading of an illustrated text: Effects on processing and learning. *Contemporary Educational Psychology*, 41, 172–187. <https://doi.org/10.1016/j.cedpsych.2015.01.004>
- McIntyre, N. A., & Foulsham, T. (2018). Scanpath analysis of expertise and culture in teacher gaze in real-world classrooms. *Instructional Science*, 46(3), 435–455. <https://doi.org/10.1007/s11251-017-9445-x>

- McIntyre, N. A., Mainhard, M. T., & Klassen, R. M. (2017). Are you looking to teach? Cultural, temporal and dynamic insights into expert teacher gaze. *Learning and Instruction, 49*, 41–53. <https://doi.org/10.1016/j.learninstruc.2016.12.005>
- McIntyre, N. A., Jarodzka, H., & Klassen, R. M. (2019). Capturing teacher priorities: Using real-world eye-tracking to investigate expert teacher priorities across two cultures. *Learning and Instruction, 60*, 215–224. <https://doi.org/10.1016/j.learninstruc.2017.12.003>
- Meschede, N., Fiebranz, A., Möller, K., & Steffensky, M. (2017). Teachers' professional vision, pedagogical content knowledge and beliefs: On its relation and differences between pre-service and in-service teachers. *Teaching and Teacher Education, 66*, 158–170. <https://doi.org/10.1016/j.tate.2017.04.010>
- Palmer, D. J., Stough, L. M., Burdinski, T. K., Jr., & Gonzales, M. (2005). Identifying teacher expertise: An examination of researchers' decision making. *Educational Psychologist, 40*(1), 13–25.
- Pianta, R. C., & Hamre, B. K. (2009). Conceptualization, measurement, and improvement of classroom processes: Standardized observation can leverage capacity. *Educational Researcher, 38*(2), 109–119. <https://doi.org/10.3102/0013189x09332374>
- Pianta, R. C., Hamre, B. K., Haynes, N. J., Mintz, S. L., & La Paro, K. M. (2007). *Classroom assessment scoring system manual, middle/secondary version*. University of Virginia.
- Reingold, E. M., & Sheridan, H. (2011). Eye movements and visual expertise in chess and medicine. In S. P. Liversedge, I. D. Gilchrist, & S. Everling (Eds.), *Oxford handbook on eye movements* (pp. 528–550). Oxford University Press.
- Seidel, T., Stürmer, K., Blomberg, G., Kobarg, M., & Schwindt, K. (2011). Teacher learning from analysis of videotaped classroom situations: Does it make a difference whether teachers observe their own teaching or that of others? *Teaching and Teacher Education, 27*(2), 259–267. <https://doi.org/10.1016/j.tate.2010.08.009>
- Sheridan, H., & Reingold, E. M. (2017). The holistic processing account of visual expertise in medical image perception: A review. *Frontiers in Psychology, 8*, 1620. <https://doi.org/10.3389/fpsyg.2017.01620>
- Sherin, M. G. (2007). The development of teachers' professional vision in video clubs. In R. Goldman, R. Pea, B. Barron, & S. J. Derry (Eds.), *Video research in the learning sciences* (pp. 383–395). Erlbaum.
- Sherin, M. G., Russ, R. S., Sherin, B. L., & Colestock, A. (2008). Professional vision in action: An exploratory study. *Issues in Teacher Education, 17*(2), 27–46.
- Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*(1), 1–23. <https://doi.org/10.17763/haer.57.1.j463w79r56455411>
- Skuballa, McIntyre, Barza, & von Suchodoletz. (manuscript under review). *Here's looking at you kid. Teacher gaze in kindergarten settings*.
- Stader, E., Colyer, T., & Berliner, D. C. (1990, April). *Expert and novice teachers' ability to judge student understanding*. Paper presented at the meetings of the American Educational Research Association, Boston.
- Stürmer, K., Könings, K. D., & Seidel, T. (2012). Declarative knowledge and professional vision in teacher education: Effect of courses in teaching and learning. *British Journal of Educational Psychology, 83*(3), 467–483. <https://doi.org/10.1111/j.2044-8279.2012.02075.x>
- Stürmer, K., Seidel, T., & Kunina-Habenicht, O. (2015). Unterricht wissensbasiert beobachten. Unterschiede und erklärende Faktoren bei Referendaren zum Berufseinstieg. *Zeitschrift für Pädagogik, 61*(3), 345–360.
- Stürmer, K., Seidel, T., & Holzberger, D. (2016). Intra-individual differences in developing professional vision – Preservice teachers' changes in the course of an innovative teacher education program. *Instructional Science, 44*(3), 293–309. <https://doi.org/10.1007/s11251-016-9373-1>
- Stürmer, K., Seidel, T., Müller, K., Häusler, J., & Cortina, K. S. (2017). What is in the eye of preservice teachers while instructing? An eye-tracking study about attention processes in different teaching situations. *Videobasierte Unterrichtsforschung, 75–92*. https://doi.org/10.1007/978-3-658-15739-5_4

- Sümer, Ö., Goldberg, P., Stürmer, K., Seidel, T., Gerjets, P., Trautwein, U., & Kasneci, E. (2018, June). *Teachers' perception in the classroom*. Paper presented at the IEEE conference on computer vision and pattern recognition (CVPR), Salt Lake City, USA.
- Sun, Q. (Chayn), Xia, J. (Cecilia), Nadarajah, N., Falkmer, T., Foster, J., & Lee, H. (2016). Assessing drivers' visual-motor coordination using eye tracking, GNSS and GIS: A spatial turn in driving psychology. *Journal of Spatial Science*, 61(2), 299–316. <https://doi.org/10.1080/14498596.2016.1149116>
- Taylor, K. L., & Dionne, J.-P. (2000). Accessing problem-solving strategy knowledge: The complementary use of concurrent verbal protocols and retrospective debriefing. *Journal of Educational Psychology*, 92(3), 413–425. <https://doi.org/10.1037/0022-0663.92.3.413>
- van den Bogert, N., van Bruggen, J., Kostons, D., & Jochems, W. (2014). First steps into understanding teachers' visual perception of classroom events. *Teaching and Teacher Education*, 37, 208–216.
- Van der Gijp, A., Ravesloot, C. J., Jarodzka, H., van der Schaaf, M. F., van der Schaaf, I. C., van Schaik, J. P. J., & ten Cate, T. J. (2016). How visual search relates to visual diagnostic performance: A narrative systematic review of eye-tracking research in radiology. *Advances in Health Sciences Education*, 22(3), 765–787. <https://doi.org/10.1007/s10459-016-9698-1>
- Van Es, E. A., & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education*, 10(4), 571–596.
- Van Gog, T., Paas, F., & Van Merriënboer, J. J. (2005). Uncovering expertise-related differences in troubleshooting performance: combining eye movement and concurrent verbal protocol data. *Applied Cognitive Psychology*, 19(2), 205–221.
- Weibel, N., Fouse, A., Emmenegger, C., Kimmich, S., & Hutchins, E. (2012, March). Let's look at the cockpit: Exploring mobile eye-tracking for observational research on the flight deck. In *Proceedings of the symposium on eye tracking research and applications* (pp. 107–114). ACM.
- Wolff, C. E., Jarodzka, H., van den Bogert, N., & Boshuizen, H. P. (2016). Teacher vision: Expert and novice teachers' perception of problematic classroom management scenes. *Instructional Science*, 1–23.
- Wolff, C. E., Jarodzka, H., & Boshuizen, H. P. (2017). See and tell: Differences between expert and novice teachers' interpretations of problematic classroom management events. *Teaching and Teacher Education*, 66, 295–308.
- Yamamoto, T., & Imai-Matsumura, K. (2013). Teachers' gaze and awareness of students' behavior: Using an eye tracker. *Comprehensive Psychology*, 2, Article 6. <https://doi.org/10.2466/01.It.2.6>
- Wolff, C. E., Van den Bogert, N., Jarodzka, H., & Boshuizen, H. P. A. (2015). Keeping an eye on learning. Differences between expert and novice teachers' representations of classroom management events. *Journal of Teacher Education*, 66(1), 68–85. <https://doi.org/10.1177/0022487114549810>

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Chapter 6

Professional Growth and Workplace Learning



Laura Pylväs, Junmin Li, and Petri Nokelainen

Abstract This chapter discusses the concept of professional growth in the context of workplace learning. Based on an overview of the relevant research, professional growth is seen as an overall developmental process that takes place during one's career and lifespan and understood as a term that overlaps with other related concepts. Furthermore, we argue that professional growth is dependent on social and institutional contexts as well as personal attributes and circumstances. Following this, a model containing three dimensions related to learning in professional contexts (formal–informal, situated–unsituated and individual–social learning) is presented. The model is formed to illustrate that promotion of professional growth in workplaces is connected to formal and informal practices, versatility of working environments and social relations. The chapter concludes with discussion and future research suggestions related to conceptual issues regarding professional growth and contemporary challenges in working life.

Keywords Professional growth · Professionalism · Professional development · Continuous learning · Workplace learning

6.1 Introduction

Professional growth is a continuous learning process that enables individuals to acquire the knowledge, skills and abilities needed to cope with changing demands for vocational proficiency throughout their careers (London & Mone, 1999). Collection of concrete developmental strategies and functions is needed to support professional growth, making such professional development actions important but

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not prerequisites for professional growth (Nokelainen & Ruohotie, 2009). The issues discussed above stress the role of continuous learning and professional growth in the knowledge society and challenge the existing workforce to engage in concrete actions to update their knowledge and skills in a flexible and rapid manner to remain employed in the future. Over two decades ago, Ruohotie (1996, p. 442) noted that ‘We can no longer think in terms of “being” educated or competent, only in terms of “becoming” educated and “retaining” or, better yet, “enhancing” our competence’ leading to a process-oriented approach to professional growth.

Organisations are increasingly recognising constant training of their employees (both formally and informally) as a competitive advantage (Aguinis & Kraiger, 2009; Noe et al., 2014; Coetzer et al., 2017; London & Smither, 1999; Westbrook & Veale, 2001). The considerations of how individuals engaging in production tasks may encounter learning opportunities in the workplace and how these opportunities may best be recognised, understood and reproduced for training are also increasingly being connected to educational purposes (Filliettaz et al., 2015). Consequently, in addition to examining an individual’s willingness to engage in learning through work (Billett, 2001), the learning potential of jobs and their influence on professional growth has also been an area of research in vocational training research (Collin, 2002). Overall, the contemporary notions of learning such as ‘lifelong’ and ‘life-wide’ position learning as a key activity over the lifespan and it is included with private and leisure activities, in which an individual is placed at the heart of the debate (Nerland, 2012). At root, the postmodern age has been driven by two major developments that have widely influenced professionalism: (1) Economics, new patterns of international economic organisation where corporate and commercial power is extensively globalised and (2) Communications, the electronic and digital revolution in communications, leading to instantaneous, globalised availability of information and entertainment (Hargreaves, 2000). For instance, the current level of digitalization is estimated to have the capacity to automate approximately 47% of existing work tasks and soon as much as 58% (Chui et al., 2015). However, research has found that automation has not progressed in parallel with its potential (Autor, 2015). There are two main reasons behind this lag. Firstly, the human work force has outperformed machines thanks to ‘bottlenecks of automation’, including issues related to social abilities (e.g., empathy, negotiation), creativity (e.g., fine arts) and originality (e.g., ‘out of the box’ thinking) (Deming, 2015; Frey et al., 2016). Secondly, political decisions have been made to promote employment and a secure, meaningful life (Nussbaum, 2011) for the workforce. Furthermore, global changes have had several effects on education. In addition, schools (like many other public institutions) have been forced to become economically efficient following market principles. The communications revolution has conquered geography, compressing space and time creating a proliferation of knowledge and information and increased contacts among diverse cultural and belief systems (Hargreaves, 2000).

In this chapter, we provide a conceptual overview of the literature on *professional growth* and reflect on its interfaces with workplace learning. Through comprehensive literature searching (systematic searching excluded), the aim in the overview was to explore the research over the past two decades, during the

twentieth century, describe its characteristics and provide a narrative synthesis of the topic (Grant & Booth, 2009). At first, we expose the historical background of professionalism and present examples of theoretical applications of the concept of professional growth. Thereafter, we present a three-dimensional model that summarises our conceptual discussion of professional growth and reflects the multi-dimensional nature of the concept. Through the model's three dimensions—formal–informal, situated–unsituated and social–individual—we identify the current issues related to workplace learning and prerequisites for deepening and expanding knowledge and skills in professional contexts. The continuums typify the complexity of the relationship between an individual and his or her organisation. The chapter concludes with a discussion and future research suggestions related to conceptual issues regarding professional growth and contemporary challenges of working life.

6.2 Professional Growth

6.2.1 Professionalism

While professional growth as a concept has been used in research for many decades, it has been defined in several ways and applied in multiple contexts. Furthermore, literature on professional growth has spread into many different disciplines such as education, psychology, philosophy, sociology, medicine, business economics and engineering. Much of the empirical research, however, is still focused on traditional academic professions that is traced to the earlier interpretations of professionalism. Historically, the fields of Professional and Vocational Learning have been conceived of as separate and different from one another based on an epistemological basis and academic requirements of certain occupations (Guile, 2019). Furthermore, professionalism has a long history among sociologists that emphasised the roles played by individuals (e.g., teachers and doctors) and institutions in relation to the functioning of society and research orientation and aimed to define the characteristics that made particular occupations 'true' professions (Martimianakis et al., 2009).

Approaches to professionalism have changed and developed over the time. According to Guile (2019), what this culturally and historically formed split between the professions and vocations has always tended to downplay is that professional and vocational formations are both concerned with the relations between theory and practice. Consequently, his reformulation of the concept of professional growth emphasises the *process* that facilitates the formation of professional or vocational expertise rather than the distinction between professions and vocations: 'Both professional and vocational formation entails learning to commingle the forms of knowledge taught in professional or vocational curricula along with the forms of knowledge available or developed in workplaces into an embodied professional or vocational form of knowing' (Guile, 2019, p. 6). Similarly, Chan et al. (2012) have

noted that while most formal education systems are still designed to produce specialised vocationalists and professionals to supply the workforce needed to support a national economy, more than just choosing a job, vocation, or occupation, young people around the world are nowadays rather expected to unfold a career over a lifetime, shaped by environmental opportunities and constraints, personal aspirations, abilities, and experiences. Thus, it is useful to distinguish the act of making a vocational choice from shaping and developing a career over a lifetime, which should be a constant work in progress (Chan et al., 2012).

Furthermore, recent sociological approaches to the study of professionalism consider professionalism, not in terms of a stable construct that can be isolated, taught and assessed but as a socially-constructed interaction (Martimianakis et al., 2009); the educational sciences approach professionalism is focused on processes of (socially constructed) knowledge creation and continuous learning. Nowadays, the traditional profession of teacher is also viewed more than the sum of competences and that competency-based systems of professional development must provide opportunities for teachers themselves to engage in deeper learning (Day, 2016). Hargreaves's (2000) has conceptualized the development of teachers' professionalism as passing through four historical phases in many countries: the pre-professional age, the age of the autonomous professional, the age of the collegial professional and the age of post-professional or postmodern. As Hargreaves notes, whereas collegial professional resulted in:

the increasing efforts to build strong professional cultures of collaboration to develop common purpose, to cope with uncertainty and complexity, to respond effectively to rapid change and reform, to create a climate which values risk-taking and continuous improvement, to develop stronger senses of teacher efficacy, and to create ongoing professional learning cultures for teachers that replace patterns of staff development, which are individualized, episodic and weakly connected to the priorities of the school ... (pp. 165–166)

Furthermore, he continues that in a postmodern, professionalism era 'teachers deal with a diverse and complex clientele, in conditions of increasing moral uncertainty, where many methods of approach are possible, and where more and more social groups have an influence and a say' (p. 175). All the conflicting pressures and tendencies are leading teachers and those who work with them to re-evaluate their professionalism and make judgements about the kinds of professional learning they need to improve their job skills (Hargreaves, 2000). According to Martimianakis et al. (2009), professionals as a group are assumed to act in the public interest and that the context of social roles clearly provides a larger framework in which to situate professionalism. On the other hand, they also remind that a different group of sociologists have argued that focusing on *any* normative definitions of professionalism (trait-based, behaviour-based or role-based) leads to an over-emphasis on codes of behaviour and misses the influences of context, institutions and socio-economic and political concerns in the creation of the definitions (Martimianakis et al., 2009)

6.2.2 *Approaches to Professional Growth*

We have earlier discussed the conceptual background of professional growth that leads to the past and current approaches to professionalism. In this chapter, we provide a conceptual overview of the literature on *professional growth*. Through comprehensive literature searching (systematic searching excluded), the aim in the overview was to explore the literature over the past two decades, during the twentieth century, describe its characteristics and to provide a narrative synthesis on the topic (Grant & Booth, 2009). The research included in this chapter were based on their accuracy in conceptual defining or application of “professional growth” or their compatibility with the scope of the chapter in other respects (e.g., conceptual discussion of professional growth or professional development). First, we present some studies that have identified the components of professional growth. Thereafter, we discuss the conceptual use of professional growth in general.

An exploration of the research literature reveals that the concept of professional growth has been applied, defined and theoretically identified in numerous ways and with different degrees of accuracy. However, in several research reports, it was approached from a holistic perspective with an emphasis on individual aspects of learning and development’ even the significance of social environment and collaborative processes was acknowledged. Furthermore, in many cases research on professional growth is still focused on traditional academic professions, especially teachers (e.g., Aarto-Pesonen & Tynjälä, 2017a, b; Clarke & Hollingsworth, 2002; Hudson-Ross, 2001; Maskit, 2011). For instance, Clarke and Hollingsworth’s (2002) empirically grounded Interconnected Model of Teachers’ Professional Growth incorporates key features of contemporary learning theory and recognises the individual nature of teacher professional growth. The authors suggest that professional growth is an inevitable and continuing process of learning and that to facilitate the professional development of teachers, the process by which teachers grow professionally and the conditions that support and promote that growth should be understood. The Interconnected Model (Clarke & Hollingsworth, 2002, p. 950) presents that: ‘Change occurs through the mediating processes of “reflection” and “enactment”, in four distinct domains which encompass the teacher’s world: the personal domain (teacher knowledge, beliefs and attitudes), the domain of practice (professional experimentation), the domain of consequence (salient outcomes), and the external domain (sources of information, stimulus or support)’. Instead, Kramarski and Michalsky (2009) have observed preservice teachers’ professional growth in four learning environments along three dimensions: self-regulated learning in a pedagogical context, pedagogical knowledge and perceptions of teaching and learning. Based on their findings, the authors call for further research on teachers’ professional growth in self-regulatory environments, with particular emphasis on defining and examining features of SRL support, that according to the authors, are linked to qualities of constructing professional growth. Similarly, Michalsky’s

study (2012) study has indicated that pre-service teacher training in a learner-centred, active-learning, peer-collaborative environment was effective in fostering learners' professional growth when SRL components (support for self-regulated cognition–metacognition, motivation, or both) were supported.

Research by Aarto-Pesonen and Tynjälä (2017a, b) recognises the holistic process of professional growth based on their analyses of physical education pre-service teachers' professional growth. The authors suggest that in contrast to previous theories of adult learning, their substantive theory places the role of emotions in professional growth at the centre. The theory identifies *criticality* (e.g., expanding self-critique/self-expression and critical thinking), *ethicality* (a holistic way of thinking, such as an increased understanding of one's own personal or culturally-based values) and *empowerment* (an experienced increase in personal capacity) as the main properties of the emotional core that define the intensity of the professional growth process (Aarto-Pesonen & Tynjälä, 2017b). On the other hand, based on her empirical research on teacher professional learning communities Owen (2014) has concluded that through moving beyond conviviality, 'navigating fault lines' of divergent views and 'negotiating the essential tensions', significant benefits for teacher professional growth will occur. In addition, engagement in challenging debates within professional learning communities supports staff professional growth; it also supports transformative educational practices and ultimately, student learning (Owen, 2014). Holmlund (2008) suggests that the creation and support of teachers' professional learning communities has been increasingly viewed as a promising environment and structure for professional growth and transformative change. The author argues that while it is recognised that each teacher participates in a professional learning community from an individual and unique starting point shaped by previous experiences and beliefs and significantly influenced by his or her school culture and context, the optimistic premise or postulation emphasises that teachers working collaboratively to understand some selected aspect of their practice contributes to significant professional growth across the group and, possibly beyond the group (Holmlund, 2008).

Conceptual definitions of professional growth have also been approached from the perspective of the work environment. A Growth-oriented Atmosphere model by Nokelainen and Ruohotie (2009) recognises thirteen factors in four main areas related to professional growth: (1) Management and leadership; (2) Supportive value of the job; (3) Team and working environment and (4) Personal attitude towards work. Their model was a result of several studies that focused on employee perceptions of how managers create conditions that support professional growth and learning and how the employees perceive their growth motivation and commitment to the organisation. One of the central arguments based on their study was that managers and leaders should be aware of the current professional growth status of diverse employee groups (e.g., job categories, various types of work contracts) and understand the potential differences in employee growth motivation (e.g., build-up of work stress, versatility of work tasks, interest in training opportunities) (Nokelainen & Ruohotie, 2009).

6.2.3 *Conceptual Discussion*

Overall, the concept of professional growth often seems to cover both the variety of individual and (formal and informal) environmental aspects related to deepening and widening expertise included with the temporal aspect of learning that emphasises the continuity of the process throughout the career and lifespan. However, the literature applying professional growth also reveals both the limited definitions of the concept as well as the lack of conceptual consensus. Consequently, professional growth can be considered as either a term that comprises other aspects or one that overlaps with other related concepts. In particular, the distinction between ‘professional growth’ and ‘professional development’ appears to overlap or be vague. However, one feature that seems to distinguish the two concepts from each other is that professional growth (deepening and widening expertise) is in several cases considered as subsequent to professional development or as a goal of the developmental processes. For instance, in her research on higher education teachers’ professional development, Teräs (2016) suggests that (p. 258) ‘while collaborative online professional development can be challenging due to the different learning needs, expectations and preferences of the participants, it can potentially lead to significant professional growth’. Similarly, Ohlsson and Johansson (2010, p. 241) suggest in their Model of practice-based competence development that ‘The model is premised on collaborative interactions between researchers and practitioners in which access to actual practice and opportunities for collective reflection on that practice is the key basis for both professional growth and the remaking of teachers’ professional practice’. Consequently, professional growth in these cases is considered as a desirable outcome of professional development.

On the other hand, the explication of professional development has also raised some (critical) discussion among researchers and brought the definitions of professional growth and professional development even closer to each other. For instance, in their critical review, Dall’Alba and Sandberg (2006, p. 384) use the term professional development ‘to refer to formal courses and programmes in professional education and to the formal and informal development of professional skill that occurs in the workplace’. They critically review contemporary stage models of professional development that are typically applied across professions and that have been modified to incorporate skilful expertise that is progressively acquired by passing through developmental stages, such as novice, competent and expert. Instead, they rather see patterns of professional development as arising from the relation between practitioner (with a particular history located in local and broader practice contexts) and professional practice, which is dynamic, intersubjective and pluralistic (Dall’Alba & Sandberg, 2006). Opfer and Pedder’s (2011) review study gathers multiple strands of literature on teacher professional development, teaching and learning, teacher change and organizational learning. Their study also illustrates that process–product logic has dominated the literature on teacher professional learning and that this has limited explanatory ability (pp. 377–378): ‘the professional development effects literature has committed an epistemological fallacy by

taking empirical relationships between forms of activity or task (e.g., being activity based), structures for learning (e.g., collaboration between teachers), location (e.g., situated in practice), and so on, and some measure of teacher change to *be* teacher learning'. Thus, the authors themselves propose a conceptualization that goes beyond a focus on the effects of professional development activity to consider the individual and school orientations to learning systems that mediate teacher learning and teacher change Opfer & Pedder, 2011).

Finally, Villegas-Reimers's (2003) review on teachers' professional development underlines that 'professional development' available to teachers has changed from 'staff development' or 'in-service training' (usually consisting of workshops or short-term courses that would offer teachers new information on a particular aspect of their work) towards being considered as a long-term process that includes regular opportunities and experiences planned systematically to promote growth and development in the profession. Thus, the author characterised the new perspective of professional development being based on constructivism rather than on a 'transmission-oriented model' and perceived as a collaborative and long-term process that takes place within a particular context (professional development may look and be very different in diverse settings and even within a single setting, it can have a variety of dimensions). Finally, the author suggests that a teacher is viewed as a reflective practitioner, someone who enters the profession with a certain knowledge base and who will acquire new knowledge and experiences based on that prior knowledge (Villegas-Reimers, 2003).

So far, based on the literature overview, we have shown that in the research literature professional growth is often seen as a holistic developmental *process* that takes place during a teacher's professional (or vocational) career and lifespan. Professional growth is particularly focused on deepening and expanding expertise (knowledge and skills) of professionals. It takes place in organisational contexts within both *formal and informal practices* of learning and it is *situated in the certain context*. The definitions of professional growth have much in common with the current approach to the constructivism-based concept of professional development such as a strong emphasis on *reflective* and *collaborative* learning. Overall, both within the area of professional and vocational learning, researchers have paid more attention to individuals' participation and their ways of navigating as members of communities of practice: the social and the individual are basically intertwined and the ways these dimensions influence each other are mediated by artefacts and objects embedded in a given practice (Nerland & Jensen, 2010). Given that the requirements for occupational practice are also constantly changing, there is a growing need to go beyond participation in professional development courses and to find ways of supporting ongoing development throughout individuals' working lives that can be realised within and as part of work practice (Billett, 2010). In the next section, we move on to a theory-driven reflection on professional growth and workplace learning.

6.3 Professional Growth and Workplace Learning

6.3.1 A Multi-dimensional Model of Professional Growth

Based on the previous section, we present a model that summarises our conceptual discussion of professional growth and reflects the multi-dimensional nature of the concept. The model contains the three dimensions that attempt to capture some of the most relevant continuums of professional growth: formal–informal, situated–unsituated and individual–social. Furthermore, the model has been formed to structure the interface between professional growth and workplace learning. In the following three subsections, some of the current research on workplace learning is being presented and discussed from the perspective of the three dimensions (see Fig. 6.1). In the model, we suggest that the formal–informal, situated–unsituated and individual–social dimensions of learning at work are actualised in processes of professional development. All the dimensions are related to each other and temporal reasoning; they are also based on the current needs of professional knowledge and skills and career developmental needs and extending as far as a continuous (lifelong) learning approach. Professional growth can be considered as a comprehensive process in which a professional’s expertise grows over time within and beyond the workplace.

6.3.2 Formal–Informal Learning

Research on workplace learning discusses opportunities of individuals and communities to expand and deepen their professional and vocational knowledge through formal or informal learning activities. Firstly, learning at work is nowadays intricately linked to formal education as boundaries between school and work are being

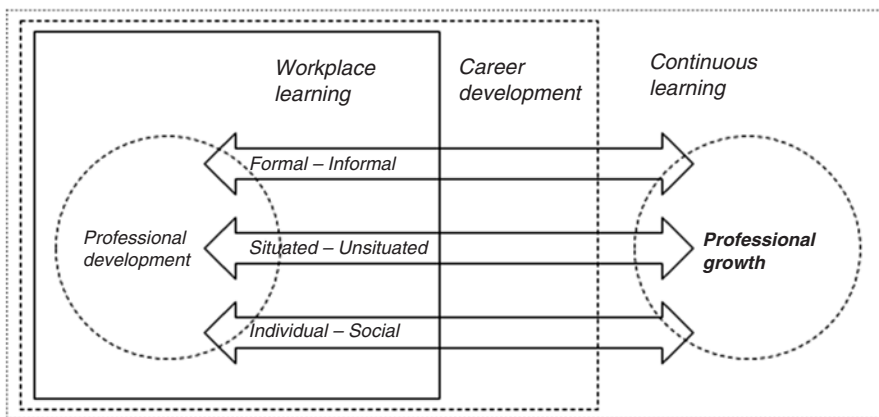


Fig. 6.1 Multi-dimensional model of professional growth

crossed because of increasing work-based learning and a continuous learning approach. According to many researchers, the transitional nature of education–work pathways today covers the full sequence of educational, labour market and related transitions. This begins at the point where educational pathways begin to diverge and ends when young adults have achieved relatively stable labour market positions, including reverse transitions from the labour market to education (Raffe, 2008). Lave and Wenger (1991) have proposed that learning occurs as part of a process in which learners gradually move from peripheral participation to full participation in the community of practice: Engagement in a range of activities provides a learner with a wealth of experience and knowledge over the years. However, the contribution of individual assistance and support by more experienced co-workers is also considered to provide a significant basis for student learning at work (Billett, 2001; Virtanen et al., 2014). Without a solid theoretical basis and guidance from experts, student learning at work may remain unsystematic and incidental (Virtanen & Tynjälä, 2008). For instance, Billett (2001, 2002) has suggested that learning cannot be regarded solely as a process of socialisation and underlined the importance of workplace affordances, which entail access to activities as well as indirect and direct guidance provided by the physical and social environment.

In addition, workplace learning among professionals may also include both formal and informal learning practices and processes. Eraut (2007) has argued that most learning for employees takes place informally in the workplace, primarily by associating with colleagues at work. Ashton (2004, p. 48) calls this ‘tacit knowledge, specific to the organisation’. He emphasises that access to new knowledge can be achieved through asymmetric exchanges between less experienced and experienced colleagues or between employees and supervisors. However, variation occurs also in how eagerly knowledge is being transferred between employees. The extent to which access to knowledge is deliberately favoured or prevented depends strongly on workplace culture (Leslie et al., 1998). Against this background, the introduction of networks or formal mentoring programmes is one way to break down such barriers (Ashton, 2004). For instance, Ellinger (2005, p. 400) calls for a strategy of professional growth ‘learning-committed leadership and management’ and managers and leaders who create informal learning opportunities, serve as developers (coaches or mentors), visibly support and make space for learning, encourage risk taking, instil the importance of sharing knowledge and developing others, give positive feedback and recognition and serve as role models.

Overall, however, learning processes and the associated professional development are triggered both intentionally and unintentionally by the individual’s interaction with his or her environment (Cseh et al., 1999; Ashton, 2004). Eraut (2000, 2004) suggests that instead of considering workplace learning as informal or incidental, it should be seen as non-formal, encompassing different levels of intention to learn. On the other hand, according to Billett (2002, 2014), one can even regard all learning experiences as intentional because they aim to ensure the continuity of social and work practices. Either way, professional growth in workplaces can be considered to include multiple levels of intentions within both formal and informal practices.

6.3.3 *Situated-Unsituated Learning*

Various situational factors are cited in the literature that encourage learning at the workplace and professional development (e.g., Fuller & Unwin, 2010; Eraut & Hirsch, 2007), i.e., the organisational structure, work infrastructure and social structure of the workplace (Cole, 2001). Professional growth is defined not only by the slow increase in cumulative knowledge but also by the experiences gained through the application of professional knowledge in various situations (Eraut & Hirsch, 2007). Billett (2001) also notes that expertise needs to be considered situationally: albeit influenced by historical and sociocultural lines of development, it is at the situational level that the goal-directed activities are shaped.

Research has shown that the potential for employees to apply new knowledge in the workplace is often affected by the work structure. Tightly cut, tailored work processes hardly allow for innovations (Fuller & Unwin, 2003). Rather, new knowledge and experience can be realised through semi-autonomous forms of work, such as project-based work groups in which group members can try different working methods and decision-making processes and the job profile is characterised by diversity (e.g., Coetzer, 2006; Ashton, 2004). According to Ryan and Deci (2000), (work) motivation is also grounded on three fundamental psychological needs: the needs for relatedness, competence and autonomy. When people experience satisfaction of these psychological needs, they also tend to internalize their value and regulation and experience activities as interesting and spontaneously satisfying (Ryan & Deci, 2000).

Various authors such as Billett and Rose (1996), Rouillier and Goldstein (Rouillier & Goldstein, 1997) and Ashton (2004) have stressed the importance of personnel support by colleagues, supervisors or mentors in order to implement new knowledge adequately and consolidate the new ability. To facilitate learning in the workplace, personnel, material, time and monetary resources are necessary. Ashton (2004) stresses that these resources must be used consciously for learning. He points out that supervisors often have little pedagogical knowledge about how they can support the employees' learning and are in part unaware of the importance of learning support (Ashton, 2004). For instance, an open approach to mistakes and uncertainties also promotes reflective learning and working (Lave & Wenger, 1991). Reflection on one's own actions is a key element for learning (Kolb, 1984) and is regarded as an important aspect in research on learning in the workplace (Billett, 1999). Ellinger (2005) discusses material and temporal resources as part of workplace learning. She emphasises the importance of material resources, no matter whether they are tools, machines, information technologies or books. Such resources are particularly necessary for informal learning in the workplace because they are related to job functions and responsibilities. She also points out that it cannot be expected that learning can take place in the workplace if no time is scheduled for it: Lack of time inhibits informal learning as a reflection of knowledge; consequently, knowledge transfer cannot be guaranteed (Ellinger, 2005). Some authors mention the right incentive mechanism as an important way to promote continuous learning

in the workplace and professional development (Coetzer, 2006; Ehrich & Billett, 2004). This also includes the career perspective for employees as an appreciation and reward for professional development (Fuller & Unwin, 2003).

The situational factors presented above show that a versatile working environment shows potential for learning and professional development in the workplace (Fuller & Unwin, 2003). Eraut and Hirsch (2007) point out that a newcomer can only become an expert if he or she is given the opportunity to expand knowledge, make own decisions, apply knowledge in diverse situations, self-evaluate performance and reflect on work. The prerequisite is an organisational structure that permits such dynamics (Ellinger & Cseh, 2007). For instance, Coetzer et al. (2017) show in their study that smaller enterprises are more likely to promote informal learning than large enterprises with fixed departments and organic departmental structures: working in departments can hinder networked thinking between different work steps and fragment the complexity of certain work situations. On the other hand, such external factors as the competitive situation and the company's market share can also play a role in employees' professional development and growth (Coetzer et al. 2017; James & Holmes, 2012). Consequently, if the focus of learning is only on organisation-specific and task-specific knowledge and skills, it may fail to affect the learners' horizontal development to help them mediate between the different forms of expertise and contexts (Griffiths & Guile, 2003; Guile & Griffiths, 2001). For instance, Tynjälä's (2013) integrative pedagogics approach emphasises that incorporating work-based learning in education requires the development of pedagogical models that not only consider the situated nature of learning but also accommodate generic knowledge on the development of expertise. Similarly, according to Guile and Griffiths (2001; Griffiths & Guile, 2003), whereas learners need to develop the capacity to participate in workplace activities and cultures, they also need to learn how to draw upon their formal learning and use it to interrogate workplace practices: to mediate between different forms of expertise and the demands of different contexts.

6.3.4 Individual-Social Learning

In socio-cultural theories of workplace training, learning is becoming a process situated within the framework of participation rather than within the learner, even if it does not replace notions of individual learning (Hager, 2011). Furthermore, learning and professional growth take place when an individual connects with both material and social working environment. Individual perceptions of the workplace and the subjective experiences associated with it are socially influenced and important for one's professional development. In turn, individuals contribute with their actions and reactions to the social construction of knowledge in the workplace (Hodkinson & Hodkinson, 2004). Therefore, organizational characteristics cannot be understood without considering individual perspectives either. The connection between the subjective experiences, including previous experiences of the individual and

perceptions of the environment leads to very personal and individual development and professional growth (Harteis & Billett, 2008).

Lave and Wenger (1991) emphasise that the professional growth of an individual is enhanced by a trusting relationship with experts who function as role models. Furthermore, the research literature also emphasises the significance of leaders and managers in promoting learning (Coetzer, 2006). The social relationship in the workplace can be considered as a driver especially for informal workplace learning (van der Rijt et al., 2013; Choi & Jacobs, 2011). Even though the master-novice relationship and the professional monopoly on expertise (based on such factors as age or status) may be visible elements in learning at work, they may also be problematic. As multiple contexts demand and afford different cognitive tools, rules, and patterns of social interaction, the criteria of expert knowledge and skill is also defined differently in various contexts (Fuller & Unwin, 2004). Ashton's (2004) research findings have indicated that knowledge is seen as power in companies. Consequently, knowledge is withheld from certain groups of people. Against this background, it is important to develop a socially optimal learning culture through various measures such as mentoring programmes, networks, participation and targeted career development for professional growth in the workplace. Clarke (2005, p. 191) summarises these measures under the goal of 'empowerment and effective communication'. Reciprocal relationships among all members of work communities have been shown to help build mutual trust and respect (Fuller & Unwin, 2004; Nielsen, 2008; Onnismaa, 2008).

6.4 Discussion

In this chapter, we have discussed the concept of professional growth and concluded that defining the concept itself, based on the current research, is challenging. Even if the term 'professional growth' is still used in the literature, research applying professional growth reveals both the limited definitions of the concept as well as the lack of conceptual consensus. Furthermore, professional growth can be considered either as a term that encompasses or overlaps with other related concepts. In particular, the distinction between 'professional growth' and 'professional development' appears to overlap. One feature that seems to distinguish the two concepts from each other is that professional growth (deepening and widening expertise) is in several cases considered as subsequent to professional development (e.g., formal learning practices) or as a goal of the developmental processes. However, as the emphasis regarding both concepts has shifted towards continuous learning including both formal and informal practices, the discrepancy between them has blurred. Against this conclusion, more conceptual and etymological research is needed to deepen the current understanding of 'growth' versus 'development'. The more the field of research on professional and vocational learning broadens, the more concepts and conceptual accuracy is needed to describe the processes of learning across a wide range of learners and environments.

This chapter approaches the concept of professional growth as a holistic developmental process that takes place during employees' professional (or vocational) careers and lifespans and is particularly focused on deepening and expanding professionals' expertise (knowledge and skills). We see the value of the use of the term 'professional growth' as an independent concept and hope that it will be used accurately with regards to setting the concept among other related terms in future research. In this chapter, we have applied the concept of professional growth in the context of workplace learning, arguing that it is dependent on the social and institutional contexts as well as personal attributes and circumstances. A model containing several types of triggering factors (e.g., working environment, work role and individual characteristics) to the acquisition and development of new knowledge and skills was presented. The model identified three dimensions of learning approaches related to professional growth (formal–informal, situated–unsituated, individual–social) placed in the context of workplace learning. Regarding these three-dimensional continuums, analysis of the relevant research suggested that: (1) professional growth in workplaces can be considered to include multiple levels of intentions (e.g., from work-based education to willingness to share knowledge or take advantage of learning opportunities) within both formal and informal practices; (2) versatile working environments (e.g., possibility to make decisions, apply knowledge in diverse situations, assess one's own performance and reflect on work) promote learning in the workplace and further, professional growth and (3) the social environment (e.g., rich interactions between novices, experts and leaders) is an important learning resource for professional growth.

We have also discussed in this chapter the changing conceptions of professionalism. In terms of the need for future studies of professional growth, our view on research over the past two decades showed that the definition of the concept has varied considerably, depending on contemporary and contextual factors related to professionals in general. This can be seen as richness but on the other hand, the discrepancies between the central elements of professional growth models and contemporary challenges in changing working life must be acknowledged. For instance, although innovative technologies have increased the relative demand for more skilled workers over the last two centuries (Goldin & Katz, 2007), the definition of what is seen as successful professional growth has changed to some extent. Development and actualisation of skills related to originality and creativity have become an important knowledge capital as such skills are least susceptible to automation in both generalist (knowledge of human heuristics) and specialist (development of novel ideas and artifacts) occupations (Nokelainen et al., 2018). In addition, automation and its relation to workers' employment in the future is a concern (e.g., contemporary expectations attached to the question of whether robots are going to take jobs; see Autor et al., 2003; Frey & Osborne, 2017). These issues have been holding back the progress of automation but for how long that will be the case? Several reports stress the urgency of digitization and digitalization in several areas (e.g., Manyika et al., 2015; Muro et al., 2017) and indicate rapid but non-equally phased development within economic sectors and related occupations.

Finally, we assume that individuals who are growing professionally in the future are not only cognitively committed to workplace learning process but they also monitor and modify their learning in a metacognitive manner and their actions are driven by motives, goals, beliefs and emotions. Consequently, future research should be, to a greater extent, related to holistic competence models that enable the analysis of modern professional growth processes in a workplace learning context. Such models (e.g., Le Deist & Winterton, 2005) contain concepts of both cognitive and functional competency, associating the traditional notion of competence with the ability to function effectively in a variety of work situations. Holistic competence models also acknowledge the role of metacognitive and social competence to acquire cognitive and functional competency, showing that self-regulatory ability is needed as an indirect factor between development of expertise and direct formal, non-formal and informal learning processes (Nokelainen et al., 2017). Focusing solely on subject-specific cognitive development is insufficient; individuals should also develop their networking and leadership skills and recognize learning opportunities in changing working environments (Hytönen et al., 2016). In sum, future research is needed on the growth processes of individuals and communities, the characteristics of holistically ‘growing’ professional expertise and the nature of modern operational environments.

References

- Aarto-Pesonen, L., & Tynjälä, P. (2017a). Dimensions of professional growth in work-related teacher education. *Australian Journal of Teacher Education*, 42(1), 1–18. <https://doi.org/10.14221/ajte.2017v42n1.1>
- Aarto-Pesonen, L., & Tynjälä, P. (2017b). The core of professional growth in work-related teacher education. *The Qualitative Report*, 22(12), 3334–3354.
- Aguinis, H., & Kraiger, K. (2009). Benefits of training and development for individuals and teams, organizations, and society. *Annual Review of Psychology*, 60, 451–474.
- Ashton, D. (2004). The impact of organisational structure and practices on learning in the workplace. *International Journal of Training and Development*, 8(1), 43–53.
- Autor, D. (2015). Why are there still so many jobs? The history and future of workplace automation. *The Journal of Economic Perspectives*, 29(3), 3–30.
- Autor, D. H., Levy, F., & Murnane, R. J. (2003). The skill content of recent technological change: An empirical exploration. *The Quarterly Journal of Economics*, 118(4), 1279–1333.
- Billett, S. (1999). Guided learning at work. In D. Boud & J. Garrick (Eds.), *Understanding learning at work* (pp. 151–164). Routledge.
- Billett, S. (2001). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning*, 13(5), 209–214.
- Billett, S. (2002). Toward a workplace pedagogy: guidance, participation, and engagement. *Adult Education Quarterly*, 53(1), 27–43.
- Billett, S. (2010). Learning through practice. In S. Billett (Ed.), *Learning through practice: Models, traditions, orientations and approaches* (pp. 1–20). Springer.
- Billett, S. (2014). Mimesis: Learning through everyday activities and interactions at work. *Human Resource Development Review*, 13(4), 462–482.

- Billett, S., & Rose, J. (1996). Developing conceptual knowledge in the workplace. In J. C. Stevenson (Ed.), *Learning in the workplace: The hospitality industry* (pp. 204–228). Centre for Skill Formation Research and Development, Griffith University.
- Chan, K. Y., Ho, M. R., Chernyshenko, O. S., Bedford, O., Uy, M. A., Gomulya, D., & Phan, W. M. J. (2012). Entrepreneurship, professionalism, leadership: A framework and measure for understanding boundaryless careers. *Journal of Vocational Behavior, 81*(1), 73–88. <https://doi.org/10.1016/j.jvb.2012.05.001>
- Choi, W., & Jacobs, R. L. (2011). Influences of formal learning, personal learning orientation, and supportive learning environment on informal learning. *Human Resource Development Quarterly, 22*(3), 239–257.
- Chui, M., Manyika, J., & Miremadi, M. (2015). *Four fundamentals of workplace automation*. McKinsey.
- Clarke, N. (2005). Workplace learning environment and its relationship with learning outcomes in healthcare organizations. *Human Resource Development International, 8*(2), 185–205.
- Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education, 18*(8), 947–967.
- Coetzer, A. (2006). Employee learning in New Zealand small manufacturing firms. *Employee Relations, 28*(4), 311–325.
- Coetzer, A., Kock, H., & Wallo, A. (2017). Distinctive characteristics of small businesses as sites for informal learning. *Human Resource Development Review, 16*(2), 111–134.
- Cole, G. (2001). *Organisational behaviour*. Thomson.
- Collin, K. (2002). Development engineers' conceptions of learning at work. *Studies in Continuing Education, 24*(2), 133–152.
- Cseh, M., Watkins, K. E., & Marsick, V. J. (1999). Re-conceptualizing Marsick and Watkins' model of informal and incidental learning in the workplace. In *Proceedings of the 1999 conference of the Academy of Human Resource Development*.
- Dall'Alba, G., & Sandberg, J. (2006). Unveiling professional development: A critical review of stage models. *Review of Educational Research, 76*(3), 383–412.
- Day, C. (2016). Competence-based education and teacher professional development. In M. Mulder (Ed.), *Competence-based vocational and professional education. bridging the worlds of work and education* (pp. 165–182). Springer.
- Deming, D. J. (2015). *The growing importance of social skills in the labor market* (The National Bureau of Economic Research Working Paper No. 21473). NBER.
- Ehrich, L. C., & Billett, S. (2004). Learning new practices in small business: Engagement and localised support. *Education + Training, 46*(8/9), 501–509.
- Ellinger, A. D. (2005). Contextual factors influencing informal learning in a workplace setting: The case of “reinventing itself company”. *Human Resource Development Quarterly, 16*(3), 389–415.
- Ellinger, A. D., & Cseh, M. (2007). Contextual factors influencing the facilitation of others' learning through everyday work experiences. *Journal of Workplace Learning, 19*(7), 435–452.
- Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work. *British Journal of Educational Psychology, 70*(1), 113–136.
- Eraut, M. (2004). Informal learning in the workplace. *Studies in Continuing Education, 26*(2), 247–273.
- Eraut, M. (2007). Learning from other people in the workplace. *Oxford Review of Education, 33*(4), 403–422.
- Eraut, M., & Hirsch, W. (2007). *The significance of workplace learning for individuals, groups and organisations* (SKOPE Monograph No. 7). SKOPE.
- Filliattaz, L., Durand, I., & Trebert, D. (2015). Learning through verbal interactions in the workplace: The role and place of guidance in vocational education and training. In L. Filiattaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices* (pp. 279–301). Springer.

- Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, *114*, 254–280.
- Frey, C. B., Osborne, M. A., & Holmes, G. (2016). *Citi GPS: Global perspectives & solutions*. Retrieved from <https://www.citivelocity.com/citigps/ReportSeries.action?recordId=49>
- Fuller, A., & Unwin, L. (2003). Learning as apprentices in the contemporary UK workplace. *Journal of Education and Work*, *16*(4), 407–426.
- Fuller, A., & Unwin, L. (2004). Young people as teachers and learners in the workplace: Challenging the novice–expert dichotomy. *International Journal of Training & Development*, *8*(1), 32–42.
- Fuller, A., & Unwin, L. (2010). *The NAS toolkit: Expansive apprenticeships: A guide for employers, training providers and colleges of further education*. National Apprenticeship Service.
- Goldin, C., & Katz, L. F. (2007). *The race between education and technology: The evolution of U.S. educational wage differentials, 1890 to 2005* (NBER working paper series). National Bureau of Economic Research.
- Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*, *26*, 91–108.
- Griffiths, T., & Guile, D. (2003). A connective model of learning: The implications for work process knowledge. *European Educational Research Journal*, *2*(1), 56–73.
- Guile, D. (2019). The concept of “recontextualization”: Implications for professional, vocational and workplace learning. *Learning, Culture and Social Interaction*, *23*, 1–11. <https://doi.org/10.1016/j.lcsi.2019.100343>
- Guile, D., & Griffiths, T. (2001). Learning through work experience. *Journal of Education and Work*, *14*(1), 113–131.
- Hager, P. (2011). Theories of workplace learning. In M. Malloch, L. Cairns, K. Evans, & B. N. O’Connor (Eds.), *The SAGE handbook of workplace learning* (pp. 17–32). Sage Publications Ltd.
- Hargreaves, A. (2000). Four ages of professionalism and professional learning. *Teachers and Teaching*, *6*(2), 151–182. <https://doi.org/10.1080/713698714>
- Harteis, C., & Billett, S. (2008). The workplace as learning environment: Introduction. *International Journal of Educational Research*, *47*(4), 209–212.
- Hodkinson, P. H., & Hodkinson, H. (2004). The significance of individuals’ dispositions in the workplace learning: A case study of two teachers. *Journal of Education and Work*, *17*(2), 167–182.
- Holmlund, T. D. (2008). Teachers’ collaborative inquiry and professional growth: Should we be optimistic? *Science Education*, *93*(3), 548–580.
- Hudson-Ross, S. (2001). Intertwining opportunities: Participants’ perceptions of professional growth within a multiple-site teacher education network at the secondary level. *Teaching and Teacher Education*, *17*(4), 433–454.
- Hytönen, K., Palonen, T., Lehtinen, E., & Hakkarainen, K. (2016). Between two advisors: Interconnecting Academic and workplace settings in an emerging field. *Vocations and Learning*, *9*(3), 333–359.
- James, S., & Holmes, C. (2012). *Developing vocational excellence: Learning environments within work environments* (SKOPE Research Paper 112). University of Oxford.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.
- Kramarski, B., & Michalsky, T. (2009). Investigating preservice teachers’ professional growth in self-regulated learning environments. *Journal of Educational Psychology*, *101*(1), 161–175.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. University Press, Cambridge.
- Le Deist, F. D., & Winterton, J. (2005). What is competence? *Human Resource Development International*, *8*(1), 27–46.
- Leslie, B., Aring, M. K., & Brand, B. (1998). Informal learning: The new frontier of employee development and organizational development. *Economic Development Review*, *15*(4), 12–18.

- London, M., & Mone, E. M. (1999). Continuous learning. In D. R. Ilgen & E. D. Pulakos (Eds.), *The changing nature of performance: Implications for staffing, motivation and development* (pp. 119–153). Jossey-Bass Publishers.
- London, M., & Smither, J. W. (1999). Empowered self-development and continuous learning. *Human Resource Management*, 38(1), 3–15.
- Manyika, J., Khanna, S., Sarrazin, H., Pinkus, G., Sethupathy, G., & Yaffe, A. (2015). *Digital America: A tale of the haves and have-mores*. McKinsey Global Institute.
- Martimianakis, M. A., Maniate, J. M., & Hodges, B. D. (2009). Sociological interpretations of professionalism. *Medical Education*, 43(9), 829–837. <https://doi.org/10.1111/j.1365-2923.2009.03408.x>
- Maskit, D. (2011). Teachers' attitudes toward pedagogical changes during various stages of professional growth. *Teaching and Teacher Education*, 27(5), 851–860.
- Michalsky, T. (2012). Shaping self-regulation in science teachers' professional growth: Inquiry skills. *Science Education*, 96(6), 1106–1133.
- Muro, M., Liu, S., Whiton, J., & Kulkarni, S. (2017). *Digitalization and the American workforce*. Brookings Institution.
- Nerland, M. (2012). Self-technologies in work-based learning. In K. Jensen, L. C. Lahn, & M. Nerland (Eds.), *Professional learning in the knowledge society* (pp. 195–209). Sense Publishers.
- Nerland, M., & Jensen, K. (2010). Objectual practice and learning in professional work. In S. Billett (Ed.), *Learning through practice: Models, traditions, orientations and approaches* (pp. 82–103). Springer.
- Nielsen, K. (2008). Scaffold instruction at the workplace from a situated perspective. *Studies in Continuing Education*, 30(3), 247–261.
- Noe, R. A., Clarke, A. D. M., & Klein, H. J. (2014). Learning in the twenty-first-century workplace. *Annual Review of Organizational Psychology and Organizational Behaviour*, 1, 245–275.
- Nokelainen, P., & Ruohotie, P. (2009). Non-linear modeling of growth prerequisites in a Finnish polytechnic institution of higher education. *Journal of Workplace Learning*, 21(1), 36–57.
- Nokelainen, P., Kaisvu, H., & Pylväs, L. (2017). Self-regulation and competence in work-based learning. In M. Mulder (Ed.), *Competence-based vocational and professional education. bridging the worlds of work and education* (pp. 775–793). Springer.
- Nokelainen, P., Nevalainen, T., & Niemi, K. (2018). Mind or machine? Opportunities and limits of automation. In C. Harteis (Ed.), *The impact of digitization in the workplace: An educational view* (pp. 13–24). Springer.
- Nussbaum, M. C. (2011). *Creating capabilities: The human development approach*. Belknap Press of Harvard University Press.
- Ohlsson, J., & Johansson, P. (2010). Interactive research as a strategy for practice-based learning: Designing competence development and professional growth in local school practice. In S. Billett (Ed.), *Learning through practice: Models, traditions, orientations and approaches* (pp. 240–255). Springer.
- Onnismaa, J. (2008). Age, experience, and learning on the job: Crossing the boundaries between training and workplace. *Journal of Employment Counseling*, 45(2), 79–90.
- Opfer, V. D., & Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of Educational Research*, 81(3), 376–407.
- Owen, S. (2014). Teacher professional learning communities: Going beyond contrived collegiality toward challenging debate and collegial learning and professional growth. *Australian Journal of Adult Learning*, 54(2), 54–77.
- Raffe, D. (2008). The concept of transition system. *Journal of Education and Work*, 21(4), 277–296.
- Rouillier, J., & Goldstein, I. (1997). The relationship between organisational transfer climate and positive transfer of transfer. In D. Russ-Eft, H. Preskill, & C. Sleezer (Eds.), *Human Resource Development Review* (pp. 330–347). Sage.

- Ruohotie, P. (1996). Professional Growth and Development. In K. Leithwood, S. Chapman, D. Carson, P. Hollinger, & A. Hart (Eds.), *International Handbook of Educational Leadership and Administration* (pp. 419–445). Kluwer Academic Publishers.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78.
- Teräs, H. (2016). Collaborative online professional development for teachers in higher education. *Professional Development in Education*, *42*(2), 258–275. <https://doi.org/10.1080/19415257.2014.961094>
- Tynjälä, P. (2013). Toward a 3-P model of workplace learning: A literature review. *Vocations and Learning*, *6*(1), 11–36.
- van der Rijt, J., Van den Bossche, P., van de Wiel, M. W. J., De Maeyer, S., Gijsselaers, W. H., & Segers, M. S. R. (2013). Asking for help: A relational perspective on help seeking in the workplace. *Vocations and Learning*, *6*, 259–279.
- Villegas-Reimers, E. (2003). *Teacher professional development: An international review of the literature*. UNESCO: International Institute for Educational Planning.
- Virtanen, A., & Tynjälä, P. (2008). Students' experiences of workplace learning in Finnish VET. *European Journal of Vocational Training*, *2*, 199–213.
- Virtanen, A., Tynjälä, P., & Eteläpelto, A. (2014). Factors promoting vocational students' learning at work: Study on student experiences. *Journal of Education and Work*, *27*(1), 43–70.
- Westbrook, T. S., & Veale, J. R. (2001). Work-related learning as a core value: An Iowa perspective. *Human Resource Development Quarterly*, *12*(3), 301–318.

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Chapter 7

Learning in and Through Work: Positioning the Individual



Stephen Billett

Abstract Understanding the purposes, processes and outcomes of learning in and through work – workplace learning – necessitates positioning individuals centrally in those deliberations. The purposes of engaging in learning in, through and for work are central to individuals developing the capacity to participate in adult and working life, to form a specific occupational identity, to have bases to realise and maintain economic independence through ongoing employment and to sustain that ability across working life. This includes advancements within an occupation field and as a means to transfer to other occupations as interests and economic circumstances change. The process of that learning is shaped by experiences afforded by social settings such as workplaces and educational institutions, but ultimately mediated by individuals. It is the construction of personal domains of occupational knowledge, including understanding variations in requirements and capacities to adapt what individuals know, can do and value that is central to occupational performance. These domains of knowledge are not some version of a textbook or uniformly constructed. Instead, they are developed in personally-specific ways that arise from the particular sets of experiences which individuals are afforded and how they construe, construct and reconcile those experiences based on the previous experiences and development. Hence, beyond what is afforded by social institutions (e.g. workplaces), ultimately, it is individuals that generate the purposes, enact the processes and realise the outcomes of learning in through and for work (i.e. workplace learning). In advancing a case for individuals as meaning makers, knowledge producers and innovators is not to position these purposes, processes and outcomes as being abstracted from the social and cultural world. On the contrary, the purposes are embedded in the social world, processes are inherently interdependent with what is experience socially and culturally, and the outcomes represent a version of what is suggested, required and enacted in the social world. It is these concepts that are advanced in this chapter to elaborate the role of the individual in what is referred to as workplace learning.

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Keywords Societal development · Individual · Personal · Interdependence · Processes and outcomes

7.1 Learning in and Through Work: Positioning the Individual

Positioning the individual is central to elaborating human endeavours associated with socially-derived goals, actions, interactions, processes and outcomes. Such an elaboration is important when seeking to illuminate endeavours that are central to the continuity, progress and advancement of humankind, such as engaging in and learning through and for occupations. These occupations have arisen historically to address particular human needs (Barley & Orr, 1997; Whalley & Barley, 1997; Wright Mills, 1973), have been manifested culturally, as the ways of addressing those needs differ across cultures (Billett, 1998; Donald, 1991), and how they are practised are subject to the requirements of specific places and circumstances (Billett, 2001a). That is, they are a product of evolving historical, cultural and situational needs. Whether it is the production of food, the construction of shelter, the care of young and old, the production of artefacts or the provision of services to individuals, all of these arise from societal needs. So, for instance, humans require their hair to be cut, and differences in meeting those needs for male and female have evolved differently (i.e. hairdressers and barbers). Yet, the style of hairdressing is shaped by cultural mores and practices, which extends to the kind of hair that is found in different countries (e.g. beading and plaits in Africa). Then, the particular clientele, location and speciality of a hairdressing salon or barbershop determine the kind of hairdressing undertaken, the skills required and the means by which that occupational practice is enacted (Billett, 2001a). Yet, the genesis of these occupations, their enactment and transformations in meeting these needs are premised upon the actions of those who learn, practice and advance them.

So, whilst occupations are central to societal need, continuity and progress, their enactment and change are premised on the actions of individuals (i.e. hairdressers/barbers) including how they enact and develop further their occupational knowledge. Consequently, learning how to effectively practice these occupations, respond to specific human needs, and respond to changing requirements and particular circumstances of their enactment have long been enacted by the individuals who practice them (Epstein, 2005). Across human history, the majority of the initial learning of occupations, the development of high levels of occupational performance and the further development and transformation of occupational practices have largely occurred through work and workplaces (Billett, 2014a; Gimpel, 1961; Turnbull, 1993). This development has not been secured through being taught, but appears largely to be the product of individuals' active and directed participation in work activities and interactions, which extends to innovations (Epstein, 1998). It follows that when seeking to understand and elaborate these processes of learning and

development, be it through work or elsewhere, that the central role that individuals play in these processes needs to be placed centre stage and in relation to what the social world contributes and suggests. Such considerations are essential to elaborating processes of societal continuity and progress as well as individuals' personal learning and development.

It is proposed here that understanding the purposes, processes and outcomes of learning and further developing these occupations in and through work – workplace learning – necessitates placing worker-learners centrally in those deliberations. The case made here is as follows. The purposes of engaging in learning in, through and for work are central to individuals developing the capacity to participate fully in adult life, as work is central to fulfilling economic and personal needs. This comprises generating occupational identities, bases for realising and maintaining economic independence through ongoing employment and sustaining that ability across lengthening working lives (Abrahamsson, 2006; Noon et al., 2013; Somerville & Abrahamsson, 2003). Having the capacities to secure advancement within an occupation or through adapting to other occupations as interests and economic circumstances change is also salient to this continuity. The process of that ongoing learning is largely mediated by individuals. Indeed, across human history the vast majority of the development of occupational capacities, including innovations, that has sustained and progressed societies have arisen through personally-mediated processes, principally mimetic learning (Billett, 2014b). That is, achieved through observation, imitation and practice. Without the intentionality, agency and exercise of individual capacities, societal progress would be moribund, and innovations restricted only to those whose specific role is wholly associated with change (Berger & Luckman, 1967). It is only in relatively recent times that the development of these capacities has become the focus of hybrid institutions (e.g. schools, colleges, universities) whose purpose is to promote intended learning outcomes. Even then, without learners' (i.e. students') active engagement in those processes, little other than reproduction would likely arise. Moreover, despite the almost ubiquitous provision of educational experiences for occupations, it is acknowledged that access to workplace experiences is now essential. The experiences provided by such institutions alone are insufficient to generate the kinds of knowledge required for effective work practice (Cooper et al., 2010). Yet, in workplace experiences, learning is largely mediated by individuals themselves, not teachers (Billett, 2001c). Indeed, individuals' construct personal domains of occupational knowledge, including understanding variations in requirements and capacities to adapt to novel requirements is central to occupational performance.

These domains of knowledge are not versions of a textbook transposed or constructed uniformly. Instead, they are developed in personally-specific ways that arise from the particular sets of experiences that individuals encounter and how they construe, construct and reconcile those experiences based on what they know, can do and value. It is individuals, therefore, that generate the purposes, enact the processes and realise the outcomes of learning in, through and for work (i.e. workplace learning), the kinds of workplace practices enacted, remade and transformed. Yet, in making this case, it is not proposed that these purposes, processes and outcomes are

abstracted from the social and cultural world. On the contrary, these purposes are embedded in the social world, processes are inherently interdependent with what is experience socially and culturally, and the outcomes represent a version of what is suggested, required and enacted in the social world. For instance, Harre (1995) proposes that:

... personality becomes socially guided and individually constructed in the course of human life. People are born as potential persons, the process of becoming actual persons takes place through individual transformations of social experience (p. 373).

That individual transformation of social experiences includes initial and on-going learning of a specific domain of knowledge, such as comprises occupational competence. It is these concepts that are advanced in this chapter to elaborate the role of the individual in what is referred to as workplace learning.

The case made here progresses by, firstly, advancing a series of four propositions that emphasise the indivisibility of the social and individual. These comprise: i) the social genesis of the personal, ii) person-dependence of experiences across the life course, iii) intra-psychological attributes; and iv) interdependence between individuals and their engagements with the social and brute world. Then, the more focussed case is made about learning through work and the remaking of occupational practice, with the central role of the individual or personal in the purposes for learning in through and for work, as foreshadowed. Then, the role of the individual in the processes of learning in and through work is elaborated with a particular emphasis given to mimetic learning, the personally-mediated process through which humans have learnt and advanced occupational practices across history. Thirdly, the outcomes of learning in, through and for work are considered in terms of the construction of personal domains of occupational knowledge, which is central to both individual progress and societal progression.

7.2 Some Premises

It is necessary to discuss the use of the term ‘individual’ in this chapter. This discussion is to offer some premises about the use of that term and how it should be considered within the case being made here. In contemporary academic discourse, the concept ‘individual’ often attracts negative responses as to militate against reasonable and helpful discussion about this concept. It is often seen as denying social factors and contributions from the social world, and is sometimes unquestioningly associated with contemporary accounts of liberalism and neo-liberalism. This is unhelpful. Importantly, emphasising the role of the individual does not deny or absolve socially-derived problems, such as inequity, discrimination or alienation. Nor does it seek to create a false sense of equity, democracy and fulfilment, as some claim (e.g. (Ratner, 2000)). It merely seeks to positon individuals’ thinking and acting more centrally in current discussions about working and learning. Yet, such is the orthodoxy within the current scientific discourse to disallow, ignore and contest

the concept of individual that it becomes necessary to qualify its usage to such an extent that risks detracting from the issue being discussed¹.

7.2.1 *Indivisibility of Social and Individual*

Firstly, it is important to state that, instead of denying the contributions, suggestions and legacies of the social world, there is nothing more social than the individual (Billett, 2006). This is because each individual's knowledge and knowing is socio-genetic. It arises through experiences they have in the social world, albeit in personally particular ways. What individuals know, can do and value (i.e. their personal epistemology) arises through our engagement with the social world (i.e. micro-genesis) as we mediate (i.e. construe, construct and reconcile) what we experience (Scribner, 1985). That process of 'experiencing' and the learning arising from it is premised on the legacy of earlier or premedial socially-derived experiences encountered in our life histories (i.e. ontogenies). The point here is that individuals' experiences and experiencing are personally particular because of the unique set of largely socially-derived experiences they have encountered and reconciled across their lives. It is this process of reconciling these experiences that iteratively and reciprocally generates their personal epistemologies. Each individual has a personal-specific social genesis of the knowledge and subjectivity or sense of self. So, not only are individuals the epitome of the social, but individuals' learning and development is socio-genetic (i.e. what arises from the social world). In explicitly using this term, as have others (Harre, 1995; Valsiner, 2000) the aim is to redress resistance to its use. The greatest resistance arises from those whose disciplines have a starting point in the social world and its contribution to how humans think and act, and yet whose disciplinary orientation seems to downplay or deny individuals' contributions to the social world (Ratner, 2000). This is despite Berger and Luckman (1967), Foucault (1986) and Giddens (1991) acknowledging the important role of persons acting in the social world. Indeed, Giddens (1984) states that:

... social systems do not reproduce themselves but require the active production and reproduction of human subjects (p. 11).

The second reason for embracing the term 'individual', as foreshadowed, is process-related – that what we experience and learn across our life histories ontogenetically is by degree person-specific, which shapes what we experience and the process of experiencing and, yet, is shaped iteratively through moment-by-moment learning (i.e. micro-genesis) (Rogoff, 1990) that occurs as we engage in everyday activities, such as our work lives. Gergen (1994) proposes:

¹This has been my experience of having work reviewed over two decades, particularly from journals based in and reviewed by academics from the United Kingdom. Moreover, this kind of privileging and its impact on the kinds of research is published is what Fejes and Nylander (2014, 2015) have illustrated in the field of adult education.

As people move through life ... we are continuously confronted with some degree of novelty -- new contexts and new challenges. Yet our actions in each passing moment will necessarily represent some simulacrum of the past; we borrow, we formulate, and patch together various pieces of preceding relationships in order to achieve local coordination of the moment. Meaning at the moment is always a rough reconstitution of the past, a ripping of words from familiar contexts and their precarious insertion into the emerging realisation of the present (pp. 269–270).

This incremental accumulation of legacies in the form of personal epistemologies comprises our ontogenetic development (i.e. what we know, can do and value come from earlier experiences) (Valsiner & van der Veer, 2000). This shapes how we construe and construct from what we experience, but is also reciprocally shaped by those experiences. The need to separate out the process of learning (micro-genesis) from development (ontogeny) emphasises this person-dependence. Learning arises from experiencing, which is shaped by what we already know, can do and value that arises from earlier experiences. So, the 'same' experience will be experienced in different ways by individuals depending upon their ontogenetic development. Moreover, that process of learning, reciprocally, also advances what we know, can do and value in ways that arise from personal reconciliations of what has been experienced. All of this occurs a myriad of times across our lives and is resolved in multi-myriad ways by individuals. Consequently, what comprises the development of conceptual knowledge (i.e. facts, goals, concepts, propositions – what we know), procedural capacities to achieve goals (i.e. specific and strategic procedures – what we can do) and dispositions, intentions and interest (i.e. what we value) that, together, comprise individuals' personal epistemologies (Billett, 2009) are a product of the interactions and reconciliations between micro-genesis and ontogenesis. It is reconciliation amongst these socially-derived bases that generate our intentions, actions and interactions, including the selective way and degree by which we exercise and extend our capacities.

Third are the intra-psychological attributes (i.e. sensory, perceptual and neural) that are a product of personal experiencing and the brute fact (Searle, 1995) of maturation that arise in diverse ways for individuals. The intra-psychological or intra-mental processes (Barsalou, 2008; Damasio, 2010; Iacoboni, 2005) encompass factors that are central to individuals' learning (i.e. personal factors), which both nativists and constructivists concur arise through ontogenies (Rogoff, 1995). These factors extend to shaping processes of cognitive and emotional responses and are also subject to physical maturation that, far from being exercised uniformly across the human population, has personal or individual emphases. This extends to brute facts associated with physical strength, capacity for introspection and proneness to fatigue and exhaustion, which also mediate how we engage in the activities and interactions that the social world presents to us.

Fourthly, conceptual accounts of relations between individuals and the world around them strongly emphasise factors that are individual-particular, yet also interdependent, and this extends to the exercise of values, such as interest, worth etc. Social theories, understandably, emphasise (and sometimes overstate) the contributions of the social world to human cognition values and action. It is important,

however, to be reminded that individuals also shape and mediate the suggestions from the social world. For instance, Valsiner (1998) proposes that: "... Most of human development takes place through active ignoring and neutralisation of social suggestion to which the person is subjected to in everyday life (p.393)". He suggests that such ignoring and rebuffing what is suggested to the person are essential to buffer individuals' personalities against constant demands of the social suggestion. He continues:

What are usually socialisation efforts (by social institutions and parents) are necessarily counteracted by the active recipients of such efforts that can neutralise or ignore to a large number of such episodes, aside from particularly dramatic ones (p. 393).

Yet, even such dramatic episodes are construed by individuals in ways not controlled by their initiators. Hence, whilst we might be ordered to undertake action under the threats of violence or worse, this does not mean that we would otherwise voluntarily take that action or construct it as being worthwhile and valid. So, what is proposed here is that more than just the mediation by social suggestion, its forms and norms and practices, individuals will play a significant role in the processes of learning through and for work, and the development of innovations in and through paid work. The agency individuals exercise in enacting that role are central to both human learning and the remaking and transformation of culture. Indeed, Berger and Luckman (1966) go as far as to suggest that "to deny individual agency acting upon social structure is to position the world as moribund and unreactive. There would be no scientific achievement, no heresy, no criticism ... (p. 124). The anthropologist Bateson (1972) also noted that rather than generating similarity, cultural practices are made diverse through their enactment by people at particular places, moments in time and responding to specific circumstances. Hence, the interdependence between individuals acting and the social worlds in which they act is seen as being central to not only individual learning, but also the advancement of socially and culturally derived practices such as those that comprise occupations.

It is these processes that are evident in individuals' roles in the purposes, processes and outcomes of learning in and through work.

7.3 Purposes: Reciprocity Between Individual and Societal Imperatives

Building upon what has been advanced above; there is reciprocity between individual and societal imperatives that are manifested in the purposes of engaging in and learning through work. As noted, societal imperatives include the enactment, continuity and advancement of occupational practices whose purposes are to meet societal needs. As foreshadowed, the knowledge required for occupational practice arises through history, culture and situation to meet their needs. Occupations arise, as noted, because of their capacity to address particular human needs (Whalley & Barley, 1997). Hence, their enactment and further development while necessary to

meet those needs are premised upon individuals' engagement with them. Without practitioners to enact, remake and transform those occupations they would not meet existing needs, or be able to respond to the new and emerging challenges that occupations need to address. Reciprocally, the purposes of engaging in learning in, through and for work are central to individuals. This includes developing the capacities to participate in adult and working life, form an occupational identity, maintain economic independence through ongoing employment and sustain that ability across working life (Noon et al., 2013). This includes advancement within an occupation and also the means to adapt to other occupations as their personal interests and/or economic circumstances transform. So central to the purposes for engaging in occupational practice is reciprocity between societal needs and those of individuals.

Importantly, whilst reciprocal, these purposes are dependent upon how individuals come to engage in, learn about, exercise and further develop their capacities to extend their personal practice and respond to new and emerging challenges, as Giddens (1984) proposes. That is, these purposes are, ultimately, mediated by individuals. This purpose can be understood through the process of remaking and transforming the occupational practice. When individuals engage in their work activities, there are two legacies (Billett, 2014a). Firstly, individuals learn through engaging in activities and interactions. When they engage in activities they have undertaken before, the learning is often associated with reinforcing, honing and refining what they know, can do and value. However, when workers engage in new tasks – ones they have not undertaken before or problems they have not addressed before – this extends their knowledge. That is, from such activities they generate new ways of knowing, doing and valuing. All of this is elaborated in the next section.

However, what is often less appreciated is the other legacy: remaking and transforming the occupational practice. As mentioned, occupational practices arise from history, are shaped by culture and have a particular manifestation in the circumstances of their enactment. These practices are not static or stagnant. They are applied in response to particular needs, in a particular circumstance and moment in time. Hence, when workers engage in these activities they are participating in the process of remaking them. That is, taking them from being abstracted concepts, practices and values (i.e. the canonical knowledge of the occupation) and enacting them in response to particular work activities. This is an active process and serves to validate, instantiate and support the efficacy of these practices as they are applied to particular problems, needs or circumstances. The occupational practice, in this way, is given life, form and is enacted by individuals who are practising them. Inevitably, the particular needs of situations, clients, and local requirements will demand particular kinds of manifestations of those practices.

So, rather than being the mere enactment of canonical occupational concepts, procedures and values these will be shaped by the circumstances of their enactment and the goals they are set to achieve. These serve the continuity of the workplace by advancing its capacity to respond to changes in the requirements for the goods or services it generates. It is the enactment of these activities that are part of the process of remaking occupational practice on a routine and regular basis so that its

currency and applicability is maintained. It is this process that occurs every day, everywhere as workers practice their occupations (Billett et al., 2005).

Moreover, occupational practices are subject to needing to be changed in response to emerging requirements, needs and circumstances (Noon et al., 2013). That is, the transformation of occupational practice to meet emerging needs and societal expectations. Central to this process of transformation are the activities of those who practice the occupations and how they engage with new challenges and novel problems. For instance, currently across the globe, healthcare workers are addressing the challenges of dealing with a growing percentage of patients with delirium and dementia. It is these doctors, nurses, and allied health workers who are transforming their practice as they engage in their daily work activities that include increasingly having to care for these kinds of patients. All of this comprises the process of transforming occupations and developing new and innovative practices, and is realised through the capacities and agencies of individuals, either collectively or individually. Innovations are a good example of this process of transformation. This process has been described as the centuries-long tradition of innovation by craft workers (Epstein, 2005) and this process remains being exercised today and across a diverse range of occupations (Hoyrup et al., 2012). Regardless of whether innovations are generated outside of the workplace or from within it, workers engage in the process of transforming the practice. Innovations generated outside of workplaces are required to be adopted to the requirements and practice of those workplaces. This necessitates both workers learning to implement the initiatives and also transforming the practising of the occupation. There are also the innovations generated in workplaces to respond to changes and these are realised through the capacities and agency of workers. Indeed, a recent study indicates that it is a combination of the agency of the worker and the discretion, support and contributions of other workers and supervisors that are central to generating, and acting and sustaining innovations in some workplaces (Billett et al., 2018b).

So, the key point here is that the purposes for learning in and through work are reciprocal in terms of meeting the needs of the workplace and supporting those of workers, and also advancing occupational practice. However, in both the enactment of those occupations, their remaking and transforming share, the key source of that development is individuals' capacities and agency, be it enacted alone or collectively with others.

7.4 Processes: Learning Through Work as Being Individually-Mediated

Both now and in the past, the process of learning through and for work is largely mediated by workers. Whilst there is no denying the different kinds of suggestion, support and even direct engagement with others, ultimately, learning through work is individually-mediated. This is evident in a range of different kinds of studies. For

instance, data from the PIAAC survey indicates that whilst workers report being supported in their learning by other workers, that their own personally mediated learning is consistently reported as being more frequent (OECD, 2013). That is, even though there is access to more experienced and expert co-workers, it is consistently reported that workers themselves engage in and mediate our learning far more frequently than when being guided by others. The findings across a series of qualitatively based studies of workers learning through their everyday activities (Billett, 2001b) identified four key contributions to that learning in authentic circumstances of work. Of those four, three were largely premised on inter-psychological processes mediated by individual workers (i.e. engagement in goal-directed activities, observing and listening, engaging in practice). The intentionality, focus, engagement and legacies of each of those three processes are predicated on the actions and engagement of individual workers. This includes their readiness to engage in the learning process (i.e. what they know, can do and value), how they construe and construct meaning from them, and also the degree and focus of the effort that those individuals direct towards the activities in which they are engaging, how they interact with others and artefacts, and the degree by which they intentionally seek to refine and hone what they know and can do. The fourth contribution referred to the support and direct guidance provided by more expert and experienced co-workers. Even here, individual workers' willingness to engage with other and more experienced workers and how and what they are constructed from that engagement are central to the effectiveness of that contribution.

The key point here is that what is afforded by the physical and social setting comprising the workplace, which includes the kind of activities and interactions that individuals can access and engage with, and the degree of direct or indirect support provided to them what is provided is all subject to how individuals will seek to engage with and learn through them. Although Valsiner (1998) refers to the difficulty of ignoring dramatic social suggestions (e.g. the demands of an immediate supervisor), being pressed into activities, as is often the case in workplaces, does not mean that external press wholly mediates learning. As Wertsch (1998) proposes, when subject to unwelcome or unhelpful suggestion individuals may elect to engage in superficial forms of learning to give the impression of compliance to that press or suggestion. He referred to this as mastery. However, he made a distinction between mastery and appropriation with the latter being what individuals generate based upon what they believed to be the case regardless of what the social suggestion might emphasise. Much earlier, Luria (1976) referred to appropriation as the process of individuals making their own from what they experience, an account that rehearses personal construal and construction. From the same Soviet Russian tradition, (Leontyev, 1981) later proposes appropriation as the active process that bridges the historical heritage of human beings and each new generation's taking over that heritage, thereby emphasising the active remaking and transformation of that heritage.

These processes are actively progressed and, taking Wertsch's point further, also indicate the capacity of humans to resist the social suggestions to which they are subject. Indeed, the active ignoring and rebuffing to which Valsiner (1998) refers to

above emphasises the capacity for resistance. This resistance is acknowledged elsewhere as occurring within individuals' responses to what they encounter in and through work. Dawe (1978), cited in (Knights & Willmott, 1989) states that:

In every testimony to the experience of the humanising pressures of modern industrial society, there is also a testimony to a contrary sense of self, of personal identity, of being human; of what it is or might be like to be in control of our own lives, to act in and upon the world, to be active human agents. So, in the name of our personal identities, our personal hopes and projects and longings, in the name of ourselves, we resist (pp. 535–536).

The case being advanced here is not to deny the contributions of others and the suggestion of social world, but to emphasise the importance and centrality of the individual as the meaning maker. This includes how we respond to what is being suggested to us. Indeed, others are important and more informed others who can model, guide or directly engage to support learning are particularly helpful when the knowledge is difficult to access and appropriate. That is, when it is opaque (i.e. symbolic knowledge), hidden (i.e. not able to be directly experienced) or otherwise difficult to engage with because of its complexity (Makovichy, 2010), or the process itself is highly codified (Merriam, 1964). In these circumstances, as that learning is unlikely to be generated by individuals alone, we require more informed partners to support and guide its learning.

However, the important principle here is that much of the learning that individuals undertake across their working lives is not dependent upon having proximal or close guidance or, even, direct teaching. Instead, it is a product of individuals mediating the experiences they encounter, applying what their knowledge and reinforcing or extending that learning arises from work. This includes the more indirect or distal forms of guidance provided by observing others, using them as models and imitating what they do and how they achieve their goals. Perhaps this is always been the case. Across human history the vast majority of the development of occupational capacities, including innovations, that has sustained and progressed societies have arisen through personally-mediated processes, and principally mimetic learning (Billett, 2014b). That is, through personally-mediated processes of observation, imitation and practice. It is only in relatively recent times (i.e. the last 150 years) that the development of these capacities has become the focus of hybrid institutions (e.g. schools, colleges, universities) whose purpose is to promote intended learning outcomes. Even then, it has been found that without students accessing workplace experiences, where the learning is largely mediated through their engagement, the experiences provided by such hybrid institutions have low prospects of generating the kinds of required knowledge that can be adapted to secure effective work practice.

The now ubiquitous process of teaching is relatively new and largely suited to hybrid institutions where learning and education is the specific goal. Although educational institutions have existed across human history, these were only for a tiny minority of individuals. Studies from anthropology and other sources indicate that before the era of schooling (i.e. the formation of modern nation-states and mass education) that across human history how people had acquired and extended their

occupational capacities was through processes of learning (Goody, 1982; Gowlland, 2012; Pelissier, 1991). So, up until the formation of modern nation states, and the advent of mass education, not only was there no teaching to develop the vast majority of occupational capacities that communities required, teaching processes, as we understand them now, were probably not practiced or modelled in the communities where people learnt and work. Up until the era of school societies' processes of mimetic learning appear to have dominated (Billett, 2014b). That is, learning through a process of imitation, observation and then practice as exercised through the agency of the learner. Indeed, whilst this process likely remains the most common process of learning in workplaces, prior to the era of schooling it was the sole means. There are very few reported instances of direct engagement by more experienced practitioners. Those identifiable instances relate to the development of tacit skills, such as learning to make pottery in which the process of shaping clay on potters' wheels often required the experienced potter to lay their hands upon those of the novice to help them to get a feel for how to shape the clay into the correct shape (Gowlland, 2012; Singleton, 1989). Yet, beyond these exceptions of hands-on approaches, there are many instances of practices that individuals engaged in to develop occupational capacities (i.e. mimetic learning, observing, et cetera) and also a set of practice pedagogies (i.e. storytelling, verbalisation, worked examples, heuristics, artefacts and mnemonics) that could support learning (Billett, 2014b). Yet, many of those pedagogic practices were dependent upon the worker–learner actively engaging and constructing meaning and procedures from them. There was little in the way of being taught or otherwise having the knowledge directly transmitted to them, as in teaching. Instead, it was the learner's job to access and secure that knowledge.

A seminal, enduring and archetypal exemplar of this individually-mediated process is learning through apprenticeships. Contemporaneously, apprenticeships are now viewed as a model of education. That is, a model of education premised upon apprentices having experiences in workplaces and educational institutions. Indeed, many discussions about models of apprenticeship are focused on the two kinds of experiences, and how they are organised, sequenced and integrated. These are institutional facts (Searle, 1995), arising through social institutions (i.e. workplaces and educational institutions). Yet, across most of human history apprenticeships have been a mode of learning. That is, a mode of learning in which individuals are the key agents and mediators. These are personal facts, arising through the capacities, actions and subjectivities of individuals. Even the word apprenticeship has its origins in the French word 'apprehende' – to take or grasp (Webb, 1999). It was not a process of knowledge transmission by the tradesperson, but the learner having to access and secure that knowledge. Indeed, as foreshadowed, across the anthropological literature it is difficult to find any instances of direct teaching. In this mode of learning – apprenticeship – it was the apprentice's job to identify what they needed to learn, find ways of learning it and then engaging in the processes of that learning, and not mediated by didactics instruction (Singleton, 1989). The Japanese word for apprenticeship refers to engaging in learning through observation. In contemporary studies of apprentices learning

to build minarets, again the same practice is evident (Marchand, 2008). That is, the apprentice minaret builders have to ‘steal’ knowledge as they are not provided with it. The way they do this is by providing support to the masons in a way that allows them to observe and support the masons engaging in their work, and through that close process of observation and support, they learn the kinds of skills required to be a mason. Whilst these processes might seem historical and archaic, they are current practices in countries such as Egypt where up to one million young people are engaged in what is referred to as traditional apprenticeships (El-ASHmawi, 2017). In other countries these practices are also common, with global agencies now trying to understand how young people who engage in this mode of learning can be given the same kind of recognition as those in apprenticeship models of education (International Labour Organisation, 2015).

So, the case made here is that, regardless of whether referring to individuals continuing to learn across their working lives through workplace-based experiences or people coming to learn a specific occupation through workplace experiences, these processes, across human history, and continuing in the present, overwhelmingly are mediated by individuals positioned as learners. However, given the kinds of largely negative labels directed towards educative experiences occurring outside of the circumstances or provisions of educational programs (e.g. informal, non-formal, semi-formal) it is important to consider the kinds and qualities of learning outcomes arising through workplace experiences, and the roles that individuals play in those outcomes.

7.5 Outcomes: Constructing and Developing Further Individuals’ Domains of Occupational Knowledge

From the discussions and accounts above, it is evident that a key outcome of learning in, through, and for work is individuals’ construction of personal domains of occupational knowledge. As proposed above, the process of participating in goal-directed occupational activities in and through work, generates legacies in terms of what individuals know, can do and value. Those legacies are associated with the enactment and further development of their occupational capacities. Ideally, this can comprise both the canonical knowledge of the occupation (i.e. what society would expect of anybody practising that occupation) as well as understanding something of variations in requirements and, in particular, how they are manifested in the specific workplaces where workers practice their occupation. Together, these provide the capacities to enact the occupation, and adapt occupational capacities in response to new challenges and problems (i.e. routine and non-routine problem-solving). As noted, these domains of knowledge are not uniformly constructed by individuals or a transposed version of a textbook appropriated wholesale into individuals’ minds. Instead, they are developed in personally-specific ways that arise from the particular sets of experiences that individuals are afforded and how they, in turn, construe,

construct and reconcile those experiences based on those earlier or premediate experiences and development. The construction of these domains of knowledge arises through a process of appropriation of what they have experienced and that process, as advanced above, is very much mediated by individuals themselves. A key rationale for having traditional modes of apprenticeship supported by educational experiences is to ensure that not only situational contributions, but also those required by the occupation as practice more broadly are engaged with by apprentices. In countries such as Australia, New Zealand, Germany, Switzerland and Austria, structured occupational preparation comprises both experiences in workplaces and educational institutions. These are guided by national statements and curriculum documents about the required capacities to practice an occupation. There is a goal of providing experiences to comprehensively address both the canonical and situational competence. In Switzerland, they have introduced the 'third space' a separate institution (i.e. teaching centre) for apprentices whose workplaces are unable to provide them with a comprehensive range of activities that are required to learn the occupation to which they are apprenticed. These intentions and processes are highly worthwhile, valuable and important for avoiding the situational determinism that arises from having experiences in just one setting, be it in a workplace or an educational institution. So, there are clear intentions with these models of education and that is to integrate workplace experiences. Yet, as noted above and as evident in recent inquiries, ultimately beyond what is proposed and planned for the curriculum (i.e. the intended curriculum) and how it is implemented (i.e. the enacted curriculum) is also the important element of how and what learners construct and construct from these experiences (i.e. the experienced curriculum). Ultimately, the experienced curriculum is mediated by individuals. Hence, educational considerations about preparing and supporting learners prior to an engaging in their workplace experiences, as well as those on educational institutions may assist in addressing issues of lack of readiness or incomplete bases to participate in these activities effectively.

Associated with desirable outcomes from educative experiences is the goal of developing occupational expertise – the ability to effectively perform occupational tasks, including responding to novel or non-routine challenges. Such an ability requires the development of both canonical occupational knowledge and some variations in understandings about and practices associated with situated occupational requirements (Billett, Harteis, & Gruber, 2018a). Canonical occupational knowledge comprises the conceptual, procedural and dispositional capacities required to practice an occupation. That is, the knowledge that anybody practising this occupation would need to know, do and value. Occupational expertise, however, is manifested, enacted and judged in particular circumstances of practice (Billett, 2001a), such as a particular workplace or work practice. There is no such thing as an occupational expert per se, because the ability to respond to the challenges and requirements of occupational practice are manifested situationally. It is the effective responses to the particular situation that generates the task, challenges, problems and perturbations which are the hallmark of occupational expertise. Individuals' canonical occupational knowledge alone is insufficient. They may possess and can

exercise canonical occupational knowledge, yet the performance associated with utilising that knowledge is ultimately premised on responding effectively to situationally derived goals and tasks. It is this outcome that arises through workplace experiences. Yet, importantly it is these two dimensions of occupational knowledge – both manifested in the social world, albeit one abstracted from practice (i.e., occupational) and the other shaped by particular instances of practice (i.e., situational), from which individuals will construct their personal domain of knowledge (Kelly, 1955; Miller, 1996) and which they use to practice their occupation.

These personal domains comprise the conceptual, procedural and dispositional occupational knowledge (i.e., what the individuals know, can do and value) that individuals have learnt, utilized and developed further through their utilisation. They are constructed individually (Billett, 2003) arising through individuals' histories: their ontogenetic development (Scribner, 1985), and through how individuals engage with and come to reconcile what they experience: i.e. their experiencing. As indicated above, that construction arises micro-genetically (i.e. through everyday thinking and acting) as individuals construe, construct and deploy what they know based on that domain of knowledge (Rogoff, 1990). The repertoire of experiences that individuals have within their working life also have the potential to shape the adaptability of individuals' occupational knowledge, albeit mediated and exercised through individuals' intentionality and agency (Goller & Billett, 2014) in what they encounter in their working lives. So, through adapting what they know, can do and value to new problems or circumstances of practice, that domain of knowledge goes beyond that comprising canonical concepts, procedures and values. Rather, it brings a prospect of extending and nuancing that knowledge and in ways that can assist in adapting to new circumstances, and thereby, reciprocally, develop further their domain of knowledge.

Emphasizing individuals' role in constructing and organising these personal domains of occupational knowledge (and expertise) is important as these arise through engagement in everyday work activities that are themselves mediated by the individual, as are the legacies (learning) that arise from them. As above, these are not taught processes, but largely generated through individually mediated processes. This includes the opportunity to engage in authentic occupational activities repeatedly and over time to refine and hone specific procedures and develop strategic understandings and practices that arise from having a range of activities and practising them over time. In all of this, workplaces can provide guidance of both direct and indirect kind, models and also others with whom to interact. Moreover, these personal domains have distinct epistemological dimensions that are central to how individuals engage in and remake occupational practices as work requirements change. As changes in technologies, work practices, and understandings bring about changes in requirements for occupational practice, those changes are manifested in particular ways in specific work settings, and it is individuals who ultimately shape their progression and the remaking of occupational practices they promote. It is the moment-by-moment and day-by-day decision-making by occupational practitioners as they utilize what their cognitive experience that continually remakes and transforms occupational practices. Whilst all of these are provided in workplace

settings, it is the active engagement of individuals that shape the kinds and characteristics of these domains of knowledge that rely as much upon propositional and causal links and associations that arise through experience as generating broad bases of factual, specific procedural and values associated with the occupation and the workplace.

7.6 The Role of the Individual in Learning in Through and for Work

The purpose of this chapter has been to identify, illuminate and elaborate the central role of the individual in learning in, through and for work to develop the kinds of occupational capacities they need to meet their needs and also that address current and emerging requirements for that occupational practice. The aim here is not to deny the importance of the experiences provided and what is afforded individuals through their workplace activities and interactions. These are important contributors to the development of the occupational capacities that serve the needs of humanity. However, the concern here is to focus on and emphasise the importance of individuals as practitioners, learners and transformers of that occupational practice. Central to the case has been that the purposes for learning in and through work, the processes of that learning and the legacies of that learning are all mediated by individuals.

The case made here is that both the societal and individual purposes for learning through work – the development and maintenance of workplace capacities to achieve its goals and the development of occupational skills – are reciprocal, but mediated by the actions of individuals. Occupations are constellations of concepts, procedures and values that need to be enacted and realised through the capacities and agency of individual workers. Moreover, it has been proposed that the continuity of effective occupational practice is dependent on its constant remaking by workers, as is its transformation in responding to new and emerging challenges. Then, the process by which individuals come to engage in and learn through work is mainly the product of individual mediation. So, whereas in an era of school societies we tend to view individuals learning as being mediated by others (e.g. teachers, experts) it would seem that much and perhaps most of the development of occupational capacities across human history has been the product of individuals actively engaging in and mediating that learning. Even in contemporary times and in circumstances where the mediation of learning by others is available, the evidence suggests that the most common basis of that learning is by individuals personally mediated efforts as they engage in their everyday work activities and interactions (Billett, 2014b). Thirdly, it is proposed that the outcomes of learning through and for work are the development of individuals' personal domains of occupational knowledge that arise from the experiences they have had, are utilised in responding to work activities, and through those responses are developed further.

Yet, these personal domains of occupational knowledge are person-dependent, with each individual's domain being shaped by the range of experiences they have had and how they have come to engage in and reconcile those experiences and, from these, have constructed the representations of occupational knowledge in their minds.

Again, it is important to be reminded that in emphasising the action of the individual, this is not seeing it as the activity of a human agent divorced from the social and physical context in which they act. Quite the opposite is the case. Central to these capacities and activities of the individual is the interdependence between the person acting and that social and physical context. It is that interdependence that is generative of the purposes for engaging in workplace learning, the processes of that learning and the outcomes in the form of personal domains of occupational knowledge.

References

- Abrahamsson, L. (2006). Exploring constructions of gendered identities at work. In S. Billett, T. Fenwick, & M. Somerville (Eds.), *Work, subjectivity and learning*. Springer.
- Barley, S. R., & Orr, J. E. (1997). Introduction: The neglected workforce. In S. R. Barley & J. E. Orr (Eds.), *Between craft and science: Technical work in US settings* (pp. 1–19). Cornell University Press.
- Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology*, 59, 617–645.
- Bateson, G. (1972). *Steps to an ecology of mind*. Chandler Publishing Company.
- Berger, P. L., & Luckman, T. (1966). *The social construction of reality*. Penguin.
- Berger, P. L., & Luckman, T. (1967). *The social construction of reality*. Penguin Books.
- Billett, S. (1998). Situation, social systems and learning. *Journal of Education and Work*, 11(3), 255–274.
- Billett, S. (2001a). Knowing in practice: Re-conceptualising vocational expertise. *Learning and Instruction*, 11(6), 431–452.
- Billett, S. (2001b). *Learning in the workplace: Strategies for effective practice*. Allen and Unwin.
- Billett, S. (2001c). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning*, 13(5), 209–214.
- Billett, S. (2003). Sociogeneses, activity and ontology. *Culture and Psychology*, 9(2), 133–169.
- Billett, S. (2006). Relational interdependence between social and individual agency in work and working life. *Mind, Culture and Activity*, 13(1), 53–69.
- Billett, S. (2009). Personal epistemologies, work and learning. *Educational Research Review*, 4, 210–219.
- Billett, S. (2014). *Mimetic learning at work: Learning in the circumstances of practice*. Springer.
- Billett, S. (2014a). Interdependence on the boundaries between working and learning. In C. Harteis, A. Rausch, & J. Seifried (Eds.), *Discourses on professional learning: On the boundary between learning and working* (pp. 369–385). Dordrecht, The Netherlands: Springer.
- Billett, S. (2014b). *Mimetic learning at work: Learning in the circumstances of practice*. Dordrecht, The Netherlands: Springer.
- Billett, S., Smith, R., & Barker, M. (2005). Understanding work, learning and the remaking of cultural practices. *Studies in Continuing Education*, 27(3), 219–237.
- Billett, S., Harteis, C., & Gruber, H. (2018a). Developing occupational expertise through everyday work activities and interaction. In K. A. Ericsson, R. R. Hoffman, & A. Kozbelt (Eds.), *Cambridge handbook of expertise and expert performance* (2nd ed., pp. 105–126). Cambridge University Press.

- Billett, S., Yang, S., Chai, A., Fang Tai, J., Lee, M., & Alhadad, S. (2018b). *The co-occurrence of learning through work and innovations at work: Prospect for personal, workplace and cultural change*. Paper presented at the 9th international conference EARLI SIG 14 Learning and Professional Development, Geneva.
- Cooper, L., Orrel, J., & Bowden, M. (2010). *Work integrated learning: A guide to effective practice*. Routledge.
- Damasio, A. (2010). *Self comes to mind*. Random House.
- Donald, M. (1991). *Origins of the modern mind: Three stages in the Evolution of Culture and Cognition*. Harvard University Press.
- El-ASHmawi, A. (2017). *Reviewing work-based learning programmes for young people: Republic of Egypt*. Retrieved from Beirut.
- Epstein, S. R. (1998). Craft guilds, apprenticeship, and technological change in preindustrial Europe. *The Journal of Economic History*, 58(3), 684–713.
- Epstein, S. R. (2005). *Transferring technical knowledge and innovating in Europe 1200–1800*. Retrieved from London.
- Fejes, A., & Nylander, E. (2014). The Anglophone International (e) a bibliometric analysis of three adult education journals, 2005–2012. *Adult Education Quarterly*, 64(3), 222–239.
- Fejes, A., & Nylander, E. (2015). How pluralistic is the research field on adult education? Dominating bibliometrical trends, 2005–2012. *European Journal for Research on the Education and Learning of Adults*, 6(2), 103–123.
- Foucault, M. (1986). *The care of the self: The history of sexuality* (Vol. 3, R. Hurley, Trans.). Penguin.
- Gergen, K. J. (1994). *Realities and relationships: Soundings in social construction*. Harvard University Press.
- Giddens, A. (1984). *The constitution of society*. Polity Press.
- Giddens, A. (1991). *Modernity and self-identity: Self and society in the late modern age*. Stanford University Press.
- Gimpel, J. (1961). *The cathedral builders*. Grove Press.
- Goller, M., & Billett, S. (2014). Agentic behaviour at work: Crafting learning experience. In C. Harteis, A. Rausch, & J. Seifried (Eds.), *Discourses on professional learning: On the boundary between learning and working*. Springer.
- Goody, E. H. (Ed.). (1982). *From craft to industry: The ethnography of proto-industrial cloth production*. Cambridge University Press.
- Gowlland, G. (2012). Learning craft skills in China: Apprenticeship and social capital in an artisan community of practice. *Anthropology and Education Quarterly*, 43(4), 358–371.
- Harre, R. (1995). The necessity of personhood as embedded being. *Theory and Psychology*, 5, 369–373.
- Hoyrup, S., Bonnafous-Boucher, M., Hasse, C., Lotz, M., & Moller, K. (Eds.). (2012). *Employee-driven innovation: A new approach*. Palgrave-McMillan.
- Iacoboni, M. (2005). Neural mechanism of imitation. *Current Opinions in Neurobiology*, 15, 632–637.
- International Labour Organisation. (2015). *Policy brief: Main findings from a pilot on upgrading informal apprenticeships in Jordan: a bottom-up approach*. Retrieved from Beirut. www.ilo.org/wcmsp5/groups/public/%2D%2D-arabstates/%2D%2D-ro-beirut/documents/publication/wcms_364567.pdf
- Kelly, G. A. (1955). *The psychology of personal constructs*. Norton.
- Knights, D., & Willmott, H. (1989). Power and subjectivity at work: From degradation to subjugation in social relations. *Sociology*, 23(4), 535–558.
- Leontyev, A. N. (1981). *Problems of the development of the mind*. Progress Publishers.
- Luria, A. R. (1976). *Cognitive development: Its cultural and social foundations*. Harvard University Press.

- Makovichy, N. (2010). 'Something to talk about': Notation and knowledge-making among Central Slovak lace-makers. *Journal of the Royal Anthropological Institute (NS)*, 16(Supplement S1), 80–99.
- Marchand, T. H. J. (2008). Muscles, morals and mind: Craft apprenticeship and the formation of person. *British Journal of Education Studies*, 56(3), 245–271.
- Merriam, A. P. (1964). *The anthropology of music*. Northwestern University Press.
- Miller, P. H. (1996). Mapping the mind: Where are the state lines? *Cognitive Development*, 11, 141–155.
- Noon, M., Blyton, P., & Morrell, K. (2013). *The realities of work: Experiencing work and employment in contemporary society*. Palgrave Macmillan.
- Organisation for Economic Co-operational and Development. (2013). *OECD skills outlook 2013: First results from the survey of adult skills*. OECD.
- Pelissier, C. (1991). The anthropology of teaching and learning. *Annual Review of Anthropology*, 20, 75–95.
- Ratner, C. (2000). Agency and culture. *Journal for the Theory of Social Behaviour*, 30, 413–434.
- Rogoff, B. (1990). *Apprenticeship in thinking – Cognitive development in social context*. Oxford University Press.
- Rogoff, B. (1995). Observing sociocultural activity on three planes: Participatory appropriation, guided participation, apprenticeship. In J. W. Wertsch, A. Alvarez, & P. del Rio (Eds.), *Sociocultural studies of mind* (pp. 139–164). Cambridge University Press.
- Scribner, S. (1985). Vygotsky's use of history. In J. V. Wertsch (Ed.), *Culture, communication and cognition: Vygotskian perspectives* (pp. 119–145). Cambridge University Press.
- Searle, J. R. (1995). *The construction of social reality*. Penguin.
- Singleton, J. (1989). The Japanese folkcraft pottery apprenticeship: Cultural patterns of an educational institution. In M. W. Coy (Ed.), *Apprenticeship: From theory to method and back again* (pp. 13–30). SUNY.
- Somerville, M., & Abrahamsson, L. (2003). Trainers and learners constructing a community of practice: Masculine work cultures and learning safety in the mining industry. *Studies in the Education of Adults*, 35(1), 19–34.
- Turnbull, D. (1993). The ad hoc collective work of building Gothic cathedrals with templates, string, and geometry. *Science, Technology, & Human Values*, 18, 315–340.
- Valsiner, J. (1998). *The guided mind: A sociogenetic approach to personality*. Harvard University Press.
- Valsiner, J. (2000). *Culture and human development*. Sage.
- Valsiner, J., & van der Veer, R. (2000). *The social mind: The construction of an idea*. Cambridge University Press.
- Webb, E. (1999). Making meaning: Language for learning. In P. Ainely & H. Rainbird (Eds.), *Apprenticeship: Towards a new paradigm of learning* (pp. 100–110). Kogan Page.
- Wertsch, J. V. (1998). *Mind as action*. Oxford University Press.
- Whalley, P., & Barley, S. R. (1997). Technical work in the division of labor: Stalking the wily anomaly. In S. R. Barley & J. E. Orr (Eds.), *Between craft and science: Technical work in U.S. settings* (pp. 24–52). Cornell University Press.
- Wright Mills, C. (1973). The meaning of work throughout history. In F. Best (Ed.), *The future of work* (pp. 6–13). Prentice Hall.

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Part II

Team Level

Chapter 8

Looking Back and Ahead: A Social Network Perspective on Workplace Learning and Professional Development



Sara Van Waes and Kaisa Hytönen

Abstract In this chapter, we set forward a social network perspective on professional learning and development. The chapter stresses that how individuals learn and develop in and around the workplace is significantly affected by the way they are tied into a larger web of social connections. We reflect on the added value of a social network perspective to workplace learning research. Building on exemplary findings of recent studies, it shows that the pattern and quality of social relationships among professionals may significantly enhance our understanding of the ways in which interaction takes place and contributes to learning and development. We discuss how a social network approach allows to capture professional interactions in a more straightforward, visual and fine-grained way; and how it can simultaneously capture professional interactions at different levels of analysis (e.g., individuals, teams, units, organizations). We conclude by looking forward and setting up several avenues for future research.

Keywords Professional learning · Workplace learning · Social network analysis · Structural and relational network features

8.1 Introduction

Given the complexity and rapid change that characterizes work and working environments in our advanced knowledge society, personal capacities for professional growth and continuous learning are crucial for professionals. Yet, in many cases a traditional cognitive approach to professional learning does not suffice any more, that is, cumulative acquisition of knowledge and augmentation of expertise by an individual. In other words, professionals in and around the workplace can no longer solely rely on their individual competencies (Tynjälä, 2008). To cope with changing

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requirements and complicated professional problems, professionals must increasingly share their knowledge and engage in collaborative activities. As a response, both practice and research are paying increasing attention to the social and relational side of professional learning, reflecting the urge for professionals to continually interact and connect (Boshuizen et al., 2004; Hakkarainen et al., 2004). As such, professionals' learning is not only shaped by their know-what (i.e., declarative knowledge) and know-how (i.e., procedural knowledge), but also by their *know-who* (i.e., relational knowledge about who knows what) (Borgatti & Cross, 2003).

In this chapter, we set forward a social network perspective to demonstrate how this *know-who* or the relational side of professional learning can be unraveled further. Network research embraces a distinct perspective that focuses on relationships among actors, which can be individuals, work units or organizations (Brass et al., 2004). According to a social network perspective, actors are embedded within networks of interconnected relationships that provide opportunities for and constraints on learning and development. A social network perspective attempts to capture interactions in a more straightforward, visual and fine-grained way (Borgatti et al., 2013). Namely, the key assumption underlying a network perspective is that the patterns and quality of social relationships (i.e. networks) offer a valuable framework to examine how, whether and to what degree interaction takes place. As such, taking a network perspective on professional learning entails that how individuals and organizations learn and develop is significantly affected by the way they are tied into a larger web of social connections (Wasserman & Faust, 1994). This perspective differs from traditional perspectives in that it focuses on the web of interactions that surrounds actors, rather than on individual actors in isolation.

In specific, the chapter is set up as follows: First, we demonstrate how a social network perspective offers a theoretical and methodological framework, and various tools for an in-depth examination of interactions. Second, we reflect on the added value a network perspective brings to the existing body of professional learning and development research. We hereby build on the cumulative body of research adopting a relational or social perspective on professional learning and development in and around the workplace. Then, we elaborate on social network theory and its most central ideas and approaches. Building on this framework, we look back at the existing body of studies relating networks and professional learning. We conclude by looking forward, and set up several avenues for future research taking a network perspective on professional learning.

8.1.1 The Added Value of a Social Network Perspective on Workplace Learning and Development

Now, what does a social network perspective add? More specifically, what does a social network perspective have to offer to study professionals' learning and development in and around the workplace? We argue that a social network perspective

may contribute at least in two important ways (Borgatti & Cross, 2003; Coburn & Russell, 2008; Daly, 2010; Moolenaar, 2012).

First, social network theory provides a powerful, analytical framework and mechanisms that allow for a detailed investigation of the nature, antecedents, and outcomes of interactions (for reviews see Borgatti & Foster, 2003; Brass et al., 2014). Through webs of relationships or ‘networks’, professionals and organizations can exchange knowledge, information, materials and other resources regarding their practice. A social network perspective foregrounds the importance of social interactions for achieving individual and collective learning. To date, a solid framework has developed, comprising theoretical concepts such as structural holes (Burt, 1992), closeness centrality (Freeman, 1979), structural equivalence (Lorrain & White, 1971), and the strength of ties (Granovetter, 1973). Using this framework, social network studies have related professionals’ relationships or network position to significant outcomes such as leadership (e.g., Carter et al., 2015), employability (e.g., Gerken et al., 2016), development (e.g., Dobrow et al., 2012), performance (e.g., Mehra et al., 2001; Sparrowe et al., 2001), and innovation (e.g., Baer et al., 2015).

Second, research on social networks builds on a long tradition of advanced and rigorous methodology and visualization to study interactions. Social network research is multilevel by nature as it allows simultaneous investigation of different levels of analysis (e.g., teachers in schools, or employees in teams). It thereby takes into account the nested structure of data, and includes a level of analysis that is often overlooked, namely the relational level. The levels of analysis can concern, for instance, interpersonal, team, interunit, and (inter)organization level interaction (Brass et al., 2004). In other words: “by embedding individual behaviors in the pattern of their interpersonal relationships, social network analysis can capture the multilevel nature of interaction to an extent that conventional methods and measures cannot” (Moolenaar, 2012, p. 9).

A major challenge for workplace research focusing on interaction and collaboration is that it has been interpreted in a very broad sense. We will now discuss how social network research attempts to capture interactions in a more straightforward and fine-grained way. And, as such, meets several conceptual and methodological challenges posed by the existing body research; such as studies on communities of practice, organizational (shared, collaborative) learning, and professional (learning) communities (Stoll et al., 2006; Wenger et al., 2002).

First, the growing body of research focusing on the social aspect of workplace learning has mostly concentrated on interactions in general. However, a gap in the extant literature is that most studies fail to measure professional interactions with much precision (Coburn et al., 2012). They describe interactions as a whole by providing descriptions, for example, using frequency indications of how often they reported a certain type of interaction. Yet, they do not actually report on differences and nuances of interactions in detail (e.g., the strength and quality of different relationships). Nor do they explore the nature and constellation of interactions (e.g., the diversity and spread of interactions). Adopting a social network perspective provides a more fine-grained exploration of professional interactions, yielding a better

understanding of professional learning. This more fine-grained or in-depth insight into interactions is obtained by precisely measuring e.g. the strength, frequency or quality of each relationship in a network; instead of offering an overall description of 'the relationship in general'. We will further illustrate our point by discussing and visualizing specific research examples in the next section.

Second, professional learning research typically assumes that the locus of professional communities is set by formal boundaries (Coburn & Russell, 2008), focusing on formal organizational boundaries such as teams, departments or workplaces. Yet, a professional is often embedded in a network of relationships that span subgroups and include individuals inside and outside organizational boundaries. Professionals increasingly face a need to engage in knowledge sharing and collaboration through multi-professional networks and teams. Consequently, scholars increasingly argue to not only pay attention to bounded communities but to also include professional interactions across boundaries of communities (Hodkinson et al., 2008; Wenger et al., 2011). A social network perspective allows simultaneous examination of individuals and the (sub)units they are nested in (e.g., professionals in functional teams), within and across organizational boundaries.

Third, traditional professional learning research has few techniques or tools at its disposal to visualize interactions in detail. Social network analysis provides a variety of tools and techniques to reveal partially hidden or informal social structures and relationships (de Laat & Schreurs, 2013; Hakkarainen et al., 2017). Recent work has extensively demonstrated the use of straightforward network visuals to promote and support professional learning processes of individuals and organizations (Hogan et al., 2007; Van Waes & Van den Bossche, 2020). Visualization of interactions have not only proven useful for scientific purposes, but are also a valuable tool to translate findings to practice; for example, to design interventions or when giving feedback on interactional data to practitioners, policy makers or managers (Cross et al., 2010).

Fourth, a network perspective enables to examine interactions taking into account the multiple levels at stake. Network analysis may concurrently consider the individual level, the dyadic or relational level, and the (sub)group or organizational level. For example, research questions may simultaneously address characteristics of an individual professional, the relationships s/he has with colleagues, within or between teams in the organization.

8.1.2 Social Network Research and Approaches

Now that we have argued why a social network perspective offers an added value to research on workplace learning and development, we move more deeply into social network research itself and the two major research approaches that can be adopted.

In recent years social network research has been firmly established as a major research area, and the number of publications referencing social network research is exploding (Borgatti et al., 2014). Networks consist of relationships, which are

termed *ties* or *links*, between actors which are called *nodes*. Actors can be individuals or collectivities, such as teams, organizations or countries. The central focus of social network theory is on relationships and interactions as an explanation of actor and network outcomes. This in contrast to traditional or individualist explanations that focus on attributes of actors that are treated as astructural and independent cases. This reflects a shift from attributes to relations; or from monadic variables (attributes of individuals) to dyadic variables (attributes of pairs of individuals), which consist of social relations and recurring interactions. The fundamental unit of analysis is the pair of actors rather than the individual (Borgatti et al., 2014).

In social network research two fundamental kinds of network research approaches can be discerned, a whole network and a personal network approach (see Fig. 8.1). Both approaches have their specific focus and merits (Borgatti et al., 2013), and offer different insights into professional learning processes. We illustrate this point with an example: Fig. 8.1 illustrates Holly’s personal network (encircled in red), extracted from the whole network. Holly will receive different information from her professional network, compared to Lee, as she occupies a bridging position between two groups. Her boundary-crossing interactions with two different groups may offer her more learning opportunities.

In *whole network* or socio-centric research, the ties among all pairs of nodes in a bounded group are studied (e.g., all teachers within a school). A whole network approach allows researchers to analyze patterns of connections, including structural

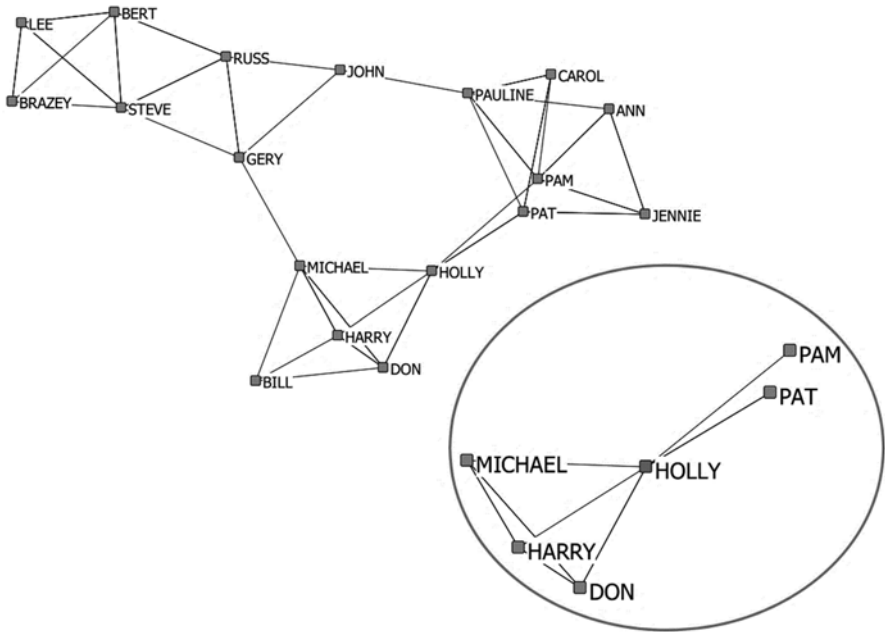


Fig. 8.1 Example of a personal network (encircled) extracted from a whole network. (Halgin & Borgatti, 2012, p. 38)

features such as centrality, density, and betweenness (cf. *infra*). A *personal network* or ego-network approach involves systematically mapping social relationships of focal individuals, termed *ego*'s; and determining the set of nodes that ego has ties with, 'alters' (Crossley et al., 2015) (e.g., a focal teacher and his/her contacts). A personal network approach allows participants to define their own network boundaries, as it intends to investigate the ties of individuals across boundaries of communities, practices and locations (e.g., all ties of a focal teacher within or outside the classroom, grade, or school).

It is important to highlight that personal network studies answer different research questions compared to whole network studies, and as such may offer different insights into how professionals learn and develop. For example, Hytönen et al. (2014a, b) used a whole network approach to examine the development of energy efficient experts' professional networks in the context of a continuing professional education in an emerging field. They aimed to understand networking processes and activities at different levels, that is, among all participants, at a small-group level and at an individual level. The results revealed differences in networking activity at the different levels. Their study showed that even though the intensity of professional knowledge exchange might be low among all professionals of a multi-professional network, intensive networking activities can take place among smaller groups and between individual actors and, thus, provide important resources for participants. Later, Hytönen et al. (2014a, b) adopted a personal network approach to identify the key actors (or cognitively central actors) of the energy efficiency experts' professional networks to understand why certain people achieved essential roles in knowledge exchange in multi-professional networks (Hytönen et al., 2014a). The study demonstrated that in multi-professional networks, the cognitive centrality of an actor is for the most part related to social context, that is, how the expert's profile fits into the wider professional context.

Van Waes (2017) adopted a personal network approach to study university teachers' networks. A personal network approach uncovered how features of a unique university teacher's network related to variables at the individual level of analysis, such as their professional development and expertise. For instance, their work showed how experienced experts developed larger and more diverse networks, compared to experienced non-expert colleagues whose small networks showed little diversity. This shows how a network perspective allows a deeper, more fine-grained exploration of interactions. The use of a personal network perspective sheds light on the fact that professional development is not a time-age effect as experienced experts seem to lapse into arrested development, linked to limited network input. This may in turn cause isolation (Bakkenes et al., 1999; Ericsson, 2006), resorting to interactions that require low interdependence. This arrested or stagnated development is associated with automaticity, i.e., their behavior becomes routine and reaches a stable plateau without further improvement (Ericsson, 2006).

8.2 Looking Back: Extant Research on Networks and Professional Learning

We further underpin our thinking by discussing exemplary research using a social network perspective to shed light on professional learning. We discuss how structural network features may affect the flow of resources between people, and how relational network features influence which resources are available from what kind of people.

8.2.1 *Structural Network Features*

A basic structural concept used in social network studies is *density*. Density characterizes the general cohesion of the network, that is, the number of existing networking ties in relation to all possible ties. This implies that the greater the proportion of ties in the network, the more dense the network is. Studies show that density increases the rate, extent and fidelity of knowledge diffusion in networks (Singh, 2005). Therefore, people with denser networks might have more diverse access to resources as they have a higher number of connections. Density is often used to examine changes taking place in networks, such as increasing or decreasing number of ties in different contexts. For instance, it is often taken for granted that professional education and training supports the development of networking ties among participants. However, recent studies have shown that the emergence of professional learning networks is not always straightforward (Hytönen et al., 2014b; Rienties et al., 2014). The development of professional learning ties does not take place automatically or without careful planning. Deliberate efforts as well as well-developed operating models are required to support tie development (Rienties et al., 2014). This specifically seems to be the case if participants come from different backgrounds and represent heterogeneous expertise (Hytönen et al., 2014b).

Another basic structural concept is centralization in social networks. Centralization can be studied by focusing on *centrality* that characterizes an individual actor's position in a network, or *centralization* of a network structure. Centrality values indicate the amount of information that a person provides to other network members. Therefore, it has been used as indicator for actors' importance or popularity in the network (Sparrowe et al., 2001). Degree centrality is probably the best known and straightforward form of centrality. It is measured by calculating 'in-degree' and 'out-degree'. In-degree captures the amount of people who seek an individual out for resources (by peer-evaluation). The more someone is nominated as a valuable resource in the network, the higher the in-degree. Out-degree stands for the number of times an individual reaches out for resources (by self-evaluation). In professional learning studies centrality measures have been used in searching for, for example, key persons in professional networks or identifying actors' different knowledge mediating roles (Hytönen et al., 2014a; Palonen et al., 2004). Network

research on newcomers' networking roles has demonstrated that newcomers and young workers can very quickly achieve a central networking position in a professional community and become important knowledge-mediating actors (Hytönen et al., 2011).

The concept of *brokerage* refers to persons who are positioned in between people who themselves are not directly connected (Burt et al., 2013). These **brokers** are considered valuable networking partners as they have access to versatile repositories of knowledge through their connections (Palonen et al., 2004). Studies have revealed that in professional communities these key persons are sought for professional help, advice and support more often than other professionals (Hytönen et al., 2014a). Therefore, the key persons with strong brokerage roles or knowledge mediating roles are often described as 'stars', 'hubs', 'gatekeepers of knowledge' or 'cognitive central participants'. They bridge *structural holes*, i.e. holes in the social structure that result from absent or weaker connections, by building connections and mediating knowledge across different people and different knowledge cultures (Burt, 1992). In professional communities and networks, these persons are seen to connect people facing similar professional problems; to translate knowledge across different knowledge cultures and disciplines as well as facilitating innovations, new operational models and professional practices (Sverrisson, 2001). Consequently, they have influential roles in professional learning processes for individuals and organizations. Their role as knowledge mediators seems to be especially important in emerging and developing fields in which the knowledge base is not yet stable or consolidated (Hytönen et al., 2014a).

8.2.2 Relational Network Features

Most extant network research focuses on the patterns or structure of networks (e.g., density, centrality). While that is important, often questions about the content, meaning and significance of relationships are less examined (Bellotti, 2014; Borgatti et al., 2014). Consequently, studies increasingly focus on examining what kinds of relational features are related to structural network qualities (Froehlich et al., 2020). Many network studies have analyzed how professional connections with different qualities assist in sharing knowledge and competence.

A central concept used in examining the exchange of resources is *tie strength*. Tie strength indicates the closeness or strength of relationships by measuring for instance the frequency, intensity, reciprocity, depth, or time spent in a relationship (Marsden & Campbell, 1984). Strong ties connect to people that are close, whereas weak ties are looser contacts. Both weak and strong ties provide access to different kinds of resources and, thus, have different roles in professional conduct and learning. For example, strong ties are instrumental in the diffusion of innovation, the transfer of tacit or complex information, as well as solving complicated problems and transferring knowledge between organizational units (Reagans & McEvily, 2003; Uzzi, 1996). Palonen et al. (2004) demonstrated that novel and complex

knowledge is not easily transmitted without strong reciprocal ties. Strong social networks are also associated with increased individual and organizational performance (Burt, 1992; Hansen, 1999). In contrast, weak ties are more likely to bridge socially distant parts of a network, and thus more likely to gain access to new resources (Granovetter, 1973). They play an important role in the formation of novel ideas and non-redundant information (Levin & Cross, 2004)

An important principle guiding network formation is *homophily*. Social networks are often homogeneous in nature meaning that people tend to interact and create strong connections with people who have characteristics similar to their own, such as age, gender, educational background, equal work status or occupational group (McPherson et al., 2001). Homophily influences the information people receive, the attitudes they form, and the interactions they experience. For example, people with more diverse networks demonstrate more innovation (Kilduff & Krackhardt, 2008). Whereas homophily or similarity between people may enhance the decay of their networks, as information or knowledge may become redundant (Burt, 2000). Networks including a rich variety of people and reaching over the borders of professionals' immediate working environments and communities are especially important for coping in changing working life. *Diversity* in professional networks has been associated with expertise development with experienced professionals, whereas experienced non-experts display more relationships with people with similar characteristics (Van Waes et al., 2015).

Scholars increasingly emphasize the *quality* of the content that flows through network ties, or the 'stories' behind networks (Baker-Doyle, 2015). Researchers have adopted qualitative network techniques as they offer extensive explorative powers to examine the nature, the meaning, intensity, and depth of interactions (Fuhse & Mützel, 2011; Hollstein, 2011). Qualitative network data enable us to examine whether interactions between people involve, for example, swapping entertaining stories, exchanging basic information, or collaborating intensively on shared products. They also allow us to investigate the in- or interdependency between people, the depth of their exchanges, and the impact of their interactions on professional learning. Work by Coburn (Coburn & Russell, 2008; Coburn et al., 2012) demonstrated how the depth of interactions in networks determined the extent to which innovative learning processes succeeded. Recent research by Van Waes et al. (2016) showed that experienced experts had more high interdependent interactions (joint work, sharing), compared to experienced non-experts, who described more independent (practical, organizing) talk (see Figs. 8.2 and 8.3).¹ The quality of ties also differed in that the experienced experts had more high interdependent

¹The nodes in the network maps stand for the people, and the lines represent the ties or relationships between the instructor and the people in his or her personal teaching network. The length and thickness of the lines in the network maps display the interdependence, where thick and short lines stand for ties in which highly interdependent interactions were reported (i.e., sharing, joint work), whereas thin and long lines indicate ties with low interdependence (i.e., storytelling, aid and assistance). The size of the nodes represents the created value, where small nodes represent immediate and potential value, whereas large nodes stand for applied, realized or reframing value.

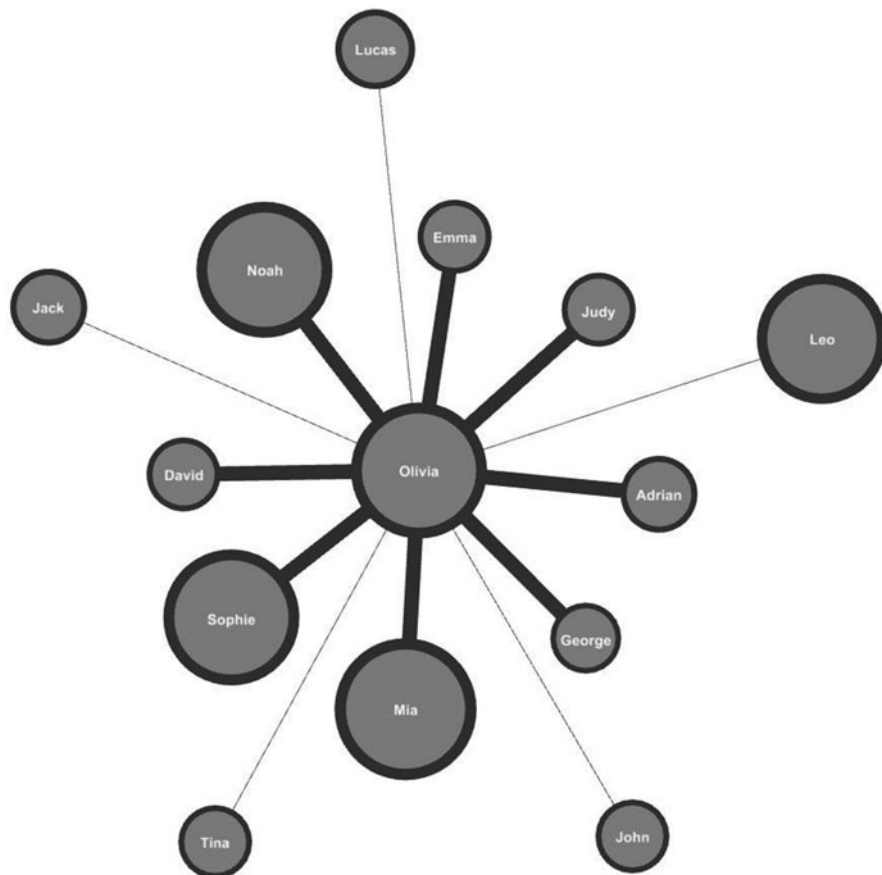


Fig. 8.2 Personal network map of experienced expert teacher

relationships in their networks and created more value, in comparison to their experienced colleagues with lower expertise. This shows how a network perspective allows a deeper, more fine-grained exploration of interactions. A promising venue to further uncover the social side of professional learning in its totality, is a mixed method network approach, using visuals such as the concentric circle method (Van Waes & Van den Bossche, 2020). Mixed method network research is gaining increasing terrain (Domínguez & Hollstein, 2014; Froehlich et al., 2020), and allows to address research questions that interact both structural and relational network features.

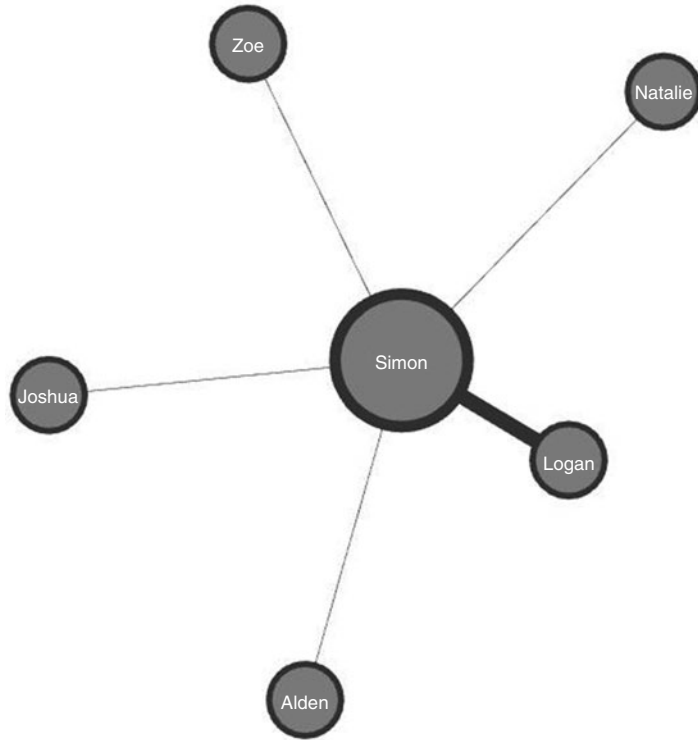


Fig. 8.3 Personal network map of experienced non-expert teacher

8.3 Looking Forward: Future Research on Networks and Professional Learning

The existing body of network studies examining professional learning opens up new avenues for research. In this section we identify several areas ripe for further exploration.

8.3.1 Further Uncovering Relations Between Professional Learning and Network Development

Network ties are often implicitly regarded as ‘learning ties’. Yet, installing networks or communities does not necessarily mean that the professionals within are actually learning. Although it is often assumed indirectly, an increasing number of ties in the network does not automatically imply that new knowledge is created, that learning has taken place, or that professionals’ development is impacted. A dropped tie does

not always imply that knowledge is lost, and a kept tie may not add anything or become redundant. The research designs of most studies are not designed to examine this causality between network development (social capital) and professionals' learning (human capital) directly. Causality between the relationships under study is often funded indirectly by suggestions from the reviewed organizational literature on network development and professional learning. As such, future studies designed to examine directional links between network development and professional learning will be important. Future studies should aim to understand the nature of a learning tie, that is, when and how learning occurs in a network or a network connection. Moreover, setting up lines of longitudinal research would allow to study patterns of development of learning ties in professional networks. For instance, tracking networks over multiple measurement moments may help to discern profiles or patterns in the development of human and social capital. Longitudinal network data and performance measures could be collected at several time points to shed further light on, for example, how professional networks of experts unfold, and which the crucial elements are in this development over time.

8.3.2 Paying Attention to the Interface of Education and Workplaces

Professional learning research has often focused on studying social structures, communication and knowledge flows within a single unit, such as an organization or team (Phelps et al., 2012). Even though workplaces are important places for facilitating professional learning, many professionals -acting in rapidly changing working environments and dealing with complex multifaceted professional problems- need to rely on their networks reaching beyond the boundaries of their immediate workplace organizations and traditional institutional resources in order to support the development of skills and competencies (Nardi et al., 2000). In this regard, recent studies emphasize the importance of deeper interactions and more strategic cooperation between educational institutions and workplaces that are often seen as separate and distant from each other (Harteis et al., 2014; Hytönen, 2016; Hytönen & Kovalainen, 2020). New kinds of efforts to bridge and combine expertise of and stronger professional connections between educational institutions are needed to meet future educational challenges and to provide flexible possibilities for professionals to update and expand their expertise. These could generate new environments, to cultivate skills, and to share and receive critical knowledge between people with different types of expertise and professional competencies (Roxå et al., 2011).

As earlier network studies have shown, the development of comprehensive professional social networks and occupational knowledge exchange forums do not take place automatically at the learning environments organized by educational institutions and workplaces (Hytönen et al., 2014a, b). Future network studies could help

to understand better the interfaces of education and working life by providing knowledge on whether and how professional learning networks and connections are constructed and how their development could be supported in a sustainable and productive way. Furthermore, future network studies should focus on examining how learning in educational institutions and workplaces can be better integrated and communication across organizational boundaries, different professional cultures and multi-professional networks facilitated. Future research could also help to overcome the question of how individuals are able to connect expertise from one specific field with the diverse expertise of their multi-professional networks. Future network studies should focus on examining the interface of education and workplaces, and more broadly multi-professional networks crossing the boundaries of workplace communities and organizations. Potential questions to be addressed in future research are: How can learning in educational institutions and workplaces be better integrated, and the development of effective learning networks more supported? How are individuals able to connect expertise from one specific field with the diverse expertise of their multi-professional networks? Future research could also help to overcome the obstacles that are related to developing actual interconnections and relations between theoretical and practical knowledge cultures.

8.3.3 *Not ‘Just’ Structure... Making Room for Network Agency in Professional Learning*

Traditionally, network research considers changes in networks as resulting from an interplay between self-organizing properties of networks, that is, networks develop because of the properties they have and the way they are structurally embedded in the larger network (Agneessens & Wittek, 2012; Brennecke & Rank, 2016). For example, if someone offers you help, you are likely to reciprocate this tie to maintain the structural balance. Social theorists have long been discussing the relative contributions of structure and human agency to social interactions and network dynamics (Bourdieu, 1986; Giddens, 1984). Some scholars have recently questioned whether structure has overwhelmed agency in empirical network studies (Gulati & Srivastava, 2014). If actors can intentionally affect their network, one may wonder whether a causal focus on structure and self-organizing properties of networks can be justified.

Few studies have examined the relation between network agency and professional learning. Professional learning in changing working environments is to a great degree embedded in deliberate creation and cultivation of network relations. Exemplary is the increased value attributed to *networked expertise* or *relational expertise* in and around workplaces (Hakkarainen et al., 2017). Research by Van Waes et al. (2015, 2016) demonstrated how experts displayed higher agency, as they described to frequently re-evaluate their networks and to act intentionally on them. Apparently, they somehow ‘learned’ to manage their network. The underlying

assumption in this type of studies is that individuals, who are aware of their networks and the resources and expertise residing in it, are more likely to reach out to the ‘right’ people at the ‘right’ time when presented with challenges or opportunities (Borgatti & Cross, 2003). Professionals who consciously act to strengthen their network, display what is recently coined as ‘network intentionality’ (Moolenaar et al., 2014), that is, agency in forming, maintaining, activating, and dissolving relations to gain access to resources for the mutual benefit of oneself and others, given their own cognitions of what makes for a ‘good’ network (Nardi et al., 2002).

Future research should challenge traditional network research by further uncovering the role of network agency in professional learning processes. For instance, it would be valuable to link the existing body of research around information and feedback seeking at the workplace with the concept of network agency. Information and feedback seeking are often regarded as individual undertakings and the role of network or relational agency is often underexposed (Ashford & Cummings, 1983; Van den Bossche et al., 2014). This also holds for information seeking in newcomer socialization processes (Morrison, 2002; Saks et al., 2011). Setting up a line of research considering a network (agency) perspective would help us to answer questions like: Which are potential barriers to the development of network agency in professional contexts? Can we support feedback and information seeking by supporting professionals’ network agency? What are good ‘beginners’ networks’ for newcomers in workplaces in terms of the pre-existing properties of networks? This sheds light on another aspect of learning: How to learn to become a professional networker, and what does this entail? Which knowledge, skills or attitudes are necessary in enhancing network agency in professionals and companies?

8.3.4 Designing Network Interventions and Using Network Visualizations as Feedback Tools

In recent years, both practitioners and researchers have also started to consider the design of effective initiatives to enhance the value of collaboration (Cross et al., 2010; Cullen-Lester et al., 2016). These ‘network interventions’ may include (research-based) coaching or consulting activities, or organizational development activities in general. Network interventions are purposeful efforts to use social network data to accelerate behavior change, to improve performance, or diffuse innovations (Valente, 2012). They are designed to support professionals and organizations to intentionally act on their networks (Cross & Thomas, 2009; Parise, 2007). In intervention research, social network methodology is used as a mapping tool to render professionals’ networks visible (Jaspersen & Stein, 2019). Network visualizations can make the characteristics of professional networks available for assessment. For instance, scholars have provided evidence that professionals who learned the properties of an effective network (‘teaching to see social capital’), achieved greater performance and career advancement (Burt & Ronchi, 2007).

However, the mere mapping of networks does not necessarily provide a clear path to intervention. More information is needed on how to encourage the development of strong networks when they do not exist or how to sustain them when they do (Coburn et al., 2010). Preliminary research has shown that mapping informal networks using social network analysis can detect multiple (isolated) networks in organizations, connect ideas, and facilitate value creation (Cross et al., 2010; de Laet & Schreurs, 2013). Studies also showed how network agency may constitute a supporting mechanism for network change. This work suggests that network agency can be fostered through intervention by raising network awareness (Van Waes et al., 2018a, b). Future research into the design and timing of network interventions could yield further insight into how to foster learning through interventions in different workplaces.

8.3.5 Exploring ‘The Dark Side’ of Professional Networks

Social network research strongly emphasizes its positive consequences. However, one should be careful to interpret all ties as prosocial and favorable (Portes, 1998). Several scholars have argued that negative or challenging relationships may be even more consequential for professional learning and may outweigh the effects of positive ties (Everett & Borgatti, 2014). Existing research sheds light on questions about how less favorable network constellations, and negative or so-called ‘difficult ties’ develop. These concern relationships in which you have to exert significant extra effort to communicate, share perspectives, or come to a common understanding about important topics (Daly et al., 2015), e.g. disliking ties, difficult collaboration ties, no-friend ties. These negative relationships would have greater power than positive relationships to explain workplace outcomes, which is termed ‘negative asymmetry’ (Labianca & Brass, 2006). Negative relationships are also related to organizationally relevant outcomes such as lower individual performance, decreased satisfaction with one’s group, and lower organizational attachment (Sparrowe et al., 2001; Venkataramani et al., 2013). For instance, individuals who dislike someone are unlikely to seek advice from the person they dislike, even if that person is highly competent (Casciaro & Lobo, 2008). Evidence is mounting that negative relationship ties can create liabilities for individuals in organizations both because resources are sometimes withheld from them, but also because negative flows are directed toward them (Marineau et al., 2016). Researchers further suggests how professional culture may hinder interactions (Roxå et al., 2011), or how lack of physical proximity can make for very isolated professionals (Spillane et al., 2017). Studies have shown that small networks lacking diversity in composition relate to arrested development (Van Waes et al., 2015), and that perceiving little value in one’s personal network may be detrimental for expertise development (Van Waes et al., 2016).

To date, few studies have provided in-depth examinations of this less favorable sides of networks, as network surveys generally probe for positive relationships (such as friendship, trust, presence of professional ties). Future research increasing

insight into the formation of negative or difficult ties may enhance our knowledge around less favorable constellations of networks for professional learning in workplaces and professional communities. For example, why some people are able to sustain joint work interactions, and while others mostly resort to superficial interactions at the workplace and stagnate in their development. Such a line of research will also inform organizations on preventing isolation and development of negative silo's, and in supporting the development of favorable network configurations.

References

- Agneessens, F., & Wittek, R. (2012). Where do intra-organizational advice relations come from? The role of informal status and social capital in social exchange. *Social Networks*, 34(3), 333–345. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0378873311000189>
- Ashford, S. J., & Cummings, L. L. (1983). Feedback as an individual resource: Personal strategies of creating information. *Organizational Behavior and Human Performance*, 32(3), 370–398.
- Baer, M., Evans, K., Oldham, G. R., & Boasso, A. (2015). The social network side of individual innovation. *Organizational Psychology Review*, 5(3), 191–223. <https://doi.org/10.1177/2041386614564105>
- Baker-Doyle, K. J. (2015). Stories in networks and networks in stories: A tri-modal model for mixed-methods social network research on teachers. *International Journal of Research & Method in Education*, 38(1), 72–82. <https://doi.org/10.1080/1743727X.2014.911838>
- Bakkenes, I., De Brabander, C., & Imants, J. (1999). Teacher isolation and communication network analysis in primary schools. *Educational Administration Quarterly*, 35(2), 166–202. <https://doi.org/10.1177/00131619921968518>
- Bellotti, E. (2014). *Qualitative networks: Mixed methods in sociological research*. Routledge.
- Borgatti, S. P., & Cross, R. (2003). A relational view of information seeking and learning in social networks. *Management Science*, 49(4), 432–445.
- Borgatti, S. P., & Foster, P. C. (2003). The network paradigm in organizational research: A review and typology. *Journal of Management*, 29(6), 991–1013.
- Borgatti, S. P., Everett, M. G., & Johnson, J. C. (2013). *Analyzing social networks*. Sage.
- Borgatti, S. P., Brass, D. J., & Halgin, D. S. (2014). Social network research: Confusions, criticisms, and controversies. In *Contemporary perspectives on organizational social networks* (Vol. 40, pp. 1–29). Emerald Group Publishing Limited.
- Boshuizen, H. P. A., Bromme, R., & Gruber, H. (2004). On the long way from novice to expert and how travelling changes the traveller. In H. P. A. Boshuizen, R. Bromme, & H. Gruber (Eds.), *Professional learning: Gaps and transitions on the way from novice to expert* (pp. 3–8). Kluwer Academic Publishers.
- Bourdieu, P. (Ed.). (1986). *Distinction: A social critique of the judgment of taste*. Harvard University Press.
- Brass, D. J., Galaskiewicz, J., Greve, H. R., & Tsai, W. (2004). Taking stock of networks and organizations: A multilevel perspective. *The Academy of Management Journal*, 47(6), 795–817. Retrieved from <http://www.jstor.org/stable/20159624>
- Brass, D. J., Labianca, G., Mehra, A., Halgin, D. S., & Borgatti, S. P. (Eds.). (2014). *Contemporary perspectives on organizational social networks* (Vol. 40). Emerald Group Publishing Limited.
- Brennecke, J., & Rank, O. N. (2016). The interplay between formal project memberships and informal advice seeking in knowledge-intensive firms: A multilevel network approach. *Social Networks*, 44, 307–318. <https://doi.org/10.1016/j.socnet.2015.02.004>
- Burt, R. S. (1992). *Structural holes: The social structure of competition*. Harvard University Press.
- Burt, R. S. (2000). Decay functions. *Social Networks*, 22(1), 1–28.

- Burt, R. S., & Ronchi, D. (2007). Teaching executives to see social capital: Results from a field experiment. *Social Science Research, 36*(3), 1156–1183. <https://doi.org/10.1016/j.ssresearch.2006.09.005>
- Burt, R. S., Kilduff, M., & Tasselli, S. (2013). Social network analysis: Foundations and frontiers on advantage. *Annual Review of Psychology, 64*(1), 527–547. <https://doi.org/10.1146/annurev-psych-113011-143828>
- Carter, D. R., DeChurch, L. A., Braun, M. T., & Contractor, N. S. (2015). Social network approaches to leadership: An integrative conceptual review. *Journal of Applied Psychology, 100*(3), 597–622. <https://doi.org/10.1037/a0038922>
- Casciaro, T., & Lobo, M. S. (2008). When competence is irrelevant: The role of interpersonal affect in task-related ties. *Administrative Science Quarterly, 53*(4), 655–684. <https://doi.org/10.2189/asqu.53.4.655>
- Coburn, C., & Russell, J. L. (2008). District policy and teachers' social networks. *Education Evaluation and Policy Analysis, 30*(3), 203–235.
- Coburn, C., Choi, L., & Mata, W. (2010). "I would go to her because her mind is math". Network formation in the context of a district-based mathematics reform. In A. J. Daly (Ed.), *Social network theory and educational change* (pp. 33–50). Harvard Education Press.
- Coburn, C., Russell, J. L., Kaufman, J. H., & Stein, M. K. (2012). Supporting sustainability: Teachers' advice networks and ambitious instructional reform. *American Journal of Education, 119*(1), 137–182.
- Cross, R., & Thomas, R. J. (2009). *Driving results through social networks: How top organizations leverage networks for performance and growth*. Jossey-Bass.
- Cross, R., Singer, J., Colella, S., Thomas, R. J., & Silverstone, Y. (2010). *The organizational network fieldbook: Best practices, techniques, and exercises to drive organizational innovation and performance*. Jossey-Bass.
- Crossley, N., Bellotti, E., Edwards, G., Everett, M. G., Koskinen, J., & Tranmer, M. (2015). *Social network analysis for ego-nets*. Sage.
- Cullen-Lester, K. L., Woehler, M. L., & Willburn, P. (2016). Network-based leadership development: A guiding framework and resources for management educators. *Journal of Management Education, 40*(1), 1–24. <https://doi.org/10.1177/1052562915624124>
- Daly, A. J. (Ed.). (2010). *Social network theory and educational change*. Harvard Education Press.
- Daly, A. J., Moolenaar, N. M., Liou, Y.-H., Tuytens, M., & del Fresno, M. (2015). Why so difficult? Exploring negative relationships between educational leaders: The role of trust, climate, and efficacy. *American Journal of Education, 122*(1), 1–38. <https://doi.org/10.1086/683288>
- de Laat, M., & Schreurs, B. (2013). Visualizing informal professional development networks: Building a case for learning analytics in the workplace. *American Behavioral Scientist, 57*(10), 1421–1438. <https://doi.org/10.1177/0002764213479364>
- Dobrow, S. R., Chandler, D. E., Murphy, W. M., & Kram, K. E. (2012). A review of developmental networks. *Journal of Management, 38*(1), 210–242. <https://doi.org/10.1177/0149206311415858>
- Domínguez, S., & Hollstein, B. (2014). *Mixed methods social networks research: Design and applications*. Cambridge University Press.
- Ericsson, K. A. (2006). The influence of experience and deliberate practice on the development of superior expert performance. In K. A. Ericsson, N. Charness, R. R. Hoffman, & P. J. Feltovich (Eds.), *The Cambridge handbook of expertise and expert performance* (pp. 685–706). Cambridge University Press.
- Everett, M., & Borgatti, S. P. (2014). Networks containing negative ties. *Social Networks, 38*, 111–120.
- Freeman, L. C. (1979). Centrality in social networks conceptual clarification. *Social Networks, 1*(3), 215–239.
- Froehlich, D., Van Waes, S., & Schäfer, H. (2020). Linking quantitative and qualitative network approaches: A review of mixed methods social network analysis in education research. *Review of Research in Education* (Special issue: Emergent Approaches for Education Research.).

- Fuhse, J., & Mützel, S. (2011). Tackling connections, structure, and meaning in networks: Quantitative and qualitative methods in sociological network research. *Quality & Quantity*, 45(5), 1067–1089. <https://doi.org/10.1007/s11135-011-9492-3>
- Gerken, M., Beausaert, S., & Segers, M. (2016). Working on professional development of faculty staff in higher education: Investigating the relationship between social informal learning activities and employability. *Human Resource Development International*, 19(2), 135–151. <https://doi.org/10.1080/13678868.2015.1116241>
- Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. University of California Press.
- Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6), 1360–1380.
- Gulati, R., & Srivastava, S. B. (2014). Bringing agency back into network research: Constrained agency and network action. In D. J. Brass, G. J. Labianca, A. Mehra, D. S. Halgin, & S. P. Borgatti (Eds.), *Contemporary perspectives on organizational social networks (Research in the sociology of organizations)* (Vol. 40, pp. 73–93). Emerald Group Publishing Limited.
- Hakkarainen, K., Palonen, T., Paavola, S., & Lehtinen, E. (2004). *Communities of networked expertise: Professional and educational perspectives*. Elsevier.
- Hakkarainen, K., Hytönen, K., Vekkailla, J., & Palonen, T. (2017). Networked expertise, relational agency, and collective creativity. In A. Edwards (Ed.), *Working relationally in and across practices: A cultural-historical approach to collaboration* (pp. 133–152). Cambridge University Press.
- Halgin, D. S., & Borgatti, S. P. (2012). An introduction to personal network analysis and tie churn statistics using E-NET. *Connections*, 32(1), 37–48.
- Hansen, M. T. (1999). The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits. *Administrative Science Quarterly*, 44(1), 82–111.
- Harteis, C., Rausch, A., & Seifried, J. (2014). Discourses on professional learning: On the boundary between learning and working. In C. Harteis, A. Rausch, & J. Seifried (Eds.), *Discourses on professional learning: Professional and practice-based learning* (pp. 1–7). Springer.
- Hodkinson, P., Biesta, G., & James, D. (2008). Understanding learning culturally: Overcoming the dualism between social and individual views of learning. *Vocations and Learning*, 1(1), 27–47. <https://doi.org/10.1007/s12186-007-9001-y>
- Hogan, B., Carrasco, J. A., & Wellman, B. (2007). Visualizing personal networks: Working with participant-aided sociograms. *Field Methods*, 19(2), 116–144.
- Hollstein, B. (2011). Qualitative approaches. In J. Scott & P. J. Carrington (Eds.), *The SAGE handbook of social network analysis* (pp. 404–416). Sage.
- Hytönen, K. (2016). *Bridging academic and working life expertise in continuing professional education: A social network perspective*. University of Turku, Turku. (ser. B, tom. 424).
- Hytönen, K., & Kovalainen, A. (2020). Vocational education goes to industry: Future skills at work derive from novel models of cooperation. In S. Poutanen, P. Rouvinen, & A. Kovalainen (Eds.), *Digital work and the platform economy: Understanding tasks, skills and capabilities in the new era* (pp. 77–95). Routledge.
- Hytönen, K., Hakkarainen, K., & Palonen, T. (2011). Young diplomats' socialization to the networked professional cultures of their workplace communities. *Vocations and Learning*, 4(3), 253–273. <https://doi.org/10.1007/s12186-011-9061-x>
- Hytönen, K., Palonen, T., & Hakkarainen, K. (2014a). Cognitively central actors and their personal networks in an energy efficiency training program. *Frontline Learning Research*, 2(2).
- Hytönen, K., Palonen, T., Lehtinen, E., & Hakkarainen, K. (2014b). Does academic apprenticeship increase networking ties among participants? A case study of an energy efficiency training program. *Higher Education*, 1–18. <https://doi.org/10.1007/s10734-014-9754-9>
- Jaspersen, L. J., & Stein, C. (2019). Beyond the matrix: Visual methods for qualitative network research. *British Journal of Management*. <https://doi.org/10.1111/1467-8551.12339>
- Kilduff, M., & Krackhardt, D. (2008). *Interpersonal networks in organizations: Cognition, personality, dynamics, and culture*. Cambridge Cambridge University Press.

- Labianca, G., & Brass, D. J. (2006). Exploring the social ledger: Negative relationships and negative asymmetry in social networks in organizations. *The Academy of Management Review*, 31(3), 596–614. <https://doi.org/10.2307/20159231>
- Levin, D. Z., & Cross, R. (2004). The strength of weak ties you can trust: The mediating role of trust in effective knowledge transfer. *Management Science*, 50(11), 1477–1490. Retrieved from <http://www.jstor.org/stable/30047959>
- Lorrain, F., & White, H. C. (1971). Structural equivalence of individuals in social networks. *The Journal of Mathematical Sociology*, 1(1), 49–80. <https://doi.org/10.1080/0022250X.1971.9989788>
- Marineau, J. E., Labianca, G., & Kane, G. C. (2016). Direct and indirect negative ties and individual performance. *Social Networks*, 44, 238–252. <https://doi.org/10.1016/j.socnet.2015.09.003>
- Marsden, P. V., & Campbell, K. E. (1984). Measuring tie strength. *Social Forces*, 63, 482–501. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=buh&AN=5285211&site=ehost-live>
- McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, 27, 415–444.
- Mehra, A., Kilduff, M., & Brass, D. J. (2001). The social networks of high and low self-monitors: Implications for workplace performance. *Administrative Science Quarterly*, 46(1), 121–146. <https://doi.org/10.2307/2667127>
- Moolenaar, N. M. (2012). A social network perspective on teacher collaboration in schools: Theory, methodology, and applications. *American Journal of Education*, 119(1), 7–39. <https://doi.org/10.1086/667715>
- Moolenaar, N. M., Daly, A., Cornelissen, F., Liou, Y.-H., Caillier, S., Riordan, R., ... Cohen, N. A. (2014). Linked to innovation: Shaping an innovative climate through network intentionality and educators' social network position. *Journal of Educational Change*, 15(2), 99–123. <https://doi.org/10.1007/s10833-014-9230-4>
- Morrison, E. W. (2002). Newcomers' relationships: The role of social network ties during socialization. *Academy of Management Journal*, 45(6), 1149–1160. <https://doi.org/10.2307/3069430>
- Nardi, B. A., Whittaker, S., & Schwartz, H. (2000). It's not what you know, it's who you know: Work in the information age. *First Monday*, 5(5). Retrieved from <http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/viewArticle/741>
- Nardi, B. A., Whittaker, S., & Schwarz, H. (2002). NetWORKers and their activity in intensional networks. *Computer Supported Cooperative Work*, 11(1), 205–242. <https://doi.org/10.1023/a:1015241914483>
- Palonen, T., Hakkarainen, K., Talvitie, J., & Lehtinen, E. (2004). Network ties, cognitive centrality, and team interaction within a telecommunication company. In H. P. A. Boshuizen, R. Bromme, & H. Gruber (Eds.), *Professional learning: Gaps and transitions on the way from novice to expert* (pp. 271–294). Kluwer Academic Publishers.
- Parise, S. (2007). Knowledge management and human resource development: An application in social network analysis methods. *Advances in Developing Human Resources*, 9(3), 359–383. <https://doi.org/10.1177/1523422307304106>
- Phelps, C., Heidl, R., & Wadhwa, A. (2012). Knowledge, networks, and knowledge networks. *Journal of Management*, 38(4), 1115–1166. <https://doi.org/10.1177/0149206311432640>
- Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, 24(1), 1. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=afh&AN=1056932&site=ehost-live>
- Reagans, R., & McEvily, B. (2003). Network structure and knowledge transfer: The effects of cohesion and range. *Administrative Science Quarterly*, 48(2), 240–267. <https://doi.org/10.2307/3556658>
- Rienties, B., Nanclares, N. H., Hommes, J., & Veermans, K. (2014). Understanding emerging knowledge spillovers in small-group learning settings: A networked learning perspective. In V. Hodgson, D. McConnell, & M. De Laat (Eds.), *Exploring the theory, pedagogy and practice of networked learning* (pp. 127–147). Springer.

- Roxå, T., Mårtensson, K., & Alveteg, M. (2011). Understanding and influencing teaching and learning cultures at university: A network approach. *Higher Education*, 62(1), 99–111. <https://doi.org/10.1007/s10734-010-9368-9>
- Saks, A. M., Gruman, J. A., & Cooper-Thomas, H. (2011). The neglected role of proactive behavior and outcomes in newcomer socialization. *Journal of Vocational Behavior*, 79(1), 36–46.
- Singh, J. (2005). Collaborative networks as determinants of knowledge diffusion patterns. *Management Science*, 51(5), 756–770.
- Sparrowe, R. T., Liden, R. C., Wayne, S. J., & Kraimer, M. L. (2001). Social networks and the performance of individuals and groups. *The Academy of Management Journal*, 44(2), 316–325. <https://doi.org/10.2307/3069458>
- Spillane, J. P., Shirrell, M., & Sweet, T. M. (2017). The elephant in the schoolhouse: The role of propinquity in school staff interactions about teaching. *Sociology of Education*, 0038040717696151. <https://doi.org/10.1177/0038040717696151>
- Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of Educational Change*, 7(4), 221–258. <https://doi.org/10.1007/s10833-006-0001-8>
- Sverrisson, Á. (2001). Translation networks, knowledge brokers and novelty construction: Pragmatic environmentalism in Sweden. *Acta Sociologica*, 44(4), 313–327. <https://doi.org/10.1177/000169930104400403>
- Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review*, 3, 130–154.
- Uzzi, B. (1996). The sources and consequences of embeddedness for the economic performance of organizations: The network effect. *American Sociological Review*, 61(4), 674–698. <https://doi.org/10.2307/2096399>
- Valente, T. W. (2012). Network interventions. *Science*, 337(6090), 49–53. <https://doi.org/10.1126/science.1217330>
- Van den Bossche, P., Van Waes, S., & van der Rijt, J. (2014). Feedback, development, and social networks. In K. Kraiger, J. Passmore, N. R. dos Santos, & S. Malvezzi (Eds.), *The Wiley Blackwell handbook of the psychology of training, development, and performance improvement* (pp. 503–520). Wiley Blackwell.
- Van Waes, S. (2017). *The ties that teach: Teaching networks in higher education*. Doctoral dissertation, University of Antwerp, Belgium.
- Van Waes, S., & Van den Bossche, P. (2020). Around and around: The concentric circles method as a powerful tool to collect mixed method network data. In D. Froehlich, M. Rehm, & B. Rienties (Eds.), *Mixed methods social network analysis* (pp. 159–174). Routledge.
- Van Waes, S., Van den Bossche, P., Moolenaar, N. M., De Maeyer, S., & Van Petegem, P. (2015). Know-who? Linking faculty's networks to stages of instructional development. *Higher Education*, 70(5), 807–826. <https://doi.org/10.1007/s10734-015-9868-8>
- Van Waes, S., Moolenaar, N. M., Daly, A. J., Heldens, H. H. P. F., Donche, V., Van Petegem, P., & Van den Bossche, P. (2016). The networked instructor: The quality of networks in different stages of professional development. *Teaching and Teacher Education*, 59, 295–308. <https://doi.org/10.1016/j.tate.2016.05.022>
- Van Waes, S., De Maeyer, S., Moolenaar, N. M., Van Petegem, P., & Van den Bossche, P. (2018a). Strengthening networks: A social network intervention among higher education teachers. *Learning and Instruction*, 53, 34–49. <https://doi.org/10.1016/j.learninstruc.2017.07.005>
- Van Waes, S., Moolenaar, N., De Maeyer, S., Van Petegem, P., & Van den Bossche, P. (2018b). Linked to professional development: Designing a network intervention to foster informal networks in a formal program. In K. J. Baker-Doyle & S. A. Yoon (Eds.), *Networked by design: Interventions for teachers to develop social capital* (pp. 44–64). Routledge.
- Venkataramani, V., Labianca, G., & Grosser, T. (2013). Positive and negative workplace relationships, social satisfaction, and organizational attachment. *Journal of Applied Psychology*, 98(6), 1028–1039. <https://doi.org/10.1037/a0034090>

- Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications*. University Press.
- Wenger, E., McDermott, R., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Harvard Business School Press.
- Wenger, E., Trayner, B., & de Laat, M. (2011). *Promoting and assessing value creation in communities and networks: A conceptual framework*. Open University.

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Chapter 9

Team Learning



Piet Van den Bossche, Catherine Gabelica, and Mieke Koeslag-Kreunen

Abstract Teams have the potential to offer greater adaptability, productivity and creativity than any one individual can offer and provide more complex, innovative and comprehensive solutions. This necessitates sharing and developing of knowledge at a team-level, fueling the thinking about and research on team learning.

This chapter expands the topic of team learning by synthesizing insights from research on collaborative learning in the learning sciences and on teamwork in the organization sciences. In doing so, it builds on the Integrative Model of Team Learning to present recent developments in empirical work on team learning. Significant phenomena are elaborated: with regard to team learning processes, the role of conflicts and team reflexivity is explained. Next, the role of leadership in teams with regard to team learning is demonstrated. In relation to the emergent states, this chapter focuses on two phenomena that are heavily studied in team research in general, but also show to be significant in describing team learning: psychological safety and team knowledge.

Lastly, four research challenges for the field of team learning are identified. The first discusses the consequences of conceptualizing team learning as complex and dynamic for measurement and analysis. The second relates to the fact that current research mainly presents a descriptive or explanatory account of team learning and does not indicate what it implies for interventionist theories. The third concerns the awareness that (the effectiveness of) team learning processes differ depending on

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the type of task that the team is dealing with. The fourth and last issue zooms in on questions how to prepare the individual team member for team learning.

Keywords Team learning · Reflexivity · Leadership · Team knowledge

9.1 Team Learning

Organizations increasingly turn to team-based working to contend with the growing complexity of the environment in which they operate. With regards to the understanding of teams, researchers increasingly converged on a view of teams as complex and dynamic systems (Arrow et al., 2000). This is shown by increasing research considering time (Roe et al., 2012) and the impact of organizational-level factors on teamwork (Bresman & Zellmer-Bruhn, 2013). For this chapter we rely on a definition of teams that is applicable to both an organizational and an educational settings. A widely used definition of teams has been introduced by Cohen & Bailey (1997, p. 241): “A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems”.

Teams have the potential to offer greater adaptability, productivity and creativity than any one individual can offer and provide more complex, innovative and comprehensive solutions. Teams can bring together people who have a variety of backgrounds, points of view, education, and/or expertise. Such teams can bring multiple perspectives and a rich (problem) conceptualization to complex problems (Van den Bossche, 2006). This need for knowledge sharing and knowledge development at team-level has fueled the thinking and research on team learning.

Team learning has been defined in terms of both the process and outcome of team interaction. An exemplary process definition is that of Edmondson (1999, p. 353) “an ongoing process of reflection and action characterized by asking questions, seeking feedback, experimenting, reflecting on results, and discussing errors or unexpected outcomes of actions.” (Edmondson, 1999, p. 353). While a definition that refers to team learning as the outcome of the process of team interaction is that of Van den Bossche et al. (2011, p. 284), defining team learning as “the development of shared cognitions”. Also Argote et al. (2001) referred to these two perspectives on team learning: as a process, team learning involves the activities through which individuals acquire, share and combine knowledge through experience with one another. On the other hand, an outcome perspective relates to the evidence that team learning has occurred which includes changes in knowledge, either implicit or explicit, that occur as a result of such collaboration.” (Argote et al., 2001).

The (renewed) attention for team learning was fueled by the book of Peter Senge ‘The Fifth Discipline’ (1990), stressing that learning is a crucial competency of thriving organizations. He pointed to teams as the fundamental learning unit in these organizations. This is reflected in a steadily rise of team learning research in fields such as management science, organizational behavior and organizational psychology from that point on.

While the organizational sciences have provided an important impetus to team learning research, it is important to recognize that the learning sciences have a long tradition in studying collaborative learning. Seminal chapters by Dillenbourg (Dillenbourg, 1999; Dillenbourg et al., 1996) describe the evolution of research on collaborative learning in this discipline. Theories of collaborative learning tended to focus on how individuals function in a group. However, this focus has shifted increasingly to the group itself as the unit of analysis. Collaborative learning research also strives to understand the process of collaboration and the interactions it involves. Although research in the learning sciences focuses foremost on outputs at the individual level (e.g. what do students learn?), the complementarity between the different research strands is obvious, however not always recognized.

9.1.1 An Integrative Model of Team Learning

The last decade has seen several comprehensive reviews of team learning. As such, this is an indication of a maturing field of research. We take the review of Decuyper et al. (2010) and their proposed model as a starting point of this chapter. Why this model? A recent overview of literature on team learning forwarded this model as one of the ‘necessary and helpful starting points’ in the topic of team learning (Amber & Porter, 2019). It is based on a review of a vast amount of research on team learning, resulting in a comprehensive overview of the broad range of variables that relate to the construct of team learning. Hereby, it considered multiple disciplines, acknowledging that this subject has been studied in different strands of literature. Since its publications in 2010 it has been widely cited both in the learning and the organization sciences, and continues to do so.

It delivered a model on team learning recognizing the importance of emergent states and positioning these in relation to team learning processes. Hereby, this model reflects significant changes in modelling teamwork in general, and team learning specifically. The research on teamwork and collaborative learning has been strongly influenced by an Input-process-output model, in which team processes as the mechanism by which individual team members resolve tasks (Dillenbourg, 1999; Kozlowski, 2015). The focus on these processes in team and collaborative learning research has progressed this literature, but Marks et al. (2001) pointed out the need to differentiate between different types of process variables. They stressed that variables such as group potency or cohesion, do not denote interaction processes. They proposed to call them ‘emergent states’, constructs that describe cognitive, motivational and affective states of the team, and these are different from the team interaction itself. Emergent states do not represent team interaction, rather they are product of them and become new inputs to subsequent processes. For example, teams with low psychological safety (as emergent state) may be less willing to share knowledge (as process), which in turn may impact the psychological safety. Moreover, the integrative team learning model also asks attention for this dynamic nature.

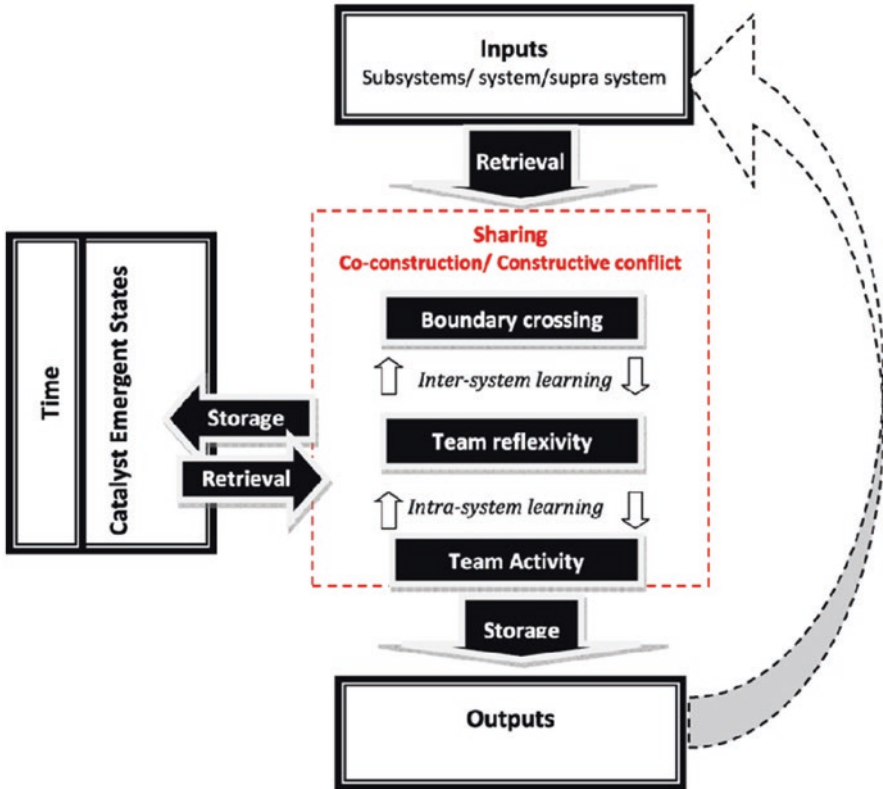


Fig. 9.1 Team learning model. (Decuyper et al., 2010)

Figure 9.1 displays this team learning model by Decuyper et al. (2010). Input-variables from various levels (individual-team-organisation) stimulate and influence the occurrence of team-level learning processes. Based on the literature, the model derived seven categories of team learning processes: (1) sharing, (2) co-construction and (3) constructive conflict; (4) team reflexivity, (5) team activity and (6) boundary crossing; (7) storage and retrieval. These team learning processes take the team towards adaptive, generative or transformative learning. These outputs are sometimes immediately observable in changing team performance. However, often they remain conceptual, as changes in the teams' capability to act differently. With regard to the emergent states as proximal outcomes of the team processes, this model points to exemplary variables such as shared mental models, team psychological safety, group potency, team efficacy, and cohesion,

While this model presents a fine overview of the field of team learning until 2010, the research field has expanded rapidly. Therefore, we have two ambitions in **this chapter**. **First**, we like to point out exemplary research on specific aspects of this model. **Second**, we forward a range of issues that are currently tackled in ongoing research on team learning. In doing so, we want to show how the field on team

learning has evolved and show how the current research efforts are changing our view on team learning (research) and may trigger future research.

9.2 Exploring the Model of Team Learning

The presented model of team learning has integrated a wide range of variables. Here, we select specific phenomena related to different aspects of the model that are exemplary and also have repeatedly shown to be of high importance to understand team learning. Firstly, with regard to team learning processes, we look to the specific role of conflicts and team reflexivity. The latter is a construct that is increasingly receiving attention. Secondly, on the input-side of the model, we gather the evidence on team leadership. This is of importance, as the role of leadership for teams is only more recently raising attention. Finally, regarding the emergent states, we focus on two phenomena that are heavily studied in team research in general, but also show to be significant in describing team learning: psychological safety and team knowledge.

9.2.1 Team Learning Processes

9.2.1.1 The Value of Conflict

In research on team learning, knowledge sharing is foremost forwarded as a crucial process. Though, it is important to acknowledge that other processes need to be regarded to fully understand team learning and its effects. In this light that Decuyper et al. (2010) identified three ‘essential’ team learning behaviors: next to sharing, co-construction and constructive conflict are forwarded. Sharing is the process of communicating knowledge, competencies, opinions, or creative thoughts of one member to other team members, who were not previously aware that these were present in the team (Decuyper et al., 2010). Co-construction is a mutual process of building meaning by refining, building on, or modifying the original offer in some way (Baker, 1994). In constructive conflicts, differences are negotiated by arguments and clarifications (Van den Bossche, 2006). Teams that engage in these team learning behaviors develop their team cognition and increase their effectiveness (Van den Bossche et al., 2006).

It is valuable to focus on constructive conflicts, and their role in team learning. The power of conflicts has both been recognized in the learning sciences (reflected in concepts such as socio-cognitive conflict and constructive controversy), and in organizational behavior research (reflected in the concept of task conflict). They all relate to the idea that differences of opinion in a team are potential learning opportunities. However, it has been repeatedly argued and shown that this is not automatically the case. Exemplary is the meta-analysis of De Dreu and Weingart (2003) that

showed very differential effects of task conflicts in teams. The emergence of differences in opinion does not guarantee conceptual advancement because it may be taken as a paradox, and resolved by ignoring one of the conflicting elements. Another argument is that it may not be seen as a difference in the interpretation of the problem, but as a personal, emotional rejection and as such can interfere with productive team behavior (De Dreu & Weingart, 2003). So, disagreement or divergence in itself seems to be less important than the fact that it generates communication between peer members (Dillenbourg et al., 1996). The team will only benefit if divergence in meaning leads to further negotiation.

Research has repeatedly underscored the particular importance of this constructive conflict (Van den Bossche et al., 2011; Van der Haar et al., 2015). Van den Bossche et al. (2011) studied student-team engaged in a business simulation game. Particularly the team learning behavior constructive conflict showed to be related to the development of shared cognition and performance. In a very different context, Van der Haar et al. (2015) examined the processes in emergency management command-and-control teams. Their task was to manage a realistic emergency simulation. A multi-rater approach involving team members, researchers, and field experts showed that constructive conflict is a crucial team learning behavior to develop a shared understanding of the crises situation, leading to better decisions. In sum, these results indicate the value of team members daring to question input information, commenting on ideas, and acting on those to get on the same page. Moreover, these effects are established in a diversity of team types.

The role of constructive conflict is crucial. Teams need to take a critical stance regarding each other's' contributions, thoroughly consideration each other's ideas and comments, and address differences in opinion and speak freely. Showing constructive conflict behavior reflects a true engagement in team learning.

9.2.1.2 Reflexivity (Towards Guided Reflexivity)

In addition to establishing a dialogical space in which team members collaboratively construct meaning, teams need to engage in higher-order or metacognitive activities allowing for proactive analysis of what is happening and what it may mean now and in the future (Decuyper et al., 2010). As such, to guide learning, teams also need to collectively evaluate and reflect upon their goals, performance, and strategies, and develop improvement strategies based on these evaluations (Schippers et al., 2003). The concept of "team reflexivity" is used in small group research to capture this reflection at the team level (West, 2000).

Similar concepts can be found in the learning sciences such as, collaborative reflection (Morris & Stew, 2007; Yukawa, 2006), peer reflection, reflective self-explanation (Rummel et al., 2009), or collective or social metacognition (McCarthy & Garavan, 2008). In this strand of literature, team reflexivity is also closely related to the concept of 'socially shared regulation', a concept that is receiving increased attention in educational psychology literature (Panadero & Järvelä, 2015). The process of socially shared regulation occurs when teams collectively regulate their

experiences and challenges by recognizing and agreeing upon these challenges and working out and using common strategies to address them (Järvelä et al., 2010; Järvenoja & Järvelä, 2009). It helps teams interpret situations consistently within the team and construct shared knowledge. Team reflexivity is also a process through which teams sustain their goal directed activity but it more specifically denotes the reflective component of shared regulation.

A robust body of literature has documented the relationship between team reflexivity and team performance (for review, see Konradt et al., 2016). According to this research, reconsidering previous accomplishments and consciously reflecting on what went wrong, and how it can be improved, can lead to better team performance (e.g. Gabelica et al., 2014a). For example, Schippers and colleagues (2003) found that teams could break out of a cycle of poor performance by reflecting after having received negative performance feedback. Although the valuable effects of team reflexivity for team performance have been demonstrated, there has only been limited research on the effects of team reflection on other subsequent outcomes and processes. For example, the effects of team reflexivity on team coordination and generally on team cognition have not been well documented (e.g., Konradt et al., 2016). Yet, reflective teams, who evaluate prior experiences and derive lessons for future performance may become more aware of the consequences of their interdependent actions, of what they still do not know, and what needs to be done differently to achieve a better match of competencies and a more accurate understanding about the task and each other (e.g., Gabelica et al., 2016). As a result, they may optimize team members' knowledge and skills. Future studies should also examine enabling factors of team reflexivity, such as team member's attitudes and motivations, or environmental factors (e.g., team leadership).

9.2.2 *Input*

9.2.2.1 **Leadership to Support Team Learning**

Leadership is an essential stimulator for engaging in team learning (Koeslag-Kreunen et al., 2018a). Leadership is defined as the process of influencing and facilitating team processes for goal achievement (Yukl, 2010). Leadership behaviors in teams involve person-focused (e.g., stimulating creativity) and task-focused (e.g., defining goals and methods) styles (Burke et al., 2006). Pearce and Sims (2002) showed that these team leadership behaviors can be performed by formal team leaders (i.e., vertical team leadership) and by multiple team members (i.e., shared team leadership). Both leadership sources and styles form important inputs for team learning (Koeslag-Kreunen et al., 2018b).

The importance of leadership to support team learning is grounded in the notion that leadership can create an environment in which it is safe and also required to take the risk of learning as a team (Koeslag-Kreunen et al., 2018a, b). Such an environment is essential for team learning because sharing personal thoughts put team

members at risk as their opinions may question habits or beliefs of others (Edmondson, 1999). Leadership can help teams to take that risk. Koeslag-Kreunen et al. (2018b) concluded that person- and task-focused leadership styles can be supportive by stimulating and structuring learning behaviors in teams. Person-focused styles emphasize the importance of sharing thoughts, stimulate shared decision-making, or bring different perspectives to problems (Burke et al., 2006). Leaders or team members adopting task-focused styles provide information, set team goals and methods and monitor performance (Burke et al., 2006).

When determining which style is most important for a specific team situation, the team task and age play an important role. Koeslag-Kreunen et al. (2018a) distinguished two types of team tasks: adaptive and developmental. Teams with adaptive tasks work towards sustaining routines, whereas teams with developmental tasks work towards creating change. In a comprehensive meta-analysis, Koeslag-Kreunen et al. (2018a) found that learning in teams for both adaptive and developmental tasks benefit from person-focused leadership, as it stimulates sharing knowledge and creativity. Task-focused leadership behaviors appeared to only support team learning for adaptive tasks; not for developmental tasks, because this style mainly emphasizes what needs to be done and how; leaving little room for exploration (Koeslag-Kreunen et al., 2018a).

Time also plays a role in determining which specific leadership style is beneficial for team learning. Lorinkova et al. (2012) illustrated how different leadership styles support team learning over time. They found that a task-focused style is important for team learning in initial stages as it determines what needs to be done, and a person-focused style in following stages as it encourages participative decision-making and teamwork. The latter corroborates Day et al. (2004) suggestion that team leadership is not only an input for team learning, but team learning itself can also result in increased shared team leadership, as it utilizes all team members' expertise.

9.2.3 Emergent States

9.2.3.1 Psychological Safety

Team learning is fundamentally a social endeavor. Therefore, research has focused on emerging team-level beliefs about the relations between the team members. Different powerful team-level beliefs which affect the learning behaviors in teams have been identified (Van den Bossche et al., 2006). Amongst those, psychological safety has consistently positively affected the extent to which teams engage in learning behavior (Edmondson, 2019; Frazier et al., 2017; Edmondson & Lei, 2014). Team psychological safety is defined as a shared belief that the team is safe for interpersonal risk-taking (Edmondson, 1999). "The term is meant to suggest neither a careless sense of permissiveness, nor an unrelentingly positive affect but rather a sense of confidence that the team will not embarrass, reject, or punish someone for

speaking up. This confidence stems from mutual respect and trust among team members” (Edmondson, 1999, p. 354).

The notion of psychological safety has a long history. In early research on organizational change, Schein and Bennis (1965) recognized the need to create psychological safety for individuals if they are to feel secure and capable of changing. In her work on organizational learning and teamwork, Edmondson (1999) introduced the construct of team psychological safety, 51 work teams in a manufacturing company were studied. This mixed method study, combining interviews, observations and questionnaires, did not only develop the construct of psychological safety in a team context, but also tested a model. The latter showed how team psychological safety impacted performance, mediated by team learning behavior.

Learning in teams can be threatening and stressful (Homan, 2001): Team members do not know each other, power games are played, people are left out, people blame each other for making mistakes.... The paradox however is that learning is often facilitated by taking risks and thinking freely. Team psychological safety facilitates learning behavior in teams because it alleviates excessive concern about others’ reactions to actions that have the potential for embarrassment or threat, which learning behaviors often have (Edmondson, 1999).

9.2.3.2 Team Knowledge

Team cognition is studied as an emergent state of team learning processes. It has long been pointed out that the development of team cognition is related to the learning potential of team (Roschelle, 1992). The development of team cognition is a process of negotiating and interrelating diverse views of group members. This process enables team members to learn from others’ preferences and viewpoints by facing different viewpoints and considering them as legitimate (Engeström et al., 1995). The recognition of these merits made it a worthwhile endeavor for many researchers to study the processes in and through which team cognition is actually developing (Cannon-Bowers & Salas, 2001).

The topic of team cognition is widely studied as a central issue in understanding (effective) team work. This can be recognized by a multitude of terms that can be found in the literature, such as common ground, team mental models, shared understanding, distributed cognition, transactive memory system and collective mind. These terms all do refer to structures of collective meaning that emerge in and coordinate the activities of a group. Akkerman et al. (2007) reviewed the conceptual frameworks used in empirical studies examining team cognition and focused on the premises of their conceptualizations. They connected these conceptualizations to either cognitive or socio-cultural perspectives. The studies taking cognitive perspectives conceptualized and accordingly measured group cognition as a state of similarity or overlap between individual mental models. Thereby they localize cognition within the individual brain, and perceive it as a structure of elements (often in terms of knowledge). The focus of this perspective is on the state of (at least partly) unification of individuals’ subjectivities. The studies in the socio-cultural perspective

conceptualized and accordingly measured team cognition as a process of coordination of actions, or as a dynamic unity of individual contributions in the joint activity. Cognition is then localized within the interrelated actions.

While Akkerman et al. (2007), focused on the conceptualization of team cognition, the review of DeChurch and Mesmer-Magnus (2010) explored team cognition as a driver of performance. In this respect, research on team cognition has generally explored two cognitive constructs as they apply to teams: mental models and transactive memory systems. The major distinction between the two constructs centers on the importance ascribed to knowledge that is held in common by team members (shared mental model) versus distributed among team members (transactive memory). In the former, expert teams develop compatibility in members' cognitive understanding of key elements of their performance environment. The latter -transactive memory systems- are a form of cognitive architecture that encompasses both the knowledge uniquely held by particular team members with a collective awareness of who knows what. Their review shows that both are positively related to team performance, and that the effect is stronger when forms of emergence are considered such as transactive memory systems. For example, it is likely less relevant to team process and performance that team members know everything similarly (i.e. shared mental models) than that team members know their own areas of expertise as well as who to consult for everything else (i.e. transactive memory).

Research has studied team learning behaviors that relate to the emergence of these different types of team cognition. With regard to shared mental models, Van den Bossche et al. (2011) performed analyses on student-teams engaged in a business simulation game. The measurement of shared mental models was based on cognitive mapping techniques. The results indicate that particularly the team learning behaviors identified as co-construction and constructive conflict are related to the development of shared mental models.

In the line of the research on transactive memory systems, Gabelica et al. (2016), studied in a multiple-measures experiment, 33 teams in flight simulations. The study showed how team learning processes (i.e., essential team learning behaviors and team reflexivity), driven by task cohesion, and group potency supported coordination development, which in turn predicted team performance

9.3 Stepping Stones for Future Research on Team Learning

The research described above evidences the recognition of team learning processes as important drivers of team performance (e.g., Argote et al., 2001; Edmondson, 2002; Van den Bossche et al., 2006). At the same time, it need to be noticed that team learning has been studied with much heterogeneity of conceptualization and operationalization (Edmondson et al., 2007; Kozlowski & Bell, 2013). In sum, academic understanding of team learning is far from complete, with some fundamental pieces and findings fragmented across varied and diffuse settings. We propose four issues that, in our modest opinion, need attention in future research and have the potential to further the field of team learning research.

These four issues relate in different ways to the presented integrative model of team learning. The first two issues are consequential to the model. By the integrative model of team learning, the authors Decuyper et al. (2010) aimed to describe team learning as complex and dynamic. The first issue this raises is the consequences for measurement and analysis in team learning research. The second issue relates to the fact that the model mainly presents a descriptive account of team learning and does not describe what it implies for interventionist theories. The two latter issues tackle aspects that are increasingly recognized in the literature, but are not explicitly part of the model as it is. It concerns the awareness that (the effectiveness of) team learning processes differ depending on the type of task that the team is dealing with. The fourth and last issue zooms in on one of the input variables and questions how to prepare the individual team member for team learning.

9.3.1 Issue1 Measurement & Analysis

Although the rise of team learning research, our understanding of team learning does not grasp the complexities of the phenomenon. Future research on team learning should incorporate measurement and analysis methods that allow us to study team learning as a (1) multilevel and (2) dynamic phenomenon. Specifically with regard to the concept of team learning it is necessary that future research deals with these challenges.

First, learning in collaborative contexts tends to be embedded within individuals, teams, and organizational contexts. This nesting arrangement of entities necessitates the use of multilevel models (Kozlowski & Klein, 2000). Conducting such analyses could increase our understanding of how environmental and organizational factors impact the nature and display of team learning behaviors in collaborating teams. It may provide for more elaborated theory related to how contextual influences shape learning in teams. Moreover, understanding how individual learning is related to learning at team level can bridge the focus of education sciences with organizational research.

Second, further work is necessary to better understand the development of team learning and the dynamic relationships among constructs (Roe et al., 2012). In particular, team research, in general, is evolving to attend more to active and dynamic processes, but most studies on team learning rely on static data collected at one point in time (Kozlowski & Bell, 2013). One of the challenges in studying dynamics and emergence in team learning is the availability of longitudinal data. Recently, innovative technologies have become available that have unobtrusive, high-frequency, data-dense, and near continuous measurement systems enabling research on team process dynamics (Kozlowski, 2015). As learning is intrinsically connected to change, describing these dynamics has a lot of potential in furthering our understanding.

9.3.2 *Issue2 Intervention Research*

What is important to recognize is how research consistently shows that teams differ in their learning behaviors (e.g., Edmondson, 1999). Some teams naturally combine team learning processes and thus increase their success from their learning efforts. Yet, other teams might be less likely to learn without adequate support (Gabelica et al., 2014a). Research on teams in practice has shown that they do not always invest time and effort to learn (e.g., Daudelin, 1996; Gabelica et al., 2014b). From such research it is clear that team learning is not always going to naturally emerge in collaborative settings. Thus, to go beyond the initial set of findings on team learning (Edmondson et al., 2007), research and practice need to more clearly specify how to support team learning so that teams, once formed, can become quickly “operational” (e.g., reach better learning outcomes) but also learn to learn (i.e., develop learning processes).

Team debriefings in which team members are confronted with feedback about their prior performance and stimulated to reflect on this feedback and plan improvement strategies accordingly are potent interventions to enhance team learning (Gurtner et al., 2007). Recently, Gabelica et al. (2014a) and Konradt et al. (2016) showed that the combination of team-level feedback and guided reflexivity was more effective in improving performance than feedback provided alone or no intervention because it allows team members to discuss and modify ineffective strategies or dysfunctional interaction patterns that can prevent goal attainment. In another study, Peñarroja et al. (2017) demonstrated that reflecting on feedback describing team performance and processes impacted affective states such as team satisfaction with the result and team cohesion. Further, it is important that team debriefings are organized in a psychologically safe team climate so that team members feel safe to contribute constructively in the discussions (Lacerenza et al., 2018). Future studies should more systematically compare different types of feedback (e.g., process versus performance feedback) and structures and support mechanisms of the debriefing sessions (e.g., trained facilitator, videoplayed performance) to highlight features of those interventions that lead to transformational learning.

9.3.3 *Issue3 The Team Task Matters*

Teams need team learning to deal with their tasks. Tasks can differ in their level of structure and novelty (Koeslag-Kreunen et al., 2018a, b). Building on Ellström’s (2001) classification of task differences related to learning, two task types can be distinguished: adaptive and developmental tasks. *Adaptive tasks* contain prescribed elements, such as goals, methods, or outcomes. Teams dealing with adaptive tasks know what to do and how to do it and can (to a large extent) predict their results. Their main activities are, for instance, executing, coordinating and applying (Cohen & Bailey, 1997). *Developmental tasks* contain many new or unpredictable elements,

indicating that goals, methods and outcomes still to be defined (Ellström, 2001). Teams dealing with developmental tasks do not exactly know what to do and how to do it, and face many uncertainties. Their activities can be centered around problem solving, designing and creating (Cohen & Bailey, 1997).

Team research does not have a tradition of including the influences of the specific team situation, such as defined by the team task. Kostopoulos and Bozionelos (2011) argued that team research is mainly concerned with narrow processes only, which results in the investigation of only fragments of the learning process within teams. However, the two types of team tasks appear to require different behavioral processes for team learning to be effective. Kostopoulos and Bozionelos (2011) showed that dealing with adaptive tasks requires team learning to slightly adapt the existing knowledge to a new situation. For example, surgery teams who follow a known protocol when operating a new patient. These teams can build upon their routines and use well-known procedures to be effective because they know what to do. On the contrary, teams with developmental tasks need to work towards new knowledge and products, such as developing a new educational course with new colleagues. These teams need to work innovatively because only relying on routines will not bring about a new course.

It is recommended for future research to include the team task when studying team learning and its inputs and outputs. Koeslag-Kreunen et al. (2018b) found that teams who view their task as highly structured (i.e., an adaptive task) also narrowed their team learning behavior to just sharing ideas. These teams indicated that they knew exactly what to do, and, as a result, possibly did not sense an urgency to change their habits. By contrast, teams who faced a developmental task not only shared their opinions and knowledge, but also engaged in co-constructions and constructive conflicts. These teams recognized that their standard methods and solutions were insufficient to succeed, and, probably for that reason, sensed they needed to build new knowledge as a team. In addition, in a series of studies, Koeslag-Kreunen (2018) showed that the team task determines what type of leadership behavior is beneficial for team learning. She also demonstrated that the task is not an objective fact, but is subject to the way team members interpret their task. Future research could include whether this interpretation aligns with organizational goals (is innovation actually needed versus is building on routines enough?). And if not, what type of intervention can be used to manage expectations from teams and leaders back and forth (Koeslag-Kreunen, 2018).

9.3.4 Issue4 Learning to Be a Good Team Player?

The current chapter shows in many ways the importance, but also the intricacy of teams needing to develop ways to deal with complex problems. This increasingly raises the question how to prepare (future) workers for this collaborative practice. Which collaborative competencies does (professional) education need to develop in students to prepare them for workplaces where teamwork is omnipresent? In this

regard, it can be noted that schools increasingly implement group work and collaborative learning environments, however this is seldom accompanied by specific and systematic training of teamwork skills. Group work in schools, as reflected in collaborative learning research in education sciences, is mostly motivated by task-based learning of individual students. Examples of focus on the development of collaborative competencies are the efforts toward interprofessional education in medicine and the assessment program by the OECD.

Medical curricula have forwarded the goal to prepare future health professionals for enhanced team-based care of patients and improved population health outcomes. Therefore, they created core competencies for interprofessional collaborative practice, to guide curriculum development across health professions schools (Interprofessional Education Collaborative, 2016).

More general and with large potential impact on educational policy is the first international assessment of ‘collaborative problem-solving competency’ by the OECD (2017) in their Program for International Student Assessment (PISA). PISA defines collaborative problem-solving competency as: The capacity of an individual to effectively engage in a process whereby two or more agents attempt to solve a problem by sharing the understanding and effort required to come to a solution and pooling their knowledge, skills and efforts to reach that solution (OECD, 2017). Their 2015 survey (500.000, 15-year old students from 52 countries) showed that approximately 8% of students across OECD member countries scored at the highest level, whereas 29% of students scored at the lowest level. This suggests problematic deficiencies when it comes to student competencies in collaboration (Graesser et al., 2018; OECD, 2017). The experiences of students in our educational systems, although comprising group-work, does not seem to not equip them with the necessary competencies (Fiore et al., 2018).

The importance of graduates equipped with teamwork competencies on the one hand and the disappointing results of assessments like PISA on the other hand support the recommendation to develop pedagogical approaches that incorporate these into curricula. However, given the current state of research, it is premature to prescribe a specific curriculum. Graesser et al. (2018, p. 82) state bluntly that “in essence, we are nearly at ground zero in terms of identifying pedagogical approaches to improving Collaborative Problem-solving skills”.

The identification of appropriate approaches need to start from a well-developed understanding of what constitutes this team-player; what are underlying competencies and knowledge, skills and attitudes? Research on teamwork in general and team learning research specifically can contribute to this. The current developments have already forwarded such descriptions (e.g. Interprofessional Education Collaborative, 2016). Validating these in different contexts and for different tasks can further this development.

Identification of these competencies needs to be accompanied by the development of assessment tools. OECD (2017) has done a tremendous effort in integrating this in their PISA, but for individual development purposes we need assessments that provide feedback at individual level, close to the performance, and information for improvement. This possibly entails integrating different sources of feedback.

This assessment should also be happening regularly. In this prospect, the research efforts that are exploring automated analyses of teamwork processes are promising.

This leads to the question what kind of educational designs are best suited to develop the collaborative problem-solving competencies. It seems logic that the plethora of group- and teamwork activities in education provide a fertile ground. Future research should explore what is needed so that these collaborative learning environments reach their potential in fostering the development of teamwork skills.

References

- Akkerman, S., Van den Bossche, P., Admiraal, W., Gijsselaers, W., Segers, M., Simons, R.-J., & Kirschner, P. A. (2007). Reconsidering group cognition: From conceptual confusion to a boundary area between cognitive and socio-cultural perspectives? *Educational Research Review*, 2(1), 39–63.
- Amber, B., & Porter, C. O. L. H. (2019). *Team learning*. Oxford bibliographies. Oxford University Press.
- Argote, L., Gruengeld, D., & Naquin, C. (2001). Group learning in organizations. In M. E. Turner (Ed.), *Groups at work: Theory and research* (pp. 369–412). Erlbaum.
- Arrow, H., McGrath, J. E., & Berdahl, J. L. (2000). *Small groups as complex systems: Formation, coordination, development and adaptation*. Sage.
- Baker, M. (1994). A model for negotiation in teaching-learning dialogues. *Journal of Artificial Intelligence in Education*, 5(2), 199–254.
- Bresman, H., & Zellmer-Bruhn, M. (2013). The structural context of team learning: Effects of organizational and team structure on internal and external learning. *Organization Science*, 24(4), 1120–1139.
- Burke, C. S., Stagl, K. C., Klein, C., Goodwin, G. F., Salas, E., & Halpin, S. M. (2006). What type of leadership behaviors are functional in teams? A meta-analysis. *Leadership Quarterly*, 17(3), 288–307. <https://doi.org/10.1016/j.leaqua.2006.02.007>
- Cannon-Bowers, J. A., & Salas, E. (2001). Reflections on shared cognition. *Journal of Organizational Behavior*, 22, 195–202.
- Cohen, S. G., & Bailey, D. E. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management*, 23(3), 239–290. <https://doi.org/10.1177/014920639702300303>
- Daudelin, M. W. (1996). Learning from experience through reflection. *Organizational Dynamics*, 24, 36–48. [https://doi.org/10.1016/S0090-2616\(96\)90004-2](https://doi.org/10.1016/S0090-2616(96)90004-2)
- Day, D. V., Gronn, P., & Salas, E. (2004). Leadership capacity in teams. *Leadership Quarterly*, 15(6), 857–880. <https://doi.org/10.1016/j.leaqua.2004.09.001>
- De Dreu, C. K. W., & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A meta-analysis. *Journal of Applied Psychology*, 88(4), 741–749.
- DeChurch, L. A., & Mesmer-Magnus, J. R. (2010). The cognitive underpinnings of effective teamwork: A meta-analysis. *Journal of Applied Psychology*, 95(1), 32–53.
- Decuyper, S., Dochy, F., & Van den Bossche, P. (2010). Grasping the dynamic complexity of team learning. An integrative systemic model for effective team learning. *Educational Research Review*, 5, 111–133. <https://doi.org/10.1016/j.edurev.2010.02.002>
- Dillenbourg, P. (1999). What do you mean by ‘collaborative learning’? In P. Dillenbourg (Ed.), *Collaborative learning. Cognitive and computational approaches*. Elsevier Science.
- Dillenbourg, P., Baker, M., Blaye, A., & O'Malley, C. (1996). The evolution of research on collaborative learning. In E. Spada & P. Reiman (Eds.), *Learning in humans and machine: Towards an interdisciplinary learning science* (pp. 189–211). Elsevier.

- Edmondson, A. C. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, 44(2), 350–383. <https://doi.org/10.2307/2666999>
- Edmondson, A. C. (2002). The local and variegated nature of learning in organizations: A group-level perspective. *Organization Science*, 13(2), 128–146.
- Edmondson, A. C. (2019). *The fearless organization. Creating psychological in the workplace for learning, innovation and growth*. Wiley.
- Edmondson, A. C., & Lei, Z. (2014). Psychological safety: The history, renaissance, and future of an interpersonal construct. *Annual Review of Organizational Psychology and Organizational Behavior*, 1(1), 23–43. <https://doi.org/10.1146/annurev-orgpsych-031413-091305>
- Edmondson, A. C., Dillon, J., & Roloff, K. S. (2007). Three perspectives on team learning outcome improvement, task mastery, and group process. *The Academy of Management Annals*, 1, 269–314.
- Ellström, P.-E. (2001). Integrating learning and work: Problems and prospects. *Human Resource Development Quarterly*, 12(4), 421–435. <https://doi.org/10.1002/hrdq.1006>
- Engeström, Y., Engeström, R., & Kärkkäinen, M. (1995). Polycontextuality and boundary crossing in expert cognition: Learning and problem solving in complex work activities. *Learning and Instruction*, 5, 319–336.
- Fiore, S. M., Graesser, A. C., & Greiff, S. (2018). Collaborative problem solving education for the 21st century workforce. *Nature Human Behavior*, 2, 367–369.
- Frazier, M. L., Fainshmidt, S., Klinger, R. L., Pezeshkan, A., & Vracheva, V. (2017). Psychological safety: A meta-analytic review and extension. *Personnel Psychology*, 70, 113–165. <https://doi.org/10.1111/peps.12183>
- Gabelica, C., Van den Bossche, P., de Maeyer, S., Segers, M., & Gijsselaers, W. (2014a). The effect of team feedback and guided reflexivity on team performance change. *Learning and Instruction*, 34, 86–96. <https://doi.org/10.1016/j.learninstruc.2014.09.001>
- Gabelica, C., Van den Bossche, P., Segers, M., & Gijsselaers, W. (2014b). Dynamics of team reflexivity after feedback. *Frontline Learning Research*, 2(2), 64–91. <https://doi.org/10.14786/flr.v2i2.79>
- Gabelica, C., Van den Bossche, P., Fiore, S., Segers, M., & Gijsselaers, W. (2016). Establishing team knowledge coordination from a learning perspective. *Human Performance*, 29(1), 33–53. <https://doi.org/10.1080/08959285.2015.1120304>
- Graesser, A. C., Fiore, S. M., Greiff, S., Andrews-Todd, J., Foltz, P. W., & Hesse, F. W. (2018). Advancing the science of collaborative problem solving. *Psychological Science in the Public Interest*, 19(2), 59–92.
- Gurtner, A., Tschan, F., Semmer, N. K., & Nagele, C. (2007). Getting groups to develop good strategies: Effects of reflexivity interventions on team process, team performance, and shared mental models. *Organizational Behavior and Human Decision Processes*, 102, 127–142.
- Homan, T. (2001). *Teamlernen. Theorie en facilitatie*. Academic Publisher.
- Interprofessional Education Collaborative. (2016). *Core competencies for interprofessional collaborative practice: 2016 update*. Interprofessional Education Collaborative.
- Järvelä, S., Volet, S., & Järvenoja, H. (2010). Research on motivation in collaborative learning: Moving beyond the cognitive-situative divide and combining individual and social processes. *Educational Psychologist*, 45(1), 15–27.
- Järvenoja, H., & Järvelä, S. (2009). Emotion control in collaborative learning situations – Do students regulate emotions evoked from social challenges? *British Journal of Educational Psychology*, 79, 463–481.
- Koeslag-Kreunen, M. (2018). *Leadership for team learning: Engaging university teachers in change* (pp. 117–137). Datawyse. <https://doi.org/10.26481/dis.20181129mk>
- Koeslag-Kreunen, M., Van den Bossche, P., Hoven, M., Van der Klink, M., & Gijsselaers, W. (2018a). When leadership powers team learning: A meta-analysis. *Small Group Research*, 49(4), 475–513. <https://doi.org/10.1177/1046496418764824>
- Koeslag-Kreunen, M., Van der Klink, M., Van den Bossche, P., & Gijsselaers, W. (2018b). Leadership for team learning: The case of university teacher teams. *Higher Education*, 75(2), 191–207. <https://doi.org/10.1007/s10734-017-0126-0>

- Konradt, U., Otte, K. P., Schippers, M. C., & Steenfatt, C. (2016). Reflexivity in teams: A review and new perspectives. *Journal of Psychology, 150*, 153–174. <https://doi.org/10.1080/00223980.2015.1050977>
- Kostopoulos, K. C., & Bozionelos, N. (2011). Team exploratory and exploitative learning: Psychological safety, task conflict, and team performance. *Group & Organization Management, 36*(3), 385–415. <https://doi.org/10.1177/1059601111405985>
- Kozlowski, S. W. J. (2015). Advancing research on team process dynamics: Theoretical, methodological, and measurement considerations. *Organizational Psychology Review, 5*(4), 270–299. <https://doi.org/10.1177/2041386614533586>
- Kozlowski, S. W. J., & Bell, B. S. (2013). Work groups and teams in organizations: Review update. In I. N. Schmitt & S. Highhouse (Eds.), *Handbook of psychology: Industrial and organizational psychology* (Vol. 12, 2nd ed., pp. 412–469). Wiley.
- Kozlowski, S. W. J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research and methods in organizations: Foundations, extensions, and new directions* (pp. 3–90). Jossey-Bass.
- Lacerenza, C. N., Marlow, S. L., & Salas, E. (2018). Team development interventions: Evidence-based approaches for improving teamwork. *American Psychologist, 73*(4), 517–531.
- Lorinkova, N. M., Pearsall, M. J., & Sims, H. P. (2012). Examining the differential longitudinal performance of directive versus empowering leadership in teams. *Academy of Management Journal, 56*(2), 573–596. <https://doi.org/10.5465/amj.2011.0132>
- Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review, 26*(3), 356–376.
- McCarthy, A., & Garavan, T. (2008). Team learning and metacognition: A neglected area of HRD research and practice. *Advances in Developing Human Resources, 10*, 509–524. <https://doi.org/10.1177/1523422308320496>
- Morris, J., & Stew, G. (2007). Collaborative reflection: How far do 2:1 models of learning in the practice setting promote peer reflection. *Reflective Practice, 8*(3), 419–432. <https://doi.org/10.1080/14623940701425220>
- OECD. (2017). *PISA 2015 results (Volume V): Collaborative problem solving*. OECD Publishing.
- Panadero, E., & Järvelä, S. (2015). Socially shared regulation of learning: A review. *European Psychologist, 20*(3), 190–203. <https://doi.org/10.1027/1016-9040/a000226>
- Pearce, C. L., & Sims Jr, H. P. (2002). Vertical versus shared leadership as predictors of the effectiveness of change management teams: An examination of aversive, directive, transactional, transformational, and empowering leader behaviors. *Group Dynamics: Theory, Research, and Practice, 6*(2), 172.
- Peñarroja, V., Orengo, V., & Zornoza, A. (2017). Reducing perceived social loafing in virtual teams: The effect of team feedback with guided reflexivity. *Journal of Applied Social Psychology, 47*(8), 1–12. <https://doi.org/10.1111/jasp.12449>
- Roe, R. A., Gockel, C., & Meyer, B. (2012). Time and change in teams: Where we are and where we are moving. *European Journal of Work and Organizational Psychology, 21*(5), 629–656.
- Roschelle, J. (1992). Learning by collaborating: Convergent conceptual change. *Journal of the Learning Sciences, 2*, 235–276.
- Rummel, N., Spada, H., & Hauser, S. (2009). Learning to collaborate from being scripted or from observing a model. *International Journal of Computer-Supported Collaborative Learning, 4*(1), 69–92. <https://doi.org/10.1007/s11412-008-9054-4>
- Schein, E. H., & Bennis, W. (1965). *Personal and organizational change through group methods*. Wiley.
- Schippers, M. C., Den Hartog, D. N., Koopman, P. L., & Wienk, J. A. (2003). Reflexivity and diversity in teams: The moderating effects of outcome interdependence and group longevity. *Journal of Organizational Behavior, 24*, 779–802.
- Senge, P. M. (1990). *The Fifth discipline. The art & practice Of the learning organization*. Doubleday.
- Van den Bossche, P. (2006). *Minds in teams. the influence of social and cognitive factors on team learning*. Datawyse.

- Van den Bossche, P., Gijselaers, W., Segers, M., & Kirschner, P. A. (2006). Social and cognitive factors driving teamwork in collaborative learning environments. *Team learning beliefs & behaviors. Small Group Research, 37*(5), 490–521.
- Van den Bossche, P., Gijselaers, W., Segers, M., Woltjer, G., & Kirschner, P. A. (2011). Team learning: Building shared mental models. *Instructional Science, 39*(3), 283–301. <https://doi.org/10.1007/s11251-010-9128-3>
- Van der Haar, S., Segers, M., Jehn, K., & Van den Bossche, P. (2015). Investigating the relation between team learning and the team situation model. *Small group research, 46*(1), 50–82. <https://doi.org/10.1177/1046496414558840>
- West, M. A. (2000). Reflexivity, revolution and innovation in work teams. In M. M. Beyerlein, D. A. Johnson, & S. T. Beyerlein (Eds.), *Product development teams* (Vol. 5, pp. 1–29). JAI Press.
- Yukawa, J. (2006). Co-reflection in online learning: Collaborative critical thinking as narrative. *Journal of Computer-supported Collaborative Learning, 1*, 203–228. <https://doi.org/10.1007/s11412-006-8994-9>
- Yukl, G. (2010). *Leadership in organizations* (7th ed.). Prentice-Hall.

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Chapter 10

Self-Regulation of Professional Learning: Towards a New Era of Research



Maaïke D. Endedijk and Katrien Cuyvers

Abstract In the workplace, employees are increasingly expected to take responsibility for their own professional learning. However, there is high variability in the capability of professionals to self-regulate their own learning. Previous descriptive and explanatory studies on self-regulation of professional learning (SRpL) have explored the operationalization of SRpL and provided insights in what personal and contextual factors benefit engagement in this self-regulated learning process. However, in-depth research on the process of how professionals regulate their learning intertwined with their daily work in various social constellations is scarce. Also, insights in how we can support professionals' self-regulation of their learning at work are limited, but highly needed. In this chapter we give an overview of the state-of-the-art of current research on SRpL. Moreover, we identified and explored three avenues to forward research on SRpL based on recent developments in the field of self-regulated learning in educational settings: inclusion of a temporal approach to study the process of SRpL, exploration of social regulation of professional learning, and the use of adaptive tools to support SRpL. This way, we identified crucial building blocks for a new era of research on SRpL.

Keywords Self-regulation of professional learning · Self-regulated learning · Self-directed learning · Professional learning · Workplace learning

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C. Harteis et al. (eds.), *Research Approaches on Workplace Learning*,

Professional and Practice-based Learning 31,

https://doi.org/10.1007/978-3-030-89582-2_10

10.1 Introduction

In the workplace, employees are increasingly expected to take responsibility for their own professional learning. Technological revolutions, new world power relationships, complex challenges such as climate change and migration, but also increasing (social) diversity at work and new work orders affect continuously how we define and carry out our work (Cairns & Malloch, 2011). To foster lifelong employability in this fast-changing knowledge society, continuous learning is required (Manuti et al., 2015). Traditional training solutions are relatively slow, costly, and often ineffective (Bersin, 2018), as related learning takes place off-the-job, content has to be developed on beforehand, and trainers need to be trained to facilitate the learning process. There is a widespread belief that learning and work should become more integrated in order to support employees to adapt to continuous changes in our knowledge economy (Ellström, 2001). However, to effectively learn in and from practices, employees need self-regulative knowledge and skills (Tynjälä, 2008). They need to be able to recognize their own learning needs, set goals, find appropriate strategies, apply and monitor these, and evaluate their learning (Sitzmann & Ely, 2011). In other words, the ability to self-regulate professional learning has become a key competence for the current workforce. However, we know from previous research that there is high variability in the capability of professionals to self-regulate their learning (Littlejohn et al., 2016).

Together with the growing interest in research on workplace learning, research on self-regulation of professional learning- for which we use the acronym “SRpL” in this chapter- gained attention in the last two decades. This research explored the operationalization of SRpL and provided insights in what personal and contextual factors benefit engagement in this process (e.g., Raemdonck et al., 2012; Straka, 2000). Nevertheless, the process of SRpL is still a black box: how professionals use different self-regulated learning strategies over time, intertwined with their daily work tasks and taking place in various social constellations is still unknown (Sitzmann & Ely, 2011). This leaves both practitioners and researchers empty-handed as these insights are needed to start supporting professionals in regulating their professional learning, especially where learners need it the most: in the daily work context. In this thematic review, we therefore synthesize and discuss previous research on SRpL by bringing together literature from the framework of self-regulated learning and self-directed learning and we identify and explore three interrelated avenues for a new era of research on SRpL: the inclusion of a temporal approach to study the process of SRpL, exploration of social regulation of professional learning, and the use of adaptive tools to support SRpL. For the identification and exploration of these avenues, we rely on recent developments in and best practices of research on self-regulated learning (SRL) in educational settings and highlight some first promising initiatives within the field of professional learning. Before we further explore these avenues for research, we first outline the current conceptualization of SRL, elucidate the concept of SRpL, give a brief overview of the history of SRpL research, and describe the outcomes of previous pivotal studies on SRpL.

10.2 The Concept of Self-Regulated Learning

SRL refers to the active personal modification of affective, cognitive, metacognitive, and behavioural processes throughout a learning experience (Panadero, 2017; Schunk & Greene, 2017; Sitzmann & Ely, 2011). The concept of SRL has been extensively investigated in a broad range of contexts over the past decades, leading to the development of different SRL models and theories (Panadero, 2017; Puustinen & Pulkkinen, 2001; Sitzmann & Ely, 2011). Although the different theories are not entirely uniform, all of the models from the field of educational psychology discern important key characteristics. In each model, a core premise is that self-regulated learners strategically and pro-actively orient their thoughts, motivations and actions to respond adaptively to environmental demands and challenges. SRL is initiated by *setting learning goals*, leading to subsequent engagement in *self-regulatory strategies* (Järvelä & Hadwin, 2013; Puustinen & Pulkkinen, 2001; Sitzmann & Ely, 2011). SRL is a cyclical process with interrelations between these self-regulatory strategies initiating, setting forward, and evaluating the progression towards the achievement of the learning goals (Panadero, 2017; Sitzmann & Ely, 2011). Based on self-observation, self-regulated learners compare the current state of functioning with the desired state, which is related to the goals set, referred to as *metacognitive monitoring* (Hadwin et al., 2011; Järvelä & Hadwin, 2013; Pintrich, 2000; Zimmerman, 2002). Then, self-regulated learners adapt the process and strategies used, referred to as *metacognitive control*. Learning and performance are reflected upon and judged, and attributions are made whenever necessary (Hadwin et al., 2011; Pintrich, 2000; Winne, 2011; Zimmerman, 2002). The two most extensively investigated models within the field of SRL, developed by Pintrich and Zimmerman, define SRL as a time-ordered sequential process delimiting different phases with consecutive or hierarchical strategy-use (Panadero, 2017). In comparison, authors of alternative models (e.g., models of Boekaerts, Efklides, Winne and Hadwin, Hadwin, Järvelä and Miller, as in Panadero 2017) do not underscore this delimited nature of the process (Panadero, 2017). Contrary, these authors argue that the process is open and includes recursive phases allowing evaluation and adaptation during each phase, directing loops back to a former phase (Hadwin et al., 2011; Sitzmann & Ely, 2011; Winne & Hadwin, 2008). They conceptualise SRL as a dynamic process that progresses in time and is formed by interrelations between SRL strategies. However, insights on these interrelations, both between different SRL strategies and also with the social context are still very scarce (Hardy III, Day, & Steele, 2018; Sitzmann & Ely, 2011).

10.3 Defining Self-Regulation of Professional Learning

Various concepts are used to describe learning of people during their professional life: lifelong learning, work-related learning, professional learning, and workplace learning (e.g., Eraut, 2004; Kyndt & Baert, 2013; Tynjälä, 2008). Lifelong learning

can be seen as an umbrella term as it includes all learning after graduation, both learning in relation to work as learning beyond the professional life, for example in relation to hobbies or personal interests (Illeris, 2007). Workplace learning and work-related learning are concepts that both used describe employees' learning during working life. However, these concepts are also used to describe learning of future employees (students) in authentic settings, for example during internships (Guile & Griffiths, 2001; Solomon et al., 2006). As we focus in this chapter on self-regulation of learning of employees *after* initial education and in relation to the profession, we use the term self-regulation of *professional learning*. We define professional learning as all learning that employees undertake in relation to their current or future work, including both more formal and more informal learning, and either taking place on or off the job (cf., Jacobs & Park, 2009). Nevertheless, the need for regulating one's own learning and development is highest in more informal learning situations where there is no support of an educational curriculum, trainers and coaches to create learning opportunities, and to co-regulate or scaffold employees' learning processes in relation to their goals (Sitzmann & Ely, 2011). This means that *self-regulation of professional learning* includes employees' dynamic process of setting learning goals, selecting learning activities (either more formal or informal), and monitoring and evaluating the achievements towards these goals. Professionals need to be agents of their own learning process, in the midst of all the challenges and responsibilities related to work and performance. Even though SRpL is often in the first place described as a deliberate process in which time is set aside to intentionally self-regulate professional learning, SRpL can also be more reactive, taking place in response to and in the midst of work-related challenges, driven by performance that is required at the same time (Cuyvers, 2019). Challenges experienced by professionals and demands related to performance can trigger SRpL in the workplace. Professionals recognise the affordance for learning herein, relate this to their self-knowledge regarding needs for learning, and engage in strategy-use which dynamically shapes an ongoing process of SRpL as time evolves (Cuyvers, 2019).

10.4 Self-Regulation of Professional Learning: A Brief History

Explorations on SRpL began around 2002 (e.g., Butler et al., 2004; Tillema & Kremer-Hayon, 2002; van de Wiel et al., 2004; Van Eekelen et al., 2005), but it is only since 2012 that different research groups started to make some systematic efforts (Gijbels et al., 2012; Littlejohn et al., 2016; Margaryan et al., 2013; Raemdonck et al., 2012). When reading through existing research on regulation of learning in the workplace, it becomes immediately clear that there is conceptual tangle regarding self-regulated learning and self-directed learning (SDL). Both concepts have different origins. As SRL stems from social cognitive theory (Zimmerman, 1989), this concept is strongly rooted in research on academic SRL taking place in educational settings. SDL originates from theories on adult learning with an

emphasis on the personal autonomy and responsibility of adults (Ellinger, 2004). One of the most cited definitions of SDL comes from Knowles who describes SDL as “a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes” (Knowles, 1975, p. 18).

Broadly conceived, SRL and SDL share major similarities. Active engagement in setting goals, choice and implementation of appropriate learning strategies, and evaluation of learning are described by both concepts with the primary responsibility lying with the learners (Jossberger et al., 2010; Knowles, 1975). Besides these similarities however, on critical examination, major differences in the conceptual basis can be found. By different authors, different dimensions are described (Candy, 1991; Garrison, 1997) highlighting the versatility of the concept. According to Candy self-directedness entails four dimensions: personal autonomy, self-management or the willingness to commit one’s own education, learner control as a mode of instruction, and independent pursuit of learning whereby individuals pursue learning opportunities in the natural societal setting. Garrison (1997) describes three intimately connected dimensions: self-management, self-monitoring, and motivation. In all, SDL describes the general approach to learning adopted by a learner, representing a process on a more global level and pursuing learning opportunities fitting the continuous professional development of learners (Jossberger et al., 2010). SRL has a specific focus on the learning process in relation to a clearly defined task (Zimmerman, 2008). SRL is highly strategic and a variety of key strategies needs to be used to ensure that the intended learning is achieved: the progress towards the selected goals is self-monitored, adaptive changes and attributions are made if needed, and the process is evaluated (Zimmerman & Schunk, 2011). Further, contrary to SDL, SRL has evolved towards a theory with different granular levels, distinguishing different aspects of learning within SRL models: cognitive, metacognitive, behavioural, motivational, and emotional/affective, and detailed descriptions of micro processes related to these aspects and the different SRL phases. In other words, SRL offers a comprehensive and holistic approach, and allows for a grain-size perspective, with a big concern for the different strategies used by the learner (Loyens et al., 2008). However, models of SRL as developed to describe learning in educational settings do not include crucial workplace learning strategies such as taking learning initiative and identifying learning opportunities, as these models depart from a situation in which the learning goal or task are pre-defined for the learner (Cuyvers et al., 2020).

Taken into account all these definitions, an effective self-directed learner should be an effective self-regulated learner, using a variety of key SRL strategies to achieve the self-identified chosen goals (Brydges et al., 2015). An effective self-regulated learner however is not by definition an effective self-directed learner, as self-directed learners are not only capable of regulating a single task, but also shape and manage their environment and select, design, and self-guide their learning trajectories as a whole (Raemdonck et al., 2017). Nevertheless, both concepts are often used interchangeably, and the conceptual tangle is apparent in the literature. In all,

as the framework of SRL offers more handles for a rich and in-depth investigation of how self-regulation of learning takes place during daily work, we will use this concept throughout this chapter, but also include outcomes of research on SDL.

10.5 Self-Regulation of Professional Learning: Outcomes of Empirical Studies

As the field has been in full development only recently, most of the studies have focused on theory-building and developing instruments to employ in research. This is analogous to the research situated in the “period of development” according to Schunk and Greene (2017). In this developmental process, different types of empirical studies have been described, distinguishing broadly two main sets of studies- the process-oriented SRL-type of studies, and the professional learning-type of studies that builds on the SDL-framework- and a third more recent line of research in which a pedagogical framework for improving and supporting SRL at the workplace has been developed (see also Cuyvers et al. (2020) for a systematic review of empirical studies on SRpL). In line with our definition of SRpL, we included outcomes of empirical studies that studied self-regulated learning or self-directed learning of professionals, leaving out studies on future professionals (e.g., interns, college students, etc).

In the *first* set of studies (Fontana et al., 2015; Littlejohn et al., 2016; Milligan et al., 2015; van de Wiel et al., 2004; Van Eekelen et al., 2005) the process-oriented focus from an SRL perspective is mainly in the forefront. The underlying premise of these studies is that professional learning requires active engagement in everyday work experiences, and that social practices and interactions play an important role (Bauer & Gruber, 2007; Billett, 2004; Harteis & Billett, 2008). However, professional learning does not merely take place by engaging in these social practices and interactions. The workplace offers learning affordances and constraints (Billett, 2001, 2004), but self-regulation strategies are needed to recognize such affordances and deal with the constraints (Cuyvers, 2019). This first set of studies often used the Self-Regulated Learning at Work Questionnaire (SRLWQ) (Fontana et al., 2015) and/or logs and semi-structured interviews to measure SRpL. These studies showed that viewing learning as a long-term, personalised self-improvement is a key characteristic of SRpL but also that for SRpL it is hard to clearly delineate discrete phases of planning, implementation, and reflections. In particular when tasks and goals are less bounded or well-defined as is the case in many workplaces, the phases suggested may not be meaningful. Rather, SRL in the workplace is suggested to be iterative, fluid and continuous. Further, distinguishing between respondents’ reflections on learning and working was found to be difficult due to the predominantly outcome-oriented focus on learning in the workplace, as well as the workers lacking knowledge of reflection strategies and techniques (Margaryan et al., 2013). Finally, SRL in the workplace is suggested to be deeply integrated with work, and highly social.

A *second* set of studies explicitly identified self-regulated aspects of professional learning by using the framework of the SDL theory. In this set of studies, different, but all quantitative self-report instruments were used to explore SDL as a predictor of workplace learning (Gijbels et al., 2012; Raemdonck et al., 2014), employability of low-qualified employees (Raemdonck et al., 2008), and career satisfaction (Joo et al., 2013). Different from the first set of studies in which a process-oriented view is dominant, these studies aimed to integrate a process-orientation with SDL as a personal characteristic. In these studies, the work-related self-directed learning scale (Raemdonck, 2006) was used to measure regulation of learning in the workplace, but also the self-directed learning readiness scale (Guglielmino et al., 1987). Using this latter scale, the study of Hashim (2008) indicated that eight SDL attributes could be distinguished: determination, independence, confidence, initiative, clarity, openness, reflection, and readiness. Self-education and working in teams were found as the prevalent methods used to acquire competences by self-directed learners (Hashim, 2008). Further, in this set of studies, also predictors of SDL have been examined. For example, cross-sectional studies using self-report measures have found effects of rather stable personal characteristics (e.g. age, gender, and personality) on the tendency to self-regulate professional learning (Gijbels et al., 2012; Raemdonck et al., 2012, 2014). In addition, studies have shown that contexts in which employees experience autonomy, competence and social relatedness (Straka, 2000) positively influence employees' self-regulated learning (SRL). Next to that, job characteristics such as task variety and growth potential, and on the organizational level also participatory staff policy (Raemdonck et al., 2012) have the same positive influence.

Finally, a new evolving line of research is the work of Siadaty and her colleagues (Siadaty et al., 2012b, 2016b, c), who suggested a pedagogical framework distinguishing micro-level (e.g., task analysis, making personal plans, etc.) and macro-level processes (planning, enactment, and evaluation & reflection) to design technological scaffolds to support self-regulated workplace learning. The micro-level approach helped to reveal what technological interventions impact which SRL processes. The studies combined trace data to measure actual behaviours with self-perception data of the effect of the interventions, which turned out to be non-related. These studies thus revealed an important mechanism of how it comes that some interventions are not perceived to support learning: when participants do not experience the intervention as a learning intervention as they associate learning with formal training and not with informal learning (Siadaty et al., 2016c). Also, this research-line pinpoints the context-specificity of SRpL and draws attention to the need for customization of approaches.

In conclusion, despite the importance of SRpL, research on SRpL is scattered and still in its infancies. More empirical research is needed to advance the field's understanding of how workers regulate their learning before, during, and after their daily work in complex and changing work environments. Below, we identify three avenues for research on SRpL that we see as important building blocks to bring our field forward.

10.6 Next Steps: Three Avenues for Research on SRpL

In the following paragraphs we identify and explore three main avenues for the next decades of SRpL research: the inclusion of a temporal approach to study the process of SRpL, exploration of social regulation of professionals learning to better describe regulation of learning taking place in various social constellations, and the use of adaptive tools to support SRpL. For each research avenue, we subsequently describe the research avenue as we envision it, followed by best practices from research on SRL in educational settings, after which we describe existing promising initiatives from the field of professional learning and directions for future research for this field.

10.6.1 *Research Avenue 1: Towards a Temporal Approach to Study the Process Self-Regulation of Professional Learning*

Regulation of learning has consistently been defined as a *cyclical* process that unfolds over *time*. Even though the majority of scholars agree on these core characteristics, measurements are not always aligned (Cuyvers et al., 2020). Traditionally, SRL has been measured in two different ways: (1) as a relatively static aptitude using off-line self-report measures (e.g., questionnaires, interviews), and (2) as contextualized behaviour that may differ from event to event, measured *in situ* by using online (real-time) measurement tools (e.g., observation, thinking aloud, trace data) (Endedijk et al., 2016; Panadero et al., 2016; Schunk & Greene, 2017). Already a decade ago, Dinsmore et al. (2008) concluded that the far majority of research on self-regulation and self-regulated learning in educational settings consisted of decontextualized self-report measures, which often do not correspond well to actual strategy use (Veenman, 2011). A recent review (Cuyvers et al., 2020) also showed that even though many studies nowadays use process-oriented conceptualizations of SRL, only a far minority also operationalises and measures SRL as a dynamic process in their empirical studies. Moreover, as at the workplace, learning and work are often intertwined, this has even more implications for study designs and measurement of the SRpL processes. First, it is difficult for the learner to see differences between regulation of learning and of performance (working) and to self-report on these behaviours. As the work of Siadaty et al. (2016c) suggested, employees might easily not recognize certain activities as part of learning when they are highly informal in nature. Second, when working and learning are intertwined, learning – and also regulation of learning – can take place at any moment on the day, instead of on a planned moment on a set location. Indeed, we need continuous and unobtrusive measurements in order to capture the crucial moments of SRpL.

This leaves the field with many remaining questions on how SRpL evolves at the workplace. Indeed, only by including time (Roe, 2008) in our research questions, designs and measures, we will be able to measure the dynamics within the

SRpL-process and answer questions such as how skilful self-regulated learners intertwine their SRL strategy-use with their work activities. Under what circumstances is a certain person capable of self-regulating learning and when not? On what moments in the process do self-regulated learners experience barriers? Thus, designs taking into account temporal features, as well as temporal analysis techniques are needed to for example show patterns in series of events of skilful self-regulators. Consequently, intensive longitudinal methods and within-person analyses are needed to find crucial moments, and the right interplay of contextual factors for SRpL to evolve (Hardy III et al., 2018). Although this may seem to intensify our research, it actually lowers the burden on the need for huge numbers of participants, as within-subject designs have greater statistical power and thus need much fewer participants to achieve the same power than between-subject designs (Bellemare et al., 2014). Moreover, only if we measure SRL dynamically in response to temporal and contextual characteristics, we will be able to know when and how to provide support and to measure the immediate and longer-term effects of it (Siadaty et al., 2016a).

In response to the call for including temporality in SRL research, a recent special issue of *Learning and Instruction* showed how the use of various process analysis techniques to analyse multimodal data (e.g., combination of video data, log data, eye-tracking, but also physiological measurements such as cardiovascular data and electrodermal activity) can reveal temporal characteristics of SRL in relation to performance (Järvelä et al., 2019). For example, process mining was used to unravel that a certain element of SRL (i.e. monitoring) was weakly connected to other SRL processes (Engelmann & Bannert, 2019). In this way, the weakest link in the SRL process could be indicated, which can inform the design of targeted interventions. Another study analysed trace data to show how not merely the *use* of SRL strategies, but in particular *when* and under what *conditions* they were used was predictive for performance (Greene et al., 2019). In addition, the study of Lajoie et al. (2019) showed how sequential analysis revealed both similarities and differences between low and high performing medical students in the order of applying SRL strategies: although all students followed the same cyclical pattern, low performers got stuck in the initial orientation phase for a longer period of time in comparison to high performers who were able to design concrete plans and select the right strategies.

If trace data and process mining techniques can be used to unravel students' SRL in digital learning environments, this must also be possible in digital environments where employees work and learn together. Existing studies show that tracing processes of self-regulation of employees is possible in highly specialized domains where knowledge is stored in online environments, but that in broader domains where knowledge is shared via face-to-face communication, this is much more difficult (Lindstaedt et al., 2010). The main challenge will thus be to translate these methods and techniques to learning at the workplace – where learning paths are more individualized and work and learning activities are not automatically traced. How can, for example, crucial self-regulation events be caught from an avalanche of professional activities? The field of professional learning analytics is still in its

infancies (Littlejohn, 2017), but due to the rapid growth of use of online work and learning platforms in many different sectors, possibilities to apply these methods to professional work settings increase. Therefore, we foresee great possibilities to use trace and log data and analysis techniques such as process mining and machine learning to better understand the process of SRpL.

10.6.2 Research Avenue 2: Exploration of Social Regulation of Professional Learning

Social and contextual aspects influence SRL (Hadwin et al., 2011, 2017; Järvelä & Hadwin, 2013; Järvenoja et al., 2015; Schunk & Zimmerman, 1997; Zimmerman, 2008). Also, in the context of work learning does not take place in a social vacuum. Organizational work takes more and more place in various collaborative settings: (self-managing) teams, project groups, inter-organizational networks, communities of practice, etc. (Vangrieken et al., 2017), and therefore also learning often takes place in interaction (Tynjälä, 2008). Given the collaborative nature of workplace learning, it is remarkable that thus far SRpL research predominantly focused on intra-individual processes of SRL without taking into account the inter-personal or social regulation processes that occur in these various social constellations. Not that studies have neglected the social context: already for decades the social context has been included in studies as a factor that influences the engagement in self-regulation of learning (Confessore & Kops, 1998). Nevertheless, these studies still focused on SRL as an individual process, while in teams, people have a shared responsibility for setting their goals, monitoring their team development, etc.

In the past two decades a strong line of research has developed from the field of computer supported collaborative learning (CSCL) on social regulation as taking place in students' collaborative learning settings (Hadwin & Oshige, 2011). Social regulation captures how individuals reciprocally regulate each other's cognitive and metacognitive processes – including goal setting, monitoring and evaluation -, and engage in shared modes of cognitive and metacognitive regulation (Volet et al., 2009). Different modes of social regulation have been identified with socially shared regulation as the dominant one: group or team members collectively regulate in a balanced way their cognition, metacognition, emotion, motivation, and behaviour for which they use various joint regulatory strategies, such as joint co-constructing of their goals (Panadero & Järvelä, 2015). These studies indicate that teams that show high levels of socially shared regulation also show better performance in educational settings (Panadero & Järvelä, 2015). A second mode of social regulation is co-regulation that has been operationalised in various ways: either as a transitional process in which a more experienced person (e.g., teacher or parent) scaffolds the regulative actions of a more novice learner, or pointing towards unbalanced ways of collaborative regulation in group settings, in which one group member is dominant in regulating other group members' activities or when goals or paths diversify (Schoor et al., 2015).

For the context of professional learning this opens up a new world of research with possibilities to bridge the field of SRpL and team learning research (Van den Bossche et al., 2011). First steps have been made in the context of ICT teams, in which empirical evidence has been found of the existence of socially shared regulation in workplace settings (Wijga et al., 2019). Important future research questions are not only how teams collaboratively regulate their knowledge construction, motivation, and behaviour, but also how these collaborative forms of regulation interplay with individual regulation of learning and how this affects both individual and team performance.

10.6.3 Research Avenue 3: Providing Adaptive Support of Professionals' Self-Regulated Learning

Not all employees manage to actively regulate their own learning in all situations and at all times (e.g., Littlejohn et al., 2016). Despite the promises of many descriptive and explanatory studies on SRpL that the outcomes of these studies could inform the design of interventions to support SRpL, the actual design of the interventions is often not realised. In the field of professional learning, we have mainly seen tools – especially coming from contexts of vocational education – to *document* self-regulated learning (e.g., via portfolios) (e.g., Kicken et al., 2009; Meeus et al., 2008; Strijbos et al., 2007; van Houten-Schat et al., 2018). Although this may help professionals to become more aware of the importance of self-regulated learning and to regulate their overall development at a higher abstraction level, it does often not give the just-in-time and just-in-place support that is needed for today's more agile way of working (Littlejohn, 2017). The third and most important research avenue is therefore to start developing and testing adaptive tools to support professionals' self-regulated learning to improve their performance.

For learning in educational settings, many tools have been developed and proved their success. Using principles of scaffolding (Azevedo & Hadwin, 2005), positive effects of instructor and computer-based prompts have been reported on the use of SRL strategies and learning outcomes. Scaffolding is a dynamic intervention, often by means of questioning, prompting and modeling, that is continuously adapted to the progress of the learner (and thus never the same for each participant) and eventually fades away (van de Pol et al., 2010). A recent review on the effects of SRL interventions for students in Higher Education (Jansen et al., 2019) revealed that various types of interventions (instruction, application, or prompting of SRL) all had positive effects on student achievement, but no evidence was found for specific design characteristics as moderators of the effects of SRL interventions on performance. Because of this lack of evidence no specific recommendations could be given from this review study on how to design future interventions (Jansen et al., 2019). For learning in collaborative settings, technological tools have been developed to support regulation of cognition, motivation,

and emotion (Järvelä et al., 2016; Järvenoja et al., 2017). For example, gStudy has been one of the first applications that showed how software can be used to both support and trace learning of individuals and in collaborative settings (Perry & Winne, 2006; Winne et al., 2010).

For work-related learning, some tools have been developed that are claimed to be suitable for self-initiated learning (e.g., employees can learn by themselves via apps), but these tools do not aim to adaptively support employees' SRL (see for example Nussbaumer et al. (2012)). Rather, these tools are often adaptive in terms of the learning content that is tried to match the employees' prior knowledge and learning goals (e.g., Dolog et al. (2007); (Lindstaedt et al., 2010) and not to adaptively co-regulate the learning of the professional. Moreover, most of these initiatives only have been evaluated from a usability perspective and not from an educational perspective. One best practice worth mentioning is the LearnB tool (Siadaty et al., 2012a, b, 2016b, c). The LearnB tool is "...implemented as an environment that allowed workplace learners to define goals, get recommendations which competences to study next, how to study these competences by receiving suggestions about learning plans and resources, and share experience with and receive updates about the progression of colleagues in the workplace" (Siadaty et al., 2016b, p. 1008). Very interesting results are that the social intervention (e.g., the possibility to inspect what operations other users performed) had the most impact on the engagement of participants in SRL strategy-use. This could indicate that social components might be a crucial asset of effective workplace learning interventions. Moreover, as the environment consisted of many components, the researchers also studied which components were most helpful for their learning. Interestingly, comparison of the trace data with the self-perception of the participants showed that what is perceived as helpful is often different from what actually is helpful (Siadaty et al., 2016b), which shows how important it is to not solely rely on self-report measures to evaluate the effects. This study is not only exemplary for how a tool could be designed that is grounded in SRpL research, but also in terms of how trace data and process analysis can reveal how it was used, the effects and how it can be further improved. Although SRpL is context-specific and SRpL interventions should be customized to the specific context, this set of studies could inspire researchers to develop and test similar environments for other contexts.

10.6.4 Conclusion: Building Blocks for a New Era of Research on Self-Regulation of Professional Learning

The importance of self-regulation of professional learning has been acknowledged from research, practice and policy perspectives. In order to move the research field conceptually and methodologically, and at the same time answer the pressing call for guidelines and tools on how professionals can be supported to self-regulate their learning – both individually and in collaborative settings – we have identified three

interrelated research avenues. That is, the need to use a temporal approach to better understand how the process of SRL unfolds over time in the work environment needs to be addressed. Further, we need to explore the social regulation of professional learning to be able to study regulation of professional learning in collaborative learning settings such as many of the contemporary workplaces are. Finally, instead of continuing the line of merely descriptive and explanatory research, we also need to start designing tools and interventions to adaptively support professionals' regulation of learning just-in-time and just-in-place. All three research avenues have already been taken up by SRL research in educational settings and in this way our paths seem to be paved. However, we often cannot simply copy operationalizations, methods and findings from the educational to the professional settings because of the different nature of the learning processes and contexts (Tynjälä, 2008). To forward our research along these proposed avenues for research, we urge for uniting expertise of researchers on SRpL with expertise of researchers from various other fields. Below we give some concrete suggestions for (interdisciplinary) collaborative research projects as a starting point for a new era of research on SRpL.

Our *first* suggestion is to start joint projects between researchers on SRpL and academic SRL to facilitate knowledge sharing and bridge the perspectives. Herein, we foresee studies on SRL in which the same learners are studied while they learn in different contexts either in parallel (e.g., in dual forms of education in which learners alternate between learning in educational settings and during practice placements), or subsequently by -for example- following these students over time during study-work transitions.

In addition, researchers in the field of professional learning are often specialized in studying a specific profession, either being medicine, teaching, engineering, etc. All these professional fields bring in unique characteristics, possibly influencing how we operationalize what skilful regulation of professional learning entails. For example, a self-employed architect who is working from home and communicates with clients at set times, might deal with different affordances and constraints for professional learning than a nurse working at the intensive care unit. However, this also results in difficulties to compare outcomes between studies. To get more insights in the domain-specificity of SRpL and how it could be operationalized and measured across professional domains, our *second* recommendation is to cross these boundaries and start projects in which professionals across professional domains are studied with the same research questions and – as far as possible – the same methods.

Moreover, not only the first research avenue, but also the other two avenues call for within-subject designs using multimodal data – using either qualitative, quantitative or mixed methods approaches – as the new standard. However, analysing data from multiple measurements of multiple sources and on various levels (individual, teams, organizations) is complex and it is easy to drown in the wealth of analysis techniques (e.g., Järvelä et al., 2019; Molenaar, 2014). Therefore, our *third* recommendation is to start collaborating with experts in for example data cleaning, data processing and visualization techniques by designing joint projects that serve research interests for all parties.

Our *fourth* and final recommendation is to start collaborating with the industry to develop apps, digital learning environments and other tools to facilitate employees in improving their self-regulation, their learning and performance. Many tools are already available, but often focus on a single aspect of work or learning and frequently lack solid grounding in theories on SRpL. For example, a risk might be that these tools take over the regulation of the learner and provide fixed support, instead of scaffolding the process of SRpL. As this type of collaboration might also be complicated because of different interests, intellectual property conflicts, etc., we recommend researchers to first explore to what extent existing free tools can already be used to support employees' SRpL. Exemplary is the work of Ley et al. (2014) and how they used existing tools such as Evernote (<https://evernote.com>) to start designing a way to scale informal learning. Another advantage of this approach is that after conducting studies with existing tools (that do not eat half of the research budget) a much more profound idea of the design requirements of a more customized tool to support SRpL can be obtained.

Concluding, the past two decades of research on self-regulation of professional learning consisted of mainly descriptive and exploratory research, which resulted in various conceptualizations and insights in influencing factors. To answer the pressing call for insights in how to support SRpL in the daily work context, we need more understanding of the temporal aspects of the process of SRpL – including social regulation of professional learning – as it unfolds in individual and collaborative settings. In line with the ideas of the third wave of measuring SRL (Panadero et al., 2016), measuring and intervening can go hand in hand, resulting in studies that give insights in the process of SRL while also intervening in it. Therefore, the time is right to start designing and experimenting with tools to adaptively support SRpL in the daily work context. To achieve these goals, interdisciplinary collaboration is crucial. Altogether, by exploring these avenues for research, we have tried to identify some crucial building blocks for a new era of research on self-regulation of professional learning.

References

- Azevedo, R., & Hadwin, A. F. (2005). Scaffolding self-regulated learning and metacognition – Implications for the design of computer-based scaffolds. *Instructional Science*, 33(5), 367–379.
- Bauer, J., & Gruber, H. (2007). Workplace changes and workplace learning: Advantages of an educational micro perspective. *International journal of lifelong education*, 26(6), 675–688. <https://doi.org/10.1080/02601370701711364>
- Bellemare, C., Bissonnette, L., & Kröger, S. (2014). *Statistical power of within and between-subjects designs in economic experiments*.
- Bersin, J. (2018). *A new paradigm for corporate training: Learning in the flow of work*. Retrieved from <https://joshbersin.com/2018/06/a-new-paradigm-for-corporate-training-learning-in-the-flow-of-work/>
- Billett, S. (2001). Workplace pedagogic practices: Participatory factors in localised arrangements. *Knowledge Demands of the New Economy*, 1, 93–101.
- Billett, S. (2004). Workplace participatory practices: Conceptualising workplaces as learning environments. *Journal of Workplace Learning*, 16(6), 312–324.

- Brydges, R., Manzone, J., Shanks, D., Hatala, R., Hamstra, S. J., Zendejas, B., & Cook, D. A. (2015). Self-regulated learning in simulation-based training: A systematic review and meta-analysis. *Medical Education*, 49(4), 368–378.
- Butler, D. L., Lauscher, H. N., Jarvis-Selinger, S., & Beckingham, B. (2004). Collaboration and self-regulation in teachers' professional development. *Teaching and Teacher Education*, 20, 435–455.
- Cairns, L., & Malloch, M. (2011). Theories of work, place and learning: New directions. In M. Malloch, L. Cairns, K. Evans, & B. O'Connor (Eds.), *The SAGE handbook of workplace learning* (pp. 3–16). SAGE.
- Candy, P. C. (1991). *Self-direction for lifelong learning*. Jossey-Bass.
- Confessore, S. J., & Kops, W. J. (1998). Self-directed learning and the learning organization: Examining the connection between the individual and the learning environment. *Human Resource Development Quarterly*, 9(4), 365–375.
- Cuyvers, K. (2019). *Unravelling medical specialists' self-regulated learning in the clinical environment*. Dissertation, University of Antwerp.
- Cuyvers, K., Van den Bossche, P., & Donche, V. (2020). Self-regulation of professional learning in the workplace: A state of the art and future perspectives. *Vocations and Learning*, 1–32.
- Dinsmore, D. L., Alexander, P. A., & Loughlin, S. M. (2008). Focusing the conceptual lens on metacognition, self-regulation, and self-regulated learning. *Educational Psychology Review*, 20, 391–409. <https://doi.org/10.1007/s10648-008-9083-6>
- Dolog, P., Kravcik, M., Cristea, A., Burgos, D., Bra, P. D., Ceri, S., ... Tattersall, C. (2007). *Specification, authoring and prototyping of personalised workplace learning solutions*.
- Ellinger, A. D. (2004). The concept of self-directed learning and its implications for human resource development. *Advances in developing human resources*, 6(2), 158–177. <https://doi.org/10.1177/1523422304263327>
- Ellström, P.-E. (2001). Integrating learning and work: Problems and prospects. *Human Resource Development Quarterly*, 12(4), 421–435. <https://doi.org/10.1002/hrdq.1006>
- Endedijk, M. D., Brekelmans, M., Slegers, P., & Vermunt, J. D. (2016). Measuring students' self-regulated learning in professional education: Bridging the gap between event and aptitude measurements. *Quality & Quantity*, 50(5), 2141–2164. <https://doi.org/10.1007/s11135-015-0255-4>
- Engelmann, K., & Bannert, M. (2019). Analyzing temporal data for understanding the learning process induced by metacognitive prompts. *Learning and Instruction*. <https://doi.org/10.1016/j.learninstruc.2019.05.002>
- Eraut, M. (2004). Informal learning in the workplace. *Studies in Continuing Education*, 26, 247–273. <https://doi.org/10.1080/158037042000225245>
- Fontana, R. P., Milligan, C., Littlejohn, A., & Margaryan, A. (2015). Measuring self-regulated learning in the workplace. *International Journal of Training and Development*, 19(1), 32–52. <https://doi.org/10.1111/ijtd.12046>
- Garrison, D. R. (1997). Self-directed learning: toward a comprehensive model. *Adult Education Quarterly*, 48(1), 18–33.
- Gijbels, D., Raemdonck, I., Verweken, D., & Van Herck, J. (2012). Understanding work-related learning: The case of ICT workers. *Journal of Workplace Learning*, 24(6), 416–429.
- Greene, J. A., Plumley, R. D., Urban, C. J., Bernacki, M. L., Gates, K. M., Hogan, K. A., ... Panter, A. T. (2019). Modeling temporal self-regulatory processing in a higher education biology course. *Learning and Instruction*. <https://doi.org/10.1016/j.learninstruc.2019.04.002>
- Guglielmino, P. J., Guglielmino, L. M., & Long, H. B. (1987). Self-directed learning readiness and performance in the workplace: Implications for business, industry, and higher-education. *Higher Education*, 16(3), 303–317.
- Guile, D., & Griffiths, T. (2001). Learning through work experience. *Journal of Education and Work*, 14, 113–131.
- Hadwin, A. F., & Oshige, M. (2011). Self-regulation, coregulation, and socially shared regulation: Exploring perspectives of social in self-regulated learning theory. *Teachers College Record*, 113, 240–264.

- Hadwin, A. F., Järvelä, S., & Miller, M. (2011). Self-regulated, co-regulated, and socially-shared regulation of learning. In B. J. Zimmerman & D. H. Schunk (Eds.), *Handbook of self-regulation of learning and performance* (pp. 65–84). Routledge.
- Hadwin, A. F., Järvelä, S., & Miller, M. (2017). Self-regulation, co-regulation, and shared regulation in collaborative learning environments. In D. H. Schunk & J. A. Greene (Eds.), *Handbook of self-regulation of learning and performance* (2nd ed.). Routledge.
- Hardy III, J. H., Day, E. A., & Steele, L. M. (2018). Interrelationships among self-regulated learning processes: Toward a dynamic process-based model of self-regulated learning. *Journal of Management*, 0149206318780440.
- Harteis, C., & Billett, S. (2008). The workplace as learning environment. *International Journal of Educational Research*, 47, 209–212.
- Hashim, J. (2008). Competencies acquisition through self-directed learning among Malaysian managers. *Journal of Workplace Learning*, 20(4), 259–271.
- Illeris, K. (2007). *How we learn: Learning and non-learning in school and beyond*. Routledge.
- Jacobs, R. L., & Park, Y. (2009). A proposed conceptual framework of workplace learning: Implications for theory development and research in human resource development. *Human Research Development Review*, 8, 133–150. <https://doi.org/10.1177/1534484309334269>
- Jansen, R. S., van Leeuwen, A., Janssen, J., Jak, S., & Kester, L. (2019). Self-regulated learning partially mediates the effect of self-regulated learning interventions on achievement in higher education: A meta-analysis. *Educational Research Review*, 100292.
- Järvelä, S., & Hadwin, A. F. (2013). New frontiers: Regulating learning in CSCL. *Educational Psychologist*, 48(1), 25–39.
- Järvelä, S., Kirschner, P. A., Hadwin, A. F., Järvenoja, H., Malmberg, J., Miller, M., & Laru, J. (2016). Socially shared regulation of learning in CSCL: Understanding and prompting individual- and group-level shared regulatory activities. *International Journal of Computer-Supported Collaborative Learning*, 11(3), 263–280. <https://doi.org/10.1007/s11412-016-9238-2>
- Järvelä, S., Malmberg, J., Haataja, E., Sobocinski, M., & Kirschner, P. A. (2019). What multimodal data can tell us about the students' regulation of their learning process? *Learning and Instruction*. <https://doi.org/10.1016/j.learninstruc.2019.04.004>
- Järvenoja, H., Järvelä, S., & Malmberg, J. (2015). Understanding regulated learning in situative and contextual frameworks. *Educational Psychologist*, 50(3), 204–219.
- Järvenoja, H., Järvelä, S., & Malmberg, J. (2017). Supporting groups' emotion and motivation regulation during collaborative learning. *Learning and Instruction*. <https://doi.org/10.1016/j.learninstruc.2017.11.004>
- Joo, B.-K., Park, S., & Oh, J. R. (2013). The effects of learning goal orientation, developmental needs awareness and self-directed learning on career satisfaction in the Korean public sector. *Human Resource Development International*, 16(3), 313–329.
- Jossberger, H., Brand-Gruwel, S., Boshuisen, H., & van de Wiel, M. (2010). The challenge of self-directed and self-regulated learning in vocational education: A theoretical analysis and synthesis of requirements. *Journal of Vocational Education & Training*, 62(4), 415–440.
- Kicken, W., Brand-Gruwel, S., Van Merriënboer, J. J. G., & Slot, W. (2009). Design and evaluation of a development portfolio: How to improve students' self-directed learning skills. *Instructional Science*, 37, 453–473.
- Knowles, M. S. (1975). *Self-directed learning. A guide for learners and teachers*. Association Press.
- Kyndt, E., & Baert, H. (2013). Antecedents of employees' involvement in work-related learning: A systematic review. *Review of Educational Research*, 83(2), 273–313. <https://doi.org/10.3102/0034654313478021>
- Lajoie, S. P., Zheng, J., Li, S., Jarrell, A., & Gube, M. (2019). Examining the interplay of affect and self regulation in the context of clinical reasoning. *Learning and Instruction*. <https://doi.org/10.1016/j.learninstruc.2019.101219>
- Ley, T., Cook, J., Dennerlein, S., Kravcik, M., Kunzmann, C., Pata, K., ... Trattner, C. (2014). Scaling informal learning at the workplace: A model and four designs from a large-scale

- design-based research effort. *British Journal of Educational Technology*, 45(6), 1036–1048. <https://doi.org/10.1111/bjet.12197>
- Lindstaedt, S., Kump, B., Beham, G., Pammer, V., Ley, T., Dotan, A., & De Hoog, R. (2010). *Providing varying degrees of guidance for work-integrated learning*. Paper presented at the European conference on technology enhanced learning.
- Littlejohn, A. (2017). Learning and work: Professional learning analytics. In *Handbook of learning analytics* (pp. 269–277).
- Littlejohn, A., Milligan, C., Fontana, R. P., & Margaryan, A. (2016). Professional learning through everyday work: How finance professionals self-regulate their learning. *Vocations and Learning*, 9(2), 207–226.
- Loyens, S. M. M., Magda, J., & Rikers, R. M. J. P. (2008). Self-directed learning in problem-based learning and its relationships with self-regulated learning. *Educational Psychology Review*, 20, 411–427.
- Manuti, A., Pastore, S., Scardigno, A. F., Giancaspro, M. L., & Morciano, D. (2015). Formal and informal learning in the workplace: A research review. *International Journal of Training and Development*, 19(1), 1–17.
- Margaryan, A., Littlejohn, A., & Milligan, C. (2013). Self-regulated learning in the workplace: Strategies and factors in the attainment of learning goals. *International Journal of Training and Development*, 17(4), 245–259.
- Meeus, W., Van Petegem, P., & Meijer, J. (2008). Portfolio as a means of promoting autonomous learning in teacher education. *Educational Research*, 50, 361–386.
- Milligan, C., Fontana, R. P., Littlejohn, A., & Margaryan, A. (2015). Self-regulated learning behaviour in the finance industry. *Journal of Workplace Learning*, 27(5), 387–402. <https://doi.org/10.1108/jwl-02-2014-0011>
- Molenaar, I. (2014). Advances in temporal analysis in learning and instruction. *Frontline Learning Research*.
- Nussbaumer, A., Berthold, M., Dahrendorf, D., Schmitz, H.-C., Kravcik, M., & Albert, D. (2012). *A mashup recommender for creating personal learning environments*. Paper presented at the international conference on web-based learning.
- Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, 8, 422.
- Panadero, E., & Järvelä, S. (2015). Socially shared regulation of learning: A review. *European Psychologist*, 20(3), 190–203. <https://doi.org/10.1027/1016-9040/a000226>
- Panadero, E., Klug, J., & Järvelä, S. (2016). Third wave of measurement in the self-regulated learning field: When measurement and intervention come hand in hand. *Scandinavian Journal of Educational Research*, 60(6), 723–735.
- Perry, N. E., & Winne, P. H. (2006). Learning from learning kits. *Educational Psychology Review*, 18, 211–228.
- Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 451–502). Academic Press.
- Puustinen, M., & Pulkkinen, L. (2001). Models of self-regulated learning: A review. *Scandinavian Journal of Educational Research*, 45(3), 269–286.
- Raemdonck, I. (2006). *Self-directedness in learning and career processes. A study in lower qualified employees in Flanders*. PhD, Universiteit Gent, Gent.
- Raemdonck, I., de Grip, A., Segers, M., Thijssen, J., & Valcke, M. (2008). Self-directedness in learning and career as predictors of employability in low-qualified employees. *Gedrag & Organisatie*, 21(4), 386–405.
- Raemdonck, I., Van der Leeden, R., Valcke, M., Segers, M., & Thijssen, J. (2012). Predictors of self-directed learning for low-qualified employees: A multi-level analysis. *European Journal of Training and Development*, 36, 572–591.
- Raemdonck, I., Gijbels, D., & Van Groen, W. (2014). The influence of job characteristics and self-directed learning orientation on workplace learning. *International Journal of Training and Development*, 18(3), 188–203.

- Raemdonck, I., Thijssen, J. G. L., & Greef, M. D. (2017). Self-directedness in work-related learning processes. Theoretical perspectives and development of a measurement instrument. In M. Göller & S. Pallonimie (Eds.), *Agency at work - An agentic perspective on professional learning and development* (pp. 401–423). Springer.
- Roe, R. A. (2008). Time in applied psychology. *European Psychologist*, *13*(1), 37–52. <https://doi.org/10.1027/1016-9040.13.1.37>
- Schoor, C., Narciss, S., & Körndle, H. (2015). Regulation during cooperative and collaborative learning: A theory-based review of terms and concepts. *Educational Psychologist*, *50*(2), 97–119. <https://doi.org/10.1080/00461520.2015.1038540>
- Schunk, D. H., & Greene, J. A. (2017). Historical, contemporary, and future perspectives on self-regulated learning and performance. In *Handbook of self-regulation of learning and performance* (pp. 17–32). Routledge.
- Schunk, D. H., & Zimmerman, B. J. (1997). Social origins of self-regulatory competence. *Educational Psychologist*, *32*(4), 195–208.
- Siadaty, M., Gašević, D., Jovanović, J., Milikić, N., Jeremić, Z., Ali, L., ... Hatala, M. (2012a). *Learn-B: A social analytics-enabled tool for self-regulated workplace learning*. Paper presented at the proceedings of the 2nd international conference on learning analytics and knowledge.
- Siadaty, M., Gašević, D., Jovanović, J., Pata, K., Milikić, N., Holocher-Ertl, T., ... Hatala, M. (2012b). Self-regulated workplace learning: A pedagogical framework and semantic web-based environment. *Journal of Educational Technology & Society*, *15*(4), 75–88.
- Siadaty, M., Gasevic, D., & Hatala, M. (2016a). Trace-based micro-analytic measurement of self-regulated learning processes. *Journal of Learning Analytics*, *3*(1), 183–214.
- Siadaty, M., Gašević, D., & Hatala, M. (2016b). Associations between technological scaffolding and micro-level processes of self-regulated learning: A workplace study. *Computers in Human Behavior*, *55*, 1007–1019.
- Siadaty, M., Gašević, D., & Hatala, M. (2016c). Measuring the impact of technological scaffolding interventions on micro-level processes of self-regulated workplace learning. *Computers in Human Behavior*, *59*, 469–482.
- Sitzmann, T., & Ely, K. (2011). A meta-analysis of self-regulated learning in work-related training and educational attainment: What we know and where we need to go. *Psychological Bulletin*, *137*(3), 421–442. <https://doi.org/10.1037/a0022777>
- Solomon, N., Boud, D., & Rooney, D. (2006). The in-between: Exposing everyday learning at work. *International Journal of Lifelong Education*, *25*, 3–13.
- Straka, G. A. (2000). Conditions promoting self-directed learning at the workplace. *Human Resource Development International*, *3*(2), 241–251. <https://doi.org/10.1080/136788600402708>
- Srijbos, J., Meeus, W., & Libotton, A. (2007). Portfolio assignments in teacher education: A tool for self-regulating the learning process? *International Journal for the Scholarship of Teaching and Learning*, *1*(2), 1–16.
- Tillema, H. H., & Kremer-Hayon, L. (2002). “Practising what we preach” – Teacher educators’ dilemmas in promoting self-regulated learning: A cross case comparison. *Teaching and Teacher Education*, *18*, 593–607.
- Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review*, *3*, 130–154. <https://doi.org/10.1016/j.edurev.2007.12.001>
- van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher-student interaction: A decade of research. *Educational Psychology Review*, *22*(3), 271–296. <https://doi.org/10.1007/S10648-010-9127-6>
- van de Wiel, M. W. J., Szegedi, K. H. P., & Weggeman, M. C. D. P. (2004). Professional learning: Deliberate attempts at developing expertise. In H. P. A. Boshuizen, R. Bromme, & H. Gruber (Eds.), *Professional learning: Gaps and transitions on the way from novice to expert*. Kluwer.
- Van den Bossche, P., Gijssels, W. H., Segers, M., Woltjer, G., & Kirschner, P. A. (2011). Team learning: Building shared mental models. *Instructional Science*, *39*(3), 283–301. <https://doi.org/10.1007/s11251-010-9128-3>

- Van Eckelen, I. M., Boshuizen, H. P. A., & Vermunt, J. D. (2005). Self-regulation in higher education teacher learning. *Higher Education*, 50, 447–471. <https://doi.org/10.1007/s10734-004-6362-0>
- van Houten-Schat, M. A., Berkhout, J. J., van Dijk, N., Endedijk, M. D., Jaarsma, A. D. C., & Diemers, A. D. (2018). Self-regulated learning in the clinical context: A systematic review. *Medical Education*, 52, 1008–1015. <https://doi.org/10.1111/medu.13615>
- Vangrieken, K., Boon, A., Dochy, F., & Kyndt, E. (2017). Group, team, or something in between? Conceptualising and measuring team entitativity. *Frontline Learning Research*, 5(4), 1–41. <https://doi.org/10.14786/flr.v5i4.297>
- Veenman, M. V. J. (2011). Alternative assessment of strategy use with self-report instruments: A discussion. *Metacognition and Learning*, 6(2), 205–211. <https://doi.org/10.1007/s11409-011-9080-x>
- Volet, S., Vauras, M., & Salonen, P. (2009). Self- and social regulation in learning contexts: An integrative perspective. *Educational Psychologist*, 44(4), 215–226. <https://doi.org/10.1080/00461520903213584>
- Wijga, M., Endedijk, M. D., & Veldkamp, B. (2019). *Understanding social regulation at the workplace: An examination of different modes of regulation and variation in quality*. Paper presented at the 19th Biennial EARLI Conference, Aachen, Germany.
- Winne, P. H. (2011). A cognitive and metacognitive analysis of self-regulated learning. In B. J. Zimmerman & D. H. Schunk (Eds.), *Handbook of self-regulation of learning and performance* (pp. 15–32). Routledge.
- Winne, P. H., & Hadwin, A. F. (2008). The weave of motivation and self-regulated learning. In D. H. Schunk & B. J. Zimmerman (Eds.), *Motivation and self-regulated learning: Theory, research, and applications*. Lawrence Erlbaum.
- Winne, P. H., Hadwin, A. F., & Gress, C. (2010). The learning kit project: Software tools for supporting and researching regulation of collaborative learning. *Computers in Human Behavior*, 26(5), 787–793. <https://doi.org/10.1016/j.chb.2007.09.009>
- Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of educational psychology*, 81(3), 329.
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, 41, 64–70.
- Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal*, 45(1), 166–183.
- Zimmerman, B. J., & Schunk, D. H. (Eds.). (2011). *Handbook of self-regulation of learning and performance*. Routledge.

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Chapter 11

Social Influences on Team Learning



Dominik Froehlich and Katerina Bohle Carbonell

Abstract In this chapter, we take the perspective of complex systems to derive a definition of teams and hence team learning. In this definition, we can see at least three levels: the macro-level system in which the team is embedded in (e.g., the wider organizational network), the meso-level of the team as an entity itself, and the individual, interdependent members to that team at the micro level. We discuss theoretical notions of social influence exerted at these three levels of teams and team learning based on network theory. This then is fed into a methodological discussion that aims to distill ways to consider the identified social influences when doing team learning research.

Keywords Social influences · Social networks · Team · Team learning

11.1 Introduction

Interest in team learning and team learning research has surged during the last two decades. Since the increasing complexity of the world and its technologies makes it impossible for individuals to stay on top of everything (Jones, 2009), the team emerged as a central entity for organizational success. Here, we define a team as “a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems” (Cohen & Bailey, 1997, p. 241). But what does it take for such a complex entity/collection of individuals to learn? Team learning is a multifaceted phenomenon. There are a host of

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C. Harteis et al. (eds.), *Research Approaches on Workplace Learning*,

Professional and Practice-based Learning 31,

https://doi.org/10.1007/978-3-030-89582-2_11

factors that boost or block it: team regulatory focus (Li et al., 2018), available “dialogical space” and consistent mental models amongst team members (Decuyper et al., 2010; Runhaar et al., 2014; Santos et al., 2015), conflicts (Van Woerkom & Sanders, 2010; Van Woerkom & Van Engen, 2009), team members’ learning behaviors (Gerber et al., 1995; Smyth & Perkins, 2011), leadership (Raes et al., 2013; Schaubroeck et al., 2016), and aspects of culture and climate (Post, 2012), to name a few.

We define team learning as the interactive social processes team members engage in to create and develop a shared understanding of a task and create a shared team product. For this reason, team learning is a social activity—this makes processes of social influence especially prevalent and important. Social influences are processes within a team that influence the spread and depth of interaction between team members. Previous research has predominantly dealt with teams as singular entities composed of team members and their attributes. In this approach, a team becomes the average team member. Here, we problematize this approach and instead argue for using the approach of relational demography (Tsui & O’Reilly, 1989) to study team learning. Both the individual team members and their relationships with each other are elements worth investigating to understand the team at the higher level.

In this chapter, we explore how social factors influence team learning at various levels. For this, we first define teams and team learning in greater detail. We then present theoretically derived notions of how social factors play a role in team learning. Since the definition of teams presented above presents teams as a complex, multifaceted construct, we have the discussion of social influences at three distinguishable levels of analysis. Last, we translate these theoretical notions also in methodological thoughts and hints.

11.2 Background

Before we can discuss how social influence is exerted in relation to team learning, we need to define both teams and teams learning in greater detail. We will first describe the main characteristics of teams. From there, we use a complex systems perspective to arrive at a definition that will be useful for the rest of this chapter. In the next section, social influences and their relationships with team learning are then introduced.

A team is a group of two or more people who work on a common task with shared responsibility (Hackman, 1987) and one or more shared goals (Kozlowski & Bell, 2001). This requires team members to interact with each other as their work-flows, goals, and outcomes are interdependent. Indeed, interdependence, the degree to which team members depend on each other to carry out their tasks (Pennington & Hastie, 1993), is another team-level characteristic. Teams are also characterized by the distribution of decision-making authority and membership boundaries. As an example, we are going to compare illustrative, exemplary medical teams (Bohle Carbonell et al., 2020), restaurant kitchen teams (Bouty & Gomez, 2010, 2013), and Open Source developer teams (Crowston & Howison, 2005). Medical teams and

restaurant teams are usually marked by centralized decision-making. There is only one person who has the (formal) power to make decisions and clear procedures need to be followed. But the workflow in surgery teams is more interdependent and less sequential than in a kitchen. Team members may come in and leave throughout a surgery, but everyone is providing input on the patient's health. In the Open Source developer teams, contributions are voluntary and leadership, too, is self-selected. Decision-making will be less centralized and the workflow will be less sequential than in a kitchen, as software components can influence each other.

Until now, we have considered a team as one closed entity. However, a team is more complex and nuanced than that as it is composed of several team members. Consider the house in which you are living. It is one house and may be understood as one entity. However, your house has several rooms. So your house is more complex than just a single entity. If a room becomes dysfunctional (e.g., a burned-down kitchen), your house and its function—and its value to you—changes. The same thing occurs in teams: If team members or their function change, the team changes. So it is necessary to adopt a complex systems perspective (Decuyper et al., 2010; Von Bertalanffy, 1968). By adopting such a perspective, we acknowledge the dynamic, adaptive, and emergent properties of teams (Kolba et al., 2016). A team is composed of interconnected and interdependent sub-systems, namely the team members and the relationships they form among each other. Following Decuyper et al. (2010), we adopt a definition of teams consistent with a complex systems perspective: “A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems” (Cohen & Bailey, 1997, p. 241). Consequentially, while a team is an entity by itself, understanding what occurs at the team level requires investigating the individual components (team members' characteristics) and the relationship between the individual components (Monge & Contractor, 2003).

We have defined teams using a complex systems perspective. In line with this, team learning is a process that occurs at an individual level, between individuals, and at the team level. Team learning cannot be understood without considering the context in which it occurs, and the interactions between the elements that co-exists within the context (Szell & Thurner, 2010). In its most basic form, team learning could be defined as learning that occurs at the team level when the team is changing what they do or how they do it (Edmondson et al., 2008) to achieve their team goal more effectively. This definition of team learning views the team as a unit, disregarding the team members and their interactions. The action, changes in what and how the team is accomplishing its goal, is attributed to the team as an entity. However, the problem with this definition is that a team itself is not able to act. Therefore, other definitions of team learning mention the shared experience of team members leading to a change in the team's collective level of knowledge and skills (Ellis et al., 2003), the activities team members engage in to acquire, refine, share, and combine task-relevant knowledge (Argote et al., 1999), and the collective acquisition, combination, and creation of knowledge (Argote, 1999). The common aspect of these different definitions of team learning is the acknowledgement that individuals engage in the learning activity through the acquisition of knowledge and

skills, and that these are shared with other team members (Ellis et al., 2003). Hence, we define team learning as team members' acquisition of knowledge and skills and the later sharing with other team members. The level of team learning hence depends not only on how much an individual learns, but also on how widely this learning being shared with other team members. The level of team learning thus depends on social forces which shape the interaction among team members and between team members and other members of the wider organizational network. These influences will be discussed in the next section.

Noticeable from these various definitions is that team learning can be defined as an outcome or as a process. We posit that regardless if team learning is the outcome of an activity or the activity itself, social factors influence the magnitude of team learning. This position is slightly artificial as social processes can be understood, from a process perspective, as learning (Decuyper et al., 2010). Hence, learning can be viewed as a social process that is influenced by other social processes. To further expand on and explain our position, we view (1) team learning as activities that lead to a change in team performance, (2) the source of activities is the interaction between individuals, (3) the pattern of dyadic interactions influences the magnitude of team learning, and (4) social factors influence what pattern of dyadic interaction emerge in a team.

Social influences refer to the cognitive and behavioral relationships between team members. On the cognitive level, social influences exist in team members' minds and the cognitive social networks each individual team member develops and maintains for their team. A cognitive social network is a mental model team members have about their team members' abilities and roles in the team (Krackhardt, 1987). The overlap, or agreement, between individual team members' cognitive social network influences the magnitude of team learning. Behavioral relationships refer to the magnitude of interaction between each pair of team member and the resulting pattern from these pairs of relationships. Thus, while interaction happens only between two team members, this interaction influences how other team members interact with each other. It is also possible that a team member interacts with not one specific, for example, when a question is asked to everybody (Gibson, 2003). These types of behavioral interactions also influence team learning, as someone should be continuing the conversation.

11.3 Theoretical Notions of Social Influences on Team Learning

We have taken the perspective of complex systems to derive a definition of teams and hence team learning. In this definition we can see at least three levels: the macro-level system in which the team is embedded in (e.g., the wider organizational network), the meso-level of the team as an entity itself, and the individual, interdependent members to that team at the micro level. Figure 11.1 shows the different levels. All actors and all relationships present in Fig. 11.1 could be considered the

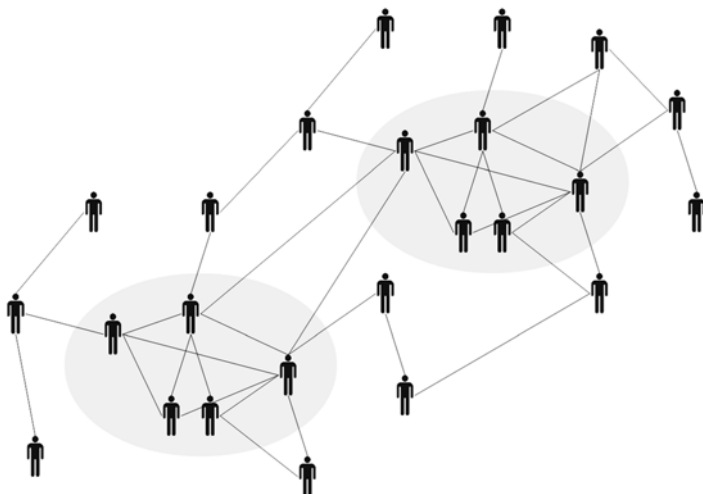


Fig. 11.1 The individual, the team, the wider network

macro-level, which may depict one single organizational entity. The two highlighted areas show team entities on the meso-level within that macro-level organization. It is important to note that this also includes the relationships (the lines between the actors). Last, on the micro-level, each individual actor may be considered.

Each level has its own set of attributes. For instance, a team, although to a large part made up by the entities on the lower level—the individual actors and their relationships—also has attributes on its own, such as a team name and characteristics that describe the interaction between team members. In the same manner, a macro-level organization comprises micro-level actors (and meso-level teams), but also has attributes on its own which describe the organization and the interaction between members of the organization.

It is important to recognize the social aspect of each of the levels: each of the levels is defined through the different actors and relationships between actors that are active on a particular level. In line with this, we will turn to social network theory (Borgatti & Halgin, 2011; Monge & Contractor, 2003) to inform the subsequent argumentation. Social network theory uses the characteristics of individuals, and the pattern of relationships they form with each other, to explain social phenomena.

To understand social influences on team learning, we now turn to each of these levels to determine how social influence is being exerted. It is also important to recognize that non-relationship-based factors are relevant at each of these levels (cf. Contractor & Monge, 2003). These include, for example, individuals' motivations or learning ability (micro level), their propensity to interact with other people and their communication skills (meso level), or wider cultural factors that influence group norms, such as team climate (BinZhao, in this volume) or, at the macro level, the organizational climate (Froehlich et al., 2014b). But these non-relationship-based factors will not be part of this discussion.

11.3.1 Social Influences at the Micro Level

On the micro level, we focus on the individual team members, including their position in the team; we consider influences at the level of individual team members. These are attributes that the team members bring to the team, and are considered input factors in the traditional input-process-output model of team processes (Hackman, 1987). One of the key characteristics that individuals bring to a team is their domain expertise and their level of proficiency. While this may be considered a non-relational construct, it is important to consider the relational aspect of it. Often, teams are constructed so that no single individual is able to complete the task alone. Hence, the expertise of team members is a criterion for membership in a team and for the division of labor among the team's members. Expertise awareness and recognition is a cognitive process that influences information exchange among team members. This has been the focus of research on transactive memory systems. A transactive memory system is a cognitive map that team members have that contains two pieces of information: information about who knows what in the team and information rating the quality and accessibility of team members (Wegner, 1995). Transactive memory systems are one of the cognitive social structures team members develop (Monge & Contractor, 2003).

When information is requested from someone, team members will remember the quality of the answer. If the answer was of satisfactory quality, the person will get further requests for information within the same domain. This feedback loop of information request and giving high quality answers will lead to further specialization in the areas in which someone receives many information requests (Palazzolo et al., 2006), even if this area might not have been one of their areas of expertise when they first started working in a team. Information exchange, in general, and asking others for information, in particular, increases members' level of expertise. The possession of specific individual attributes, that is, domain expertise, thus drives the presence or absence of relationships among team members and hence influences team learning.

It is important to note that it is often perceived expertise that influences information exchange and not self-reported expertise (e.g., Palazzolo, 2005). This perception can shape the level of specialization of team members; as team members specialize in particular areas they receive many information requests (as outlined above). This effect can happen within intact teams, but is especially prone to occur when a team's composition is changing. The old team members rely on the past distribution of expertise, not considering how the new team member(s) are different from those who have left (Lewis, 2004). Consequently, new team members might possess greater expertise in certain areas than existing team members, however, due to a fixed expertise distribution are forced to specialize in a new domain. In such cases, team members might have to change their level of expertise to adapt their knowledge to their task and the information requests they receive. Consequently, knowledge of individuals can change (individual learning) or the team may develop new interaction patterns to adapt to the new team composition (team learning).

Social capital theory (Nahapiet & Ghoshal, 1998) argues that networks of relationships are the basis for accessing valuable resources, which can impact the learning process in teams. Social capital is thus a function of the network, which consist of interactions between the members of the network (Bourdieu, 1986). Social capital can be utilized on the individual, team and organizational levels (Lin et al., 2001). The benefit of social capital for learning lies in the connections between individuals. Every relationship an individual has provides an opportunity for accessing and exchanging resources, knowledge, time, money, direct connection, and even further, the connections of one's connections. In this sense, social capital as a source for learning extends beyond one's immediate relationships and includes individuals with whom someone does not have a direct relationship. The social capital someone holds also changes. Life events, such as a new job or moving to a different city, create new relationships while old relationships might disappear and thus changes one's social capital. Also, within an existing set of connections it is possible to gain social status or reputation within the network (Bourdieu, 1986; Burt, 1992; Froehlich, 2018).

Social capital does not automatically lead to learning. Adler and Kwon (2002) explain that goodwill is necessary for social capital to translate into learning gains, meaning that two parties need to be willing to engage in an exchange of resources. This is the foundation of (social) exchange theory (Emerson, 1976), which argues that any type of transaction between two people is based on the implicit understanding that an act of giving will be reciprocated in the future. Hence, it is not possible to only receive; in some way, the knowledge gained from one's connections must be repaid. This implies that someone who has received knowledge from another person also needs to be give knowledge, or another resource, to a member of the same network.

11.3.2 Social Influences on the Meso Level

On the meso level, we focus on individuals' embeddedness in social relationships towards other individuals within the same team. Learning often is a social process; it involves more than just one person (Froehlich et al., 2014a, 2015a, b, 2017). So it is also important to recognize social influences on the meso level, where we consider factors that transcend the attributes of a single individual and also study a team member's relationship or exchange with other team members. We discuss three important social concepts and theories: reciprocity, balance, and homophily.

Reciprocity focuses on the mutuality of exchange. Technically, this means that the ties between two nodes go into both directions. Many types of relationships tend to be reciprocal (Gouldner, 1960). For instance, friendship and other close emotional relationships are often based on reciprocity. Other relationships, for example, advice-seeking relationships, are rather complementary and not reciprocal (Fuhse, 2016).

Reciprocity is an interesting feature in terms of the social influences within teams, as we can see reciprocity as a proxy for equality and stability (cf. Hanneman & Riddle, 2011). Networks marked by inequality and hence instability, however, may be ineffective in providing the structures needed for team learning processes. In this respect, the underlying attributes may be relevant to this discussion, as they often promote (or hinder) the existence of (reciprocal) ties. For instance, one well-researched phenomenon is homophily or similarity-attraction, the tendency of people to be attracted to similar others based on demographic information (Frieling & Froehlich, 2017; McPherson et al., 2001). There are also more latent categories such as values (Froehlich & Messmann, 2017; Harwood & Froehlich, 2017). Additionally, there are previous learning instances in a dyadic relationship. If one person had asked a colleague for help once, the colleague might at one point be able to return the favor (Froehlich & Gegenfurtner, 2019). Or, to put it differently, learning relationships may be reciprocal, as argued by social exchange theory (Cropanzano, 2005; Emerson, 1976).

The quality of learning relationships may not be attributed to one person alone. Either of the two parties involved in a learning relationship could have learning relationships with third parties. These other learning relationships may have an influence on the focal relationship. For instance, person A may request information from person B, but if person B had not previously received the information from person C the request could not be answered. Thus, studying a group of three people, a triad, and their ability and willingness to form a complete structure connecting all three individuals and their transitivity adds important information to the analysis (Louch, 2000). When considering the mental model team members build about their task, a closed triad is often beneficial as each member of the team connects to the others, and thus trust and information is shared among members of the triad. Transitive triads lead to a better-developed transactive memory system and team performance (Lee et al., 2014), thanks to the third team member's coordination of the action and information flow (Obstfeld, 2005).

Individuals' attributes are important at the meso level, too. Team research has a long tradition of studying the influences of diversity on aspects of team performance (Buyl et al., 2011; Cady & Valentine, 1999; Horwitz & Horwitz, 2007; Kearney et al., 2009; Stahl et al., 2010). In this chapter, we do not intend to discuss these (inconclusive) findings. Instead, we set out to focus on one specific social theory that explains some of these findings: homophily (McPherson et al., 2001). The tendency of individuals to connect with others that are similar in terms of easily observable attributes such as gender or age is well document across fields and contexts (Frieling & Froehlich, 2017; Froehlich & Messmann, 2017; Golub & Jackson, 2012; Ibarra, 1992; Stehlé et al., 2013; Wright, 2000). Importantly, similarity attraction extends beyond easily observable, physical attributes. Value homophily, the tendency to connect with individuals with whom some latent value is shared, is another importance social influence on the meso level (Lazarsfeld & Merton, 1954). In their meta-review, Mesmer-Magnus and DeChurch (2009) report higher levels of information sharing in teams with similar team members, and that more information is shared when team members possess similar information. This effect can be

explained by social identity theory (Tajfel, 1974). According to this theory, individuals are perceived to belong to specific social groups. This membership, which only exists at a mental level, drives individuals to adopt norms and values favored by the social group. Additionally, individuals develop a preference for interacting with other group members and attach greater value to their contributions and the information they provide (Thomas-Hunt et al., 2003). However, this preference can be diminished through contact with members from other groups. According to the contact hypothesis (Gaertner et al., 1996), members from different groups who share the same work or goals, and hence have to interact, will re-categorize each other. This re-categorization changes who is considered to be an in- or outgroup member and thus leads to more frequent inter-group communication links. In social network terms, this implies that relationships are not just formed among similar team members (homophily theory; McPherson et al., 2001), but also between groups. This could lead to a more denser, and cohesive, network.

In conclusion, the effects of homophily are widespread (Monge & Contractor, 2003); similarity-attraction is an important perspective to consider when studying social influences on team learning. For more information on meso level processes, see the chapter by Endedijk (in this volume).

11.3.3 Social Influences at the Macro Level

The macro level is concerned with broad-scale influences such as the network properties of the organization or the team. We will discuss the different processes of social influence at each of these (interrelated) levels. Any learning that occurs in a group is also influenced by macro level properties. These properties encompass aspects of the environment in which a network is embedded. These could be, for instance, characteristics of the task or physical features of the workplace.

One macro level property is how task information is distributed among the team members. This refers to the distribution of operational information necessary to complete the task. To achieve one end, all team members could possess some information about how to complete the task and who is actually in the team (low centralization). This is beneficial for tasks which require a diversity of information. When coordination is of utmost importance, such as in action teams like emergency care teams, it is better for one team member to possess all the information about expertise and distribution in the team (high centralization). In global support teams, the same policies and guidelines need to be applied in various regional units. In this case, every team member possesses a complete set of information, and teams will benefit from low levels of centralization (Mell et al., 2013).

Network coevolution occurs when one form of interaction (e.g., a work-related interaction) influences interaction of another form (e.g., friendship). In this case, the strength of one network influences the strength of the relationships in the other network. Su et al. (2010) analyzed two types of information-sharing networks: asking for information and giving information to someone without being asked. Both are

information exchange networks. However, the trigger for exchanging information is different. Therefore, the network metrics of centrality and density also differ. Additionally, these networks evolve differently over time and their changes are driven by different variables (Bohle Carbonell et al., 2016). For team learning, this implies that any growth that could be gained from one information exchange network can be leveraged or hampered due to another network.

An increasing number of studies discuss how specific social network metrics influence learning. This is often conducted in online courses using interaction among students in discussion forums. For example, Hernández-García et al. (2015) reports that, in general, there seems to be a moderate relationship between centrality (the degree to which a person is connected to many other people in the network) and academic performance. However, when this relationship is analyzed on a class level, inconsistent results are found. This is somewhat in line with the work by Romero et al. (2013), who looked at a larger set of social network metrics and their relation to academic performance. He also reports a positive relationship between centrality and academic performance.

Network density measures the level of cohesion in a group. The more team members interact with each other, the higher the potential for learning as information passes between each team member. Density is a macro level measure that captures how many of the potential interactions are realized. High density indicates that all team members are talking with each other. With increasing numbers of interactions among team members, the level of density increases. However, the larger teams become, the less likely it is for density to be high, as it will cost team members too much time and energy for everybody to have meaningful interactions with the other members (De Laat et al., 2007).

When focusing on social network metrics that describe the structure of the complete network and not solely position of individuals, a logical assumption is that the level of interaction, hence density, should influence team learning. If team learning is viewed from a behavioral perspective and equated with information sharing and meaning making, measuring the communication networks in a team should be an acceptable proxy for measuring how much information is shared among team members, and thus provide an indication of team learning. Following this reasoning, if there is a higher the level of density in a team, the level of team learning would also be higher. Unfortunately, it is not possible to simply equate high density with high levels of team learning. It is necessary to determine the sources of interaction. For example, a common problem with teams is that more shared information is exchanged than unique information (Mesmer-Magnus & Dechurch, 2009). In addition, team members interact with each other for various reasons (Cross & Sproull, 2004). Based on this, density remains a (rather weak) proxy for team learning—its meaning depends on the data collection methods.

11.4 Methodological Thoughts on the Studying Social Influences on Team Learning

In this chapter, we have discussed an array of social influences that are relevant to team learning research on several levels. Subsequently, an important question to be answered is how this list of social influences can be considered when doing team learning research. To tackle this question in a broad manner, we will now discuss two important approaches to team learning research that have been used in past research: the demography approach and the relational approach. In the demography approach, we consider the team as one “mass” of individuals that has certain characteristics: size, the sum of its expertise, the sum of its interaction within the team, diversity metrics, etc. In this approach, the team becomes the average of the team members. This also means that the different levels of the multi-layered team learning phenomenon outlined above are collapsed into one. No interrelations may be studied. While researchers acknowledge the dynamic nature of teams and the different way to aggregate individual level data to the team level, the argument we are making is that the demographic approach does not consider that a team consists of a number of individuals, their relationships, and the variance between team members’ characteristics and relationships (Cronin et al., 2011; Harrison & Klein, 2007; Kozlowski & Klein, 2000).

In the relational approach, which in this case is synonymous with the relational demography approach (Tsui & O’Reilly, 1989) or social network analytic approach (Froehlich & Brouwer, 2021; Hytonen and Van Waes, in this volume), we consider the individual team members, their individual relationships, and their interactions as the elements to be simultaneously investigated to understand the team. Hence, to develop our understanding about team learning, it is helpful to consider variables and relationships at several levels within one study.

Also, a decision must be made about the methodological framework to be used and ensure that it is able to capture both social influences and team learning processes and outcomes, all of which are highly latent concepts. Given the mutual dependence of team members in terms of their learning, it is our conviction that the data needs to be treated as dyadic data, as it is done within the framework of social network analysis, amongst others. In this regard, the multi-theoretical multilevel framework proposed by Monge and Contractor (2003) provides insights into how multiple theories can be used in one study to make sense of multiple social influences exerting influences on variables at various levels in a team. It must be stressed that this does not mean cherry-picking variables and theories. Monge and Contractor (2003) provide several fundamental and long established social influences which explain the formation of social network structure. For example, homophily theory explains the existence of relationships based on the attributes of individuals, whereas (social) exchange theory clarifies how dyadic relationships are formed based on prior interactions. Such approaches to studying team learning can help to shed light on inconsistent results by providing a richer analysis of team learning.

In a similar vein, for gaining understanding of a complex relationship such as the one between team learning and various social forces, taking a single methodological approach may be limiting. Just like Monge and Contractor's (2003) proposition to include multiple explanations and multiple theories, different methodological approaches are necessary to understand complex constructs in their many facets. Specifically, relational quantitative data is a tremendous help when it comes to identifying patterns, structures, and positions. At the same time, however, qualitative relational methods excel when it comes to giving meaning to relationships or handling (day-to-day) fluctuations in the intensity of relationships (Crossley, 2010; Froehlich et al., 2020a). This suggests the use of mixed methodologies (Johnson & Onwuegbuzie, 2004; Schoonenboom et al., 2018) when studying team learning empirically; or, more specifically, mixed methods social network analysis (Domínguez & Hollstein, 2014; Froehlich et al., 2020b).

References

- Adler, P. S., & Kwon, S.-W. (2002). Social capital: Prospects for a new concept. *The Academy of Management Review*, 27(1), 17–40. <https://doi.org/10.2307/4134367>
- Argote, L. (1999). *Organizational learning: Creating, retaining, and transferring knowledge*. Kluwer Academic.
- Argote, L., Gruenfeld, D., & Naquin, C. (1999). Group learning in organizations. In M. Turner (Ed.), *Groups at work: Advances in theory and research* (pp. 369–413). Erlbaum.
- Bohle Carbonell, K., Könings, K. D., Segers, M. S. R., & Van Merriënboer, J. J. G. (2016). Measuring adaptive expertise: Development and validation of an instrument. *European Journal of Work and Organizational Psychology*, 25(2), 167–180. <https://doi.org/10.1080/1359432X.2015.1036858>
- Bohle Carbonell, K., Marcum, C., Könings, K. D., Stassen, P., Segers, M. S. R., & Van Merriënboer, J. J. G. (2020). The role of knowing and valuing others' expertise in accelerating information exchange. In D. E. Froehlich, M. Rehm, & B. C. Rienties (Eds.), *Mixed methods social network analysis: Theories and methodologies in learning and education*. Routledge.
- Borgatti, S. P., & Halgin, D. S. (2011). On network theory. *Organization Science*, 22, 1168–1181. <https://doi.org/10.1287/orsc.1110.0641>
- Bourdieu, P. (1986). The forms of capital. In J. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241–258). Greenwood.
- Bouty, I., & Gomez, M.-L. (2010). Dishing up individual and collective dimensions in organizational knowing. *Management Learning*, 41(5), 545–559. <https://doi.org/10.1177/1350507610377584>
- Bouty, I., & Gomez, M.-L. (2013). Creativity in haute cuisine: Strategic knowledge and practice in gourmet kitchens. *Journal of Culinary Science & Technology*, 11(1), 80–95. <https://doi.org/10.1080/15428052.2012.728979>
- Burt, R. S. (1992). *Structural holes: The structure of social capital competition*. Harvard University Press.
- Buyl, T., Boone, C., Hendriks, W., & Matthyssens, P. (2011). Top management team functional diversity and firm performance: The moderating role of CEO characteristics. *Journal of Management Studies*, 48(1), 151–177. <https://doi.org/10.1111/j.1467-6486.2010.00932.x>
- Cady, S. H., & Valentine, J. (1999). Team innovation and perceptions of consideration: What difference does diversity make? *Small Group Research*, 30(6), 730–750. <https://doi.org/10.1177/104649649903000604>

- Cohen, S. G., & Bailey, D. E. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management*, 23(3), 239–290. <https://doi.org/10.1177/014920639702300303>
- Contractor, N. S., & Monge, P. R. (2003). *Using multi-theoretical multi-level (MTML) models to study adversarial networks*. National Research Council.
- Cronin, M. A., Weingart, L. R., & Todorova, G. (2011). Dynamics in groups: Are we there yet? *The Academy of Management Annals*, 5(1), 571–612.
- Cropanzano, R. (2005). Social exchange theory: An interdisciplinary review. *Journal of Management*, 31(6), 874–900. <https://doi.org/10.1177/0149206305279602>
- Cross, R., & Sproull, L. (2004). More than an answer: Information relationships for actionable knowledge. *Organization Science*, 15(4), 446–462. <https://doi.org/10.1287/orsc.1040.0075>
- Crossley, N. (2010). The social world of the network. Combining qualitative and quantitative elements in social network analysis. *Sociologica*, 1. <https://doi.org/10.2383/32049>
- Crowston, K., & Howison, J. (2005). The social structure of free and open source software development. *First Monday*, 10(2). Retrieved from <https://firstmonday.org/ojs/index.php/fm/article/view/1207>
- De Laat, M., Lally, V., Lipponen, L., & Simons, R.-J. (2007). Investigating patterns of interaction in networked learning and computer-supported collaborative learning: A role for social network analysis. *International Journal of Computer-Supported Collaborative Learning*, 2(1), 87–103. <https://doi.org/10.1007/s11412-007-9006-4>
- Decuyper, S., Dochy, F., & Van den Bossche, P. (2010). Grasping the dynamic complexity of team learning: An integrative model for effective team learning in organisations. *Educational Research Review*, 5(2), 111–133. <https://doi.org/10.1016/j.edurev.2010.02.002>
- Domínguez, S., & Hollstein, B. (2014). In S. Domínguez & B. Hollstein (Eds.), *Mixed methods social networks research: Design and applications*. Cambridge University Press.
- Edmondson, A. C., Dillon, J. R., & Roloff, K. S. (2008). Three perspectives on team learning. *The Academy of Management Annals*, 1(1), 269–314. <https://doi.org/10.1080/078559811>
- Ellis, A. P., Hollenbeck, J., Ilgen, D. R., Porter, W., Porter, C. O. L. H., & Moon, H. (2003). Team learning: Collectively connecting the dots. *Journal of Applied Psychology*, 88(5), 821–835.
- Emerson, R. M. (1976). Social exchange theory. *Annual Review of Sociology*, 2, 335–362.
- Frieling, M., & Froehlich, D. E. (2017). Homophilie, diversity und feedback: Eine soziale Netzwerkanalyse [Homophily, diversity, and feedback: A social network analysis]. In *Internationales Personalmanagement: Rollen – Kompetenzen – Perspektiven. Implikationen für die praxis [international human resource management: Roles – Competencies – Perspectives]*. SpringerGabler.
- Froehlich, D. E. (2018). Burt (2005): Brokerage & closure. In B. Holzer & C. Stegbauer (Eds.), *Schlüsselwerke der Netzwerkforschung*. VS Verlag für Sozialwissenschaften.
- Froehlich, D. E., & Brouwer, J. (2021). Social network analysis as mixed analysis. In A. J. Onwuegbuzie & R. B. Johnson (Eds.), *Reviewer's guide for mixed methods research analysis*. Routledge.
- Froehlich, D. E., & Gegenfurtner, A. (2019). Social support in transitioning from training to the workplace: A social network perspective. In H. Fasching (Ed.), *Beziehungen in pädagogischen Arbeitsfeldern [Relations in pedagogical work]*. Klinkhardt.
- Froehlich, D. E., & Messmann, G. (2017). The social side of innovative work behavior: Determinants of social interaction during organizational innovation processes. *Business Creativity and the Creative Economy*, 3(1), 31–41. <https://doi.org/10.18536/bcce.2017.10.3.1.03>
- Froehlich, D. E., Beusaert, S. A. J., Segers, M. S. R., & Gerken, M. (2014a). Learning to stay employable. *Career Development International*, 19(5), 508–525. <https://doi.org/10.1108/CDI-11-2013-0139>
- Froehlich, D. E., Segers, M. S. R., & Van den Bossche, P. (2014b). Informal workplace learning in Austrian banks: The influence of learning approach, leadership style, and organizational learning culture on managers' learning outcomes. *Human Resource Development Quarterly*, 25(1), 29–57. <https://doi.org/10.1002/hrdq.21173>

- Froehlich, D. E., Beausaert, S. A. J., & Segers, M. S. R. (2015a). Age, employability and the role of learning activities and their motivational antecedents: A conceptual model. *The International Journal of Human Resource Management*, 26(16), 2087–2101. <https://doi.org/10.1080/09585192.2014.971846>
- Froehlich, D. E., Beausaert, S. A. J., & Segers, M. S. R. (2015b). Great expectations: The relationship between future time perspective, learning from others, and employability. *Vocations and Learning*, 8(2), 213–227. <https://doi.org/10.1007/s12186-015-9131-6>
- Froehlich, D. E., Beausaert, S. A. J., & Segers, M. S. R. (2017). Development and validation of a scale measuring approaches to work-related informal learning. *International Journal of Training and Development*, 21(2), 130–144. <https://doi.org/10.1111/ijtd.12099>
- Froehlich, D. E., Mejeh, M., Galey, S., & Schoonenboom, J. (2020a). Integrating units of analysis: Applying mixed methods social network analysis. In D. E. Froehlich, M. Rehm, & B. C. Rienties (Eds.), *Mixed methods social network analysis: Theories and methodologies in learning and education*. Routledge.
- Froehlich, D. E., Rehm, M., & Rienties, B. C. (2020b). *Mixed methods social network analysis: Theories and methodologies in learning and education*. Routledge.
- Fuhse, J. A. (2016). *Soziale Netzwerke*. UVK Verlagsgesellschaft mbH.
- Gaertner, S. L., Dovidio, J. F., & Bachman, B. A. (1996). Revisiting the contact hypothesis: The induction of a common ingroup identity. *International Journal of Intercultural Relations*, 20(3), 271–290. [https://doi.org/10.1016/0147-1767\(96\)00019-3](https://doi.org/10.1016/0147-1767(96)00019-3)
- Gerber, R., Lankshear, C., Larsson, S., & Svensson, L. (1995). Self-directed learning: Does it affect team performance? *Education and Training*, 8, 26–32.
- Gibson, D. R. (2003). Participation shifts: Order and differentiation in group conversation. *Social Forces*, 81(2003), 1335–1380.
- Golub, B., & Jackson, M. O. (2012). How Homophily affects the speed of learning and best-response dynamics. *Quarterly Journal of Economics*, 127(3), 1287–1338. <https://doi.org/10.1093/qje/qjs021>
- Gouldner, A. W. (1960). The norm of reciprocity: A preliminary statement. *American Sociological Review*, 25(2), 161. <https://doi.org/10.2307/2092623>
- Hackman, J. R. (1987). The design of work teams. In J. Lorsch (Ed.), *Handbook of organizational behavior* (pp. 315–342). Prentice Hall.
- Hanneman, R. A., & Riddle, M. (2011). Concepts and measures for basic network analysis. In J. Scott & P. J. Carrington (Eds.), *The Sage handbook of social network analysis* (pp. 340–369). SAGE.
- Harrison, D. A., & Klein, K. J. (2007). What's the difference? Diversity constructs as separation, variety, or disparity in organizations. *Academy of Management Review*, 32(4), 1199–1228.
- Harwood, J., & Froehlich, D. E. (2017). Proactive feedback-seeking, teaching performance, and flourishing amongst teachers in an international primary school. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (pp. 425–444). https://doi.org/10.1007/978-3-319-60943-0_21
- Hernández-García, Á., González-González, I., Jiménez-Zarco, A. I., & Chaparro-Peláez, J. (2015). Applying social learning analytics to message boards in online distance learning. *Computers in Human Behavior*, 47(C), 68–80. <https://doi.org/10.1016/j.chb.2014.10.038>
- Horwitz, S. K., & Horwitz, I. B. (2007). The effects of team diversity on team outcomes: A meta-analytic review of team demography. *Journal of Management*, 33(6), 987–1015. <https://doi.org/10.1177/0149206307308587>
- Ibarra, H. (1992). Homophily and differential returns: Sex differences in network structure and access in an advertising firm. *Administrative Science Quarterly*, 37(3), 422–447.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7), 14–26.
- Jones, B. F. (2009). The burden of knowledge and the “death of the renaissance man”: Is innovation getting harder? *Review of Economic Studies*, 76(1), 283–317.

- Kearney, E., Gebert, D., & Voelpel, S. C. (2009). When and how diversity benefits teams: The importance of team members' need for cognition. *Academy of Management Journal*, *52*(3), 581–598.
- Kolba, C., Gerrits, L., Rhodes, M. L., & Meek, J. W. (2016). Complexity theory and systems analysis. In C. Ansell & J. Torfing (Eds.), *Handbook on theories of governance* (pp. 364–380). Edward Elgar Publishing.
- Kozlowski, S. W. J., & Bell, B. S. (2001). Work groups and teams in organizations. In W. C. Borman, D. R. Ilgen, & R. J. Klimoski (Eds.), *Industrial and organizational psychology* (pp. 333–375). Wiley-Blackwell.
- Kozlowski, S. W. J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 3–90). Jossey-Bass.
- Krackhardt, D. (1987). Cognitive social structures. *Social Networks*, *9*(2), 109–134. [https://doi.org/10.1016/0378-8733\(87\)90009-8](https://doi.org/10.1016/0378-8733(87)90009-8)
- Lazarsfeld, P. F., & Merton, R. K. (1954). Friendship as a social process: A substantive and methodological analysis. In M. Berger (Ed.), *Freedom and control in modern society* (pp. 18–66). Van Nostrand.
- Lee, J.-Y., Bachrach, D. G., & Lewis, K. (2014). Social network ties, Transactive memory, and performance in groups. *Organization Science*, *25*(3), 951–967. <https://doi.org/10.1287/orsc.2013.0884>
- Lewis, K. (2004). Knowledge and performance in knowledge-worker teams: A longitudinal study of Transactive memory systems. *Management Science*, *50*(11), 1519–1533. <https://doi.org/10.1287/mnsc.1040.0257>
- Li, C.-R., Lin, C.-J., & Liu, J. (2018). The role of team regulatory focus and team learning in team radical and incremental creativity. *Group & Organization Management*, *44*, 1036–1066. <https://doi.org/10.1177/1059601118775196>
- Lin, N., Cook, K. S., & Burt, R. S. (2001). *Social capital: Theory and research*. Transaction Publishers.
- Louch, H. (2000). Personal network integration: Transitivity and homophily in strong-tie relations. *Social Networks*, *22*, 45–64.
- McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, *27*, 415–444. <https://doi.org/10.1146/annurev.soc.27.1.415>
- Mell, J. N., Van Knippenberg, D., & Van Ginkel, W. P. (2013). The catalyst effect: The impact of Transactive memory system structure on team performance. *Academy of Management Journal*, *57*(4), 1154–1173. <https://doi.org/10.5465/amj.2012.0589>
- Mesmer-Magnus, J. R., & Dechurch, L. A. (2009). Information sharing and team performance: A meta-analysis. *The Journal of Applied Psychology*, *94*(2), 535–546. <https://doi.org/10.1037/a0013773>
- Monge, P. R., & Contractor, N. S. (2003). *Theories of communication networks*. Oxford University Press.
- Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review*, *23*(2), 242–266. <https://doi.org/10.2307/259373>
- Obstfeld, D. (2005). Social networks, the Tertius Iungens orientation, and involvement in innovation. *Administrative Science Quarterly*, *50*(1), 100–130. <https://doi.org/10.2189/asqu.2005.50.1.100>
- Palazzolo, E. T. (2005). Organizing for information retrieval in transactive memory systems. *Communication Research*, *32*, 726–761.
- Palazzolo, E. T., Serb, D. A., She, Y., Su, C., & Contractor, N. S. (2006). Coevolution of communication and knowledge networks in Transactive memory systems: Using computational models for theoretical development. *Communication Theory*, *16*(2), 223–250. <https://doi.org/10.1111/j.1468-2885.2006.00269.x>

- Pennington, N., & Hastie, R. (1993). Reasoning in explanation-based decision making. *Cognition*, 49(1), 123–163. [https://doi.org/10.1016/0010-0277\(93\)90038-W](https://doi.org/10.1016/0010-0277(93)90038-W)
- Post, C. (2012). Deep-level team composition and innovation: The mediating roles of psychological safety and cooperative learning. *Group & Organization Management*, 37(5), 555–588. <https://doi.org/10.1177/1059601112456289>
- Raes, E., Decuyper, S., Lismont, B., Van den Bossche, P., Kyndt, E., Demeyere, S., & Dochy, F. (2013). Facilitating team learning through transformational leadership. *Instructional Science*, 41(2), 287–305. <https://doi.org/10.1007/s11251-012-9228-3>
- Romero, C., López, M.-I., Luna, J.-M., & Ventura, S. (2013). Predicting students' final performance from participation in on-line discussion forums. *Computers in Education*, 68(C), 458–472. <https://doi.org/10.1016/j.compedu.2013.06.009>
- Runhaar, P., ten Brinke, D., Kuijpers, M. A. C. T., Wesselink, R., & Mulder, M. (2014). Exploring the links between interdependence, team learning and a shared understanding among team members: The case of teachers facing an educational innovation. *Human Resource Development International*, 17(1), 67–87. <https://doi.org/10.1080/13678868.2013.856207>
- Santos, C. M., Uitdewilligen, S., & Passos, A. M. (2015, June). A temporal common ground for learning: The moderating effect of shared mental models on the relation between team learning behaviours and performance improvement. *European Journal of Work and Organizational Psychology*, 1–16. <https://doi.org/10.1080/1359432X.2015.1049158>
- Schaubroeck, J., Carmeli, A., Bhatia, S., & Paz, E. (2016). Enabling team learning when members are prone to contentious communication: The role of team leader coaching. *Human Relations*, 69(8), 1709–1727. <https://doi.org/10.1177/0018726715622673>
- Schoonenboom, J., Johnson, R. B., & Froehlich, D. E. (2018). Combining multiple purposes of mixing within a mixed methods research design. *International Journal of Multiple Research Approaches*, 10(1), 271–282. <https://doi.org/10.29034/ijmra.v10n1a17>
- Smyth, M., & Perkins, G. D. (2011). Self-directed learning: Does it affect team performance? *Resuscitation*, 82(3), 241–242. <https://doi.org/10.1016/j.resuscitation.2011.01.003>
- Stahl, G. K., Maznevski, M. L., Voigt, A., & Jonsen, K. (2010). Unraveling the effects of cultural diversity in teams: A meta-analysis of research on multicultural work groups. *Journal of International Business Studies*, 41(4), 690–709. <https://doi.org/10.1057/jibs.2009.85>
- Stehlé, J., Charbonnier, F., Picard, T., Cattuto, C., & Barrat, A. (2013). Gender homophily from spatial behavior in a primary school: A sociometric study. *Social Networks*, 35(4), 604–613. <https://doi.org/10.1016/j.socnet.2013.08.003>
- Su, C., Huang, M., & Contractor, N. (2010). Understanding the structures, antecedents and outcomes of organisational learning and knowledge transfer: A multi-theoretical and multilevel network analysis. *European Journal of International Management*, 4(6), 576. <https://doi.org/10.1504/EJIM.2010.035590>
- Szell, M., & Thurner, S. (2010). Measuring social dynamics in a massive multiplayer online game. *Social Networks*, 32(4), 313–329.
- Tajfel, H. (1974). Social identity and intergroup behaviour. *Social Science Information*, 13(2), 65–93. <https://doi.org/10.1177/053901847401300204>
- Thomas-Hunt, M. C., Ogden, T. Y., & Neale, M. A. (2003). Who's really sharing? Effects of social and expert status on knowledge exchange within groups. *Management Science*, 49(4), 464–477.
- Tsui, A. S., & O'Reilly, C. A. (1989). Beyond simple demographic effects: The importance of relational demography in superior-subordinate dyads. *Academy of Management Journal*, 32(2), 402–423.
- Van Woerkom, M., & Sanders, K. (2010). The romance of learning from disagreement. The effect of cohesiveness and disagreement on knowledge sharing behavior and individual performance within teams. *Journal of Business and Psychology*, 25(1), 139–149. <https://doi.org/10.1007/s10869-009-9136-y>

- Van Woerkom, M., & Van Engen, M. L. (2009). Learning from conflicts? The relations between task and relationship conflicts, team learning and team performance. *European Journal of Work and Organizational Psychology, 18*(4), 381–404. <https://doi.org/10.1080/13594320802569514>
- Von Bertalanffy, L. (1968). The meaning of general system theory: The quest for a general system theory. In *In general system theory* (pp. 30–53). Braziller.
- Wegner, D. M. (1995). A computer network model of human Transactive memory. *Social Cognition, 13*(3), 319–339. <https://doi.org/10.1521/soco.1995.13.3.319>
- Wright, K. (2000). Perceptions of on-line support providers: An examination of perceived Homophily, source credibility, communication and social support within on-line support groups. *Communication Quarterly, 48*(1), 44–59. <https://doi.org/10.1080/01463370009385579>

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Chapter 12

Knowledge Creation in Teacher Teams



Crina Damşa

Abstract In a changing work landscape, teamwork and team learning often represent strategies to engage ill-structured or sizable projects that require sophisticated solutions, which individual professionals alone may not be able to provide. Creating knowledge in teams implies that team members are acting jointly to generate new ideas and materialize these into artefacts or practices that can have instrumental value for the team's work and learning. This chapter advances understanding of the epistemic nature of teamwork by university teachers. It does so by examining and further developing conceptualizations of collaborative knowledge creation and by examining empirically, discussing and illustrating the way knowledge is created in a team of teachers who worked collaboratively on curricular innovation over the period of an academic year. The chapter analyzes mechanisms of collaboratively generating new ideas and knowledge and teachers' teamwork on shared knowledge artefacts – new curriculum elements, which serve both as focus of their epistemic inquiry and as mediating tools for improving and innovating their teaching. Dialogical action and jointly developed material, together with awareness of complexities and constant adjustment to team dynamics are recommendations for professionals engaging in team work. The chapter proposes a conceptual framework for knowledge creation in teams, and reflects on the importance of collaborative knowledge work in professional contexts where ill-structured problems require joint efforts and complex solutions.

Keywords Teamwork · Knowledge creation · Interaction · Shared artefacts · Academic teachers · Qualitative analysis

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© Springer Nature Switzerland AG 2022
C. Harteis et al. (eds.), *Research Approaches on Workplace Learning*,
Professional and Practice-based Learning 31,
https://doi.org/10.1007/978-3-030-89582-2_12

12.1 Introduction

Knowledge is a pervasive feature of contemporary society. Therefore, mobilising and creating new knowledge has become increasingly relevant, as the need to address complex problems suffusing professional, academic, and educational contexts has become increasingly more acute. These problems, which are often ‘wicked’, that is, amorphous, ambiguous, and contradictory (Farrell & Hooker, 2013; Jordan et al., 2014), arise at both the societal and the ‘work floor’ level. An example from the educational context is the increased diversity of the student population in higher education due to globalisation, which requires solutions at the systemic level, as well as locally, at the curriculum level and in the way teaching is delivered. In such situations, standard work procedures and solutions or invoked, existing knowledge is no longer suitable or sufficient. A ‘knowledge turn’ (Nerland & Jensen, 2012) is, thus, paramount as knowledge creation or production becomes one of the purposes of professional work. Ways of working that are specific to academic practice and innovation environments, especially the creation of new knowledge and knowledge solutions, are ‘spilling over’ into professional contexts. This implies that professional work and learning also gain new dimensions, which involve non-linear practices of knowledge creation in local, specific situations and diverse learning modes to serve these rather ‘decentralised’ activity landscapes (Knorr Cetina & Reichmann, 2015). Knowledge is no longer only invoked; it has become the purpose of work and local practice.

In this changing, knowledge-laden landscape, teamwork and team learning are strategies applied to ill-structured or sizeable projects that require new or sophisticated solutions that individual professionals may not be able to provide (Bronstein, 2003). These strategies have the potential to create environments that facilitate individual and collective knowledge and competence expression and adoption, as well as provide solutions or advance practice (Meyer & Lees, 2013). Creating knowledge in teams implies that team members are acting jointly to generate new ideas and inputs of an epistemic nature and materialise them into artefacts or practices of instrumental value in the team’s work and learning (Damşa, 2014). An interesting challenge for researchers is to understand the mechanisms of collaborative knowledge creation and how these may contribute to team productivity and learning. Although it is acknowledged as important, few studies of teamwork have focused on this knowledge creation dimension.

Teamwork has been studied in several contexts, including the workplace, organisations, and education (e.g., Edmondson & Harvey, 2018; Hu & Randel, 2014; O’Neill & Salas, 2018), and from multiple angles. A large body of work has focused on team functioning and performance, with an emphasis on team effectiveness (e.g., Kozlowski & Ilgen, 2006; Rico et al., 2018; Salas et al., 2017), team composition and functioning (e.g., Chiochio & Hobbs, 2015; Halvorsen, 2013), or factors influencing team functioning and decision making. Psychological factors have been extensively examined, mostly using a framework highlighting cognitive factors and their influence on team performance (e.g., Cooke et al., 2013; Mesmer-Magnus et al., 2017; Salas & Fiore, 2004). Psychological safety or team cohesion has also

been explored to understand the framing conditions of team activity (e.g., Greer, 2012; Van den Bossche et al., 2006). In more recent years, research has focused especially on social processes in teamwork, examining it through various interpretative lenses using different methodologies. Studies building on social capital theories primarily employ social network analysis to reveal the nature of teams' social ties and ways to access information or build connections (e.g., Croker et al., 2012; Froehlich & Messmann, 2019). A more recent wave of research inspired by socio-cultural, sociomaterial, and sociology of knowledge led to studies of collaborative work that focuses on social interaction in teams (e.g., Kvarnström et al., 2018; McMurtry et al., 2016; Nerland & Damşa, 2019). Such studies expose the way teams capitalise, at the micro-level, on intellectual, social, digital-material or technological resources available in their environment. The latter studies touch upon the way knowledge is involved in team activities, but the focus is not on the ways in which the team engages in creating new ideas, solutions, and artefacts.

This chapter addresses the need for a better understanding of collaborative knowledge creation in teams in two ways. First, it aims to advance our understanding of the epistemic nature of teamwork and conceptualisations of collaborative knowledge creation with the potential to shed light on mechanisms and dimensions of the processes taking place in teams. Conceptual models focusing on processes involved in generating knowledge emphasise different aspects of these processes; thus, an integrative overview that distils the most relevant mechanisms or dimensions is needed. Second, the current work aims to combine conceptualisations and an empirical examination of teamwork to provide theory-grounded interpretations of how knowledge creation unfolds and an illustration of possible methodological approaches when attempting to study knowledge creation in teams. The chapter addresses these aims by discussing and illustrating the ways knowledge is created in a team of academic teachers who worked collaboratively on curricular innovation over the period of an academic year. The chapter examines mechanisms of collaboratively generating new ideas and knowledge from an individual and collective perspective by examining teachers' teamwork in the creation of shared knowledge artefacts, which serve as both the focus of their epistemic inquiry and as mediating tools for improving and innovating their teaching. The chapter proposes a conceptual framework for knowledge creation in teams and applies it to interpreting knowledge co-creation work (i.e., team dialogues and products, as well as the teachers' reflections regarding the team and their collaborative efforts). The chapter builds on insight emerging from these interpretations to reflect on the importance of research on collaborative knowledge work and the implications for how such research insights can be employed productively in professional work and learning.

12.2 Models Underlying Knowledge Construction in Teams

Research concerned with learning and knowledge work has, in the past decade, undergone a major epistemological shift that emphasises knowledge as being created, as opposed to simply being absorbed in a mechanistic manner (e.g., by

memorisation). This shift brought about new concepts and models, as well as the need to better understand not only the way knowledge is manipulated and used but also how new knowledge is generated in collaborative work. Collaborative team or group work has been explored in a variety of studies, resulting in the generation of conceptual models illustrating different facets of this process.

The *knowledge creation metaphor*, initially proposed and elaborated on by Finnish researchers (Paavola et al., 2004; Paavola & Hakkarainen, 2005), is among the most relevant models conceptualising work involving knowledge. It explicitly addresses the creation of knowledge in collaboration, in small groups of people/learners, and the materialisation of created knowledge into concrete output. Collaborative knowledge creation is defined as a specific type of learning and work; it is intentional in nature and directed toward delivering a knowledge product (i.e., an intellectual output, service, or technology). The core idea behind the knowledge creation metaphor is that participation in (social) activities benefits cognitive processes, and it strongly emphasises the aspect of collaboration around shared objects of activity (Paavola et al., 2004). It builds on the essential tenets of the three models of learning and innovation. The model of (a) knowledge building characterises human experts as constantly striving to advance beyond present knowledge, while (b) expansive learning is a continual striving to shift from ‘reactive forms of learning’ to qualitative changes in activity systems, and (c) Nonaka and Takeuchi’s model of active knowledge creation focuses on knowledge per se. The knowledge creation metaphor proposes that knowledge work and learning do not focus on the interaction between people but on specific objects of activity being systematically developed within these communities. In workplace learning, it has been examined and shown to concentrate on interaction through these common objects (e.g., concepts, artefacts, products, and practices) of activity, not just between people or between people and the environment (e.g., Børte & Nerland, 2010; Karlgren, 2012; Solevåg & Karlgren, 2016). In the educational context, empirical studies have examined the implementation of the model in higher and secondary education. Findings show specifically how collaborative processes involving knowledge creation require appropriate design and guidance, as students are learning how to collaborate and how to generate knowledge at the same time (Damşa, 2014; Damşa & Nerland, 2016; Damşa & Ludvigsen, 2016; Damşa & Muukkonen, 2020; Muukkonen et al., 2019; Lakkala et al., 2015; Spence, 2020).

The *knowledge building* model (Bereiter, 2002; Scardamalia & Bereiter, 2006) highlights learning through work with new ideas, which may model experts’ work and usually takes place as problem-solving. It emerged from observations showing work at the edge of one’s competence and seeking collective knowledge advancement beyond individual learning. The model criticises theories of learning wherein learning is viewed as an accumulation of information ready-made for the human mind—the mind being understood as a container or archive of knowledge (Bereiter, 2002). Instead, it proposes knowledge building, which is collective work for advancing ideas that could, in turn, become solutions to problems and lead to the development of conceptual artefacts (e.g., product plans, business strategies, marketing plans, theories, ideas, and models). In modern enterprises, knowledge is considered to consist of conceptual artefacts that can be systematically produced and developed

through collective discourse. For example, scientific research groups typically work with theories and models that may be understood as shared knowledge artefacts. The primary goal of members of an innovative community is not necessarily to learn something (i.e., to change or simply add to their own mental states) but to solve problems, originate new thoughts, and advance communal knowledge. Specifically, their goal is to create new knowledge. The model has been extensively applied to educational contexts, with the knowledge building principles being employed to support pupils' exploration of phenomena and elaboration of newly developed ideas. Examining experts' work (Russell, 2002) has shown how inter-professional medical teams innovate their practices by using portfolios, as a shared artefact, through ideation and high-level reflections on professional knowledge and practice.

Essential in the effort to understand knowledge creation is Engeström's model of *expansive learning* (Engeström, 2001, 2015). The model builds on principles of activity theory, according to which human beings live and act (e.g., learn or work) within a sociocultural context, and the notion that their behaviour cannot be understood independently of this context (Engeström, 2001; Paavola & Miettinen, 2019). Learning and work that is associated with it are viewed as an 'activity-producing activity', which can lead to new knowledge or new forms of activities (Engeström, 2001). Knowledge creation is addressed in the model in the form of *new practices* that emerge through achieving a collective zone of proximal development (Vygotsky, 1978) by adopting the most advanced practices within a community as a goal to be pursued. The model operationalises these expansive and knowledge creation processes through a cycle with seven stages in its ideal form. First, individual participants question and criticise certain existing practices, for example, management in an organisation (Haapasaari et al., 2016) or teachers' reflective practices in a school (Engeström, 2008). Then, they analyse the situation, as well as the historical causes and empirical relations of the activity system, followed by engaging in modelling a new solution to the problematic situation. Next, they examine the new model by experimenting to determine whether it works, its potentialities, and its limitation and then implement the new model to explore practical actions and applications. Finally, they reflect on and evaluate the process and then engage in consolidating the new practice in its new form, based on knowledge gained in the process. Through this expansive cycle, in which the participants focus on reconceptualising their own activity, the activity is transformed, and forms of practice are created. This model is useful in relation to interventions involving the renewal of work practices and allows identifying activities that have knowledge creation potential.

Finally, a review study by Du Chatenier et al. (2009) synthesises ideas brought forward by various models and studies. In the knowledge creation process, knowledge is viewed, for instance, as a commodity, a personal capability, or as something embedded in a (joint) action and context (Patriotta, 2003). In this synthesis, Du Chatenier departs from Nonaka and Takeuchi's (1995) organisational knowledge creation framework, which emphasises an epistemological distinction between two kinds of knowledge, *tacit* and *explicit*. Explicit knowledge is easy to articulate and express formally in clear terms, while tacit knowledge is 'personal knowledge embedded in individual experience' (Nonaka & Takeuchi, 1995, p. viii). Although

people may find it difficult to conceptualise and reflect on new phenomena or complex problems, they have a rich body of tacit knowledge that can support the development of new insights. This can facilitate knowledge creation through a process of knowledge conversion involving the socialisation, externalisation, synthesising, and internalisation thereof. Before scaling up to the organisational level, the creation of new knowledge involves passing through several ‘ontological’ levels, including individual and group, where tacit knowledge is teased out for collective benefit (Ahn & Hong, 2019; Nonaka & Toyama, 2015). The integrative model by Du Chatenier poses that these different views are partly related to the aggregation level at which the collaborative knowledge creation process is described, which can express itself in different ways. In *externalising and sharing*, professionals verbalise and share their (implicit) knowledge, information, and needs with other professionals, resulting in distributed knowledge. *Interpreting and analysing* involves professionals absorbing what they hear and interpret, and they analyse it by associating it with their own knowledge, resulting in different interpretations by different individuals, also referred to as decentralised knowledge. In *negotiating and revising*, professionals gather and order these different interpretations and build mutual understandings and meanings, and as a result, they sometimes need to revise their own way of thinking, resulting in shared knowledge. While *combining and creating*, professionals combine different knowledge bases and accumulate and create new ideas, resulting in co-created knowledge (e.g., an innovation goal, an action plan, new technologies, or ideas about how things can improve). Accordingly, knowledge is created in a process where two or more individuals switch between interactive stages and individual stages, resulting in different kinds of knowledge (i.e., knowledge exclusive to the individuals and knowledge common within the group).

These models of knowledge creation, knowledge building, and the expansive learning framework highlight processes and activities considered the core of the knowledge creation process. The models allow us to identify (a) activities that are seen as central to teams’ collaborative work, (b) principles for team productivity in epistemic terms, and (c) considerations for how teamwork involving knowledge creation can be shaped and enhanced.

12.3 Dimensions and Mechanisms of Knowledge Creation in Teams

In the following subsections, a micro-level elaboration of the mechanisms that constitute these processes is conducted by exploring three dimensions within which such processes are enacted: epistemic, interactional (or intersubjective), and objectual (i.e., related to the way created knowledge is materialised into knowledge products or objects for use or further exploration). These dimensions are generic and entail mechanisms that are identifiable and cut across the conceptual models discussed.

12.3.1 *Epistemic Dimension*

The notion of collaborative knowledge work has been foregrounded by research mainly within sociocultural and sociomaterial studies of work and learning, as well as studies of networked practice (e.g., Engeström, 2004; Fenwick & Nerland 2014; Knorr Cetina, 1999; Langemeyer et al., 2015). The common denominator in this research is the contextualisation of work and learning, with the context being epistemic, which means it is related to knowledge and cultural, social, or digital-material in nature. The epistemic cultures framework captures, to a large extent, the logic and arrangements through which knowledge comes into being or is circulated, approached, used, and applied in a particular domain/disciplinary field (Jensen, 2007; Nerland & Jensen, 2012). Such epistemic cultures encompass both the generic, common characteristics of how knowledge is produced and used in the society and the distinctive features for each knowledge domain or professional area. An epistemic culture is constituted by its distinct heuristic practices and knowledge relations, such as instruments and configurations of people, resources, and strategies. There is a mutually constituting relationship between these arrangements and mechanisms, as they work together to ‘make up how we know what we know’ (Knorr Cetina, 1999, Knorr Cetina & Reichmann, 2015). Knorr Cetina uncovers different ordering patterns and creation principles, which also incorporate different placements of the professional/learner, resting on communitarian mechanisms in the first case and individuation in the second.

From this perspective, professional practice and learning rests on a collective base of knowledge but will, at the same time, contribute to the development of this knowledge base through the ways knowledge is explored and performed, with teamwork being an instance thereof. Following this line of thought, professional knowledge cultures can be regarded as collective frameworks (cf. Nerland, 2008) that both express themselves in certain practices and are made possible through the ways in which knowledge is organised and (collectively) engaged by individuals or groups. Furthermore, knowledge is something ‘real’, materialised, objectified, and subjected to consensus. In the processes of materialisation and articulation, the principles of knowledge creation manifest themselves as ways of understanding and dealing with knowledge, enacted locally by individuals or groups. Knowledge processes in various contexts and constellations, such as teamwork, are thus mediated by artefacts and collective practices, tools and activities organised in time and space, and their linkages with structures of collective action and knowledge of the respective epistemic (domain) culture. For example, in teachers’ work, studies have indicated that a knowledge culture is expressed mostly through epistemic resources available in local communities, with the exception, perhaps, of general policy documents. The development of knowledge and practices happens in these small communities and is often based on face-to-face interaction and individual efforts; hence, they are not driven by generic, profession-specific artefacts (Grossman et al., 2009). This may be related to the nature of the problems teachers faced, which are often locally situated and require tailored solutions and practices. In this case, teachers often develop their own tools and knowledge/practice, which leads them into a process of knowledge re(creation), for which they may tap into larger pools of domain-specific knowledge.

12.3.2 *Objectual Dimension*

Knowledge work and learning are mediated by symbolic and material objects, currently dominated by data representations, records, and digital software. From a theoretical practice perspective, objects are carriers of knowledge and routines and ‘capture experiences, ideas, thoughts and goals’ (Markauskaite & Goodyear, 2016, p. 200), aiding the creation of new meaning-making. The different objects available in a given epistemic culture do not stand alone but, rather, form complex sets of connections that carry different opportunities for exploration, use, and re-creation (Ewenstein & Whyte, 2009; Sutherland et al., 2009).

Traditionally, a distinction has been made between the notions of object and artefact, with objects referring to the objective of activity and artefacts the tools mediating the achievement of these objectives (Ramduny-Ellis et al., 2005). Knowledge artefacts embody the type of activity they mediate, and perhaps, the most general include material artefacts (e.g., a pen), abstract or intangible artefacts (e.g., software or reports), and processes (e.g., manufacturing processes). Paavola and Hakkarainen (2005) emphasise Bereiter’s statement that in knowledge work, human activity focuses increasingly on conceptual artefacts rather than physical objects. Furthermore, artefacts play a seminal role in the advancement of knowledge, in which they have multiple values; they are instrumental (i.e., used to create other artefacts), historical (e.g., embody knowledge created in time), and can be the outcome of knowledge work (e.g., can be shared, articulated, and extended by shared efforts and by mobilising collective cognitive resources). Environments for knowledge work and learning can be potentially stimulating, as they comprise what is described as ‘tertiary artefacts’ (see Wartofsky, 1979), often described as a ‘kind of higher-order artefact’ (Sutherland et al., 2009, p. 41). Their nature is not one that primarily lends itself to direct and instrumental application in the context of productive activity; instead, they carry an imaginary potential that may or may not be realised. Sutherland et al. (2009) mention computer software, simulation programs, pedagogical designs, and scientific models as examples of tertiary artefacts.

One of the main aspects to draw upon is the open character of knowledge objects, which makes them more like processes and projections than definitive ‘things’ to be created, developed, and elaborated. These are ‘material entities or processes—physical structures, chemical reactions, biological functions—that constitute the objects of inquiry’ (Rheinberger, 1997, p. 28). Their defining features are this changing, unfolding character (Knorr Cetina, 2001) and their incomplete, continuously evolving nature. Miettinen and Virkkunen (2005) refer to epistemic or knowledge objects as rather open-ended projections oriented toward something that does not yet exist or something that is uncertain; they are, therefore, generators of new conceptions and solutions. Consequently, working with these objects is a continuous process of transforming an object from its current state into a required end state. The complexity of this construct lies in its dynamic position in relation to the interactional process, which can assign the object the role of an outcome of the co-construction, as well as that of a mediating tool or object of inquiry in the process. A key

characteristic present in various models describing innovativeness or knowledge creation appears to be that collaboration is organised around long-term efforts in developing shared objects of activity. According to Kaptelinin (2005), this builds on the fact that individuals' activities are focused on some type of object, such as writing a project report or developing a new product. Software developers' work is illustrative of the versatile nature of the knowledge object. Programmers, often working in a team on joining software development projects, use various programming resources and develop code. In the development stage, the code is their object of inquiry and focus. Once it is finalised and deployed, the software product is the knowledge object, while the code has gained an instrumental, mediating value, facilitating the knowledge creation process.

12.3.3 *Interactional Dimension*

Collaborative work on knowledge objects requires a particular level of intersubjectivity and productive interaction (Damsa, 2014). Within a sociocultural framework, Valsiner and Van der Veer (2000) proposed a bi-directional constructive model that is applicable to learning and knowledge development. In this model, the individual is in an active process of relating to the environment and other individuals. The individual receives and transforms information from/about the world into internalised personal knowledge, in the fashion in which Vygotsky (1978) described it. However, the process is not unidirectional. Once the individual constructs some form of personal knowledge, it becomes externalised in various forms—actions, artefacts, or language—and is then incorporated into communication with other individuals. Through this iterative, intersubjective process, knowledge is exchanged, adjusted, and elaborated.

A commonly agreed upon notion is that the (co-)creation process calls for conduct that renders possible the emergence of new ideas, insights, or knowledge. An aspect essential in this regard is the need for active involvement with the knowledge content. Holding a belief about knowledge and simply memorising given knowledge is a passive strategy or a lack of strategy. Active participation involves re-creating the meaning of this knowledge (Linell, 2009). An illustrative explanation is given by Bereiter (2002) in his elaboration of the belief and design modes of knowledge building, an approach that specifies deliberate activities for building knowledge in an interactive manner. In *belief mode*, learners attempt to understand given knowledge, and in *design mode*, a more participative and productive stance allows engaging with knowledge. Bereiter discusses productive knowledge, which learners use, question, and elaborate on, together with others, and is a stepping-stone toward new conceptualisations. Another aspect of importance is what Valsiner and Van der Veer (2000) call 'intellectual interdependence', which relies on intersubjectivity, traditionally conceived of as a collection of individual subjectivities. Matusov (2001) argues, however, that intersubjectivity cannot be viewed as a set of

overlapping subjectivities or understandings; instead, it is the coordination of contributions in joint activity and suggests three stages in the emergence of intersubjectivity. Searching for common background and mutual ‘mindreading’ is the first stage and involves coordinating with others on common goals and interests. The intermediate stage involves creating common ground for engagement, based on explicit communication among the participants. This involves shared understanding and prepares for the final stage, joint activity/knowledge construction. Common ground and shared states drive joint action toward an outcome (i.e., the knowledge object), as per the previous dimension. Collaborative knowledge creation is, thus, realised through interaction and mediation, among which communication with others is most important. Individuals monitor each other’s orientation and actions, modify their own intentions and act in accordance. In other words, this type of interactional achievement is realised in productive moment-to-moment interaction, in which a certain degree of intersubjectivity is required (an empirical illustration is provided in the following section).

12.4 Empirical Illustration of Knowledge Creation in Teams

In this section, an empirical case presented in the form of an extended vignette (Barter & Reynold, 2000) is used to illustrate the abovementioned mechanisms and dimensions of knowledge creation. The illustration is grounded in empirical work conducted in a research study on pedagogical innovation at a department for teacher education in a large Scandinavian university. This is a case study (Yin, 2013), selected due to its potential to display aspects of knowledge creation in academic teacher teams engaging in innovating their course designs and teaching practices. In addition to providing an empirical illustration of the phenomenon of interest, the case analysis also lays out an analytical approach to collaborative work where the analysis of a complex, rich, and varied dataset is of great importance.

12.4.1 The Empirical Case: Curriculum Innovation in Teacher Education

12.4.1.1 The Context and Participants

The study examined an orchestrated effort by a group of academic teachers to renew the curriculum in a teacher education programme. As an emphasis has been placed, in recent years, on generating ways to activate students and design more engaging learning activities, this programme has systematically engaged in a comprehensive renewal of its curriculum, forms of teaching, and learning activities and materials. The curriculum was intended for part-time students in the programme, characterised as having far less time for studying and the additional challenge of having an

overly practice-driven approach to their learning of pedagogy and discipline didactics. Subject to renewal, in this case, was a compulsory course in pedagogy, taught through a flipped-classroom model, comprising online modules in the assigned learning management system (LMS) Canvas and face-to-face seminars. The LMS supports communication, the sharing of materials, assignment submission, and other online activities as part of a flipped-classroom teaching model.

The participants were seven teachers in the part-time programme who were all female and ranged in age from 26 to 60 years old, with teaching experience at the university level ranging from one semester to 20 years. All participants had a background in pedagogical studies or discipline didactics; five of them held academic positions, while two held teaching-only appointments.

12.4.1.2 Collaborative Curriculum Innovation Project

Under the guidance of the programme leader, meetings were organised at regular intervals of 2 months over the course of an academic year, with the exception of summer and winter breaks. The meetings lasted 4 h each and were aimed at (a) identifying problems associated with student engagement, (b) devising solutions (i.e., activities and materials) to address these problems, (c) integrating these solutions into a flipped classroom model that constituted the new curriculum, and (d) evaluating the implementation of the new curriculum in each subsequent meeting. Prior to each meeting, a set of materials (i.e., slides, notes, a readings list, and reflections) were prepared by assigned members or the team leader; the division of labour was usually agreed upon at the end of the previous meeting. The team assembled in a meeting room with a large table, projector, and screen. The course space on the Canvas LMS was projected onto the screen, along with the team's repository and work platform space (Dropbox) and documents under analysis or development during the meeting time. The team members brought portable computers, syllabus materials, and other relevant materials to each meeting. The designed curriculum was gradually implemented, based on each meeting's output. After each session, each teacher provided a reflection on her own teaching and the value of the designed curriculum for the respective session.

12.4.2 Data and Analytical Framework

This vignette was created based on a larger corpus of data that included *observations* of team meetings (through audio recordings and field notes), collected *team products* (i.e., course materials and notes), *reflections* on teaching sessions, and *interviews* with the six participating teachers. The audio recordings were transcribed verbatim and anonymised. The vignette is presented as a selection of excerpts from different data types, informing an illustrative sequence of a team that constitutes a form of knowledge construction. The *selection of data* from the corpus was


performed by identifying relevant episodes of interaction, corresponding to relatively bounded sequences of speech or encounters in group discussions (Linell, 2009). The episodes indicate the general thematic orientation of the discussion following a set of topics drawn based on the dimensions identified in this study (see below). Next, data from the reflections and interview were labelled according to these orienting themes.

The analysis included two levels. The *first level of analysis* involved generating a descriptive account of the content of the selected data to generate a clear understanding of teachers' utterances or output (see the 'descriptive account' column in the illustrative vignette below). This analysis yielded information about explicit dialogue on pedagogical design topics linked to new knowledge, concrete actions towards developing shared artefacts, and explicit reflections by team members on knowledge creation actions. In the *second level of analysis*, the descriptive account served as a stepping stone for interpretations made possible by the thematic dimensions. For the interpretation, a hybrid approach (Swain, 2018) to thematic analysis (cf. Braun & Clarke, 2006) was conducted to identify aspects of the team's collaboration and processes of knowledge creation. The analytical framework used for interpretation builds on notions elaborated in this chapter, which highlight essential mechanisms and dimensions of the knowledge co-construction process: interaction, object-orientedness, and embeddedness in epistemic cultures of the profession. It also highlights the local and dynamic nature of knowledge work in a team, where problems and solutions are identified and developed through a combination of group interaction, resourcefulness, and active participation in activities by group members.

An interpretative framework of actions in knowledge creation processes, developed in a previous study (Damşa, 2014), was applied to the data. While the framework entails three sets of actions (i.e., epistemic, regulative, and relational), only the epistemic actions were interpreted in this case, as they were deemed core to the process. These actions are considered to reflect the gradual involvement of the group with knowledge, beginning with identifying the problem, followed by brainstorming ideas and, finally, transforming these ideas into knowledge object drafts and other outputs.

12.4.2.1 Illustrative Vignette – Analysis and Findings

The tabular presentation is intended to provide an overview of the types of data from the team's work, each contributing to understanding the members' knowledge creation process. The first column displays data: an image of the physical setup, an excerpt from a team dialogue during the meeting, immediate reflection on the activity, an excerpt from an individual interview (based on the author's translation), and a description of the knowledge objects the team worked on during the selected meeting. The second column presents a descriptive account (first-level analysis) of the data displayed; a brief interpretation (second-level analysis) follows the descriptive account of each data type.

<p>Data excerpts</p>	<p><i>Collaborative settings</i></p> 
<p>Descriptive, analytical account of the data</p>	<p>In this image, we observe the physical and digital setup of the room and resources the teacher team mobilised and capitalised on during the meeting. The screen is in the back of the image, with the LMS constantly open. The digital platform for the team's work (Dropbox) is also open, displaying the following: (a) an open Word document under development, which is an assignment that helps students prepare for the seminar (as part of flipped-classroom activities); b) a PowerPoint file to be used in the seminar, where the named assignment is identified and discussed. Each team member has brought various intellectual resources/tools (e.g., books, compendia, and a laptop), which are placed on the table, available for use by all team members. Analogue tools (e.g., pens, notebooks, and a whiteboard) are also available and in use</p>

The depiction of the collaborative settings indicates a physical setup that allows the team to sit together, face-to-face, at a large table providing adequate space for them to display their physical/analogue, digital, and intellectual tools and resources. The books and various documents in digital format are carriers of domain knowledge, which is actively mobilised during the team’s work; therefore, they function as instrumental objects. The digital tools have the same function, enabling the display and elaboration of knowledge content simultaneously with the group’s dialogical knowledge creation (see next data excerpt). Both the LMS and the team’s shared workspace on Dropbox are arenas for sharing resources, as well as materialising and making visible the gradual elaboration of the created knowledge.

Dialogue excerpt – third team meeting

TM 5: The biggest problem [with past semester’s design] was that students didn’t link to the literature, and exercises designed to support their understanding of theoretical concepts were not engaging
TM 1: Is there a possible solution to combine addressing these two challenges? [...]
TM 2: Well, we can reason through the steps we need to build up the exercises. Differentiation in teaching can be realised through... signposts for definitions, criteria, and examples
TM 5: My examples are from ethics and foreign language learning. These are the ones (explains the examples for differentiated assignments)
TM 1: And guiding them in using sections of the theoretical texts? To combine their seminar preparation with what is done in the lectures. So, which texts are most explicit on these concepts?
TM 2: [names two article titles]
TM 1: Right. We are mostly concerned with their understanding of theoretical notions, as well as in relation to teaching practice. So, the consolidation moment should contain a reflection question that addresses both

This dialogue episode is extracted from the team’s third meeting and discussion in their second semester of activity. The goals of the 3.5-h meeting were to assess existing teaching material and develop/redesign material for the flipped-classroom component and the face-to-face seminar on the topic ‘Differentiation and adaptive learning’. Materials developed in the previous academic year were available to the team, along with the previously chosen set of syllabus articles
 In this discussion excerpt, we observe the team engaging in an explorative but targeted and, eventually, productive dialogical exchange about how to teach the notion of ‘differentiation’ (i.e., teaching that should address students’ varied learning needs)

Interactional mechanisms for knowledge creation are identifiable in this short dialogue excerpt, as well as mobilising knowledge domain resources (instrumental objects) and setting the course for the creation of new knowledge and a new object (the assignment for consolidation purposes). The team engages in *problem identification and explication*—students not understanding theoretical concepts (TM5), proposing solutions and ways of implementing them (TM2), *information sharing and analysing* – examples and relevant articles (TM5/TM2), and verbally

combining and elaborating on how the proposed solution can be embedded in the seminar design (TM1). The problem is reiterated, reframed, and grounded in the group's understanding. An alternative knowledge solution is proposed and further elaborated on jointly in the knowledge objects identified in the following excerpt.

<p><u>Shared objects description</u></p> <p>(1) PowerPoint slides containing a series of figures connecting concepts of differentiation and adaptation and the reflection question to be discussed at the end of the seminar</p> <p>(2) A pre-seminar assignment, requiring students to identify a teaching experience in which differentiation was of relevance, read two articles, and work through a set of step-wise exercises indicating examples and explanations thereof, as well as the corresponding concepts in the two articles</p>	<p>During the team meeting, some of the members started developing the knowledge content for the seminar and the assignment text on the adaptive learning topic. The content was gradually developed and added during the discussion and was eventually finalised by team members by following assigned tasks after the meeting</p>
<p><u>Reflection on the use of created knowledge objects</u></p> <p><i>'The formulation of the assignment providing both stepping stones for helping to understand the concepts 'differentiation' and 'adaptation' work well. I did have to work a little to facilitate the reflection in the consolidation moment, as the links to the examples seemed to be too loose'</i></p>	<p>A team member reflects on how the design feature developed subsequent to the conversation shown above served its purpose in the teaching-learning activity. The emphasis in the reflection is on how the new features built into the artefact functioned, and what may require further adjustments or improvement</p>

The two knowledge objects integrate and materialise the knowledge and pedagogical solutions put forward by team members. Concrete ideas expressed in the team discussion are clearly identifiable in these objects. During the discussion, these ideas were negotiated, redefined, elaborated on, and revised before being 'frozen' into the final form and used for seminar teaching. The seminar resources (e.g., examples and, research articles) and the type of activities in these final objects follow ideas generated during the team's discussion. The objects represent the materialisation of interactional actions and epistemic content that feed into the team's knowledge creation process and output. An important aspect of the objects and the knowledge they contain and convey is their value and the way they are put to use. In the reflection immediately after the seminar, one team members explained how the developed assignment mediated teaching and supported them in achieving the goals envisioned together with the team. The reflection also indicates the open nature of the assignment, as the use triggered a need for adjustment to better address the problem for which it was created. This indicates knowledge creation at several levels of object development, enactment during use, and further elaboration due to new insights.

<p><i>Interview with team member TM2</i></p> <p><i>‘I think an advantage of working in a team, and in this team specifically, was [...] a good distribution of knowledge. I could contribute to learning theories and assessments. TM1 knows about youth culture, while TM5 works with ICT in education, and you can ask “What does it mean, and what does this look like in a classroom?”. They would share their knowledge, so we just start building together [...] Then, in terms of objects, obviously, PowerPoint is very important because the concrete product guides us, each slide providing ways of organising our ideas and discussions about knowledge relevant to each seminar, the sequencing of activities. I think that structured how we worked, probably for good and bad, but it gave a very explicit focal point. [...] And the learning outcomes were important because they raised discussions about what knowledge we are supposed to develop that we didn’t have before’</i></p>	<p>This excerpt is extracted from an individual interview with team member TM2. Team members were asked to reflect on their collaborative work and on the role of the knowledge artefacts they worked on. TM2 reflects on her own perspective on the value of teamwork and shared knowledge objects the team created during the meetings</p>
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Finally, team members’ overall reflections on the team and knowledge work they engaged in makes a case for the way knowledge creation processes capitalise on epistemic, interactional, and objectual mechanisms and dimensions. The interview excerpt highlights the advantage of knowledge and resources distributed within the group, which anchored the knowledge work in a rich pool of domain-specific resources. These resources, needed for the creative process, were teased out, analysed, externalised, selected, combined, and elaborated on through dialogue and productive interaction, which the team engaged in deliberately. In this way, meaning was made collectively of both existing and emerging knowledge. Meaning-making is an activity that promotes individual enlightenment and facilitates the process of knowledge creation. The knowledge objects developed are viewed as ways to ‘freeze’ the knowledge created by the team. However, they also help to synthesise the produced knowledge and are a means to keep the collaborative process focused on the goals and needed outcomes.

12.5 Bridging Models and Dimensions in Enacted Knowledge Creation in Teams

This chapter presented an overview of models, dimensions and enactment of knowledge creation in teams. It aimed at clarifying conceptualizations and mechanism of the process through which professionals work together to generate knowledge and to illustrate these empirically through a case of a teacher team working on curriculum innovation. While the process is labelled according to different notions (e.g.,

knowledge creation, expansive learning, or knowledge building), the models outline common features that distinguish mechanisms through which new knowledge and knowledge practices emerge. A vignette consisting of combined categories of qualitative data, and a brief analysis thereof, shed light on an episode of the teachers' knowledge creation work, and their reflections of how the knowledge created was employed for teaching. While the selected data excerpts represent only a brief snapshot of the team's activity, it allows us to identify and understand the way the collaborative knowledge creation process emerges, is pursued and experienced. The dimensions used to characterize this process, namely, epistemic, interactional and objectual, span elements of action, interaction, resources, and outcomes being created or being instrumental in the process. Teamwork and team learning are constituted through combinations of such processes, dimensions and mechanisms, which materialise into new knowledge or novel practices for individual and collective benefits.

Dialogical interaction during the team's meetings and the interview excerpts reveals not only elements of the *interactional* dimension, as highlighted by socio-cultural scholars (Valsiner & van der Veer, 2000), but also the synthesis by Du Chatenier and colleagues, which identifies, e.g., externalising, sharing, and negotiating as typical activities in knowledge creation teams. The data discussed provide explicit evidence of the team members sharing identified problems and ideas for solutions (group discussions) and their more generic knowledge and expertise in the teacher education field (interviews). Based on the interviewed team member's reflections, we can clearly qualify the nature of this intersubjective practice as deliberate, with team members being fully aware of and seeking the exchange of knowledge. In this regard, the framework features of knowledge co-construction identified by Damşa (2014) are also illustrated here, through collaborative actions surrounding the identification of the problem in the previous seminar, teasing out possible ideas from the team members, framing and drafting a solution together, followed by implementing it and reflecting upon its functionality.

The *epistemic* dimension and associated processes are undoubtedly represented, through embeddedness in the knowledge culture of the teacher education domain (cf. Knorr Cetina, 1999; Jensen et al., 2012) and the enactment of knowledge construction at the local level (Nerland, 2008; Damşa & Ludvigsen, 2016; Nerland & Damşa, 2019). One element of this dimension is clearly referenced, in both the discussion and the interview excerpts, of the knowledge domain of teacher education and learning sciences in which the team is operating. This aligns with the idea that knowledge work by the team, that is, creating new teaching and learning designs for students, builds on theoretical and practical knowledge from these knowledge domains, practices and cultures. Resources are concretely identified through readings proposed for the syllabus or the connection made to conventions for team teaching and reflection practices in the teaching domain. The local enactment is through the team's knowledge creation work, resulting in a new curriculum structure for seminars or the formulation of assignments, as well as through the implementation of newly developed ideas materialised in various knowledge, and the reflections on the use of the created knowledge in the teaching practice.

Finally, the *objectual* dimension is most prominent in this team's collaborative enactment of knowledge creation. The way knowledge objects and artefacts are materialised is aligned with conceptualisations outlined by activity theoretical, sociocultural and sociomaterial ideas. The shared knowledge objects are unifying the collaborative work, and are achieved through dialogue around problems and solutions (Lakkala et al., 2015). As specified in the interview, the team has focused the knowledge creation process on various knowledge objects, which, in turn, guide the subsequent dialogical and co-constructions process. Although limited in range, the data snapshot provides insight into how dialogical actions, such as problem identification and negotiation, knowledge sharing, negotiation, and problematisation (cf. Damşa, 2014), contribute to the eventual creation of these knowledge objects. The purposeful way these artefacts give direction to and materialise the team's work provide clear evidence of how knowledge co-construction is shaped by and into these objects. Being concrete and central to the process makes it possible for the team to return and reflect on their value, and the way they serve the purpose for which they were developed (see Engeström, 1999, 2008).

The conceptual models and the dimensions entailing mechanism of knowledge creation have proven to be valuable lenses for interpreting and understanding the variegated nature of the knowledge creation process taking place in teams. The models have differing emphases in relation to knowledge work. The knowledge building model (Bereiter, 2002) highlights the ideas proposed by individual team members and which can be further worked on through collective efforts. The knowledge creation metaphor (Paavola et al., 2004) indicates as salient the joint activities that lead to new knowledge and how that is materialized in knowledge objects, which, in turn, are important for the collaboration. The expansive learning model (Engeström, 2015) emphasizes knowledge creation as innovation of practices, which emerges from collective work with addressing problems and generating solutions. Finally, the integrative model by Du Chatenier et al. (2009) systematize activities that span across the stage of the process, with an underlying purpose of making implicit knowledge explicit. But each of these models helps understand better the knowledge creation process, conceptually and at empirical level, by depicting it from different angles. The knowledge creation processes identified in the empirical case relate to various levels of knowledge aggregation, from the synthesis of existing knowledge to the creation of new knowledge, as outlined by Du Chatenier and colleagues (2010). The way knowledge is created in a dialogical manner, not necessarily constrained by conventional knowledge, aligns with the principles of knowledge creation outlined by Paavola et al., 2004, Paavola & Hakkarainen, 2005 and Du Chatenier et al., 2010. Building on each other's ideas to create solutions and to improve teaching is in line with the knowledge-building principles, while the object-orientation value for the potential transformation of teachers' knowledge practices is accounted for by Engeström's expansive learning model.

At the same time, the three dimensions cut across these models and allow us to identify and understand epistemic, interaction and object-related mechanism of knowledge creation that operate in an orchestrated way at different stages in the process. Such features are instrumental both in terms of examining collaborative

knowledge processes and in establishing the position of such processes in the greater context of professional knowledge practice and learning.

The knowledge created and the named transformations of practices have potential value and impact on the context in which they emerge in different ways and at different levels. At the organisational level, advanced practices and developed knowledge objects create opportunities for practice sharing and improvement beyond the team boundaries. At the level of the team, knowledge creation generates fuel for new activities in new ways, with teachers learning both from the knowledge creation process, through producing and implementing the knowledge objects and through reflecting on their use and the team's process. At the individual level, the processes and outcomes of this knowledge creation effort lead to the activation of possessed knowledge in a shared environment and the advancement of individual knowledge and practice, unattainable through individual efforts. Understanding the mechanisms of how teams create knowledge and engage in productive interaction makes possible the application of knowledge creation principles and guiding structures to support a knowledge-based practice. Guiding teams to engage in productive dialogue, learn to identify and share relevant knowledge sources and creative practices or create shared and open platforms (digital or otherwise) that foster and host interaction and joint work on knowledge objects are part of the recommendations. For organisations and leaders, recognising the need to create conditions for teams to engage in such creative practices, ensuring both means and conditions, and the recognition of knowledge creation work as valuable are necessary considerations.

Further empirical studies are, however, still needed to advance relevant lines of research, of which the most important are examining the following: (a) micro-level mechanisms of the knowledge creation process, its emergence, and its characteristics in various disciplinary contexts, (b) the relationship with wider knowledge cultures, domain knowledge and practices, and how knowledge creation at the team level is fostered or hindered in this context, and (c) the way knowledge creation in teams can be fostered and employed to generate development and innovation at the organisational level.

References

- Ahn, J., & Hong, A. H. (2019). Transforming I into we in organizational knowledge creation: A case study. *Human Research Development Quarterly*, 30(4), 565–582. <https://doi.org/10.1002/hrdq.21371>
- Barter, C., & Reynold, E. (2000). 'I wanna tell you a story': Exploring the application of vignettes in qualitative research with children and young people. *International Journal of Social Research Methodology*, 3(4), 307–323.
- Bereiter, C. (2002). *Education and mind in the knowledge age*. Erlbaum.
- Børte, K., & Nerland, M. (2010). Software effort estimation as collective accomplishment. An analysis of estimation practice in a multi-specialist team. *Scandinavian Journal of Information Systems*, 22(2), 65–98.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>

- Bronstein, L. L. (2003). A model for interdisciplinary collaboration. *Social Work, 48*(3), 297–306.
- Chiocchio, F., & Hobbs, B. (2015). *The psychology and management of project teams: An interdisciplinary perspective*. Oxford University Press.
- Cooke, N., Gorman, J. C., Myers, J. C., & Duran, J. (2013). Interactive team cognition. *Cognitive Science, 37*, 255–285. <https://doi.org/10.1111/cogs.12009>
- Crocker, A., Trede, F., & Higgs, J. (2012). Collaboration: What is it like? – Phenomenological interpretation of the experience of collaborating within rehabilitation teams. *Journal of Interprofessional Care, 26*(1), 13–20.
- Damşa, C. I. (2014). The multi-layered nature of small-group learning: Productive interactions in object-oriented collaboration. *International Journal of Computer-Supported Collaborative Learning, 9*(3), 247–281. <https://doi.org/10.1007/s11412-014-9193-8>
- Damşa, C. I., & Ludvigsen, S. R. (2016). Learning through interaction and co-construction of knowledge objects in teacher education. *Learning, Culture and Social Interaction, 11*, 1–18. <https://doi.org/10.1016/j.lcsi.2016.03.001>
- Damşa, C., & Muukkonen, H. (2020). Conceptualising pedagogical designs for learning through object-oriented collaboration in higher education. *Research Papers in Education, 35*(1), 82–104. <https://doi.org/10.1080/02671522.2019.1677751>
- Damşa, C. I., & Nerland, M. (2016). Student learning through participation in inquiry activities. Two cases from teaching and computer engineering education. *Vocations and Learning, 9*, 275–294. <https://doi.org/10.1007/s12186-016-9152-9>
- Du Chatenier, E., Verstegen, J. A. A. M., Biemans, H. J. A., Mulder, M., & Omta, O. (2009). The challenges of collaborative knowledge creation in open innovation teams. *Human Resource Development Review, 8*(3), 350–381. <https://doi.org/10.1177/1534484309338265>
- Du Chatenier, E., Verstegen, J. A. A. M., Biemans, H. J. A., Mulder, M., & Omta, O. (2010). Identification of competencies for professionals in open innovation teams. *R&D Management, 40*(3), 271–280. <https://doi.org/10.1111/j.1467-9310.2010.00590.x>
- Edmondson, A. C., & Harvey, J. F. (2018). Cross-boundary teaming for innovation: Integrating research on teams and knowledge in organizations. *Human Resource Management Review, 28*(4), 347–360. <https://doi.org/10.1016/j.hrmr.2017.03.002>
- Engeström, Y. (1999). Activity theory and individual and social transformation. In Y. Engeström, R. Miettinen, & R. L. Punamäki (Eds.), *Perspectives on activity theory* (pp. 19–38). Cambridge University Press. <https://doi.org/10.1017/CBO9780511812774.003>
- Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of Education and Work, 14*(1), 133–156. <https://doi.org/10.1080/13639080020028747>
- Engeström, Y. (2004). New forms of learning in co-configuration work. *Journal of Workplace Learning, 16*(1/2), 11–21. <https://doi.org/10.1108/13665620410521477>
- Engeström, Y. (2008). From teams to knots: *Activity-theoretical studies of collaboration and learning at work*. Cambridge University Press.
- Engeström, Y. (2015). *Learning by expanding: An activity-theoretical approach to developmental research*. Cambridge University Press.
- Ewenstein, B., & Whyte, J. (2009). Knowledge practices in design: The role of visual representations as ‘epistemic objects’. *Organization Studies, 30*(1), 7–30. <https://doi.org/10.1177/0170840608083014>
- Farrell, R., & Hooker, C. (2013). Design, science and wicked problems. *Design Studies, 34*(6), 681–705. <https://doi.org/10.1016/j.destud.2013.05.001>
- Fenwick, T., & Nerland, M. (Eds.). (2014). *Reconceptualising professional learning: Sociomaterial knowledges, practices and responsibilities*. Routledge.
- Froehlich, D. E., Segers, M., Beusaert, S. et al. (2019). On the relation between task-variety, social informal learning, and employability. *Vocations and Learning, 12*, 113–127. <https://doi.org/10.1007/s12186-018-9212-4>
- Greer, L. (2012). Group cohesion: Then and now. *Small Group Research, 43*(6), 655–661. <https://doi.org/10.1177/1046496412461532>

- Grossman, P., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching: Theory and Practice*, 15(2), 273–289.
- Haapasaari, A., Engeström, Y., & Kerosuo, H. (2016). The emergence of learners' transformative agency in a change laboratory intervention. *Journal of Education and Work*, 29(2), 232–262. <https://doi.org/10.1080/13639080.2014.900168>
- Halvorsen, K. (2013). Team decision making in the workplace: A systematic review of discourse analytic studies. *Journal of Applied Linguistics and Professional Practice*, 7(3), 273–296. <https://doi.org/10.1558/japl.v7i3.273>
- Hu, L., & Randel, A. E. (2014). Knowledge sharing in teams: Social capital, extrinsic incentives, and team innovation. *Group & Organization Management*, 39(2), 213–243. <https://doi.org/10.1177/1059601114520969>
- Jensen, K. (2007). The desire to learn: An analysis of knowledge-seeking practices among professionals. *Oxford Review of Education*, 33(4), 489–503. <https://doi.org/10.1080/03054980701476055>
- Jensen, K., Lahn, Leif, C., & Nerland, M. (2012). Professional learning in new knowledge landscapes: A cultural perspective. In K. Jensen, L. C. Lahn, & M. Nerland (Eds.), *Professional learning in the knowledge society*. BrillSense.
- Jordan M.E, Kleinsasser, R.C. & Roe, M.F. (2014). Wicked problems: Inescapable wicked-ity. *Journal of Education for Teaching*, 40(4), 415–430. <https://doi.org/10.1080/02607476.2014.929381>
- Kapteinlin, V. (2005). The object of activity: Making sense of the sense-maker. *Mind, Culture and Activity*, 12(1), 4–18. https://doi.org/10.1207/s15327884mca1201_2
- Karlgren, K. (2012). Triological design principles as inspiration for designing knowledge practices for medical simulation training. In A. Moen, A. I. Mørch, & S. Paavola (Eds.), *Collaborative knowledge creation: Practices, tools, and concepts* (pp. 163–184). Sense.
- Knorr Cetina, K. (1999). *Epistemic cultures: How the sciences make knowledge*. Harvard University Press.
- Knorr Cetina, K. (2001). Objectual practice. In T. R. Schatzki, K. Knorr Cetina, & E. Von Savigny (Eds.), *The practice turn in contemporary theory* (pp. 184–197). Routledge.
- Knorr Cetina, K., & Reichmann, W. (2015). Professional epistemic cultures. In I. Langemeyer, M. Fischer, & M. Pfadenhauer (Eds.), *Epistemic and learning cultures* [Woher und wohin sich Universitäten entwickeln] (pp. 18–33). Juventa Verlag.
- Kozlowski, S. W. J., & Ilgen, D. R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest*, 7(3), 77–124. <https://doi.org/10.1111/j.1529-1006.2006.00030.x>
- Kvarnström, S., Jangland, E., & Dahlgren, M. A. (2018). Introducing the nurse practitioner into the surgical ward: An ethnographic study of interprofessional teamwork practice. *Scandinavian Journal of Caring Sciences*, 32(2), 765–771. <https://doi.org/10.1111/scs.12507>
- Lakkala, M., Toom, A., Ilomäki, L., & Muukkonen, H. (2015). Redesigning university courses to support collaborative knowledge creation practices. *Australasian Journal of Educational Technology*, 31(5). <https://doi.org/10.14742/ajet.2526>
- Langemeyer, I., Fischer, M., & Pfadenhauer, M. (2015). *Epistemic and learning cultures* [Woher und wohin sich Universitäten entwickeln]. Juventa Verlag.
- Linell, P. (2009). *Rethinking language, mind and world dialogically: Interactional and contextual theories of human sense-making*. Information Age.
- Markauskaite, L., & Goodyear, P. (2016). *Epistemic fluency and professional education: Innovation, knowledgeable action and actionable knowledge*. Springer.
- Matusov, E. (2001). Intersubjectivity without agreement. *Mind, Culture, and Activity*, 3(1), 25–45.
- McMurtry, A., Rohse, S., & Kilgour, K. N. (2016). Socio-material perspectives on interprofessional team. *Medical Science*, 50(2), 169–180. <https://doi.org/10.1111/medu.12833>
- Mesmer-Magnus, J., Niler, A., Plummer, G., Larson, L., & DeChurch, L. (2017). The cognitive underpinnings of effective teamwork: A continuation. *Career Development International*, 22(5), 507–519. <https://doi.org/10.1108/CDI-08-2017-0140>

- Meyer, E., & Lees, A. (2013). Learning to collaborate: An application of activity theory to interprofessional learning across children's services. *Social Work Education, 32*(5), 662–684. <https://doi.org/10.1080/02615479.2012.704012>
- Miettinen, R., & Virkkunen, J. (2005). Epistemic objects, artifacts and organizational change. *Organization, 12*(3), 437–456. <https://doi.org/10.1177/1350508405051279>
- Muukkonen, H., Lakkala, M., Lahti-Nuutila, P., Ilomäki, L., Karlgren, K., & Toom, A. (2019). Assessing the development of collaborative knowledge work competence: Scales for higher education course contexts. *Scandinavian Journal of Educational Research*. <https://doi.org/10.1080/00313831.2019.1647284>
- Nerland, M. (2008). Knowledge cultures and the shaping of work-based learning: The case of computer engineering. *Vocations and Learning, 1*, 49–69. <https://doi.org/10.1007/s12186-007-9002-x>
- Nerland, M., & Damsa, C. I. (2019). VET as lifelong learning: Engagement with distributed knowledge in software engineering. In D. Guile & L. Unwin (Eds.), *The Wiley handbook of vocational education and training* (pp. 395–414). Wiley-Blackwell.
- Nerland, M., & Jensen, K. (2012). Epistemic practices and object relations in professional work. *Journal of Education and Work, 25*(1), 101–120.
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford University Press.
- Nonaka, I., & Toyama, R. (2015). The knowledge-creating theory revisited: Knowledge creation as a synthesizing process. In J. S. Edwards (Ed.), *The essentials of knowledge management: OR essentials series* (pp. 95–110). Palgrave Macmillan.
- O'Neill, T. A., & Salas, E. (2018). Creating high performance teamwork in organizations. *Human Resource Management Review, 28*(4), 325–331. <https://doi.org/10.1016/j.hrmr.2017.09.001>
- Paavola, S., & Hakkarainen, K. (2005). The knowledge creation metaphor—An emergent epistemological approach to learning. *Science & Education, 14*, 535–557. <https://doi.org/10.1007/s11191-004-5157-0>
- Paavola, S., & Miettinen, R. (2019). Dynamics of design collaboration: BIM models as intermediary digital objects. *Computer Supported Cooperative Work, 28*, 1–2. <https://doi.org/10.1007/s10606-018-9306-4>
- Paavola, S., Lipponen, L., & Hakkarainen, K. (2004). Models of innovative knowledge communities and three metaphors of learning. *Review of Educational Research, 74*(4), 557–576.
- Patriotta, G. (2003). *Organizational knowledge in the making: How firms create, use and institutionalize knowledge*. Oxford University Press.
- Ramdueny-Ellis, D., Dix, A., Rayson, P., Onditi, V., Sommerville, I., & Ransom, J. (2005). Artefacts as designed, artefacts as used: Resources for uncovering activity dynamics. *Cognition, Technology, and Work, 7*, 76–87. <https://doi.org/10.1007/s10111-005-0179-1>
- Rheinberger, H.-J. (1997). *Towards history of epistemic things: Synthesizing proteins in the test tube*. Stanford University Press.
- Rico, R., Hinsz, V., Davison, R. B., & Salas, E. (2018). Structural influences upon coordination and performance in multiteam systems. *Human Resource Management Review, 28*(4), 332–346. <https://doi.org/10.1016/j.hrmr.2017.02.001>
- Russell, A. (2002). *The role of epistemic agency and knowledge building discourse to foster interprofessional practice in a Canadian hospital*. Paper presented at AERA conference, New Orleans. Retrieved November 19, 2004, from <http://ikit.org/fulltext/2002AERAAnn.pdf>
- Salas, E., & Fiore, S. M. (2004). *Team cognition: Understanding the factors that drive process and performance*. American Psychological Association.
- Salas, E., Reyes, D. L., & Woods, A. L. (2017). The assessment of team performance: Observations and needs. In A. A. von Davier, M. Zhu, & P. C. Kyllonen (Eds.), *Innovative assessment of collaboration* (pp. 21–36). Springer.
- Scardamalia, M., & Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In R. K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 97–118). Cambridge University Press.

- Solevåg, A., & Karlgren, K. (2016). Competences for enhancing interprofessional collaboration in a paediatrics setting: Enabling and hindering factors. *Journal of Interprofessional Care*, 30(1), 129–131. <https://doi.org/10.3109/13561820.2015.1066319>
- Spence, N. (2020). *Designing for epistemic agency: How university student groups create knowledge and what helps them do it* [Unpublished doctoral dissertation]. University of Sydney. Retrieved May 16 2020, from http://scholar.google.com/scholar_url?url=https://ses.library.usyd.edu.au/spence_na_thesis.pdf
- Sutherland, R., Lindström, B., & Lahn, L. C. (2009). Sociocultural perspectives on technology-enhanced learning. In N. Balacheff, S. Ludvigsen, T. de Jong, A. Lazonder, & S. Barnes (Eds.), *Technology-enhanced learning: Principles and products* (pp. 39–54). Springer.
- Swain, J. (2018). A hybrid approach to thematic analysis in qualitative research: Using a practical example. In *Sage research methods cases in sociology*. Sage. <https://doi.org/10.4135/9781526435477>
- Valsiner, J., & Van der Veer, R. (2000). *The social mind: Development of the idea*. Cambridge University Press.
- Van den Bossche, P., Gijsselaers, W. H., Segers, M., & Kirschner, P. A. (2006). Social and cognitive factors driving teamwork in collaborative learning environments: Team learning beliefs and behaviors. *Small Group Research*, 37(5), 490–521.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Wartofsky, M. (1979). *Models: Representation and scientific understanding*. Reidel.
- Yin, R. K. (2013). *Case study research, design and methods* (4rd ed.). Sage.

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Chapter 13

Advancing Research on Team Learning by Taking into Account Complexity, Dynamics and Context



Regina H. Mulder

Abstract Work teams are crucial entities in all kinds of organizations for their contribution to the delivery and quality of products and services. Because of changes in society, such as demands of clients and digitization, work teams need to always further develop. Team learning is essential for the quality of performance, and the development of organizations.

The amount of research on team learning at work has increased in the past years, but it does not provide consistent research outcomes. Nor does it give a complete, holistic picture of all relevant aspects of team learning, the outcomes and the antecedents.

This contribution provides insight into what is needed in future team learning research in order to enhance understanding of its processes and be able to sustainably foster team learning and improve the outcomes of team learning. A conceptual framework is developed by starting with analyzing definitions on work teams and team learning, and providing, analyzing and integrating evidence on team learning at work, their effects and the antecedents. The results of the analysis of current approaches, definitions, theories, and empirical results, are taken into account in this conceptual framework which contains aspects of team learning itself in the context of the team, the organization and the society with their antecedents, the outcomes of team learning and the interventions that can foster team learning.

Three specific issues are identified as major challenges for research which are discussed, namely the (characteristics of) the dynamics, the complexity and the context. Concrete implications are provided, challenges for research identified with respect to the objectives and content of future research taking into account the three challenges, the methodological issues, the need for clarity, consistency and coherence in research, and the decisions to make to increase insight into team learning processes and how they can sustainably be fostered.

Keywords Team learning · Work teams · Dynamics · Complexity · Context

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C. Harteis et al. (eds.), *Research Approaches on Workplace Learning*,

Professional and Practice-based Learning 31,

https://doi.org/10.1007/978-3-030-89582-2_13

13.1 Introduction

Changes in society, such as technological developments, changes in the population or major disturbances concerning economics and health (e.g., Brexit, COVID-19 pandemic), have major consequences for work at all kinds of organisations in all domains (e.g., Beer & Mulder, 2020). Organisations need to be responsive and proactive, which means that they have to develop to be able to cope with changes. Senge (2006) emphasised the importance of learning organisations, particularly the fifth dimension which constitutes the understanding of patterns of processes in the organisation. This systems thinking integrates the other components (or disciplines) of learning organisations: personal mastery, the team mental model (TMM), shared vision and team learning.

Research on team learning and development at the workplace has increased in the past years (e.g., Rebelo et al., 2020). There is a wide variety of studies, yet they seem to be scattered. There are major differences in topics, objectives, emphases and definitions of key aspects such as team learning, domains and scientific paradigms, including designs, methods and data analyses. These disparities may partly account for the inconsistent, and even contradictory, outcomes of research thus far. Some examples include the effects of transformational leadership on team learning (Rebelo et al., 2020; Anselmann & Mulder, 2020), the effects of social cohesion on team learning (Boon et al., 2013; Van den Bossche et al., 2006), the effects of team learning on team performance (Mathieu et al., 2007; Knight, 2015) and the effects of team learning on innovation (Somech & Drach-Zahavy, 2007; Edmondson, 2003). While some studies have identified positive relationships between the aforementioned variables (Boon et al., 2013; Mathieu et al., 2007; Somech & Drach-Zahavy, 2007), others did not find any relationships. Thus, the studies have different foci and deliver inconsistent outcomes. This finding is herein taken as the reason for the need of an analysis for further research and for identifying the challenges of future research on work team learning to evolve research on the topic of team learning. The objective of this contribution is to deliver information to enhance further research on team learning, to be able to increase insights on this subject and foster team learning for sustainable outcomes. Concomitantly, recommendations will be made for decisions that need to be adopted in future research to realise more coherence and consistency in our knowledge base on team learning in organisations.

Key issues will be derived from the analysis of existing research on team learning by citing exemplary studies to identify the gaps and determine what is needed in future team learning research to improve understanding of its processes, the impact of antecedents and the effects on outcomes, which are needed to sustainably foster team learning and boost its outcomes. The analysis of current approaches, definitions, theories and empirical results will lead to an overall conceptual framework that comprises the aspects of team learning itself, its context, the antecedents and the outcomes of team learning. From these analyses, three major issues that have to be taken into consideration will be derived, namely, complexity, dynamics and context. These elements will form the basis of concrete suggestions and the formulation

of needs and challenges for research on team learning in the last section, such as the content gaps to fill and the decisions to make in investigating team learning.

13.2 Development of a Conceptual Framework

In this section, the definitions of the key aspects of a team and team learning, along with its consequences for research, will be briefly discussed. Furthermore, the results or the outcomes of team learning, as well as the different possible antecedents, will be analysed. This will result in a conceptual framework on team learning.

13.2.1 *Work Team*

Different definitions that emphasise different components have been used in the research on teams. One definition is that teams are ‘a group of employees, normally between three and 15 members, who meet with some regularity in order to work interdependently on fulfilling specific tasks’ (Müller et al., 2000, pp. 1398–1399). Salas et al. (2008) defined teams based on Dyer (1984) as ‘social entities composed of members with high task interdependency and shared and valued common goals. They are usually organised hierarchically and sometimes dispersed geographically’ (p. 541). A frequently used definition is by Kozlowski and Bell (2003, p. 334): ‘Work teams and groups: (a) are composed of two or more individuals, (b) who exist to perform organisationally relevant tasks, (c) share one or more common goals, (d) interact socially, (e) exhibit task interdependencies (i.e., workflow, goals, outcomes), (f) maintain and manage boundaries, and (g) are embedded in an organisational context that sets boundaries, constrains the team, and influences exchanges with other units in the broader entity’. Cohen and Bailey’s (1997, p. 241) is rather similar: ‘A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and are seen by others as a social entity embedded in one or more larger social systems (...), and who manage their relationships across organisational boundaries’.

Another component of work teams is mentioned by Van Woerkom and Croon, who stated that ‘real teams’ (2009, p. 565) additionally have a moderate stability of membership, which could foster effectiveness. Next, to this aspect of time, differences can be found in the characteristics of teams that are investigated in empirical research, for instance, in the background characteristics and experiences of the team members and the team composition (e.g., interdisciplinary teams) (Erhardt et al., 2016; Van der Haar et al., 2015; Watzek & Mulder, 2019). Furthermore, field studies have been conducted in a wide variety of domains, such as emergency (Van der Haar et al., 2015), healthcare (Buljac-Samardzic & Van Woerkom, 2015), industry (Erhardt et al., 2016; Zhang et al., 2011), vocational colleges (Bednall et al., 2014; Widmann et al., 2019) and consultancy (Rupprecht et al., 2011), with focusing on a

wide variety of work tasks and work characteristics, such as working in shifts in elder care (Leicher & Mulder, 2016), working together in command-and-control teams (Van der Haar et al., 2015), virtual teams (Peñarroja et al., 2015), (geographically) dispersed teams (Sole & Edmondson, 2002), or being part of different teams in different projects at the same time (Rupprecht et al., 2011).

In perusing these different definitions, various components can be identified, namely, the characteristics of the *people* (the individual team members and the team as a whole, diversity in gender, age, background, experience), the *structural aspects of the team* (such as size, duration, stability, hierarchy), *cultural aspects* (such as team climate, shared responsibility), the *objectives* (or goal orientation, effectiveness, performance) and the *characteristics of the work tasks* (interdependency, complexity). Furthermore, the *level of actual behaviour* can be distinguished (such as performance, activities of the team members, the processes within a team), as well as the *relation with the context* (e.g., boundaries). Understanding the outcomes of empirical research requires information on the arguments for the decisions upon which these aspects need to be taken into account when defining ‘work team’ and what the decisions are, with the provision of a clear definition of work team.

13.2.2 Team Learning

To obtain insights into the origin and development of teams, different lenses can be applied. There are various approaches in analysing and investigating the changes and processes that work teams undergo during their development. At the team level, a well-known approach is the model of group development by Tuckman (1965), who reviewed group literature in natural settings as well as in laboratory group studies and proposed that groups go through the developmental phases of forming, storming, norming and performing. The basic premise is that forming is considered to be the phase in which work is started together, followed by a phase with conflicts, problems and challenges, and then the development of norms for effective cooperation, which subsequently leads to performance. Another model that gives the impression that there is a specific sequence in stages is the concept of communities of practice (CoP) (Wenger, 1998), which assumes that there are different stages in the development of teams. Snyder and Wenger visualized (in Saldana, 2017) the stages, where the first stage of a community consists of a loose network of people with similar needs and issues (potential), followed by the start of a community, and then by the forming of an identity that grows, which leads to an established community that finally fulfils its potential. They mentioned activities related to the different phases, such as discovering common ground, coordinating a variety of learning activities, setting standards, celebrating accomplishments and generating new communities.

Such activities happen within a team through the team members. The emphasis on what happens within teams can be found in the work of Senge, who defined team learning as ‘the process of aligning and developing the capacity of a team to create

the results its members truly desire' (Senge, 2006, p. 218). The learning ability of a team is important. He argues that team learning involves dialogue and discussion. Dialogue entails a free and creative exploration of complex issues (deeply listening to one another), while in discussion, different views are presented and defended. Balancing dialogue and discussion is important for learning teams. All this indicates that the development within teams does not have to be a linear process, but that there can be a variety of activities in a nonstructured way.

This is in line with the work of Decuyper and colleagues, wherein processes and activities were emphasised. Decuyper et al. (2010) integrated research and took different views into consideration. They focused on concrete activities and their functions and took different levels (individual, team, organisational levels) into account. Knowledge sharing, co-construction and constructive conflict are considered the basic activities, team reflexivity, team activity, and boundary spanning are the facilitating activities and storage and retrieval constitute the third category. They defined team learning as '...a compilation of team-level processes that circularly generate change or improvement for teams, team members and organizations, etc.' (Decuyper et al., 2010; p. 128). In addition, Edmondson (1999, p. 351) defined team learning as 'a process and attempt to articulate the behaviours through which such outcomes as adaptation to change greater understanding or improved performance in teams can be achieved'. Based on this definition, she conceptualised team learning as input-process-output models that include various antecedents, behaviours and outcomes of team learning (Edmondson, 1999) by studying work teams in organisational settings.

From these different theories and models, it can be deduced that to obtain in-depth insights and understanding of team learning, it needs to be considered as a process with activities and behavioural aspects within teams, and can be the sum of individual learning and/or teams can be considered as systems that can learn (Sessa & London, 2006). All of these factors need to be investigated and their dynamics taken into account. Although the emphasis of team learning research is mainly on cognitive development and performance, other outcomes, such as identity development, can also be the result. Concurrent with the objectives of the team, team learning needs to be clearly defined in research by also providing the information underlying the arguments.

13.2.3 Outcomes

To get an overview of the possible and already investigated outcomes of team learning, structure is needed. Various components of the outcomes of team learning have been investigated, such as performance, knowledge, behaviour at different levels (individual, team, organisation), products and processes, and different domains. The relevance of the latter seems obvious when thinking about the value of all these aspects in sports teams and in work teams in the car industry. In addition, for instance the quality of the outcome also relates to the domain. In sports, the quality

of performance (also) depends on the performance of the competitors, while the performance of a car production unit can be determined on its own account, according to specific standards.

Team learning can lead to different outcomes at different levels. At the *organisational level*, team learning can result in products, processes, performance, employee retention (e.g., Kuipers & Stoker, 2009). At the *individual level*, team learning can influence individual knowledge, skills, experience, and performance (e.g., Kuipers & Stoker, 2009; Van Woerkom & Croon, 2009; Lan et al., 2020). Performance can be defined as production, services and innovation, as the results of the activities of the team. One specific form of behaviour is innovative work behaviour, which is a prerequisite for innovations. Innovative work behaviour involves opportunity exploration, idea generation, idea promotion and idea realisation (Janssen, 2003; Messmann & Mulder, 2020). Many aspects of team learning behaviour positively affect different components of innovative work behaviour of individuals (Widmann et al., 2019).

For team learning research, in particular, outcome measures at the team level are typical. This innovative work behaviour is also defined and measured at the *team level* (Widmann et al., 2016). Furthermore, outcomes can be evaluated in terms of the behaviour of the team members, especially in how the teams operate (efficiency, effectiveness, innovativeness, see Van Woerkom & Croon, 2009). Moreover, there are other outcome measures at the team level as a result of team learning, such as quality, performance, innovation, team rewards or team achievement (Bednall & Sanders, 2017; Buljac-Samardzic & Van Woerkom, 2015; Konradt & Eckardt, 2016; Knight, 2015; Mathieu et al., 2007; Schippers et al., 2015).

In addition, the knowledge of the team can also be considered an outcome. In this respect, the concepts of Team Mental Model (TMM) and shared cognition need to be given attention. Klimoski and Mohammed (1994, p. 421) defined TMM as ‘overlapping shared and organized knowledge and mental representation of knowledge by members of a team about the key elements of their relevant environment’. TMM can also be defined as the team members’ shared beliefs on the key elements of their environment, including their conception and interpretation of problems, tasks, processes and situations (Cannon-Bowers et al., 1993; Van den Bossche et al., 2006), which relates to shared vision, which Senge (2006) considers one of the disciplines of learning organisations.

TMM is important for teams to be able to interact effectively because it organises knowledge into structured patterns (Cannon-Bowers et al., 1993). The assumption is that it is good for the other outcomes: performance, innovation, quality of products and services, etc. Although some cross-sectional studies show that TMM is important for team performance (e.g., Van den Bossche et al., 2006), there are also contrary results, for instance results of an empirical study showed no relationship between TMM and innovativeness (Widmann & Mulder, 2020). This can be explained by the differences in the nature of the teams and their work task of the samples, as well as the domains. For instance, the need for innovativeness is not very high in routine tasks. And teams that are organised in shifts have little opportunity to develop a TMM since they have few possibilities for interaction.

In addition, in relation to TMM, transactive memory systems are relevant because they refer to the strategies to make use of these TMMs. Next to the output, TMM can also be an antecedent of team learning.

To gain better insights into the outcomes of team learning by being able to interpret the different research results, it has to be clear what the outcome is (behaviour, knowledge, performance) and at what level (team, individual, organisation).

13.2.4 *Input: The Team Itself*

The team learning characteristics and incidents in the work team can affect the outcomes of the team's work. The conditions of team learning can be the aforementioned characteristics, such as the structure of a team or the work tasks. A wide variety of variables have been investigated in association with this topic.

For instance, in relation to the *characteristics of the team members* at the individual level, antecedents such as motivation, background characteristics, experiences and attitudes have been discovered (e.g., emotional competence, Gerbeth et al., [submitted](#); motivation, Argote et al., [2003](#); prior knowledge, Sweet & Michaelsen, [2007](#)). Such individual factors that are considered as team characteristics are investigated in research on cognitive, ethnical and informational diversity (e.g., Rupperecht et al., [2011](#)), background characteristics (gender, age, religion) (Timmerman, [2000](#)), cultural identities (Ely & Thomas, [2001](#)) and team composition (Bouncken et al., [2016](#)).

Notably, the *culture in the team* also plays a role, as concluded from the studies on feedback culture, learning culture and error culture (Zakaria et al., [2008](#); Jehn & Ruppert, [2008](#)) and team culture (Argote, [1993](#)). Relevant in this respect are the studies on the effects of variables such as cohesion or conflict, team goal orientation (e.g., Porter, [2008](#)) and psychological safety or safe team climate (e.g., Edmondson, [1999](#); Leicher & Mulder, [2016](#)).

In many studies, the *structural aspects of the team* (such as size, duration, stability, hierarchy) are taken into account (Savelsbergh et al., [2015](#)). For instance, the way by which they organise their work (e.g., virtual teams) is important (Nader et al., [2012](#)), along with the tools they use (e.g., technology) as well as the content and *characteristics of the work tasks* (interdependency, complexity). The nature of the work is considered relevant. For instance, the assumption based on Piaget ([1977](#)) that disturbances (or cognitive conflicts) can be used as a trigger for engaging in learning activities has been the argument in several studies for investigating teams with knowledge-intensive work tasks (e.g., Sanner & Bunderson, [2015](#); Widmann & Mulder, [2020](#)).

Furthermore, the *level of actual activities* is of paramount importance in team learning, such as the performance of the individual members, the processes within the team and the engagement in team learning activities, such as reflection. There is a need to distinguish between the level of individual behaviour of the team members, and the level of the team. For instance, the reflection of one team member can

increase knowledge within the team. Furthermore, these individual engagement in learning activities can cause engagement in learning activities of the other team members, which can be determined in longitudinal studies (Widmann et al., 2019). In addition, it is important to realize that the level of the team can concern the interactions of the team members where they learn together and therefore the team as a whole, as well as that the team can be considered the entity that learns. *Occurrences* in the team, such as committing errors or getting feedback (e.g. Gabelica et al., 2014) or leadership (e.g. Koeslag-Kreunen et al., 2018) can lead to team learning, as well as other forms (verbal and non-verbal) of interactions, not only on cognitive aspects but also on affective aspects, such as emotional occurrences and reactions (Walter & Van der Vegt, 2013; Watzek & Mulder, 2019; Watzek et al., submitted-b; Zoethout et al., 2017).

13.2.5 *Input: The Context of the Team*

The context of work teams consists of the organisation as well as the society. In addition to the characteristics of the team, the characteristics of the *organisation* can foster team learning, for instance, the organisational *culture* (Bain, 1998; Zellmer-Bruhn & Gibson, 2006), the learning, feedback and error culture, the leadership culture and structure, as well as the work cultures between domains (e.g., between the finance and healthcare sectors, Leicher & Mulder, 2016) and between countries (within international organisations), which influence team learning. Furthermore, *structural aspects* such as the organisation of work and teams is of vital importance (e.g., virtual teams, self-organized teams).

In addition to organisational cultures and structures, it can be derived from Argyris and Schön (1978) and Senge (2006), among others, that the *strategy* in an organisation is essential for team learning, for instance, the vision on leadership and the role of teams in the organisation. Decuyper et al. (2010) emphasised the importance of organisation strategy by citing Zellmer-Bruhn and Gibson (2006), who showed how different organisational strategies of international companies that use teamwork affect team learning. Decuyper et al. (2010) conclude, for instance, that strategies supporting local responsiveness are important and that by using local resources and by emphasising the importance of learning, team learning and its effectiveness can be fostered.

In addition, *developments in society*, such as technological and economical advancements, influence the organisation and the possibilities for the teams to learn. For instance, the changes between generations in work attitude, national *cultures* (Yorks & Sauquet, 2003), as well as increase in diversity (Bouncken et al., 2016; Rupperecht et al., 2011) and globalisation (in terms of cooperation, internationalisation and competition) impact team learning. From previous studies, we know that boundary crossing, that is for instance the entry of new knowledge in the team, can foster team learning. Considering that societal changes will keep on happening, this emphasises the need for work teams to be flexible and continuously develop.

13.2.6 Input: Interventions

The aspects of team learning, such as reflection and knowledge sharing, can be fostered by leadership (Koeslag-Kreunen et al., 2018), for instance with transformational leadership (Anselmann & Mulder, 2020; Bucic et al., 2010). Notably, such informal interventions can foster team learning.

For learning organisations especially the learning ability of the teams is important (Senge, 2006). This makes team learning as such important, as well as the sustainable development of teams. Little is known about how all this can be fostered by formal interventions such as training and coaching. There are some indicators that the formal interventions training (e.g. Buljac-Samardzic et al., 2018; Nielsen et al., 2017) and coaching (e.g. Buljac-Samardzic & Van Woerkom, 2015) might be successful, because of their impact on other outcomes at the team level. Furthermore, the effects of team meetings of data teams (as a professional learning community) on knowledge creation of a team of school teachers and the school leader (Hubers et al., 2017), the effects of cross-training on team functioning (Volpe et al., 1996), and the development of intercultural competence in a change laboratory (Teräs & Lasonen, 2013) might give hope. In addition, effects are found from peer-group mentoring on teacher development (Heikkinen et al., 2012), and of communities of practice in the school workplace (Brouwer et al., 2012). Moreover, there is some evidence that simulations have impact on team development of students (business simulation with graduate students, Konradt & Eckhardt, 2016).

Overall, there is little evidence that has demonstrated the effects of interventions, but it shows potential for fostering team learning as well. Specifically in relation to sustainable work team development there is a major gap in knowledge on the possibilities of interventions. This needs to be filled with a focus on these variables (of team learning and sustainable team development) as content and as objectives in combination with the work task and the work context. This topic requires further studies, taking into account the components of the measures (such as content, teacher/coach behaviour, assessment and the didactics, methods and instruments used), the theories and models on instruction and instructional design, as well as the evaluation of such measures by considering the characteristics of the target team and the objectives. If the objectives are reached requires evaluation. In addition, more insight into long-term effects of interventions is needed.

13.2.7 Conceptual Framework on Team Learning

Team learning is considered a process in which learning activities of the team members exist, such as reflection and knowledge sharing. This can be fostered or hindered by the characteristics and behaviour within the team, as well as by the characteristics of the organisation and society. Furthermore, interventions can affect team learning. The outcomes of team learning can be cognitive, emotional, products

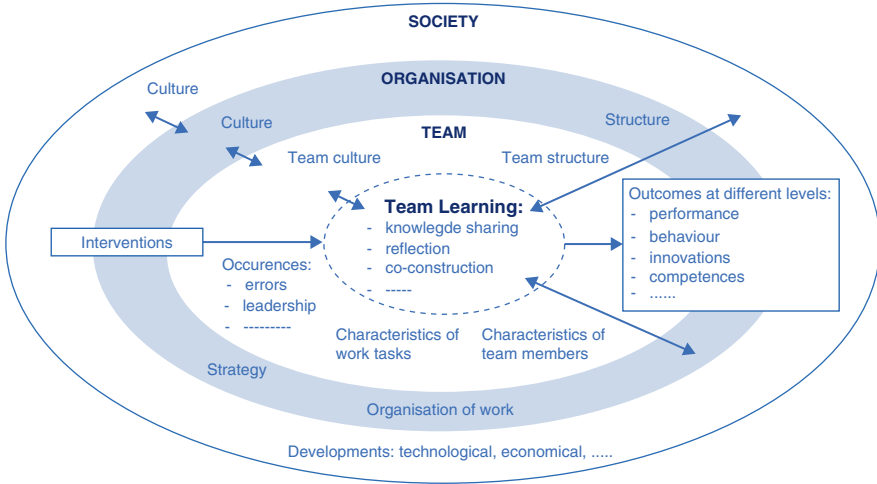


Fig. 13.1 Framework: Team learning in the context of the team, organisation and society, the interventions as input and the outcomes

and processes at the individual, team and organisational levels. For an overview of all these components and the potential relationships, the classical input-process-output model (McGrath, 1964; Edmondson, 1999) can be of help. The input are the antecedents that come from the interventions (coming from different contexts), and the context of the team, organisation and society, whereas the outcomes at different levels (with consequences for different contexts) are the output (Fig. 13.1).

At the centre of the model, we find (the process of) team learning that happens in the context of the team which, in turn, is situated in the organisations and the wider context of society, with their different categories (such as culture) with various components (such as errors as occurrences). There are mutual relations between the components, the categories and all the levels. This shows the complexity of team learning in its context.

It is important to realise that this figure provides an overview and is a simplification of reality. This overview is not to be interpreted as something static. On the contrary, it must be understood as a framework of dynamic processes and relationships. The assumption here is that the components as well as the relationships between the components, if they exist, are dynamic. And all aspects can influence one another mutually with time.

13.3 Central Issues as Challenges for Research

From the above insights obtained from research on team learning, three central issues can be derived that have to be taken into account when fostering understanding of team learning. In this section, I will probe deeper into these three aspects,

namely, complexity, dynamics and context, and identify the issues that need attention in further research that will be used to formulate concrete suggestions for research in the next section.

13.3.1 Complexity

Figure 13.1 shows that team learning is a complex phenomenon in itself. Depending on the different views on what it is, different aspects of team learning (such as activities) need to be taken into consideration. Furthermore, these activities are not independent in reality. Yet, little is known about the interaction of the different aspects of team learning. Therefore, this second level needs to be taken into account, namely, the relationships between the different aspects of team learning, and the different combinations of them. These form the processes of team learning.

A further indicator of complexity concerns the relationships between aspects of team learning with a large amount of antecedents and outcomes, namely the components of all categories at all levels. Many assumed relationships (between antecedents, team learning and outcomes) have not been extensively investigated or only partially investigated, or only in certain domains to date. Thus far, studies focus mainly on a small selection of variables and is scattered in terms of variables, jobs, domains and relationships, which makes a profound holistic overview based on evidence very difficult to obtain.

In addition, the combination of these two identified gaps (at the level of team learning itself, and that of the relationships with its contexts) has not been sufficiently investigated. For instance, there remains a gap in studies on the relations between the combinations of the different aspects of team learning and outcomes.

This complexity touches two relevant aspects that need more attention: dynamics and the context of team learning.

13.3.2 Dynamics

Kozlowski (2015) emphasised the dynamics in teams and showed different forms of emergence, varying from convergent linear emergence, divergent emergence and discontinuous emergence. He also examined within-team variability and gave suggestions for getting insights into the dynamics of team learning. Nonetheless, there are still gaps to fill in relation to dynamics, at the level of team learning itself as well as on team learning in relation to the context. The dynamics within teams need more attention and pose some specific challenges in their investigation.

A few issues need to be taken into account when trying to fill this gap. Firstly, the meaning of dynamics and change. The terms change and dynamics are often not clearly defined and can have different meanings. Moreover, various terms, such as variability, trajectories and patterns are used to describe the same issue (cf. Delice

et al., 2019; Roe et al., 2012). The position taken here is that dynamics refers to something (e.g., an object) that moves, in contrast to being static. An object moving does not necessarily change. Change refers to the transformation of such an object.

Secondly, it needs to be clear what it is exactly that moves or changes. For instance, the behaviour of individuals. Other aspects comprise their knowledge, interaction between team members (e.g., feedback, discussions, reflection, verbal and non-verbal behaviour, emotions), the actual processes at the team level, as well as the characteristics of the work itself. A second level is the combination of behavioural aspects. Investigations could, for instance, find out if there are optimal combinations of behavioural aspects for specific objectives, and how they need to change.

Furthermore, there is a need to define what change is exactly and establish if it is more or if it is different. For instance, Collins et al. (1989) distinguished in their cognitive apprenticeship model increasing complexity (more aspects), increasing diversity (more diverse aspects) and global before local skills (that is, from more general to more specific). In addition to this aspect complexity, change can occur in different ways: the amount, frequency, intensity, length and complexity of change. Such aspects all need further clarification in future studies.

Moreover, change can have different forms. For instance, linear progression is a process with variations of more and less occurrences. But change can also have a specific pattern (Widmann & Mulder, [submitted](#)). In addition, the relationships between all of the aforementioned aspects can change in interaction with the contexts which, in turn, can also change. This is not a linear process nor an iterative process. This can be best understood with approaches such as the chaos theory (Stacey, 2003), and system and evolutionary models of innovation (e.g., Marinova & Phillimore, 2003).

It is obvious that this call for investigating dynamics raises the need for longitudinal research (cf. Kozlowski, 2015; Lehmann-Willenbrock, 2017). Some have been conducted (e.g., Widmann et al., 2019), but they are still scarce, especially longitudinal studies with many measurement points. In addition, more detailed investigations of processes and change, such as observations of team meetings (e.g., Raes et al., 2017; Watzek & Mulder, 2019), should be conducted. Moreover, there is still a gap in investigations with many measurement moments, also in short intervals. Time plays an important role in relation to change, as do the (changes in) relationships between different aspects that occur in a specific context with specific characteristics. This emphasizes the importance of context.

13.3.3 Context

Team learning occurs in the context of the team. From the previous section can be derived that the characteristics of the teams, with the different categories, such as characteristics of the members, and team structure, as well as the components within these categories, such as leadership and feedback affect team learning. Furthermore, the characteristics of the work task are of primary importance. For instance, it is

assumed that knowledge-intensive tasks provide more opportunities for team learning than other tasks. Sanner and Bunderson (2015) found for instance that psychological safety is more related with learning and performance in knowledge-intensive task settings, than in settings where less creativity, complexity and sense making is required. Team learning in less knowledge-intensive jobs, such as some blue collar work teams, has been investigated at a lesser degree. In addition, there is some evidence that team context characteristics can play a moderating role, for instance in the relationship between reflexivity and innovation (Schippers et al., 2015). In addition, the way by which work is structured (e.g., division of labour, virtual teams, teams working in shifts, being part of different teams at the same time, (inter)disciplinary teams) influences team learning. Herein, there are also gaps in knowledge.

Aforementioned were research results where differences in results from empirical field studies might be partly explained by differences in the domain or sector, such as healthcare (e.g., Van der Haar et al., 2015), vocational colleges (e.g., Widmann & Mulder, 2020), industry, consultancy (e.g., Rupperecht et al., 2011), sports (e.g., Timmerman, 2000) and mixed (e.g., Anselmann & Mulder, 2020), because of differences in culture, among others. Next to that, other factors of society and the organisation can hinder and foster team learning and its outcomes, such as technological developments (as digitization, industry 4.0), the organisation of work in the organisation and its strategy. With respect to the importance of organisational learning for team learning (Senge, 2006), the issue of the relationship between team learning with organisational learning needs more attention in empirical research (cf. Rebelo et al., 2020).

13.4 Conclusions and Implications for Future Research

To enhance insights into team learning, consistent and coherent research is required. The previous sections have delivered information on the topics of future research, as well as the methodological issues and aspects that need to be taken into account when carrying out research and for improving team learning in practice.

13.4.1 Objectives and (Consequential) Content

Based on the overview of aspects that are relevant in relation to obtaining increasing insights into team learning processes and their antecedents and outcomes, the gaps in research have been identified. The analyses gave rise to the overall conclusion that there are quite a few studies on this topic, but they are scattered with regards to the content. Also Edmondson et al. (2007) found different research traditions, one focused on outcome improvement, one with lab experiments in relation to task mastery, and field studies in existing teams on learning processes. In addition, Rebelo et al. (2020), conclude that there are two different streams of research, with different

foci and using different theories. They emphasize the gap in research on the relations between organisational learning and team learning. Senge (2006) argued that team learning is part of organisational learning, that the learning ability of the team is crucial and that in fact all five disciplines need to jointly develop. Therefore, all these components, and their relationships need further investigation.

The central objective is to acquire insights into the processes, components and relationships, the relationships between input, process and output, as well as the meaning of relationships, and the context. Knowledge about the relations between the characteristics of teams (what is a team) and team learning and their relations with the job task (task interdependence, complexity, technology), outcome and context characteristics are needed. The topics that need more holistic attention are the processes within team learning that meet the demands of the complexity in reality. In addition, the role of emotions is still barely researched, as can be deduced from above.

Furthermore, there are major gaps in research that take into account the complexity, such as the relations between behaviours and emotions within team learning and combinations of interactions. We need to do justice to these complexities in real life. There are major consequences at different levels. On the one hand, there is a need for a more holistic approach, by for instance taking organisational learning into account. On the other hand, more in-depth studies are needed. Both of these aspects need to fit well together.

The same goes for the dynamics, and especially the changes in such processes and the other variables. There have been attempts to investigate dynamics, for instance, in longitudinal studies (Bednall & Sanders, 2017; Erhardt et al., 2016; Van der Haar et al., 2017; Widmann et al., 2019), and specifically on interactions (e.g., threads in emotional reactions, Watzek et al., [submitted-a](#)).

More clarifications are needed to determine what is it exactly that changes and how, and what causes these changes. Furthermore, the relationships between changes and specific outcomes require more attention, as well as identifying the successful combinations of processes and changing aspects.

Studies are also needed to increase external validity. This means that more insights are needed into the role of the context on characteristics of work (e.g., the consequences of digitization and globalising on work tasks, such as autonomy and complexity). Furthermore, replication studies are needed to determine the effect of context.

Obtaining more insight requires clear foci and definitions on the central constructs, and puts further requirements on the methodology.

13.4.2 Methodological Issues

Next to content, all components of empirical research need attention. A major requirement for putting forward research is coherence in the research questions, use of theory, methodology and scientific paradigm. The latter often receives little

attention. The theoretical basis of research on team learning would profit from a more profound basis. The use of theories is also very scattered. Furthermore, theories on team learning and the development of research methods for investigating team learning could be further developed.

The diversity in objectives and topics shows the need for a wide variety of studies (e.g., field studies, experiments, interventions) and designs, whether quantitative, qualitative or mixed. In addition, the choices (quantitative or qualitative) need to be made at every level: at the level of the design, in the use of (fitting) instruments, and at the level of the data (cf. Niglas, 2010). Although these are rather general suggestions for research, they still need more attention on team learning research. Aforementioned is the need for intervention studies to be able to increase insights into possibilities of fostering team learning ability and sustainable team learning. And that these issues are combined in the objectives and the content of the intervention with work related and relevant content. Important is that also such studies have solid theoretical base (by using for instance theories and models on instruction, instructional design, learning and motivation). Furthermore, replication studies are required for getting insights into the role of characteristics of the team, organisation and/or society, and increase generalizability of research results.

There are many specific challenges for future research on team learning that are related to the level of inquiry and the level of analysis, in particular, the measurement at individual and team levels (e.g., Bell et al., 2012). Clear and consistent choices in relation to these levels should be made and the consequences of these choices taken into account. Decisions need to be made in the selection of the sources of information (individual team member, team and/or the leader) and the data itself (e.g., items asking for individual behaviour, versus behaviour of the team). In addition, decisions on data analyses should take into account the different levels, in such a way that the results of the data analyses can be adequately interpreted at level(s) required (in coherence with the objective of the study). For example, shared-cluster construct models or multilevel structural equation models can be used (cf. Stapleton et al., 2016).

Furthermore, a specific challenge for team learning research is dealing with missing data in teams, especially in longitudinal studies. Challenges arise when all team members are not responsive at every measurement moment. It can also be that the team composition changes over time. Such issues make the analyses and interpretation of data and results challenging. Moreover, taking into account the complexity of reality combined with restrictions on analyses, the challenge is quite substantial. Of course, the possibilities and limitations of existing instruments (e.g., questionnaires, focus groups, observations) in relation to the different levels need to be taken into account. More in-depth analyses are required where additional forms of analyses need to be further developed (e.g., verbal interaction). Also in relation to team learning research there is the issue of self-reports. There are indications that there are differences between ratings between the team members and the leaders (e.g., regarding the relationship between team learning behaviours and team performance, Leicher & Mulder, 2016). Self-reported data is sometimes needed to answer the research question. In other cases, indeed supervisor ratings can be added or an independent observer (e.g., Van der Haar et al., 2015).

Accounting for the complexity and dynamics of team learning, it is required to (also) go beyond input-process-output models, or input-mediator-output-input models as learning process models (see analyses of models Edmondson, Kayes, McCarthy and Van den Bossche, in Knapp, 2010). Capturing the dynamics and their consequences better requires trials in research. In relation to organisational change Van de Ven and Poole (1995) suggested four different approaches for studying change. Next to the variance studies with causal analysis of independent variables to explain dependent variables, process studies are possible, where sequences of occurrences can be described, and the stages, phases or cycles of change. Whereas the third focuses on describing behaviours, actions and activities, the fourth one concerns variance studies on for instance dynamic modelling of chaotic adaptive systems. Especially the last approach could give new insights into the processes of team learning itself and at the same time the relationships with antecedents and outcomes. In this approach processes are investigated quantitatively by using for instance event time series, nonlinear dynamic models, fine-grained data, and ‘time’ as a variable of change processes (Van de Ven & Poole, 1995). Using this approach, data analytics might be supportive. Also here, the use of theories needs to be solid and fit to the analyses. Ideas of Stacey for instance fit this last approach, and the theories of Engeström and Luhmann could be coherently used in the third approach.

13.4.3 Considerations for Carrying Out Research

To realise consistency and coherence and take into account the requirements of internal and/or external validity, there are a few general rules to consider as well. One rule is to determine what choices need to be made. The combination of clear objectives and research questions, and clear definitions of key constructs is needed. Choices also need to be made with regards to the scientific paradigm, development of theoretical basis, fitness with the design, instruments, data and analyses.

Being concrete is also a necessity, that is, it should always be clarified what a team is, what is exactly meant by team learning, what the focus is (behaviour, knowledge, products, processes, etc.) and what the outcomes are. In relation to experiments and interventions, the objectives should set requirements on the characteristics of the treatments. In addition, especially in field studies, in relation to the context, they need to be clear what the exact nature of work is, the (relevant) characteristics of the organisation and the broader context where the complexity of practice caused by future processes and domains need to be taken into account. Only when all of these requirements and challenges are met can team learning research be elevated to the next level.

Acknowledgement I would like to express my thanks to Andreas Widmann for his support in the development of this chapter.

References

- Anselmann, V., & Mulder, R. H. (2020). Transformational leadership, knowledge sharing and reflection, and work teams' performance: A structural equation modelling analysis. *Journal of Nursing Management*, 28, 1627–1634. <https://doi.org/10.1111/jonm.13118>
- Argote, L. (1993). Group and organizational learning curves: Individual, system and environmental components. *British Journal of Social Psychology*, 32, 31–51. <https://doi.org/10.1111/j.2044-8309.1993.tb00984.x>
- Argote, L., McEvily, B., & Reagans, R. (2003). Managing knowledge in organizations: An integrative framework and review of emerging themes. *Management Science*, 49, 571–582. <https://doi.org/10.1287/mnsc.49.4.571.14424>
- Argyris, C., & Schön, D. A. (1978). *Organizational learning: A theory of action perspective*. Addison-Wesley Publishing Company.
- Bain, A. (1998). Social defenses against organizational learning. *Human Relations*, 51, 413–429. <https://doi.org/10.1177/001872679805100309>
- Bednall, T. C., & Sanders, K. (2017). Do opportunities for formal learning stimulate follow-up participation in informal learning? A three-wave study. *Human Resource Management*, 56, 803–820. <https://doi.org/10.1002/hrm.21800>
- Bednall, T. C., Sanders, K., & Runhaar, P. (2014). Stimulating informal learning activities through perceptions of performance appraisal quality and human resource management system strength: A two-wave study. *Academy of Management Learning & Education*, 13, 45–61. <https://doi.org/10.5465/amle.2012.0162>
- Beer, P., & Mulder, R. H. (2020). The effects of technological developments on work and their implications for continuous vocational education and training: A systematic review. *Frontiers in Psychology*, 11, 918. <https://doi.org/10.3389/fpsyg.2020.00918>
- Bell, B. S., Kozlowski, S. W. J., & Blawath, S. (2012). Team learning: A theoretical integration and review. In S. W. J. Kozlowski (Ed.), *The Oxford handbook of organizational psychology* (Vol. 2, pp. 859–909). Oxford University Press.
- Boon, A., Raes, E., Kyndt, E., & Dochy, F. (2013). Team learning beliefs and behaviours in response teams. *European Journal of Training and Development*, 37, 357–379. <https://doi.org/10.1108/03090591311319771>
- Bouncken, R., Brem, A., & Kraus, S. (2016). Multi-cultural teams as sources for creativity and innovation: The role of cultural diversity on team performance. *International Journal of Innovation Management*, 20, 1–34. <https://doi.org/10.1142/S1363919616500122>
- Brouwer, P., Brekelmans, M., Nieuwenhuis, L., & Simons, P. R. J. (2012). Communities of practice in the school workplace. *Journal of Educational Administration*, 50, 346–364. <https://doi.org/10.1108/09578231211223347>
- Bucic, T., Robinson, L., & Ramburuth, P. (2010). Effects of leadership style on team learning. *Journal of workplace learning*, 22, 228–249. <https://doi.org/10.1108/13665621011040680>
- Buljac-Samardzic, M., & Van Woerkom, M. (2015). Can managers coach their teams too much? *Journal of Managerial Psychology*, 30, 280–296. <https://doi.org/10.1108/JMP-12-2012-0380>
- Buljac-Samardzic, M., Dekker-van Doorn, C., & Maynard, M. T. (2018). Teamwork and teamwork training in health care: An integration and a path forward. *Group & Organization Management*, 43, 351–356. <https://doi.org/10.1177/1059601118774669>
- Cannon-Bowers, J. A., Salas, E., & Converse, S. (1993). Shared mental models in expert team decision making. In N. J. Castellan (Ed.), *Individual and group decision making: Current issues* (pp. 221–246). Erlbaum.
- Cohen, S. G., & Beiley, D. E. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management*, 23, 239–290. <https://doi.org/10.1177/014920639702300303>
- Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. In L. B. Resnick (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 453–494). Lawrence Erlbaum Associates.

- Decuyper, S., Dochy, F., & Van den Bossche, P. (2010). Grasping the dynamic complexity of team learning: An integrative model for effective team learning in organizations. *Educational Research Review*, 5, 111–133. <https://doi.org/10.1007/s11251-010-9128-3>
- Delice, F., Rousseau, M., & Feitosa, J. (2019). Advancing teams research: What, when, and how to measure team dynamics over time. *Frontiers in Psychology*, 10, 1–20. <https://doi.org/10.3389/fpsyg.2019.01324>
- Dyer, J. L. (1984). Team research and team training: A state of the art review. In F. A. Muckler (Ed.), *Human factors review* (pp. 285–323). Human Factors Society.
- Edmondson, A. C. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, 44, 350–383. <https://doi.org/10.2307/2666999>
- Edmondson, A. C. (2003). Speaking up in the operating room: How team leaders promote learning in interdisciplinary action teams. *Journal of Management Studies*, 40, 1419–1452. <https://doi.org/10.1111/1467-6486.00386>
- Edmondson, A. C., Dillon, J. R., & Roloff, K. S. (2007). Three perspectives on team learning: Outcome improvement, task mastery, and group process. *The Academy of Management Annals*, 1, 269–314. <https://doi.org/10.5465/078559811>
- Ely, R. J., & Thomas, D. A. (2001). Cultural diversity at work: The effects of diversity perspectives on work group processes and outcomes. *Administrative Science Quarterly*, 46, 229–273. <https://doi.org/10.2307/2667087>
- Erhardt, E., Gibbs, J., Martin-Rios, C., & Sherblom, J. (2016). Exploring affordances of email for team learning over time. *Small Group Research*, 47, 243–278. <https://doi.org/10.1177/1046496416635823>
- Gabelica, C., Van den Bossche, P., de Maeyer, S., Segers, M., & Gijsselaers, W. (2014). The effect of team feedback and guided reflexivity on team performance change. *Learning and Instruction*, 34, 86–96. <https://doi.org/10.1016/j.learninstruc.2014.09.001>
- Gerbeth, S., Stamouli, E., & Mulder, R. H. (submitted). The relationships between emotional competence and team learning behaviours.
- Heikkinen, H. L. T., Jokinen, H., & Tynjälä, P. (Eds.). (2012). *Peer-group mentoring for teacher development*. Routledge.
- Hubers, M. D., Poortman, C. L., Schildkamp, K., Pieters, J. M., & Handelzalts, A. (2017). Opening the black box: Knowledge creation in data teams. *Journal of professional capital and community*, 1(1), 41–68. <https://doi.org/10.1108/JPCCC-07-2015-0003>
- Janssen, O. (2003). Innovative behaviour and job involvement at the price of conflict and less satisfactory relations with co-workers. *Journal of Occupational and Organizational Psychology*, 76, 347–364. <https://doi.org/10.1348/096317903769647210>
- Jehn, K. A., & Ruppert, J. (2008). Group faultlines and team learning: How to benefit from different perspectives. In V. I. Sessa & M. London (Eds.), *Work group learning. Understanding, improving & assessing how groups learn in organizations* (pp. 119–148). Lawrence Erlbaum Associates.
- Klimoski, R., & Mohammed, S. (1994). Team mental model: Construct or metaphor? *Journal of Management*, 20, 403–437. <https://doi.org/10.1177/014920639402000206>
- Knapp, R. (2010). Collective (team) learning process models: A conceptual Review. *Human Resource Development Review*, 9, 285–299. <https://doi.org/10.1177/1534484310371449>
- Knight, A. P. (2015). Mood at the midpoint: Affect and change in exploratory search over time in teams that face a deadline. *Organization Science*, 26, 99–118. <https://doi.org/10.1287/orsc.2013.0866>
- Koeslag-Kreunen, M., Van den Bossche, P., Hoven, M., Van der Klink, M., & Gijsselaers, W. (2018). When leadership powers team learning: A meta-analysis. *Small Group Research*, 49, 475–513. <https://doi.org/10.1177/1046496418764824>
- Konradt, U., & Eckardt, G. (2016). Short-term and long-term relationships between reflection and performance in teams: evidence from a four-wave longitudinal study. *European Journal of Work and Organizational Psychology*, 25, 804–818. <https://doi.org/10.1080/01359432X.2016.1160058>

- Kozlowski, S. W. J. (2015). Advancing research on team process dynamics: Theoretical, methodological, and measurement considerations. *Organizational Psychology Review*, 5, 270–299. <https://doi.org/10.1177/2041386614533586>
- Kozlowski, S. W. J., & Bell, B. S. (2003). Work groups and teams in organizations. In W. C. Borman, D. R. Ilgen, & R. J. Klimoski (Eds.), *Handbook of psychology: Industrial and organizational psychology* (pp. 333–375). Wiley.
- Kuipers, B. S., & Stoker, J. I. (2009). Development and performance of self-managing work teams: A theoretical and empirical examination. *The International Journal of Human Resource Management*, 20, 399–419. <https://doi.org/10.1080/09585190802670797>
- Lan, J., Huo, Y., Chai, Z., Wong, C.-S., Chen, Z., & Lam, W. (2020). Uncovering the impact of triadic relationships within a team on job performance: An application of balance theory in predicting feedback-seeking behaviour. *Journal of Occupational and Organizational Psychology*, 93, 654–686. <https://doi.org/10.1111/joop.12310>
- Lehmann-Willenbrock, N. (2017). Team learning: New insights through a temporal lens. *Small Group Research*, 48, 123–130. <https://doi.org/10.1177/1046496416689308>
- Leicher, V., & Mulder, R. H. (2016). Team learning, team performance and safe team climate in elder care nursing. *Team Performance Management: An International Journal (TPM)*, 22, 399–414. <https://doi.org/10.1108/TPM-04-2016-0017>
- Marinova, D., & Phillimore, J. (2003). Models of Innovation. In L. V. Shavinina (Ed.), *The international handbook on innovation* (pp. 44–53). Elsevier Science.
- Mathieu, J. E., Maynard, M. T., Taylor, S. R., Gilson, L. L., & Ruddy, T. M. (2007). An examination of the effects of organizational district and team contexts on team processes and performance: A meso-mediational model. *Journal of Organizational Behavior*, 28, 891–910. <https://doi.org/10.1002/job.480>
- McGrath, J. E. (1964). *Social psychology: A brief introduction*. Rinehart and Winston.
- Messmann, G., & Mulder, R. H. (2020). A short measure of innovative work behavior as a dynamic, context-bound construct. *International Journal of Manpower*, 41, 1251–1267. <https://doi.org/10.1108/IJM-01-2019-0029>
- Müller, F., Procter, S., & Buchana, D. (2000). Teamworking in its context(s): Antecedents, nature and dimensions. *Human Relations*, 53, 1387–1424. <https://doi.org/10.1177/00187267005311001>
- Nader, A. E., Shamsuddin, A., Salwa, H. A. R., & Zahari, T. (2012). Technology use in the virtual R&D teams. *American Journal of Engineering and Applied Sciences*, 5, 9–14. <https://doi.org/10.3844/ajeassp.2012.9.14>
- Nielsen, K., Randall, R., & Christensen, K. B. (2017). Do different training conditions facilitate team implementation? A quasi-experimental mixed methods study. *Journal of Mixed Methods Research*, 11(2), 223–247. <https://doi.org/10.1177/1558689815589050>
- Niglas, K. (2010). The multidimensional model of research methodology: An integrated set of continua. In A. Tashakkori & C. Teddlie (Eds.), *SAGE handbook of mixed methods in social and behavioral research* (pp. 215–236). Sage. <https://doi.org/10.4135/9781506335193>
- Peñarroja, V., Orenge, V., Zornoza, A., Sánchez, J., & Ripoll, P. (2015). How team feedback and team trust influence information processing and learning in virtual teams: A moderated mediation model. *Computers in Human Behavior*, 48, 9–16. <https://doi.org/10.1016/j.chb.2015.01.34>
- Piaget, J. (1977). *The development of thought: Equilibration of cognitive structures*. Basil Blackwell.
- Porter, C. O. L. H. (2008). A multilevel, multiconceptualization perspective of goal orientation in teams. In V. I. Sessa & M. London (Eds.), *Work group learning. Understanding, improving & assessing how groups learn in organizations* (pp. 149–174). Lawrence Erlbaum Associates.
- Raes, E., Boon, A., Kyndt, E., & Dochy, F. (2017). Exploring the occurrence of team learning behaviours in project teams over time. *Research Papers in Education*, 32, 376–401. <https://doi.org/10.1080/02671522.2016.1225793>
- Rebelo, T., Laourenco, P. R., & Dimas, I. D. (2020). The journey of team learning since The Fifth Discipline. *The Learning Organization*, 27, 42–53. <https://doi.org/10.1108/TLO-10-2019-0144>
- Roe, A. R., Gockel, C., & Meyer, B. (2012). Time and change in teams: Where we are and where we are moving. *European Journal of Work and Organizational Psychology*, 21, 629–656. <https://doi.org/10.1080/1359432X.2012.729821>

- Rupprecht, M., Birner, K., Gruber, H., & Mulder, R. H. (2011). Dealing with diversity in consultancy teams: Results of two Delphi studies. *Human Resource Development International*, *14*, 561–581. <https://doi.org/10.1080/13678868.2011.618348>
- Salas, E., Cooke, N. J., & Rosen, M. A. (2008). On teams, teamwork, and team performance: Discoveries and Developments. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *50*, 540–547. <https://doi.org/10.1518/001872008X288457>
- Saldana, J. B. (2017). Mediating role of leadership in the development of communities of practice. In J. McDonald & A. Cater-Steel (Eds.), *Communities of practice. Facilitating social learning in higher education* (pp. 281–312). Springer.
- Sanner, B., & Bunderson, J. S. (2015). When feeling safe isn't enough: Contextualizing models of safety and learning in teams. *Organizational Psychology Review*, *5*, 224–243. <https://doi.org/10.1177/2041386614565145>
- Savelsbergh, C. M., Poell, R. F., & Van der Heijden, B. I. (2015). Does team stability mediate the relationship between leadership and team learning? An empirical study among Dutch project teams. *International journal of project management*, *33*(2), 406–418.
- Schippers, M., West, M. A., & Dawson, J. F. (2015). Team reflexivity and innovation: The moderating role of team context. *Journal of Management*, *41*, 769–788. <https://doi.org/10.1177/0149206312441210>
- Senge, P. M. (2006). *The fifth discipline. The art & practice of the learning organization*. Random House.
- Sessa, V. I., & London, M. (2006). *Continuous learning in organizations: Individual, group, and organizational perspectives*. Lawrence Erlbaum Associates.
- Sole, D., & Edmondson, A. (2002). Situated knowledge and learning in dispersed teams. *British Journal of Management*, *13*, 17–34. <https://doi.org/10.1111/1467-8551.13.s2.3>
- Somech, A., & Drach-Zahavy, A. (2007). Schools as team-based organizations: A structure-process-outcomes approach. *Group Dynamics: Theory, Research, and Practice*, *11*, 305–320. <https://doi.org/10.1037/1089-2699.11.4.305>
- Stacey, R. D. (2003). *Strategic management and organisational dynamics: The challenge of complexity*. Pearson Education Limited.
- Stapleton, L. M., Yang, J. S., & Hancock, G. R. (2016). Construct meaning in multilevel settings. *Journal of Educational and Behavioral Statistics*, *41*, 481–520. <https://doi.org/10.3102/1076998616646200>
- Sweet, M., & Michaelsen, L. K. (2007). How group dynamics research can inform the theory and practice of postsecondary small group learning. *Educational Psychology Review*, *19*, 31–47. <https://doi.org/10.1007/s10648-006-9035-y>
- Teräs, M., & Lasonen, J. (2013). The development of teachers' intercultural competence using a change laboratory method. *Vocations and Learning*, *6*, 107–134. <https://doi.org/10.1007/s12186-012-9087-8>
- Timmerman, T. A. (2000). Racial diversity, age, diversity, interdependence, and team performance. *Small Group Research*, *31*, 592–606. <https://doi.org/10.1177/104649640003100505>
- Tuckman, B. W. (1965). Development sequence in small groups. *Psychological Bulletin*, *63*, 384–399. <https://doi.org/10.1037/h0022100>
- Van de Ven, A. H., & Poole, M. S. (1995). Explaining development and change in organizations. *Academy of Management Review*, *20*, 510–540. <https://doi.org/10.2307/258786>
- Van den Bossche, P., Gijsselaers, W. H., Segers, M., & Kirschner, P. A. (2006). Social and cognitive factors driving teamwork in collaborative learning environments: Team learning beliefs and behaviors. *Small Group Research*, *37*, 490–521. <https://doi.org/10.1177/1046496406292938>
- Van der Haar, S., Segers, M., Jehn, K., & Van den Bossche, P. (2015). Investigating the relation between team learning and the team situation model. *Small Group Research*, *46*, 50–82. <https://doi.org/10.1177/1046496414558840>
- Van der Haar, S., Koeslag-Kreunen, M., Euwe, E., & Segers, M. (2017). Team leader structuring for team effectiveness and team learning in command-and-control teams. *Small Group Research*, *48*, 215–248. <https://doi.org/10.1177/1046496417689897>

- Van Woerkom, M., & Croon, M. (2009). The relationships between team learning activities and team performance. *Personnel Review*, 38, 560–577. <https://doi.org/10.1108/00483480910978054>
- Volpe, C. E., Cannon-Bowers, J. A., & Salas, E. (1996). The impact of cross-training on team functioning: An empirical investigation. *Human Factors*, 38(1), 87–100. <https://doi.org/10.1518/00187209677890741>
- Walter, F., & Van der Vegt, G. S. (2013). Harnessing members' positive mood for team-directed learning behaviour and team innovation: The moderating role of perceived team feedback. *European Journal of Work & Organizational Psychology*, 22, 235–248. <https://doi.org/10.1080/01359432X.2012.660748>
- Watzek, V., & Mulder, R. H. (2019). Team learning behaviours and team affective reactions: an empirical study on interdisciplinary work teams. *Vocations and Learning*, 12, 1–22. <https://doi.org/10.1007/s12186-018-9205-3>
- Watzek, V., Mulder, R. H., & Rehm, M. (submitted-a). Exploring dynamics of emotional reactions in online collaboration of communities of learners and their relations with learning outcomes.
- Watzek, V., Widmann, A., & Mulder, R. H. (submitted-b). The relationships between emotions and team learning in organizations over time.
- Wenger, E. (1998). *Communities of practice – Learning, meaning, and identity*. Cambridge University Press.
- Widmann, A., & Mulder, R. H. (2020). The effect of team learning behaviours and team mental models on teacher team performance. *Instructional Science*, 48, 1–21. <https://doi.org/10.1007/s11251-019-09500-6>
- Widmann, A., & Mulder, R. H. (submitted). Behavioural change in work teams – A systematic review.
- Widmann, A., Messmann, G., & Mulder, R. H. (2016). The impact of team learning behaviors on team innovative work behavior: A systematic review. *Human Resource Development Review*, 15, 429–458. <https://doi.org/10.1177/1534484316673713>
- Widmann, A., Mulder, R. H., & König, C. (2019). Team learning behaviours as predictors for innovative work behaviour – A longitudinal study. *Innovation: Organization & Management*, 21, 298–316. <https://doi.org/10.1080/14479338.2018.1530567>
- Yorks, L., & Sauquet, A. (2003). Team learning and national culture: Framing the issues. *Advances in Developing Human Resources*, 5, 7–25. <https://doi.org/10.1177/1523422302239180>
- Zakaria, N., Amelinckx, A., & Wilemon, D. (2008). Navigating across culture and distance: Understanding the determinants of global virtual team performance. In V. I. Sessa & M. London (Eds.), *Work group learning. Understanding, improving & assessing how groups learn in organizations* (pp. 175–192). Lawrence Erlbaum Associates.
- Zellmer-Bruhn, M., & Gibson, C. (2006). Multinational organization context: Implications for team learning and performance. *Academy of Management Journal*, 49, 501–518. <https://doi.org/10.5465/AMJ.2006.21794668>
- Zhang, A. Y., Tsui, A. S., & Wang, D. X. (2011). Leadership behaviors and group creativity in Chinese organizations: The role of group processes. *The Leadership Quarterly*, 22, 851–862. <https://doi.org/10.1016/j.leaqua.2011.07.007>
- Zoethout, H., Wesselink, R., Runhaar, P., & Mulder, M. (2017). Using transactivity to understand emergence of team learning. *Small Group Research*, 48, 190–214. <https://doi.org/10.1177/10464964176916147>

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Part III
Organizational Level and Beyond

Chapter 14

Assessment of Vocational Competences – Definitions, Issues and Quality Criteria



Viola Deutscher and Esther Winther

Abstract Assessing what people learn and are able to do at the workplace is a central target of WPL research. Adequate measurement instruments for the assessment of vocational competences are clearly rare though a prerequisite for accountable systems to authorize access to vocational activities on a national and international level as well as for the provision and design of vocational trainings on an organizational and individual level. The chapter draws on existing literature on competence assessment in the field of WPL in order to (1) define vocational competence, (2) carve out different characteristics of the concept, (3) describe common challenges and (4) offer validity standards of vocational competence assessment. Subsequently, new directions and desiderata for vocational competence assessment will be briefly discussed.

Keywords Competence · Assessment · Authenticity · Workplace · Process-orientation

14.1 Relevance

Measures of vocational competence can be applied in different phases and on different levels of vocational education and training (VET): They relate to formative assessments in order to support vocational learning processes as well as to summative assessments in order to test vocational learners' abilities at the end of a training sequence on an individual or group level. Moreover, they pertain to national or international educational levels, by proving relevant information for managing the

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C. Harteis et al. (eds.), *Research Approaches on Workplace Learning*,
Professional and Practice-based Learning 31,
https://doi.org/10.1007/978-3-030-89582-2_14

305

quality of the vocational educational systems, developing adequate support programs and regulating the access to occupational groups through an acknowledgement of competences. The acknowledgement of vocational competences is particularly important for individuals, but also intriguing for employers and society and thus constitutes an ever-growing research field. For the individual the acquisition and acknowledgement of competence is correlated to levels of remuneration (see e.g. Billett, 2005; OECD, 2016) and associated with occupational identity (see also Pusey, 2003). It can also be argued that the level of (assessed) vocational competence does not only influence an individuals' capacities to participate in professional life but also facilitates its participation in social and political life. For employers and societies, a high level of competence recognition can facilitate a more effective distribution of workforce to work tasks leading to higher productivity and improved living standards. Therefore, increasingly, measurement instruments and acknowledgement mechanisms also appear in national and international policy agendas (e.g., OECD 2016). Yet, currently, the practice of the recognition and certification of skills learnt through work is underdeveloped and constrained by complexities in its organization and enactment that have particular and significant implications. To meet the multiple expectations presented above, the assessment and acknowledgement of competences, for the sake of encouraging lifelong, formal and informal vocational learning, require adequate measurement instruments. The strategies of the worker in the workplace are predominantly self-directed, intentional, and field-based (Cerasoli et al., 2014; Decius et al., 2019). Though the assessment of competences thus is a central target of VET research; coherent definitions, frameworks und instruments with respect to the diagnostics of vocational competence are rare (for exemptions see e.g. Achtenhagen & Weber, 2003; Gulikers et al., 2004; Deutscher & Winther, 2018), even though, such research is indeed needed as a prerequisite for accountable systems to authorize access to vocational activities, as well as for international qualification acknowledgement.

The paper draws on existing literature on competence assessment in order to (1) define vocational competence, (2) carve out different characteristics of this term, (3) describe common challenges and (4) offer validity standards of vocational competence assessment. Subsequently, new directions and desiderata for vocational competence assessment will be briefly discussed.

14.2 Defining Vocational Competence

The concept of competence, formerly referred to as occupational competence (e.g. Klemp, 1980), is widely used in the context of vocational education, workplace learning as well as higher education and has often been adopted on a national level (particularly by EU member states). Though the concept is characterized by a wide diversity of understanding and use among different educational and cultural contexts (see e.g. Biemans et al., 2004), Weigel et al. (2007, p. 4) conclude that "(...) although the diversity of the concept of competence in VET is stressed repeatedly,

and our comparison confirms this, there is enough commonality and convergence in its use to speak of common principles of competence (...).” This convergence mostly relates to an understanding of vocational competence being a latent construct (or most often a conglomerate of several constructs) that allows people to act in various vocational situations in a vocational domain. E.g. Mulder et al. (2006, p. 82) define the concept of vocational competence as “the capability to perform by using knowledge, skills, and attitudes that are integrated in the professional repertoire of the individual”.

It is important to note that this definition (1) relies on the assumption that competence and performance are related in the sense that competence allows for performance in variable situations (see e.g. Chomsky, 1965; Weinert, 2001). Further, (2) cognitive as well as non-cognitive facets accompany this notion of competence (e.g. Weinert, 2001). Beyond that, the concept (3) explicitly exceeds just “knowing” and rather emphasizes applying knowledge to everyday (work) problems and tasks (e.g. Shavelson, 2010, p. 41). That is, the demand is for both knowing and being able to use that knowledge at work including all cognitive levels needed for that use. In this respect three levels of cognitive processing can be theoretically and empirically identified that accompany vocational competence: conceptual, procedural, and interpretational.¹ Together, these competences represent an action schema for performing vocational tasks (Gelman and Greeno 1989; Shavelson, 2008). Moreover, (4) an output perspective versus an input perspective on vocational education is stressed with this definition, paying no attention to the question if competences where acquired outside or inside formal educational settings, which is a central difference to the concept of qualification. Further, vocational competence is (5) usually associated with a shift from a discipline or subject orientation to competence-based education (Weigel et al. 2007) relying rather on learning areas, sometimes referred to as learning fields, derived from work and business processes in an occupational field. Another central feature of vocational competence lies (6) in its natural composition of generic and specific aspects that are required for job performance (e.g. Mulder et al., 2005), which are often referred to as domain-linked and domain-specific competences in recent research literature (Winther & Achtenhagen, 2009; Winther et al., 2016). This conceptualization corresponds with Gelman and Greeno’s (1989) conception of domain-linked and domain-specific competence. According to Klotz et al. (2015) domain-linked vocational competence is generally relevant in decontextualized form to an occupational domain. It refers to key skills, or knowledge and ability that is general but also relevant for solving vocational problems.

¹ Conceptual competence implies an understanding of the principles in the domain and corresponds to factual knowledge that can be translated into an action schema. Procedural competence is an understanding of the principles of action, which usually takes the form of knowledge applications, such as ways to operate with facts, structures, knowledge nets, and their corresponding elements. Interpretational competence focuses on appropriate strategic decision-making processes that reflect a grounded interpretation of the results obtained through conceptual and procedural competence. This last category therefore entails the appropriate application of conceptual and procedural competence and constitutes the most complex and difficult ability (Shavelson 2008).

Domain-specific competence instead entails specific occupational knowledge and skills, including occupation-specific contents and job- or enterprise-specific rules and skills (Oates 2004), which are reflective of specific aspects, guidelines, and action maxims of an occupational group forming a “community of practice” (e.g. Lave and Wenger, 1991).

These six aspects largely connote the competence concept in current theoretical and empirical vocational competence research and impose far reaching implications for the diagnosis of vocational competence.

14.3 Issues Accompanying the Assessment of Vocational Competence

Based on assumption (1), it is noteworthy that the construct, competency, is an idea, a construction shaped by what societies or relevant decision-makers expect and define as professional knowledge skills and attitudes. It is therefore hypothetical and cannot be observed directly (Shavelson, 2008), why the term *competence measurement*, occasionally used in prevailing research, is somewhat misleading. It can only be inferred from a person’s behavior, where the presence or absence of performance, or different level’s of performance can be observed. However, as no task could be a perfect (reliable) and/or full (valid) representation of this hypothetical concept, several observations are needed in order to make assumptions about an individual’s vocational competence. Vocational assessment, transferring basic ideas of assessment theory (Messick, 1994) to vocational domains, thus can be defined as a complex design process reaching from the very start around the inference one wants to make (concept and purpose of the assessment), the observations one needs to ground them, the situations that will evoke those observations (vocational tasks), and the chain of reasoning that connects them (diagnostic procedures). In line with this definition it is therefore reasonable to deduce cognitive structures from the solution of authentic situations (performance), assuming adequate item design and psychometric procedures (e.g., Chomsky 1965; Shavelson 2008; Wilson 2008).

However, there are three issues specific to WPL that impede the validity of this assessment design process at different levels and stages, if not addressed carefully:

1. As a first characteristic, vocational competence assessments relate to multiple application layers of one’s skills and attitudes. Therefore, particularly, the identification of work tasks can rapidly stray to the level of abstractabilities which reveal very little about vocational competence at a specific workplace (Rauner, 2007, p. 53). Even if vocational learning is formalized through a common curriculum of basic competences, aggregating practitioners’ shared beliefs about what comprises the competence constituting an occupation, the composition and degree of competences can still be quite heterogeneous in specific workplaces (Billett, 2005). In this respect it is noteworthy, that requirements for workplace

performance are not uniform or a version of the occupation practice but can have distinct qualities (Billett, 2001). So, while there are general rules and heuristics of an occupational community of practice, there usually are industry and workplace-specific characteristics as well that define competent behavior in a given work-context. This abundant variation creates an ongoing dilemma in respect of the need to construct generally valid competence tests. Thus, the reference point for vocational competence can relate either to an occupation in general, to a specific sector or industry and finally even to a specific company or workplace. So the domain of application of a vocational competence assessment should at least be subdivided into occupation-specific, industry-specific or workplace-specific assessment instruments and be made transparent in order to be valid.

2. As a second characteristic, the purposes of vocational assessments are vast to say the least. Assessments are used at different phases of a vocational learning process; assessments at entry to a program or workplace to explicate previous knowledge, assessments used to determine progress during vocational learning, and assessments to evaluate the learning progress at the end of a vocational training or after a certain time of work experience. Apart from that, they might be conducted by different partners of the vocational learning process (e.g. self-assessment, peer-assessment, assessment by an employer or centralized assessments by certified institutions) with quite different intentions regarding the resulting test decisions (e.g. assuring quality of the learning process, admission to an occupation, recruitment and promotional purposes, etc.). Respective of this diverse and sometimes conflicting purposes, vocational assessment designs require careful consideration of the assessment reference (e.g. criteria-referenced or norm-referenced), the assessment mode, and the administration of vocational assessments. Therefore, not all kinds of assessments are adequate for all purposes of assessment. The focus of this chapter will henceforth be on assessments that may form a basis for vocational acknowledgement of competences.
3. A third characteristic relates to the different learning sites that play a role for vocational competence assessment. Vocational learning can take place at the workplace itself, at a vocational learning institution (e.g. a school or a cooperative training centre) or during the private life of an individual. Given that workplaces are in any case the final places for the demonstration of competence, they present not only a viable but a preferable option for the assessment and acknowledgement of work skills as they are the “natural” assessment site and may in this respect potentially assist overcome disadvantage in formal educational settings and be used to maintain the recognition of skills throughout working life (see Billett, 2005, p. 943). However, workplaces are not always adequate assessment sites, at least not for all occupations and assessment purposes of assessment. For example, if the aim of the assessment is demonstrating competence as an astronaut or pilot, usually simulated environments present a safer option for assessment. The same applies for a variety of high-risk vocations e.g. for electricians, fire fighters or military. Moreover, cost-related or fairness-related arguments in high-stakes assessments e.g. final examinations on national levels with the pur-

pose of vocational admission may call for a centralized assessment that does not take place at an individual's workplace.² In this respect, Thomson (1991, p. 7) contributes an interesting concept to the discussion by suggesting that the cornerstone of a competency-based approach is the use of assessment in „workplace situations“. It follows, that if workplace situations cannot be assessed adequately at the workplace they have to be authentically simulated. E.g. Thomson & Pearce (1990) illustrate the need for both on- and off-the-job assessment, because some skills need to be assessed in classroom situations (e.g. occupation-specific aspects of competence for external recognition), others in simulated contexts off the job, and yet others in a real workplace setting. Nevertheless, every vocational competence assessment, no matter the assessment site, should relate to authentic workplace situations that form the tasks and mirror learning in realistic work situations, requiring problem-solving and decision-making, instead of low-importance learning metrics (e.g. isolated knowledge questions). Therefore, the concept of authenticity plays a crucial role in vocational competence assessment.

Summing up, the concept of vocational competence and workplaces present novel challenges for assessment and certification. These challenges are central to issues of securing fair assessment and legitimated recognition.

14.4 Types and Methods of Vocational Competence Assessment

The American National Center for Research in Vocational Education (NCRVE) identified four types of vocational assessment with the purpose of competence acknowledgement³ that are widely used in vocational education (Stecher et al. 1997):

1. Written assessments (including selected response types and constructed responses types such as essay items or writing samples)
2. Performance tasks (hands-on activities that require learners to demonstrate their ability to perform certain actions)
3. Projects (cumulative assessments e.g. including research papers, a work product and oral presentations)
4. Portfolios (cumulative assessments e.g. representing a collection of studentwork and a documentation of student performance)

Since then, with the development of educational software, technology-based assessments (e.g. in particular simulations) have become more prominent. However, it can be argued that they do not represent a new category but can again be assigned

²Note however, that the claim of assessing workplace-specific competence is not valid then, even though many aspects might be assessed that also raise the probability of good workplace-specific performance.

³Henceforth self-assessment and peer-assessment as types of assessment will not be further considered, as the focus of this chapter is on assessment with the purpose of competence acknowledgement.

to written assessments administered via digital devices, performance tasks (e.g. work simulations) or cumulative assessments (e.g. assessment over a collection of studies and work products via learning platforms).

In principle every assessment type can contribute to the assessment and acknowledgement of vocational competences. However, depending on the competence being assessed (e.g. customer communication versus technical knowledge) some types of assessment may seem not appropriate, especially if they do not go beyond mere repetition of knowledge. Here, the various assessment purposes discussed as well as the nature of the targeted competence aspect should be carefully considered. Moreover, the theoretical definition of vocational competence, as a holistic concept allowing for performance in various situations, favors assessments relying on performance tasks, work products as well as well-grounded cumulative assessment-types.

Regarding the categories of methods, that are available for the assessment of vocational competences, three levels of observational quality can be distinguished, forming a hierarchy regarding the proximity to the theoretical concept of vocational competence: Observing knowledge as a prerequisite for vocational competence, observing work task products as a result of competence and observing work-task performance as the actual demonstration of competence in an action process including the work-product it finally leads to. On all three levels we find methods that can be applied at the workplace or at vocational schools. Though, as argued before, the workplace should be considered the natural and therefore preferable assessment site, if both alternatives are viable. The possible concrete methods have to be identified for different vocational domains. While some may be viable for multiple occupations (e.g. multiple-choice items for the assessment of knowledge), some are specific assessment procedures only valid in certain domains (e.g. Gantt charts for productions for the economic domain). Table 14.1 contains as an example a selection of possible evidence for the economic domain.

14.5 Quality Criteria and Process of Vocational Competence Assessment

Though vocational assessment is broadly discussed in scientific literature, coherent frameworks with respect to the quality criteria for the assessment of vocational competence are scant. However, drawing on different streams of WPL research (particularly authenticity and competence research), six major key-categories of quality criteria can be identified, that define high-quality assessments of vocational competence. Following Deutscher and Winther (2018)⁴ those will be explicated in paragraph 5 in brief and substantiated by various research strings in the WPL field:

⁴An extended version of the following paragraph can also be found in Deutscher, V. & Winther, E. (2018). A Conceptual Framework for Authentic Competence Assessment in VET: A Logic Design Model. In S. McGrath et al. (eds.), *Handbook of Vocational Education and Training: Developments in the Changing World of Work* (pp. 317–338). Springer. https://doi.org/10.1007/978-3-319-49789-1_80-1

Table 14.1 Exemplary evidence for the economic domain

Observing knowledge	
<i>Workplace</i>	<i>Vocational school</i>
Cause and effect diagrams	Multiple choice questions
Event chains	Short questions
Flowcharts	Essays
Concept maps	Graphic organizers
Workplace discussion	Event chains
...	Concept maps
...	...
Observing work task products	
<i>Workplace</i>	<i>Vocational school</i>
Business letters	Collages
Business charts and tables	Posters
Storyboard reports for labor	Drawings/illustrations
Gantt charts of production	Booklets
Balance sheet analysis	Wall Walks
....	...
Observing work task performance	
<i>Workplace</i>	<i>Vocational school</i>
Work demonstrations (e.g. customer counselling interview)	Games/quiz bowls
Presentations (e.g. slide show for suppliers)	Student-led discussions
...	Prepared and extemporaneous speeches
...	Plays-TV/radio broadcasts
...	...

1. Assessment Mode
2. Task Relevance
3. Task Complexity
4. Assessment Context
5. Process-Oriented
6. Social Interaction

It is noteworthy that these design categories and criteria explicitly exclude general assessment standards relevant for all fields of learning (including workplace and vocational learning). Those include e.g. construct validity, reliability, objectivity, instructional sensitivity, etc., which are extensively discussed in contemporary assessment literature (for an overview see e.g. AERA/NCME, 2014). The chapter will instead focus on aspects of vocational assessment that are additionally relevant in vocational domains in order to validly assess vocational competences.

14.5.1 Assessment Mode

Like mentioned under characteristic (3) workplaces are the preferable option for the assessment and acknowledgement of vocational competences. If this option is not viable due to occupational risks or as conflicting with the purpose of an assessment,

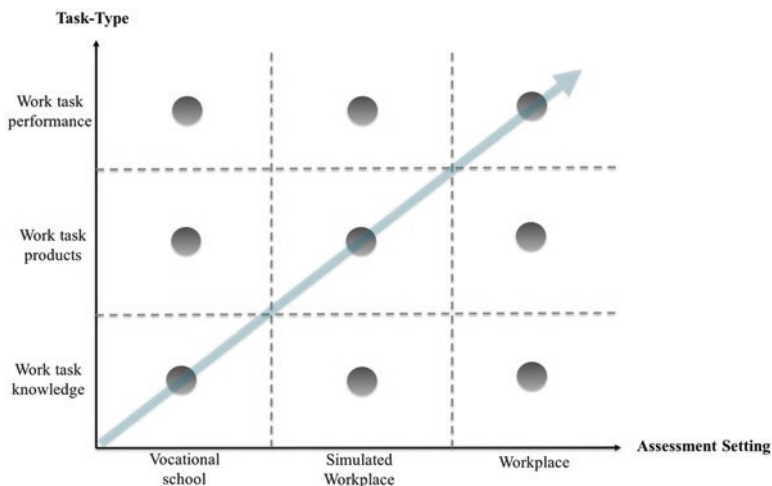


Fig. 14.1 Modes of vocational competence assessment

the workplace has to be represented in an artificial environment, reflecting the surrounding of the real workplace as authentic as possible. E.g. Gulikers et al. (2004) stress the importance of a high fidelity of an assessment’s test environment, which they refer to as the “physical context” (p. 74). Here two dimensions of the test environment, that determine the authenticity of this aspect can be distinguished (see Fig. 14.1): First, the assessment can take place at different settings. It can be administered at a vocational school or another testing institution or directly at the workplace and therefore at the natural surrounding where competence is demonstrated. As a compromise, it could also be administered as a computer simulation of a typical workplace. Second, as mentioned in connection to the categories of methods of vocational assessment, the task-types presented in the test environment can focus on either observing knowledge at the workplace (typically multiple-choice or short tasks), on work-products (e.g. a chair for a carpenter or a business letter for an industrial apprentice) or on observing work-task performance (observing the process of problem solving leading to a work-product at the workplace, via log-data in a simulation or by analyzing the solving approach in a paper-pencil task). The more up the matrix, the more appropriate the assessment mode seems for the diagnostics of vocational competence.

As a quality criterion, vocational competence assessments should strive to move up the matrix, or state compelling reasons not to. For example, high stakes testing for the purpose of certification may require a certain degree of standardization and comparability between persons. Both properties may be hard and sometimes impossible to obtain in natural settings.

14.5.2 Task Relevance

Different research emphasizes that tasks are at the core of any diagnostic decision and therefore should play a crucial role for valid vocational assessments (Wiggins, 1993, Newman, 1997, Gulikers et al., 2004). The tasks chosen in a VET-assessment are appropriate if they are perceived by test takers as “representative, relevant and meaningful” in the sense that they resemble the criterion task carried out in professional practice (Gulikers et al., 2004, p. 71). Moreover, the distribution of relevant tasks over different fields of action of a vocational domain, i.e. the proportion of different contents, should reflect the natural weighing at the workplace in order to capture vocational competence. This means that activities that are given a large focus at the workplace (in terms of frequency of occurrence and their importance for work processes) should be presented proportionally within the assessment, allowing for a harmony between the vocational curriculum (formal or informal), vocational instruction and learning (formal or informal) and vocational assessment.

14.5.3 Task Complexity

Some authors argue that with respect to the complexity of tasks there should be an emphasis on higher level thinking and more complex learning (Custer et al., 2000, p. 13; Wiggins, 1993). This corresponds to a notion of vocational competence as excellence. However, the definition of vocational competence as the capability to perform in vocational situations, does not yet define the complexity of the situations in which performance has to be demonstrated. It is therefore initially open for different levels of complexity and at its’ core neutral regarding the normative judgment of complexities. Rather, it should be argued that the extend of complexity is appropriate as long as it reflects the complexity of the relevant criterion-task at the workplace (e.g. Gulikers et al., 2004). Vocational tasks may be relatively unchallenging requiring a rather low level of cognitive and/or manual complexity. Still, those not complex activities are part of the concept of vocational competence and should not per se be excluded from an assessment. Rather, the assessment of vocational competence should represent the complexity of a real work surrounding, which of course usually contains a certain (domain-specific) amount of complex tasks.

14.5.4 Assessment Context

Learning at the workplace is highly contextualized. Therefore, if assessments cannot be administered at the actual workplace of an individual a realistic vocational setting should be modeled in which all tasks are embedded (e.g. Shavelson, Seminars, 1968). This authentic test-environment should mirror central aspects of a

real work-environment and stage all tasks in this environment as a situated anchor. E.g., for the commercial domain this could mean to stage all tasks in a model-company (see e.g. Achtenhagen & Weber, 2003; Winther et al., 2016; Rausch & Wuttke, 2016; Michaelis & Seeber, 2019) or for the medical domain in a model-hospital or in a doctor's practice (see e.g. Seeber et al., 2016). The trick of this quality category is to form a close-to-reality-surrounding that facilitates the transfer of vocational competence in assessment situations. Regarding the modeled framing and materials, the number and kinds of material and information available to testees should equal the number and kinds of information at the workplace (Segers et al., 1999). In this respect, the surrounding also tends to be more authentic, if it contains relevant and irrelevant information (Herrington & Oliver, 2000), as it is usually the case in a workplace situation, where learners have to filter e.g. documents, object properties or conversations for the necessary information to solve a problem. With respect to the proximity of the context to an actual workplace, the sector and industry chosen should fit the individual's workplace. Whereas it is not feasible to model the exact branch and workplace for each learner. This is not in conflict with the definition of vocational competence, as it demands for a demonstration of competence in variable situations and therefore in a range of possible vocational contexts. Note however, that the claim of assessing workplace-specific competence is not valid then, even though many aspects might be assessed that also raise the probability of good workplace-specific performance.

14.5.5 Process-Orientation

Typically, events and resulting work tasks take place in a “natural order” at real workplaces (e.g. Hacker, 2003; Preiß, 2005). It is crucial, that vocational learners also have to think and operate in work processes in order to find ideal solutions to vocational problems. Hence, the sequence of vocational tasks administered to vocational test-takers should not be randomly or follow a content structure, but rather follow the logic of workplace processes. Accordingly, process-orientation in vocational assessments can be conceived of administrating a chronological sequencing of vocational tasks following the natural occurrence of vocational events at the workplace. E.g. in industrial or various service domains, tasks should be arranged around the production-chain or around customer-service.

14.5.6 Social Interaction

Following socio-cultural approaches, WPL is characterized by a high degree of social interaction in which knowledge among a vocational community is shared and individually constructed (e.g. Lave & Wenger, 1991; Tynjälä, 2008). Against this background, apart from administering tasks in a real or realistic work-environment,

they moreover should be contextualized socially. Though working and learning usually require a consistent involvement in social interaction, it is notable, that not each vocational activity requires social interaction. Therefore, if the vocational activity assessed requires social interaction, the assessment should as well involve social interaction (Gulikers et al., 2004, p. 74). If we define social interaction, following a basic definition of Goffman (1959), as the process by which we act and react to our social environment, we can here differentiate between different qualities of social interaction in vocational assessments that can be interpreted as a taxonomy with respect to their proximity to the vocational competence concept. On a first level, the learner is placed at the center of test-events. On a second level, the learner has to solve a task as a reaction to a social environment in a game-like process. On a third level, the assess has to actively approach others (e.g. writing an e-mail) in order to solve a task. On a final level, in certain assessment modes it is technically feasible to let the learner interact with the assessment's environment and/or other learners. Again, also with respect to this quality category there may be good reasons not to reach out for the highest level of the taxonomy, e.g. if the assessment aims for an acknowledgement of individual competence (where the possibility of group collaboration on tasks usually has to be excluded). Table 14.2 graphically summarizes the possible levels of social interaction in vocational assessments and gives descriptors as well as examples for the commercial domain.

Table 14.2 Taxonomy of social embedding in (vocational) assessments

Level	Descriptor	Example
4 Social Interaction	Let the learner interact with the test environment and/or others	The learner a voicemail informing about a no sufficient quantity of synthetic materials on stock to execute an order. His task is to order 25 tons of new synthetic materials by contacting various suppliers via e-mail. An intelligent test environment or other assessment participants respond to his request with offers and feedback.
3 Social Reaction	Let the learner solve a task by actively approaching others	The learner receives a voicemail informing about a no sufficient quantity of synthetic materials on stock to execute an order. His task is to order 25 tons of synthetic materials by contacting various suppliers via e-mail.
2 Social Action	Let the learner solve tasks upon a social request	The learner receives an email by her superior Ms White, informing the assessee about changing currency rates and asking to adapt the price lists in the company's pricing system.
1 Social Placement	Place the learner at the center of action	The learner addressed and placed in the assessment plot. (e.g. „You have been employed with <i>Ergonomics</i> since the beginning of this year. Ms White, the team leader and Mr Friebel an experienced employee, are your colleagues. You are asked to support your project team by managing the following work tasks.”

14.6 Summary and Outlook

Assessing learning at and for the workplace is a central target of WPL research and serves various purposes. Vocational competence has over the last decades evolved as a crucial concept for vocational learning and therefore deserves special attention with respect to possible assessment methods and standards. Yet, currently, the practice of developing vocational competence assessments is constrained by complexities in its concept and employment. Those aspects have particular implications for vocational competence assessment that need to be addressed. The chapter defines vocational competence as a latent construct that allows people to act in various vocational situations in a vocational domain and stressed that competence is to be deduced in a complex design process. With respect to this theoretical concept, three issues specific to WPL are identified that impede the validity of the assessment design process at different levels and stages, if not addressed carefully: (1) varying abstractabilities of reference, (2) varying purposes and (3) multiple assessment sites. With respect to different types and methods of assessment, four types of vocational competence assessment can be distinguished: (1) written assessments, (2) performance tasks, (3) projects and (4) portfolios. Those types of assessments can be used to gather information on three levels of observation, forming a hierarchy regarding the proximity to the theoretical concept of vocational competence: (1) observing work-task knowledge, (2) observing work-task products and (3) observing work-task performance. The respective assessment methods for these observations should be defined according to the typical methods fitting the workplace of a vocational domain. Finally, six design categories and respective design criteria can be adhered to in order to create high quality assessments of vocational competence. In detail, attention has to be paid to (1) the assessment mode (2) task relevance, (3) task complexity, (4) assessment context, (4) process-orientation, and to (6) social interaction.

While most of the research with respect to vocational competence assessment currently focuses on summative assessments (assessment of learning), it should be noted that future directions should also address the assessment of longitudinal competency development in formative settings to support the learning process and give learners and teachers insight into their learning progressions (assessment for learning) (e.g. Van der Vleuten, 1996). Then, the quality categories above have to be broadened, particularly by ensuring meaningful feedback to learners and instructors, to further the attainment of professional competencies. Moreover, without a measurement of the qualities of workplace learning (working environment, work-task characteristics, learning methods, etc.) and connecting those learning factors to assessment, we deprive ourselves of the opportunity to improve vocational learning designs by comparing different learning settings and methods. Instead, it would be worthwhile to use the rise of assessment and digital technologies to install cycles of continuous improvement in different domains of vocational learning.

References

- Achtenhagen, F., & Weber, S. (2003). „Authentizität“ in der Gestaltung beruflicher Lernumgebungen. In A. Bredow, R. Dobischat, & J. Rottmann (Eds.), *Berufs- und Wirtschaftspädagogik von A-Z* (pp. 185–199). Schneider.
- AERA/NCME. (2014). *The standards for educational and psychological testing*. American Educational Research Association.
- Biemans, H., Nieuwenhuis, L., Poell, R., Mulder, M., & Wesselink, R. (2004). Competence-based VET in the Netherlands: Backgrounds and pitfalls. *Journal of Vocational Education and Training*, 56(4), 523–538.
- Billett, S. (2001). Knowing in practice: Re-conceptualising vocational expertise. *Learning and Instruction*, 11(6), 431–452.
- Billett, S. (2005). Recognition of learning through work. In N. Bascia, A. Cumming, A. Datnow, K. Leithwood, & D. Livingstone (Eds.), *International handbook of educational policy* (pp. 943–962). The Netherlands Springer.
- Cerasoli, C. P., Nicklin, J. M., & Ford, M. (2014). Intrinsic motivation and extrinsic incentives jointly predict performance: A 40-year meta-analysis. *Psychological Bulletin*, 140(4), 980–1008.
- Chomsky, N. (1965). *Aspects of the theory of syntax*. MIT Press.
- Custer, R. L., Schell, J., McAlister, B. D., Scott, J. L., & Hoepfl, M. (2000). *Using authentic assessment in vocational education*. ERIC.
- Decius, J., Schaper, N., & Seifert, A. (2019). Informal workplace learning: Development and validation of a measure. *Human Resource Development Quarterly*, 30, 495–535.
- Deutscher, V., & Winther, E. (2018). A conceptual framework for authentic competence assessment in VET: A logic design model. In S. McGrath et al. (Eds.), *Handbook of vocational education and training: Developments in the changing world of work* (pp. 317–338). Springer.
- Gelman, R., & Greeno, J. G. (1989). On the nature of competence: Principles for understanding in a domain. In L. B. Resnick (Ed.), *Knowing and learning: Issues for a cognitive science of instruction*. Erlbaum.
- Goffman, E. (1959). *The presentation of self in everyday life*. Doubleday.
- Gulikens, J. T., Bastiaens, T. J., & Kirschner, P. A. (2004). A five-dimensional framework for authentic assessment. *Educational Technology Research and Development*, 52(3), 67–86.
- Hacker, W. (2003). Action regulation theory: A practical tool for the design of modern work processes? *European Journal of Work and Organizational Psychology*, 12(2), 105–130.
- Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Development*, 48(3), 23–48.
- Klemp, G. O. (1980). *Assessment of occupational competence*. National Institute of Education.
- Klotz, V. K., Winther, E., & Festner, D. (2015). Modeling the development of vocational competence: A psychometric model for economic domains. *Vocations & Learning*, 8(3), 247–268.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.
- Messick, S. (1994). The interplay of evidence and consequences in the validation of performance assessments. *Educational Researcher*, 23(2), 13–23.
- Michaelis, C., & Seeber, S. (2019). Challenges of the diagnostic of competence development in vocational education and training. In S. McGrath, J. Papier, M. Mulder, & R. Stuart (Eds.), *The international handbook of education for the changing world of work* (pp. 1–20). Springer.
- Mulder, M., Wesselink, R., & Bruijstens, H. C. J. (2005). Job profile research for the purchasing profession. *International Journal of Training and Development*, 9(3), 185–204.
- Mulder, M., Weigel, T., & Collins, K. (2006). The concept of competence concept in the development of vocational education and training in selected EU member states. A critical analysis. *Journal of Vocational Education and Training*, 59(1), 65–85.

- Newmann, F. M. (1997). Authentic assessment in social studies: Standards and examples. In G. D. Phye (Ed.), *Handbook of classroom assessment: Learning, achievement, and adjustment* (pp. 359–380). Academic.
- Oates, T. (2004). The role of outcome-based national qualifications in the development of an effective vocational education and training system: The case of England and Wales. *Policy Futures in Education*, 2(1), 53–71.
- OECD. (2016). *The survey of adult skills: Reader's companion* (OECD Skills Studies) (2nd ed.). OECD Publishing. <https://doi.org/10.1787/9789264258075-en>
- Preiß, P. (2005). Entwurf eines Kompetenzkonzepts für den Inhaltsbereich Rechnungswesen/Controlling. In P. Gonon, F. Klauser, R. Nickolaus, & R. Huisinga (Eds.), *Kompetenz, Kognition und neue Konzepte der beruflichen Bildung* (pp. 67–85). Verlag für Sozialwissenschaften.
- Pusey, M. (2003). *The experience of middle Australia*. Cambridge University Press.
- Rauner, F. (2007). Practical knowledge and occupational competence. *European Journal of Vocational Training*, 40(1), 52–66.
- Rausch, A., & Wuttke, E. (2016). Development of a multi-faceted model of domain-specific problem-solving competence and its acceptance by different stakeholders in the business domain. *Unterrichtswissenschaft*, 44(2), 164–189.
- Seeber, S., Schumann, M., Ketschau, T., Rüter, T., & Kleinhans, J. (2016). Modellierung und Messung von Fachkompetenzen Medizinischer Fachangestellter (CoSMed). In K. Beck, M. Landenberger, & F. Oser (Eds.), *Technologiebasierte Kompetenzmessung in der beruflichen Bildung – Resultate aus dem Forschungsprogramm ASCOT* (pp. 205–223). Bertelsmann.
- Segers, M., Dochy, F., & De Corte, E. (1999). Assessment practices and students' knowledge profiles in a problem-based curriculum. *Learning Environments Research*, 2, 191–213.
- Shavelson, R. J. (2008). Reflections on quantitative reasoning: An assessment perspective. In B. L. Madison & L. A. Steen (Eds.), *Calculation vs. context: Quantitative literacy and its implications for teacher education* (pp. 27–47). Mathematical Association of America.
- Shavelson, R. J. (2010). On the measurement of competency. *Empirical research in vocational education and training*, 2(1), 41–63.
- Shavelson, R. J., & Seminara, J. (1968). Effect of lunar gravity on man's performance of basic maintenance tasks. *Journal of Applied Psychology*, 52(3), 177–183.
- Stecher, B. M., Rahn, M. L., Ruby, A., Alt, M., & Robyn, A. (1997). *Using alternative assessments in vocational education*. Rand.
- Thomson, P. (1991). *Competency based training: Some developments and assessment issues for policy makers*. TAFE National Centre for Research and Development.
- Thomson, P., & Pearce, P. (1990). *Testing times: A study of assessment on and off the job*. TAFE National Centre for Research and Development.
- Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review*, 3(2), 130–154.
- Van der Vleuten, C. P. M. (1996). The assessment of professional competence: Developments, research and practical implications. *Advances in Health Sciences Education*, 1(1), 41–67.
- Weigel, T., Mulder, M., & Collins, K. (2007). The concept of competence in the development of vocational education and training in selected EU member states. *Journal of Vocational Education and Training*, 59(1), 51–64.
- Weinert, F. E. (2001). Concept of competence: A conceptual clarification. In D. S. Rychen & L. H. Salganik (Eds.), *Defining and selecting key competencies* (pp. 45–65). Hogrefe & Huber Publishers.
- Wiggins, G. P. (1993). *Assessing student performance: Exploring the purpose and limits of testing*. Jossey-Bass/Pfeiffer.
- Wilson, M. (2008). Cognitive diagnosis using item response models. *Journal of Psychology*, 216(2), 74–88.

- Winther, E., & Achtenhagen, F. (2009). Measurement of vocational competencies – A contribution to an international large-scale assessment on vocational education and training. *Empirical Research in Vocational Education and Training, 1*, 88–106.
- Winther, E., Festner, D., Sangmeister, J., & Klotz, V. K. (2016). Facing commercial competence: Modeling domain-linked and domain-specific competence as key elements of vocational development. In E. Wuttke, S. Schumann, & J. Seifried (Eds.), *Economic competence and financial literacy of young adults – Status and challenges* (pp. 149–164). Budrich.

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Chapter 15

Technologies for Professional Learning



Allison Littlejohn and Viktoria Pammer-Schindler

Abstract This chapter interrogates the concept of technology as driver for change in professional learning and as a (potential) enabler for new forms of learning. Changes in technology-enhanced professional learning are influenced by the inter-relationship of work practices, learning processes and technology systems. Based on an analysis of current research in professional learning with technologies, we identify a number of important trends. First, work practice tends to be agile and constantly changing so professionals are tending to use technologies to support just-in-time learning alongside formal professional training and education. Second, with widespread adoption of digital media in society, there appears to be increasing reliance on recommendations from AI systems for learning alongside guidance from workplace mentors or experts. Third, employers and employees want to find ways to extend assessment of formal educational qualifications through accreditation of the outcomes of informal, work-integrated learning. To shape the ongoing transformation of both work(places) and learning, the chapter highlights the ways diverse disciplines need to align reflectively, critically, and constructively to bring together theories and methods from learning sciences, computer science and human-computer interaction to identify problems and engineer solutions. Finally, we propose three constructs that are critical for technology-enhanced professional learning, but often are not taken into consideration: the goals and motivations of learners, the work environment and structure, and the tools and resources available for work and learning.

Keywords Professional technology-enhanced learning · Socio-technical design · Future work · Future of learning

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15.1 Technology as Enabler of Changed Learning Practice

Global, organisational and technological changes are transforming the world of work, which elevates the need for lifelong professional learning. Organisations continually are seeking ways to solve increasingly complex problems by developing solutions that require the integration and application of different areas of specialist knowledge. Professionals have to find ways to work on problems with others who have different areas of specialist knowledge, deepening their own knowledge. A consequence of this increased specialism and complexity of work problems is a marked change in the ways people work together: workers collaborate around shared problems, working together in ways that build knowledge, solve problems and create products. Changes in ways of working lead to new forms of organisation, as workers collaborate around shared problems, working in teams, groups and networks that are often geographically distributed. As work practices constantly evolve, there is a need for professionals to learn new skills and knowledge on an ongoing basis (Hager, 2004; Hadwin et al., 2011; Illeris, 2011). This cycle of ever-more complex work problems, increasing specialisation of roles and new organisational structures has led to an unprecedented demand worldwide for professional learning (Littlejohn & Margaryan, 2014).

Professional learning is expected to increase by 50% globally by 2040 (AlphaBeta, 2019). This demand is unlikely to be met through established forms of professional development, such as training and workshops that traditionally have enabled large numbers of people to reach a specific level of competency. In the past learning a standard curriculum has been helpful to enable large numbers of workers to learn skills and knowledge that apply to standard work practices. However, large-scale training of a standard curriculum is not helpful for workers who need to learn specialist knowledge and individual work practices (Littlejohn & Margaryan, 2014). Each professional has to learn specific skills and knowledge to apply to niche problems and work tasks. There is a general recognition that simply scaling up conventional forms of professional development – such as training or degree programmes that require a long-term, full-time commitment by students, – will not provide the volume or variety of professional learning needed. Many of the theories, assumptions and models that underpin professional learning have been developed with large-scale formal training in mind, therefore new approaches are needed to meet this growing demand for professional learning.

Adapting work and upskilling the workforce requires reconstructing the views of and processes within institutions and companies, taking into consideration the required diversity and decentralisation of training in ways that better support lifelong learning. Recent reports have called for forms of lifelong learning that support professionals upskilling more regularly (AlphaBeta, 2019). This has led to the development of a range of shorter and more focused learning opportunities, such as just-in-time learning, where people learn the new knowledge or skills they need for an immediate work task. There is recognition that different forms of expertise require diverse approaches to professional learning, depending on the domain of

application (Boud et al., 2000). Some occupations, such as healthcare, require workers to continually update their skills and knowledge through certification, which could involve longterm commitment to a course where credit is awarded, or short-term skills learning with granular credits, sometimes termed micro-credentialling or badging. In other occupations, such as computer coders, there is a culture of demonstrating expertise by producing outputs such as algorithms, rather than by accumulating qualifications or certificates.

Aside from the size and granularity or certification of learning, there are other features around which professional learning could be reimaged. Professionals learn an increasing range of skills and knowledge on-the-job, through everyday work tasks (Colley & Jarvis, 2007). This movement places emphasis and value on informal learning. The term ‘informal learning’ is considered contentious because it may imply that informal learning – learning through everyday work tasks – is somehow inferior to formal learning (Billett, 2004). Yet there have been few largescale attempts to rethink professional learning by integrating learning with work (Littlejohn et al., 2016a). An insight review by the Australian Government, the Australian Qualifications Review (AQR, 2018), questioned whether and how informal learning might be recognised as new forms of professional practice evolve. The same year the UK Government commissioned a foresight report to examine how professional learning might be expanded in ways that extend beyond formal training (Fuller & Unwin, 2016). The report emphasises the importance of learning for work both through formal training and informal, on-the-job learning. The degree of formality of learning, whether formal (pre-planned and structured) or informal (one-the-job) is an important dimension along which to consider how professional learning might be enabled.

Another feature around which professional learning can be reconceived is the application of technology. Technology tools often are the enablers of new and emerging forms of work practice, some of which would not be possible without technological support. For example, platforms such as Amazon and AirBnB connect traders with customers, Fiverr connects freelance workers with people who want to hire them and enterprise platforms support professionals distributed across global organisations to connect, form groups, collaborate, disperse then reform around well-defined problems. Technology tools may use algorithms or Artificial Intelligence (AI) to automatically build expertise profiles and use these to recommend experts for a given subject or problem (cp. Reichling & Wulf, 2009; Lindstaedt et al., 2010).

Although technologies are (in part) drivers for new ways of working and learning, they have not yet been fully exploited as enablers of changed learning practice (Littlejohn & Margaryan, 2014). This may be because the tools to support learning often are developed with formal training in mind and are designed for use outside the workplace. Technologies for formal learning include enterprise systems such as Learning Management Systems as well as Massive Open Online Course platforms, such as Coursera (www.coursera.org) that support distributed, Online Learning.

Digital systems can gather multi-modal data about professionals, including demographic data, contextual data, and data that indicates the affective state of the

learner, through face tracking, temperature or even skin conductivity (Malmberg et al., 2018; Järvelä & Hadwin, 2013). Artificial Intelligence-based systems are being developed to interpret these multi-modal data and make decisions on behalf of the learner (see for example Järvelä et al., 2018). However, the interpretation of these sorts of data have been questioned by learning scientists, concerned that the assumptions that underpin the algorithms that analyse data and make decisions for the learner are dangerous, because they have societal stereotypes and biases coded within them (Williamson, 2016).

Thus, embedding professional learning technologies in organisations is controversial. It requires a ‘whole system’ approach that takes into consideration digitalisation and innovation management. Yet, research and development of technology tools for professional learning seldom focuses on the whole work system and tends to view learning as taking place in a bounded digital environment, missing opportunities to exploit a range of socio-material resources at work. Most workplaces are sites for learning that are imbued with a range of useful tools and resources for the learner, including people, materials and technologies (Boud & Garrick, 1999). Therefore, it is important to take the whole system into consideration. At the same time, workplace structures and processes may constrain how learning take place and how insights can be acted on. This means that, although the organisation of work sets the conditions of learning, it is the reciprocal interaction between the individual and the workplace that determines learning (Tynjälä, 2008).

Work-based field studies on professional learning technologies are rare. There is insufficient understanding of how professionals use technologies in practice in real-world settings to work and learn. Particularly specialist workers, for whom learning is likely to be most effective when closely aligned with work practice and who mainly learn through work. Thus, there has been less attention paid to the research and development of technologies that support informal, work-integrated learning such as learning through reflecting on work tasks, Augmented Reality to overlay digital information within workplace settings, or the use of Artificial Intelligence systems to guide decisions and build connections through work tasks. Research and development of technology-enhanced professional learning requires critical insight into the ways professionals work and learn within their work environment (Littlejohn & Margaryan, 2014) and, at the same time, needs research, development and design of technologies that align learning with emerging ways of learning for work.

This chapter examines critical approaches within the learning sciences that examine work practice and professional learning alongside design methodologies used to research technology systems. The chapter argues the importance of bringing together these methods and perspectives in order to research and develop tools that mediate the relationship between professional work and learning in specific work contexts. In Sect. 15.2 we consider the diverse areas of knowledge, including work, learning and domain knowledge, that are necessary to research technologies for professional learning. Section 15.3 offers an overview of trends in technology-enhanced professional learning, illustrated through examples and case studies, before, in Sect. 15.4, examining current directions of research in the fields of learning science and computer science.

15.2 Where We Are Going: Directions in Technology-Enhanced Professional Learning

15.2.1 *The Inter-relationship of Work, Learning and Technology*

In the previous section we described how professional learning is moving towards lifelong learning, as people continually adapt their skills and knowledge. Some of the changes in the ways professionals learn are facilitated by technology. This section explores trends associated with professional learning, examining how technologies are influencing these.

15.2.1.1 From Longterm Commitment to Training to Just-in-Time Learning

Gaining a qualification, such as a diploma, degree or professional qualification, is no longer sufficient for a lifelong career. Professionals routinely participate in lifelong learning, refreshing their knowledge and skills through different approaches to learning. Many professional organisations now require people to engage in continual learning to retain their professional affiliation, with a growing number encouraging professionals to engage in online versions of face-to-face professional training.

Massive Open Online Courses (MOOCs) have become popular over the past decade as a way for professionals to learn skills over a few days or weeks. MOOCs are online courses staged in real-time with the geographically distributed participants (Littlejohn & Hood, 2018a). The term ‘massive’ refers to the large number of learners who participate in a MOOC, typically thousands or tens of thousands. ‘Open’ refers to the fact that often anyone, anywhere – no matter his or her background, prior experience or current context – may enrol in a MOOC. When they were first offered, around 2008, MOOCs were heralded as ‘the next big thing’ in higher education, though, more recently, they have been criticised for the poor quality experience many offer (Margaryan et al., 2015).

A number of commercial MOOC platform providers have been established over the past decade, including Coursera,¹ Udacity,² EdX³ and FutureLearn⁴ to partner with universities or other organisations to offer courses. MOOC platform providers have been seeking ways to generate profit and view the business-to-business market as a potential growth area. Coursera in particular has been partnering with

¹ www.coursera.org

² www.udacity.com

³ www.edx.org

⁴ www.futurelearn.com

universities and other organisations to provide courses for professions. Coursera uses data analytics to connect MOOC learners with companies who are advertising vacancies, charging the company a fee. These and other analytics-based forms of revenue generation are becoming embedded within online higher education, with data viewed as a valuable source of income. The ethical implications are difficult to predict and control. Algorithms may bias opportunities and selections and learners may be unaware of how their data is being used (Berendt et al., 2017).

Professionals need to have ways to learn how to solve a specific and immediate work task. Online platforms with professional communities can help professionals find experts who can help them or can help them find out how someone else has solved a similar problem. For example, coding specialists connect using online platforms, such as Stack Overflow, to share code, understand how specific coding problems might be solved by learning from peers about solutions to problems. Stack Overflow was not developed as a learning platform, but it supports professional learning by bringing together people with similar problems.

Intelligent systems are being developed to support specific work tasks, replacing professionals or augmenting their expertise so they are freed up to focus on more complex tasks. For example, pattern recognition software is being used to diagnose specific cancers, freeing up cancer specialists to work with patients. These systems using ‘Artificial Intelligence’, are increasingly being used to guide professionals in their work and learning.

15.2.1.2 From Guidance by an Expert Teacher to AI Recommendations

Artificial Intelligence (AI) is a range of analytic methods based on machine learning, where large amounts of data are gathered and fed into algorithms that use statistical models to identify patterns and inferences. These systems require large amounts of data (so-called ‘Big Data’) including personal data about learners. The more the algorithm is fed data, the greater the system ‘learns’ and applies this new knowledge to make predictions or decisions. In this way decisions about what the learner should do next shifts from the teacher to a system. Most systems are designed as a support system to help teachers decide how to support students, rather than as a direct replacement for the teacher. For example, AI systems that provide early prediction of ‘at-risk’ students can be used by teachers to identify which students to direct support towards. Predictive models are used to analyse data on individual learner profiles and data related to learner interaction within online environments to forecast whether a student is ‘at risk of dropping out’ of a course (Siemens & Long, 2011; Wolff et al., 2013). These data are then presented to learners or teachers using a variety of dashboards to support decisions about the next steps (Papamitsiou & Economides, 2014).

One example of a predictive system is ‘OU Analyse’, a system developed by The Open University, UK to provide early prediction of ‘at-risk’ students. The system uses data about each student’s demographics, including their age, gender, place of residence and prior qualifications and combines these data with observed activity

within the university's Virtual Learning Environment (Moodle). Each individual's data is analysed in relation to data from prior cohorts of students to predict the likelihood of passing the next Tutor Marked Assessment. These predictions are visualised for course tutors as a course overview dashboard where they can view the progress of individual students (see Kuzilek et al., 2015 and <https://analyse.kmi.open.ac.uk>). Progress is illustrated using a 'traffic light' system, to show whether a student is likely to pass their next tutor-marked assessment, based on their previous actions, grades and those of previous students. The system then uses the data to make a decision whether remedial action is needed and recommends to the tutor or student what the learner should do next.

At the informal learning side, Fessl et al. (2017) for instance have developed an adaptive reflection guidance concept and technology that reminds and supports professionals to reflect about relevant aspects of their work practice. The reflection guidance implemented by the authors prompts for action, which motivate users to do something, typically to use the app in which reflection guidance is embedded. The system prompts for reflection, which directly relates to content or data that is available within the app in which reflection guidance is implemented. By prompting the professional to reflect, the intention is to trigger reflection about specific content or data as representations of work practice. This reflection, of course, is on a representation of work practice, rather than on realworld practice. Nevertheless, it offers a step forward in terms of integrating and assimilating knowledge into practice. As informal learning becomes a more recognised form of legitimate professional learning, organisations are seeking ways to authenticate informal forms of assessment. The next section outlines some examples.

15.2.1.3 From Assessment and Accreditation by an Organisation to Informal Accreditation

In partnership with the MOOC platform providers, universities have been developing ways to allow professionals to gain qualifications faster through small-sized, credit bearing, 'micro credential courses' such as Microdegrees or Nanodegrees (Littlejohn & Hood, 2018a). The university supplies the course materials, assessment and accreditation and the platform provider supplies technology and marketing services. One example is the Masters in Computer Science offered by Georgia Tech which students can complete in 10 months. Four thousand students enrolled in this Masters in 2017, each paying 10 monthly payments of \$200 (USD) to study the course and gain the qualification.

Assessment has a number of social norms associated with it and is, therefore, been an area of professional learning that is difficult to change. One example of change is offering 'Badges' (micro certificates) that signify small amounts of learning or completion of a short course through 'Badged Open Courses': online learning events that offers some form of recognition for completing the course (Law, 2015). Recognition is recorded as a 'digital badge' from a recognised university, college or organisation demonstrating that the learner reached a specific

competency or completed a course. This certificate can be added to an online portfolio or CV. The value placed in a 'Badge' depends on the context of the learner. For example, an eye surgeon might not place high value on a digital badge from a BOC on Advanced Computing from MIT. However, a young professional in Bangalore may view the Badge as a way to make their CV stand out to startup companies in the city. A survey of learners studying in the UK Open University's 'OpenLearn' platform identified that 80% wanted their online learning achievements recognised and valued Badges released under a Creative Commons licence.

A variation on Badging is 'competency-based accreditation', where professionals participate in a learning event and demonstrate their competency to an acknowledged expert who assesses and records the learner's competency level. Competency based accreditation is being used by online international communities or networks of people with a shared interest. For example, #PHONAR (<https://phonar.org/>) is an open, online photography course where learners and experts help them gain expertise and develop online portfolios. Students learn through developing a portfolio of photographic images. Learning is realised through developing and maintaining connections with other students and photography experts and with the resources produced to support learning (for example course content materials) and as a by-product of learning (such as photographs, comments and other artefacts). The course requires learners to be proactive, taking responsibility for building and nurturing connections with relevant people and resources that can help them learn. The decentralised nature of the internet provides the environment to support an open and participatory culture of knowledge building through collaboration, participation and engagement. Although the course has a set of overarching objectives, each learner (implicitly or explicitly) sets and achieves personalised goals. The topics in the forum discussions tend to be emergent and responsive to the immediate needs of the learners. This approach is different from conventional courses, where the curriculum and objectives are predefined.

One difficulty with assessing online learning is in ensuring that the accreditation is from a trusted source. Attempts are being made to adapt the 'blockchain' technology system used to legitimise digital money (Bitcoin) to substantiate qualification credits (Sharples & Domingue, 2016). Blockchain is a set of linked data items stored on distributed, participating computers where the next item can only be added through a system of consensus. Each computer performs a significant amount of data mining work to corroborate an item before it can be added to a blockchain. Blockchains are being used to provide learners with persistent records of achievement provided by universities and other recognised organisations.

Effective ways to assess learning are of fundamental interest to the learning sciences, but often difficult to address in workplace environments. Learning science researchers are trying to find ways to recognise learning when skills and knowledge are acquired through the performance of every-day work. One example, is in 'learning from incidents', when there is an accident or near-miss in a hazardous work environment (Littlejohn et al., 2017). However, understanding whether people are learning is not as simple as observing a reduction in the number of incidents experienced by a company. A study by Murphy et al. (2018) identified a range of

indicators that can be measured by organisations to signify whether people are learning from incidents. Examples of indicators range from communications, that can be analysed through online, semantic analysis, to leadership actions that can be detected through online surveillance to product development that demonstrates effective learning from incidents. A study of sexual and reproductive health education in low-to-middle income countries will use data from news agencies to identify whether health workers in refugee camps are learning new forms of practice. Future research is likely to focus on identifying a range of different indicators that signal effective, informal learning.

15.2.1.4 From Formal to Informal Learning

Informal learning increasingly is supported through use of the technologies people use for work. Eraut and Hirsh (2010) has drawn attention to the importance of learning through work, emphasising that learning can be both ‘intentional’ and ‘unintentional’. Intentional learning takes many forms ranging from formal learning – workshops, training and classroom teaching to ‘non-formal’ learning, such as asking a colleague for advice. Examples of unintentional learning include watching a colleague doing a routine job in a new way and adopting a new form of practice. Unintentional learning is not always recognised as learning. For example, a professional working in a new organisation with a different work culture may develop new forms of practice, without appreciating or acknowledging that learning has taken place.

The knowledge gained through formal training needs to be contextualised within work practice and this contextualisation often happens informally. This contextualisation process may be difficult or impossible due to a misalignment of what is taught in formal trainings, and what is practical or culturally acceptable in workplace contexts. For example, hospital laboratory professionals may learn new laboratory detection processes (Littlejohn et al., 2019). However, this learning cannot be applied to the workplace if the right form of equipment is not available (Charitonos et al., 2018).

Informal learning is especially relevant where professionals are working at the boundaries of knowledge and cannot rely on courses to expand their knowledge (Littlejohn et al., 2016a). Self-regulated learning takes into consideration various affective, behavioural and cognitive factors that influence learning (Zimmerman & Kitsantas, 2005), alongside the social and situative features of the workplace. In these informal learning settings, the workplace context and culture influences and shapes learning, by constituting the environment in which professionals expand and develop their practice (Fuller & Unwin, 2016). Therefore, these sorts of learning practices cannot be understood without also understanding work practice. The relationships between work practice, learning and technology use is explored in the next section.

15.2.2 *Synthesis: How Do Technologies Support Work and Learning?*

The previous section exemplified a number of ways technologies are already being used to support professional work and learning, both in formal training contexts and while learning on-the-job. Technologies support a range of diverse activities, from providing access to information resources, enabling communication, supporting co-work and knowledge building, to drawing on data to recommend actions and make decisions.

The typology below illustrates a range of technologies and their uses, based on work by Pammer-Schindler (2019):

- Learning Management Systems or Virtual Learning Environments support the *documentation of learning activities and assessment outcomes* in ways that mirror conventional teaching and learning in universities and colleges.
- Platforms such as Social Media Environments (eg YouTube, Slideshare) or Massive Open Online Course (Coursera, EdX) support the *distribution and consumption of digital learning materials*. Mirroring conventional forms of distance learning, these platforms are designed to support the delivery of course materials, though the social technologies could be used to enable learners and teachers to interact in ways that are difficult in classrooms. For example, learners can directly enquire about problems they encounter and can link their own materials and make these available for others.
- *Communication technologies and social software* (eg Slack, WhatsApp) support discussions amongst learners and between learners and teachers (cp. Stahl et al., 2014). These technology systems allow people to communicate and collaborate at a distance, either in real-time or asynchronously, thereby supporting learning in ways that are not possible without the technology.
- *Virtual simulations and augmented reality systems* support *experimentation* in ways that can be safer (for example learning how to perform a hazardous procedure), cheaper, or not possible in reality (such as observing molecular structures) (cp. de Jong & Van Joolingen, 1998). One specific form of simulation is gaming technology which can be used to support learning in a ‘playful’ environment (for an overview of serious games or learning games – cp. van Eck, 2006).
- *Data analytics* are used to derive insights about learning drawing data from all kinds of sources using educational data mining techniques and learning analytics (cp. Baker & Siemens, 2014). The outputs can be used by various stakeholders including learners (to support their learning), teachers (to support teaching activity), and relevant institutions (to support institutional decision making and resource planning).
- *Artificial Intelligence based systems* proactively make decisions about the learner, such as predicting learner outcomes, recommending next steps and guiding learning activities in ways that complement human teachers (for an overview of recommender systems – cp. Manouselis et al., 2010; intelligent tutoring – see

Baker, 2016 for a critical discussion that includes an overview of intelligent tutoring literature).

From these examples, there are relatively few studies of technology-supported, informal learning in workplace contexts, triggering at least two major problems. First, formal learning contexts take prominence, missing opportunities to investigate how informal learning can be supported by technology systems. Second, TEL research in workplace contexts often is orientated towards investigation of the technology- systems. Rather than focusing on work practices and how these can be supported by technologies. This may be because technologies themselves are still maturing, and hence have not had significant take-up by organisations. These two problems have to be considered to advance beyond the state-of-the-art in technology-enhanced professional learning.

15.2.3 How to Go Beyond What Is: What Researchers Need to Know to Advance the State-of-the-Art

The previous section identified two problems that have to be addressed to advance beyond the state-of-the-art in technology-enhanced professional learning. Overcoming these issues requires knowledge from the learning sciences, specifically focusing on how professionals learn in different contexts, computing science, concentrating on the knowledge needed to design technology solutions as well as knowledge from the domain of work. Thus, the research and development of technical systems has to integrate knowledge from at least three domains: learning sciences, computer science and relevant knowledge from the domain of application (for example knowledge about the Manufacturing Sector, Health Sector, Energy Sector and so on). This section examines these diverse perspectives.

15.2.3.1 Learning Sciences: A Critical Perspective

The learning sciences encompass a range of distinct traditions, from educational psychology which may involve quantitative testing of laboratory-based simulations, to socio-cultural traditions, using qualitative anthropological or ethnographic methodologies to examine learning in ‘realworld’ settings. Many of these studies adopt a critical approach, aiming to uncover the underlying phenomenon and causality, rather than focusing on a solution. This critical approach makes it difficult to envision how technology developments, such as the introduction of Artificial Intelligence, might change learning processes. This critical approach also lacks a design-orientation, which is necessary however in order to develop technologies that are suitable for (professional) learning whilst at the same time being transformative.

15.2.3.2 Computer Science and Human-Computer Interaction: A Design-Oriented Perspective

Computer science is carried out within distinct communities with different epistemologies. Focussing solely on communities that also or solely focus on computer technologies for learning, a few stand out, such as artificial intelligence and data mining for education (AIEd, EdM, LAK), natural language processing for educational purposes (Sig Edu of ACL), or human-computer interaction from the perspective of learning as a particular domain of application (CHI). These different epistemologies range from contextual design to technical (algorithmic) approaches. The distinctiveness of these approaches are evidenced in the different sorts of research questions asked by each of the communities, such that for instance analytics-focussed communities tend to require that research is about analytics, and subordinately to that allowing the research of algorithms or learning-centered research questions. Overall, technology-based research tends to be design-focused. This approach runs the risk of designing technologies around known approaches to learning, missing opportunities to develop new conceptualisations of learning (cp. Fischer, 2007).

15.2.3.3 Domain Knowledge

Domain-specific knowledge of how to teach a particular subject exists around fundamental fields of knowledge, such as mathematics, computer science, language learning (with, again, specific knowledge for specific languages), etc. Such domain-specific didactical knowledge has had a chance to evolve for major subjects taught in primary and secondary education; where in many countries there are specific degree programs for teachers in particular subjects. Specific didactical knowledge is not to the same degree existent for fields taught in higher education and is significantly non-existent for specific fields of professional expertise. This is probably mostly due to the fact, that significantly fewer people learn about the specifics of how to measure car engines at the time of car engine development than people who need to learn mathematical foundations. However, there is such a thing as domain-specific didactical knowledge (see, for example, Kirschner et al., 2006).

15.2.3.4 Synthesis of Perspectives

Computer science and learning science each assume distinct viewpoints, with learning sciences leading towards a critical perspective and computer science taking a design perspective. Ideally these distinct views would be integrated in ways that underpin the research, design and implementation of technology-enhanced professional learning. We acknowledge that there have been attempts to integrate these perspectives without having a single, dominant perspective. For example, conferences such as the EC-TEL (European Conference on Technology-Enhanced

Learning) explicitly calls for researchers to take into consideration both perspectives, though papers often assume either a “learning” or a “technology” focus. Therefore, a key challenge in the research and development of technologies for professional learning is in considering both a critical and design perspective in order to analyse and critique existing and emerging workplace learning practice; and to design technological support for learning practice enabled through technology support. Thus, in order to design targeted and specific support for professional learning that is contextualised within domain knowledge and specific work practice, domain-specific didactical knowledge for professional learning needs to be developed in parallel with technology support for professional learning. The following section proposes a way forward to achieve this goal.

15.3 Professional Learning Systems: A Structure to Critically Inform Technology Design

Technology systems can gather and interpret multi-modal data using Artificial Intelligence to make decisions for the learner. However, there are concerns that the assumptions that underpin the algorithms that analyse data and make decisions have societal stereotypes and biases coded within them (Williamson, 2016; Berendt et al., 2017). Therefore, the design of technologies for professional learning must be informed by a range of critical data that inform technology-based support. Computer scientists normally use a design-oriented perspective, which complements the research methods described in the other chapters of this book. However, this design perspective is not sufficient in itself if the assumptions underpinning the design are based on social norms and conventions.

A proposal to move beyond the current status quo is to take a systemic, critical perspective that aims to de-construct the learning context in ways that critically inform the design of the technology. This critical perspective has to precede the design in order to provide a systemic baseline on which to design the technology.

This approach is illustrated through a usecase set in a global manufacturing organisation developed by one of the authors. Usecases are used by computer scientists to inform the design of technology systems by describing the context of use. The purpose of this usecase was to redesign training materials to support outcome-oriented learning..

The empirical work (focus group discussions, and interviews) leading up to the final usecase description pinpointed that the workplace had a diverse and heterogeneous set of approaches to training at different educational and organisational levels. These approaches varied in terms of the participants, from apprentices to academics; from early career professionals to senior managers; level of competency or skills, from theoretical to practical; from transversal issues, such as soft skills to core domain knowledge and skills; length of training and commitment to study, from two days to multiple weeks. In parallel, there were multiple types of

representations of training, and sometimes multiple representations for a single type of training: every training was described within the training management system, such as a system for booking the training room, registration, payment, and so on. For some types of training, learning materials were centrally available, while for others, only trainers could source the materials and make these available to participants. Some forms of training were designed around self-learning, with interactive electronic assessments, while others included assessments and exams with exam questions. Initially, only a training ID and a title denoted that these different representations referred to the same training.

The research team carrying out the study suggested including a description of the learning goals. There are several benefits to this approach: the learning goals are included in every description of the different forms of training within the organisation's training management system, as well as in the other enterprise systems, such as content or learning management systems. Therefore, the learning goals can be used as index to learning materials. In interactive electronic quizzes, learning goals can be used to give professional learners an overview of their learning progress. If each individual's progress is available in the system, future design could use data to provide an overview of the whole organisation. These contextual data provide critical information about the professional learner and the tools and resources available to him or her within the workplace, yet these data are not normally taken into consideration in usecases. These data can better inform the design of learning analytics systems, interactive systems for self-study, and automated learning guidance. However, this example provides only a first step towards aligning critical and design perspectives. Aligning these approaches is not straightforward, as discussed in the next section.

To overcome the challenge of aligning both a critical perspective on work and learning and a design-oriented perspective on designing effective technology supports, the research and design space had to be structured to provide a focus for critique, and to both constrain and direct design.

In this chapter we propose as useful overarching themes for combining the critical and design perspective when designing technologies for workplace learning:

1. **Goals and Motivation:** What is the primary goal of learning, and what is the main motivation of the learners? What is the value of what is being learned for work?
2. **Work Structure:** How is work and learning structured? What are relevant roles, divisions of labour, organisational culture?
3. **Tools:** What are the mediating objects (knowledge or practical resources) used for work/learning? How is the object of learning represented – in curated learning materials, in materials that can be re-purposed for learning, or in the form of data?

These questions can be used to guide design-oriented fieldwork that aims to elicit design context and to identify design opportunities..

This framework provides a starting point to consider various designs perspectives that can be built to support users within a usecase. The usecase

methodology can be used to consider workplace resources and tools that can be adapted to support both formal and informal learning. This framework supports the design process to scaffold the development of technological tools for specific work contexts. Table 15.1 illustrates examples of technology tools used to support professional learning, focusing on the three themes. The goal of this table is to lay out the design space and give example options.

15.3.1 Goals and Motivation

A concern expressed by learning scientists is that, by not taking into account the learner's context, technical designs may oversimplify how we understand learning. Research suggests that there is considerable variety in learners' motivations for professional learning (Littlejohn et al., 2016b). The goals of the professional learner usually align (tacitly or explicitly) with work tasks (Littlejohn et al., 2012). The learner's work role, discipline and geographic location affects their interest in topics (Liyaganawardena et al., 2013), Confidence, prior experience and motivation (Milligan et al., 2013), and a learner's occupation (Hood et al., 2015) have been found to mediate engagement. Some professionals primarily are motivated by solving immediate work tasks, expanding knowledge, or broaden their skillset in order to work more effectively (Milligan & Littlejohn, 2017). Others may be motivated to gain a qualification, depending on their context of work. For example, health workers often require certification to carry out tasks, while computer scientists are more motivated to solve tasks and demonstrate their competency through their outputs (Littlejohn & Hood, 2018b).

Research by one of the authors on how professionals self-regulated their learning suggests that learners displaying higher levels of self-regulation were more likely to conceptualise MOOCs as non-formal learning opportunities and to independently structure their learning and engagement to best serve their self-defined and self-identified needs (Littlejohn et al., 2016b). These needs might be to learn how to carry out a task more effectively. Alternatively, the need may be to gain certification to allow them to carry out work tasks (for example health professionals require certification for most work tasks).

Diverse motivations influence the socio-technical learning design: Where certification is the goal, technologies that connect learners to educational institutions may be useful. These systems include computer-mediated distance learning or MOOCs. New systems are being developed to allow certification or forms of formal recognition of learning outside education courses or MOOCs. This brings with it challenges in the transition. For example, in a case led by one of the a blended learning course for the unemployed is under discussion, provided by an unemployment agency. The usecase has an associated online system that supports self-study, by combining multimedia content with interactive learning exercises. In this usecase, the time spent on learning should be documented, as there is concern that in the online system will encourage learners to spend less time learning. Underlying this concern is the

Table 15.1 Overview of examples

	Formal learning	TEL examples	Informal learning	TEL examples
1 What are the main goals, motivators for learning?	Gain accreditation. Develop skills/competencies relevant for current or future work.	Online classroom. MOOCs and online courses. Competency development systems used by organisations, such as Volkswagen. Augmented reality headsets (see Sect. 15.2).	Solve problems and gain competencies (eg through onboarding, or lifelong professional learning). Modular access to content/knowledge resources. Participation in a community of practice.	Global knowledge networks, which are wikis used by companies (eg Shell) to support professionals in sharing their knowledge. Referencing text snippets to allow flexible access to content resources. Collaborative mood tracking as a trigger for peer support.
2 How is work and learning structured? What are relevant roles, divisions of labour, organisational culture?	Learning is usually guided by course structure and objectives. Time and space may be allotted by the organisation; or learning happens in the learner's private space of life	Blended learning course (partly online and partly face-to-face). Online apprenticeships. Predictive Analytics. MOOC (Coursera). BOC (Open Learn). Simulations.	Finding time and space for learning is a challenge Is a teacher (maybe an informal one) available – someone to ask, someone who supports learning?	Augmented reality, where an automotive technician wears a headset which overlays information about an engine she is repairing. Mediating communication and contextualisation in communities-of-practice/interest. Automated learning guidance. 'Charting' systems that prompt learners to define learning goals then connect them with other relevant people and resources.

<p>3 What are the mediating objects (knowledge or practical resources) used for work/learning? How is the object of learning represented – in curated learning materials, in materials that can be re-purposed for learning, or in the form of data?</p>	<p>Learning guided by content resources Resources created by an external provider or in-house.</p>	<p>MOOCs/online courses. Learning materials are available. – content creation and updating is a challenge in specialised learning domains.</p>	<p>Learning guided by resources often sourced by the learner and created by peers or other learners. – materials created for other purposes than learning are re-purposed. Learning goals may be explicitly available, or, where not, other conceptual artefacts possibly structure the learning domain. Data can represent relevant aspects of work practice as basis for data-driven learning.</p>	<p>Semantic analysis of the discussions within a team to analyse team cohesion. Use of Wikis (eg Wikipedia) as a site for learning, as distributed editors work together to create wiki entries. Augmented search applications, where AI systems 'learn' from the searching/sourcing behaviours of people. Re-purposing materials that are by-products of work for learning. Intelligent Digital Workspace – dynamic and living organisational memory enhanced with learning guidance Analytics of work practice that support learning.</p>
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concept that learners should spend significant time on learning. In reality, it is the quality of engagement, rather than the quantity of time on task, that will bring about competency development. Outcome assessment is complex and difficult to actuate, so professional's competency assessment often involves a lightweight assessment of learning outcomes. These concepts, from conventional training, are often directly transferred and applied to online settings, where time on task learning is tracked and documented as 'learning time'. Tracking is technologically challenging but possible when all learning takes place within a single system. However, if learning is across multiple sites and systems, tracking time is technologically challenging.

If the professional's goal is to solve a work problem, they may engage in 'just-in-time' learning focused around a specific work task and exploring a narrow concept, rather than a broad field of knowledge. In this case professionals will likely benefit from modular access to granular knowledge resources they can learn from. Modular access to resources is an important form of support for workplace learning and is sometimes termed "flexible delivery" (Smith, 2003). This terminology may seem unconventional to learning scientists, who understand that 'learning' cannot be 'delivered', but who are likely to agree that flexible access to knowledge resources is important for professional learning. The "flexible delivery" approach provides a baseline for a research design prototype for professional learning. A flexible technological system can reference and link fine-grained content, and aggregate granular content resources into constellations of relevant materials that can be used by the professional learner. The prototype system uses semantic technologies to gather data used to realise aggregations of knowledge resources. This enables the professional to have fine-grained access to knowledge that is relevant to the his or her work task (Lindstaedt et al., 2010).

If the professional is problem solving within a team or community, technology systems can be used to support communication within a community-of-practice to support collaborative problem-solving. For instance, while evaluating a collaborative mood tracking application in business-to-business call centres, Rivera-Pelayo et al. (2017) observed that reflection-in-action could be mediated by a technology tool. Online reflection was brief, but it triggered a lot of face-to-face dialogue, where problems were tackled and solved. These forms of supported conversations, leading to formation of a community-of-practice might increase the learner's motivation to learn, through the creation of a respectful social environment or by explicitly rewarding the learner with recognition for his or her expertise.

15.3.2 Work Structure

For professionals, finding the time and space for learning is a challenge. In some work settings the time for work is unstructured. This means that finding time for learning within work hours in principle can be done, but is not easily organised so may not take place. Traditional forms of training are organised during working hours. For computer-mediated formal training, particularly informal learning,

learning may take place outside working hours. Pammer-Schindler et al. (2018) describe a case where, despite the work-relevance of trainings, no explicit learning resources (i.e. time) are allocated for computer-mediated training. Even in cases where the working day can be used for learning, workload may be high, which inhibits people from learning during work. Another challenge is finding a space to learn. Both in Pammer-Schindler et al. (2018) and Fessler et al. (2014), the authors describe cases where clients (e.g. patients in a doctors surgery) may expect immediate attention of a professional (e.g. a receptionist) who is learning at work, and may raise questions about professionalism when the professional is found to be doing something other than work. Where these sorts of issues are not addressed by the system designers, they remain a problem for the learner to solve him or herself.

Similarly, finding time and space for learning is challenging in online professional learning. In some settings, such as an online classroom, there is a clearly defined teacher and learners who aim to achieve the same learning goals. However, in MOOC settings students teach their peers and the teacher-student role is not well defined. It is a characteristic of the work and learning structure, whether and in which roles teachers and co-learners all participate in the same organisation. This interchangeability of roles impacts the types of contextualisation that can happen around formal training.

Informal learning scenarios are equally complex, since it is difficult to predict how a professional might learn informally or who they might learn from. In vocational apprentice training, supervisors are typically assigned to apprentices. This assignment has a quasi formal and the supervisor may be responsible for the professional development of those whom he or she manages. In one case from a large-scale global organisation, a manager was responsible for identifying the training needs of those he managed and was also accountable for assessing the impact of the training. However, a key problem was that the training impact assessment was not mandatory. This meant that the training organisers and learners did not have useful information about the quality and suitability of the training in terms of impact on practice. This is a problem because support for learning can be made available by capitalising on quality management processes. For example, if an employee is uncertain about a procedure, or how to deal with a potential problem, a triage system (a chain of reporting and discussion) developed for quality assurance can be adapted to support learning. The use of these supports can be mediated and contextualised through online discussions within Communities of practice (cp. Santos et al., 2016) or online learning networks

One of the authors has explored how professionals learn on-the-job within online networks in the petrochemical industry (Littlejohn et al., 2012; Margaryan et al., 2009). These studies identified four key learning actions as firstly consuming knowledge and resources created by others. This can be supported by search tools, social media, recommender systems and AI systems that recommend pathways and resources. Second, creating new knowledge, by authoring and extending resources to elaborate and record current practice. Creating actions are supported by enterprise systems such as Sharepoint as well as open knowledge creation tools such as Google Docs, blogs, wikis, media players as well as video or audio capture. Third,

connecting with people and resources (information sources), including linking with peers who share interests or goals to develop ideas, share experience, provide peer-support, or work collaboratively to achieve shared goals. Connections are made through conventional tools, such as email and videoconferencing (eg Skype). However, a range of systems including WhatsApp, Slack, Twitter and other systems are increasingly being used for work. Fourth, contributing new knowledge resources either formally (as reports, publications, and other standalone artefacts) or informally (as reflections, ideas, ratings and other context-dependent content). In this way, one individual's learning becomes available to others. As professionals self-regulate their learning, they 'chart' their learning pathways, therefore we term this metacognitive process of planning and instantiating learning 'charting'.

Another way to guide the learner is via an automated learning guidance. Lindstaedt et al. (2010) developed an adaptive system based on semantic models of work tasks, concepts that shall be learned, and user's current competencies in order to adapt learning support to the user's level of competence in relation to the concept that shall be learned. Fessler et al. (2017) have developed a reflection guidance concept that is based on Schön's (1983) distinction between reflection-in-action, and reflection-before/after-action, i.e. reflection that is intertwined with operative work, and reflection that is temporally separated from work. The reflection guidance concept is largely domain-independent, but concrete instantiations hide didactical knowledge about the domain of application, such as what kind of data are useful representations of the learning domain; and which types of data patterns are salient and potentially useful for reflection.

15.3.3 *Tools*

Automated learning guidance systems, using Artificial Intelligence, are being used to support novices to gain expertise (cp. Kirschner et al., 2006). The rationale behind these systems often is to point the novices towards available and relevant learning materials. However, this approach has a number of questionable assumptions, including the supposition that expert knowledge can be codified and transferred to novices. State-of-the-art systems are using 'analytics of work practice' to support professional learning. These systems guidance from the system (for example, pointing the professional to relevant information and resources) with human guidance from an expert, mentor or coach. In this system the learner him/herself sometimes acts as an expert. This system brings together at least three fields of knowledge needed to design future technologies for professional learning: the knowledge about technology systems, knowledge about learning and domain knowledge about the workplace. These three knowledge domains have to be combined to create advanced adaptive and intelligent technology systems.

Data analytics can be an enabler for learning guidance. However, there are concerns that the algorithms that inform analytics systems are based on traditional models of education and professional development. New analytics systems are

being developed to gather domain data as basis for evidence-based practice guidance for professional learning. This closes the gap in knowledge around how professionals learn, how they use technologies to learn, and about the impact of socio-technical interventions. These sorts of data can be used to overlay augmented reality within authentic work situations, in ways that integrate professional work and learning. The tools and resources in the workplace – information systems, specialist technologies and non-technical resources such as guidelines; templates error categories, or taxonomies – will structure work and learning. A key question is whether and how existing systems and resources should be incorporated in a novel systems design.

A project led by one of the authors developed a system to support automotive engineers. These production workers were part of a car assembly line in Austria and had specific responsibility for rectifying cars that failed to meet the required quality standard, for example had surface scratches in the paintwork. These arbitrary errors in assembly-line produced cars are complex. Within the organisation there was a taxonomy of error categories and errors were logged, but there was no systematic way to compare or analyse instances of how errors had been repaired. Having data on similar errors not only can improve the efficiency and effectiveness of the assembly line, but allows opportunity for the organisation, teams and individual workers to learn. The challenge of designing a system for workers to document and analyse errors within a pressurised work environment is a challenge for human-computer interaction specialists. A key information retrieval challenge is to determine which errors are similar and which solutions to errors are transferrable and this decision making requires the knowledge and skills of the production workers. In this case professional learning was supported through structured reflection of prior error handling cases, based on the concept of adaptive and computer-mediated reflection support (cp. Fessler et al., 2017). By aligning the benefits of a digital system – to record and document representations of errors – with the strengths of the workforce – the knowledge around how specific errors can be resolved – an intelligent digital workspace can provide support for work and learning. Rather than producing ‘learning materials’, the system supports the production workers in knowledge sharing. The system connects to existing workplace tools and artefacts, such as the taxonomy of errors, the company’s quality management system, and a system that documents the assembly-line production.

In these sorts of examples, where learning is integrated within work practice, existing work systems can be used to log relevant activity data about work practice, which generates data that can support workers reflection about their work practice. In this way the analytics of work practice supports (data-driven) learning, rather than performance monitoring. It is critical that the data used to represent work practice is relevant for learning. Pammer et al. (2015) have investigated how activity log data from the computers used by of IT and strategy consultants can be used to help them reflecting on their workflow and time management in the case of IT and strategy consultants, with study participants having generated useful insights about own time management. Prilla (2015) examined ways to support physicians to learn how to have difficult conversations with patients and their relatives. There are no data

within medical information systems that can be used to support physicians' learning. Therefore, additional data that can be used as basis for reflection needed to be gathered. This raises critical issues around data sensitivity, with respect both to professionals and their patients. Computer scientists are facing growing challenge and scrutiny over the design of these sorts of systems. Therefore, these issues of data protection and other issues that influence decision making in technological systems need to be considered and informed by critical analyses that provide a baseline for designing technology systems.

15.4 Conclusion: The Future of Professional and Digital Learning

Technologies have the potential to help shape and transform professional work and learning.

However, learning scientists have real concerns that technology systems developers have an overly simplistic view of the ways professionals learn. At the same time computer scientists are worried that criticism of technology system development, without a solution, does not help identify a positive way forward. Technology systems have to be designed in ways that do not incorporate societal stereotypes and biases, are supportive of learning, usable and acceptable for professionals.

Overcoming these challenges is an interdisciplinary problem that requires knowledge from at least three areas: the learning sciences, computer science (most notably human-computer interaction and artificial intelligence) and the domain of application (i.e. healthcare knowledge, finance knowledge etc depending on the workforce). In this chapter we have proposed a way forward that brings together methods and approaches from both a critical and design-oriented perspective.

In this chapter we suggest a structure to support critical design of technology systems for professional learning, illustrated by examples that represent the state-of-the-art for computing science. These examples illustrate how the design space has to transform to take into consideration a wide range of contextual and critical data to support the development of more innovative and transformative solutions.

However, deeper approaches to combining critical approaches with design approaches are needed to alleviate concerns around the use of data for efficiency gains or income revenue valanced against data protection, unintended biases being coded into systems, unfounded assumptions underlying data analysis and contextual information about the workplace and context of professional learning not being taken into consideration. These concerns are very relevant for the modern age and call for an integrated approach to research, bringing together different critical and design perspectives, alongside a stronger inter-relationship between the learning sciences and computer science.

References

- Alphabeta. (2019). *The automation advantage*. Retrieved on March 14, 2019, from <https://www.alphabeta.com/our-research/the-automation-advantage/>
- AQR. (2018). *Australian qualifications framework review*. Retrieved on March 14, 2019, from <https://www.caul.edu.au/news/australian-qualifications-framework-review-2018>
- Baker, R. (2016). Using learning analytics in personalized learning. In *Handbook on personalized learning for states, districts, and schools* (pp. 165–174). Information Age Publishing.
- Baker, R., & Siemens, G. (2014). Learning analytics and educational data mining. Cambridge handbook of the leaning sciences (2nd edn). Cambridge University Press: New York, NY, 253–272.
- Berendt, B., Littlejohn, A., Kern, P., Mitros, P., Shacklock, X., & Blakemore, M. (2017). *Big data for monitoring educational systems*. Publications Office of the European Union.
- Billett, S. (2004). Workplace participatory practices: Conceptualising workplaces as learning environments. *Journal of Workplace Learning*, 16(6), 312–324.
- Boud, D., & Garrick, J. (1999). Understandings of workplace learning. In D. Boud & J. Garrick (Eds.), *Understanding learning at work* (pp. 29–44). Routledge.
- Boud, D., Garrick, J., & Greenfield, K. (2000). Understanding learning at work. *Performance Improvement*, 39(10), 45–47.
- Charitonos, K., Littlejohn, A., Seal, T., & Kaatrakoski, H. (2018). *Ways of working and learning in AMR surveillance systems in LMICs: Findings from the scoping phase*. The Open University.
- Colley, H., & Jarvis, J. (2007). Formality and informality in the summative assessment of motor vehicle apprentices: A case study. *Assessment in Education*, 14(3), 295–314.
- De Jong, T., & Van Joolingen, W. R. (1998). Scientific discovery learning with computer simulations of conceptual domains. *Review of Educational Research*, 68(2), 179–201.
- Eraut, M., & Hirsh, W. (2010). *The significance of workplace learning for individuals, groups and organisations*. SKOPE.
- Fessler, A., Bratic, M., & Pammer, V. (2014). Continuous learning with a quiz for stroke nurses. *International Journal of Technology Enhanced Learning*, 6(3), 265–275.
- Fessler, A., Wesiak, G., Rivera-Pelayo, V., Feyertag, S., & Pammer, V. (2017). In-app reflection guidance: Lessons learned across four field trials at the workplace. *IEEE Transactions on Learning Technologies*, 10(4), 488–501.
- Fischer, G. (2007). Designing socio-technical environments in support of meta-design and social creativity. In *Proceedings of the 7th international conference on computer supported collaborative learning, CSCL'07* (pp. 2–11). International Society of the Learning Sciences/ACM DL.
- Fuller, A., & Unwin, L. (2016). Applying an apprenticeship approach to HRD: Why the concepts of occupation, identity and the organisation of workplace learning still matter. In *Human Resource Management, Innovation and Performance* (pp. 66–79). Palgrave Macmillan.
- Hadwin, A. F., Järvelä, S., & Miller, M. (2011). Self-regulated, co-regulated, and socially shared regulation of learning. In *Handbook of self-regulation of learning and performance* (Vol. 30, pp. 65–84). Routledge.
- Hager, P. (2004). Conceptions of learning and understanding learning at work. *Studies in Continuing Education*, 26(1), 3–17.
- Hood, N., Littlejohn, A., & Milligan, C. (2015). Context counts: How learners' contexts influence learning in a MOOC. *Computers & Education*, 91, 83–91.
- Illeris, K. (2011). Workplaces and learning. In *The SAGE handbook of workplace learning* (pp. 32–45). Credo Reference.
- Järvelä, S., & Hadwin, A. F. (2013). New frontiers: Regulating learning in CSCL. *Educational Psychologist*, 48(1), 25–39.
- Järvelä, S., Hadwin, A., Malmberg, J., & Miller, M. (2018). Contemporary perspectives of regulated learning in collaboration. In *International handbook of the learning sciences* (pp. 127–136). Milton Routledge.

- Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational psychologist, 41*(2), 75–86.
- Kuzilek, J., Hlosta, M., Herrmannova, D., Zdrahal, Z., & Wolff, A. (2015). OU Analyse: Analysing at-risk students at The Open University. *Learning Analytics Review, LAK15-1*, 1–16.
- Law, P. (2015). Digital badging at The Open University: Recognition for informal learning. *Open Learning: The Journal of Open, Distance and e-Learning, 30*(3), 221–234.
- Lindstaedt, S., Kump, B., Beham, G., Pammer, V., Ley, T., Dotan, A., & de Hoog, R. (2010). Providing varying degrees of guidance for work-integrated learning. In *Proceeding of european conference on technology-enhanced learning* (pp. 213–228).
- Littlejohn, A., & Hood, N. (2018a). The Many Guises of MOOCs. In A. Littlejohn & N. Hood (Eds.), *Reconceptualising learning in the digital age: The [Un]democratising potential of MOOCs* (SpringerBriefs in Open and Distance Education) (pp. 1–19). Springer.
- Littlejohn, A., & Hood, N. (2018b). Massive Numbers, Diverse Learning. In A. Littlejohn & N. Hood (Eds.), *Reconceptualising learning in the digital age: The [Un]democratising potential of MOOCs* (SpringerBriefs in Open and Distance Education) (pp. 57–77). Springer.
- Littlejohn, A., & Margaryan, A. (2014). Technology-enhanced professional learning. In S. Billet, C. Harteis, & H. Gruber (Eds.), *International handbook on research in professional and practice-based learning* (pp. 1187–1212). Springer.
- Littlejohn, A., Milligan, C., & Margaryan, A. (2012). Charting collective knowledge: Supporting self-regulated learning in the workplace. *Journal of Workplace Learning, 24*(3), 226–238.
- Littlejohn, A., Milligan, C., Fontana, R. P., & Margaryan, A. (2016a). Professional learning through everyday work: How finance professionals self-regulate their learning. *Vocations and Learning: Studies in Vocational and Professional Education, 9*(2), 207–226.
- Littlejohn, A., Hood, N., Milligan, C., & Mustain, P. (2016b). Learning in MOOCs: Motivations and self-regulated learning in MOOCs. *The Internet and Higher Education, 29*, 40–48.
- Littlejohn, A., Margaryan, A., Vojt, G., & Lukic, D. (2017). Learning from incidents questionnaire (LFIQ): The validation of an instrument designed to measure the quality of learning from incidents in organisations. *Safety Science, 99*(A), 80–93.
- Littlejohn, A., Charitonos, K., & Kaatrakoski, H. (2019). The Role of Professional Learning in Addressing Global Challenges. In *Frontiers in Education* (Vol. 4, p. 112). Frontiers.
- Liyaganunawardena, T. R., Adams, A. A., & Williams, S. A. (2013). MOOCs: A systematic study of the published literature 2008–2012. *The International Review of Research in Open and Distributed Learning, 14*(3), 202–227.
- Malmberg, J., Järvelä, S., Holappa, J., Haataja, E., Huang, X., & Siipo, A. (2018). Going beyond what is visible: What multichannel data can reveal about interaction in the context of collaborative learning? *Computers in Human Behavior, 96*, 235–245.
- Manouselis, N., Vuorikari, R., & Van Assche, F. (2010). Collaborative recommendation of e-learning resources: An experimental investigation. *Journal of Computer Assisted Learning, 26*(4), 227–242.
- Margaryan, A., Milligan, C., Littlejohn, A., Hendrix, D., & Graeb-Koenneker, S. (2009, 28 April). Self-regulated learning and knowledge sharing in the workplace. *Organizational learning, knowledge and capabilities conference*, Amsterdam.
- Margaryan, A., Bianco, M., & Littlejohn, A. (2015). Instructional quality of massive open online courses (MOOCs). *Computers & Education, 80*, 77–83.
- Milligan, C., & Littlejohn, A. (2017). Why study on a MOOC? The motives of students and professionals. *The International Review of Research in Open and Distributed Learning, 18*(2), article no. 4117.
- Milligan, C., Littlejohn, A., & Margaryan, A. (2013). Patterns of engagement in connectivist MOOCs. *MERLOT Journal of Online Learning and Teaching, 9*(2), 149–159.
- Murphy, V. L., Littlejohn, A., Rienties, B., King, S., & Bryden, R. (2018, 16–18 April). How do you know if you're learning from incidents? In *SPE international conference and exhibition*

- on health, safety, security, environment, and social responsibility*. Abu Dhabi, UAE, Society of Petroleum Engineers.
- Pammer, V., Bratic, M., Feyertag, S., & Faltin, N. (2015). The value of self-tracking and the added value of coaching in the case of improving time management. In *Proceeding of the 10th european conference on technology enhanced learning (ECTEL 2015)* (pp. 467–472).
- Pammer-Schindler. (2019). *What can computer technologies do for learning? – An overview on the roles and functions of technologies in learning*, from <https://viktoriapammer.wordpress.com/2019/01/29/what-can-computer-technologies-do-for-learning-the-roles-and-functions-of-technologies-in-learning/>. Accessed 28 Apr 2019.
- Pammer-Schindler, V., Thalmann, S., Fessler, A., & Füssel, J. (2018). Virtualizing face-2-face trainings for training senior professionals: A comparative case study on financial auditors. In *Proceeding of the fifth annual ACM conference on learning at scale* (p. 37).
- Papamitsiou, Z., & Economides, A. A. (2014). Learning analytics and educational data mining in practice: A systematic literature review of empirical evidence. *Journal of Educational Technology & Society*, 17(4), 49–64.
- Prilla, M. (2015). Supporting collaborative reflection at work: A socio-technical analysis. *AIS Transactions on Human-Computer Interaction*, 7(1), 1–17.
- Reichling, T., & Wulf, V. (2009). Expert recommender systems in practice: Evaluating semi-automatic profile generation. In *Proceedings of the conference on human factors in computing systems (CHI)* (pp. 59–68).
- Rivera-Pelayo, V., Fessler, A., Müller, L., & Pammer, V. (2017). Introducing mood self-tracking at work: Empirical insights from call centers. *ACM Transactions on Computer-Human Interaction*, 24(3), 1–28.
- Santos, P., Dennerlein, S., Theiler, D., Cook, J., Treasure-Jones, T., Holley, D., Kerr, M., Attwell, G., Kowald, D., & Lex, E. (2016). Going beyond your personal learning network, using recommendations and trust through a multimedia question-answering service for decision-support: A case study in the healthcare. *Journal of Universal Computer Science*, 22(3), 340–359.
- Schön, D. (1983). *The reflective practitioner – How professionals think in action*. Ahsgate. Reprint 2006.
- Sharples, M., & Domingue, J. (2016, September). The blockchain and kudos: A distributed system for educational record, reputation and reward. *European conference on technology enhanced learning* (pp. 490–496). Springer.
- Siemens, G., & Long, P. (2011). Penetrating the fog: Analytics in learning and education. *EDUCAUSE Review*, 46(5), 30.
- Smith, P. J. (2003). Workplace learning and flexible delivery. *Review of Educational Research*, 73(1), 53–88.
- Stahl, B. C., Eden, G., Jirotko, M., & Coeckelbergh, M. (2014). From computer ethics to responsible research and innovation in ICT: The transition of reference discourses informing ethics-related research in information systems. *Information & Management*, 51(6), 810–818.
- Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review*, 3(2), 130–154.
- Van Eck, R. (2006). Digital game-based learning: It's not just the digital natives who are restless. *EDUCAUSE Review*, 41(2), 16.
- Williamson, B. (2016). Digital education governance: Data visualization, predictive analytics, and 'real-time' policy instruments. *Journal of Education Policy*, 31(2), 123–141.
- Wolff, A., Zdrahal, Z., Nikolov, A., & Pantucek, M. (2013, April). Improving retention: Predicting at-risk students by analysing clicking behaviour in a virtual learning environment. In *Proceedings of the third international conference on learning analytics and knowledge* (pp. 145–149). ACM.
- Zimmerman, B. J., & Kitsantas, A. (2005). Homework practices and academic achievement: The mediating role of self-efficacy and perceived responsibility beliefs. *Contemporary Educational Psychology*, 30(4), 397–417.

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Chapter 16

Vocational Education and Training in Germany: Benefits and Drawbacks of the Dual Approach as Preparation for Professional Employment



Stefanie Zutavern and Jürgen Seifried

Abstract Employees increasingly need to keep pace with the dynamics of the labor market to be professionally successful in the long term. This requires flexibility in shaping one's employment biography by continuously adapting one's skills portfolio to the current labor market conditions. 21st century skills are becoming increasingly important in this context. In addition, risk management, as well as planning and organizational skills, are also required of employees. Since not everyone has these skills per se, the vocational training system can be seen as jointly responsible for preparing future employees for these work-related requirements.

In Germany, training companies and the state pursue a cooperative approach that has become established for the majority of training occupations. In the German dual system, apprentices complete both practical phases at a training company and theoretical phases at a vocational school. By linking these two elements, apprentices can gain practical experience and at the same time acquire in-depth theoretical knowledge to make the best possible use of the opportunities to learn offered by both learning sites. The development of the dual system to date, however, raises doubts as to whether a fundamental shift is underway here away from a holistic vocational qualification that also includes the trainees' personal development and toward a system geared one-sidedly to the usability of competencies on the labor market.

Against this background, it will be discussed whether the German system of dual vocational training can prepare trainees for the requirements of their future workplace. To this end, the extent to which the dual system fosters successful transitions from training to working life will be examined. Furthermore, it will be discussed whether the dual approach is suitable for the acquisition of vocational competencies and how uniform quality standards can be ensured.

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Keywords Vocational education and training · Dual system · Employability · Workplace learning · 21st-century skills · Professional competence

16.1 Learning for and in the Workplace in Times of Change

Changing jobs or breaking new ground have become part of modern employment biographies. On the one hand, such changes may be due to factors that lie beyond the individual such as new production or management techniques, new business segments, mergers and acquisitions, and so on. On the other hand, the individual himself/herself can also bring about change. Young employees in particular tend to change their employer (Eurostat, 2021c) and occupation frequently (Kalleberg & Mouw, 2018). Over and above the age groups, retraining, further education, and other training activities also play a role for individual employment biographies. On average, 43.7% of EU employees participate in such practices (Eurostat, 2021a). The OECD average even approximates half of the workforce (OECD, 2018).

These short remarks may highlight that “work and career are no longer static and predetermined entities” (Manuti et al., 2015, p. 2). Rather, they develop in the sense of a constant reaction to external and individual conditions. One factor that has kept the labor market on its toes for the past decades is the shortage of skilled workers and the struggle for the best minds it has brought with it (martially called “war for talents”; Chambers et al., 1998). This situation can be seen as a result of a combination of two developments: First, there is a continuous decline in birth rates (Eurostat, 2021b) accompanied by an increase in life expectancy (Eurostat, 2021d), which leads to a reduced number of (young) people available for work. Second, the demand for qualified workers is increasing with a stable economic situation (Cedefop, 2016) and new qualification requirements that arise, for example, from the digitalization of business processes (Brynjolfsson & McAfee, 2014; Frey & Osborne, 2017; Harteis, 2019). This leads to a contrary development of supply and demand for qualified personnel and thus an excess demand.

In particular, new technologies and industries, digitalization, and globalization have caused a change in the competencies and skills demanded. These developments have shaped the concept of *21st century skills*. In the OECD approach, 21st century skills and competencies include those skills and competencies that have gained in relevance for mastering work-related demands and social participation in today’s knowledge society (Ananiadou & Claro, 2009). This does not define new skills and competencies, but rather emphasizes their significance in the current labor market context and for managing individual life circumstances. For instance, in addition to individual problem-solving competence, information and media competence is becoming increasingly relevant (OECD, 2019). The focus here is on the ability to process information and to communicate and collaborate digitally and non-digitally. At the same time, social responsibility and the ability to assess and evaluate the consequences of one’s own actions are gaining in relevance (Binkley et al., 2012; Dede, 2010; van Laar et al., 2017).

Kirpal (2007) also recognized the changing demands workers are confronted with. By replacing stable employment relationships, fixed tasks, and fixed areas of competence, risk management and the demand-oriented provision of relevant competences are transferred from the employer to the employees. These more flexible employment patterns force employees to not only continuously improve their skills and competencies, but also to plan individual career paths independently of a single company. Such individualization underlines the relevance of metacognitive competences such as planning and organizing future actions—the “career management skills” (European Lifelong Guidance Policy Network [ELGPN], 2012, 2015). According to this development, Kirpal (2007) formulates the necessity of a change from a classical work attitude to an entrepreneurial work attitude, which is characterized by the willingness for multiple qualification, flexibility, and mobility. Goller (2017) and others (e.g. Jääskelä et al., 2016; Vähäsantanen & Eteläpelto, 2018) highlight the relevance of agentic behavior. This means that learners and workers must actively seek learning opportunities and find their own ways to develop their competences. Since not all individuals *per se* possess these skills, one can see the vocational training system as jointly responsible for preparing future employees for these work-related demands. Against this background, a fundamental discussion took place in Germany on, for example, questions of the relationship between occupation and employability. There are concerns of a fundamental change from a holistic vocational qualification including the personal development of trainees to a system that is one-sidedly oriented towards the usability of skills on the labor market (e.g. Seifried et al., 2019). This development is to be judged critically because employers around the world still attach high value to personality characteristics such as integrity, honesty, respect and team spirit or work ethics (Ju et al., 2012; Suarta et al., 2019). In this light, an individual’s composition of skills and competencies as well as attitudes, agency, and initiative has become increasingly important in two respects: (1) From an individual’s perspective, the above-mentioned developments underline the relevance of lifelong learning. With regard to their employability, employees should constantly match their own skills and competences to the skills and competences currently in demand on the labor market. This enables them to uncover and tackle any gaps in their own repertoire. In addition, it is important to identify job profiles that can be exercised with the existing bundle of knowledge, skills, and competencies. In this way, employees can achieve and maintain maximum employability in the long term. Lifelong development efforts are also necessary with regard to aspects such as personality development, meaningful work, and the balancing of one’s own interests and aspirations and operational requirements. (2) From an organizational and economic point of view, competitive advantages are opening for employers who develop along with these changes and are open to individual skills and competences. Such employers can succeed in retaining qualified personnel and attracting new qualified personnel. Taken these two perspectives together, it is illustrated that the concept of employability is not limited to specific job profiles and the individual level. Rather, it also encompasses the career and life planning of employees. It also touches on the organizational and economic level, which shapes and changes the labor market.

To sum up: Organizations as well as individuals need to respond to the outlined changes and become as adaptive as the environment in which they operate. Accordingly, learning and adaptability have become an increasingly important competence of employees and employers. Ultimately, this is because the successful response to change determines economic success on an individual and organizational level. However, the question of how to prepare future employees within dual apprenticeship for such an agile work context remains largely unanswered. Certainly, this cannot be done by only one learning site. Rather, the characteristics of both learning sites need to be considered in order to prepare young adults for employment in practical and cognitive terms. This is particularly true if one does not look one-sidedly at operational or economic requirements but also at the personality development of young people. Against this background, the objectives of vocational education and training are diverse and address both directly subject-related and interdisciplinary perspectives (Baethge et al., 2003). Three overarching objectives should be mentioned, namely (1) the development of the individual's ability to regulate (autonomy), (2) the safeguarding of a society's human resources, and (3) the promotion of social participation and equal opportunities. The ability to regulate as an action-related category is regarded as the most complex and at the same time the most general person-related target category. With the aim of securing human resources, two dimensions are addressed: In addition to the socio-economic component, there is also an individual perspective. Both dimensions are closely interlinked and highlight the relationship between the business and economic requirements (securing the qualitative and quantitative demand for labor) and the people working in it or their desire for a satisfying and livelihood-securing gainful activity while at the same time making good use of their own skills on the labor market.

With a special focus on the German vocational education and training (VET) system, the purpose of this paper is to discuss whether the German dual vocational training system can prepare future employees for the requirements of their workplace. To this end, we characterize the work context as a learning site and portray the system of dual VET in Germany (Chap. 2). In the following, we will discuss to which extent dual VET prepares future employees for the learning and development-related requirements of their workplace (Chap. 3). Finally, we will make recommendations for the practical implementation of the points discussed and for future research (Chap. 4).

16.2 Workplace Learning and the Vocational Education and Training System in Germany

As outlined above, the development of vocational skills and competences and the willingness to acquire new work-related skills and competences have become crucial for working life. Such characteristics make it easier for employees to cope with changes that affect their work environment. This increases employees' adaptability

while promoting their individual employability and professionalism. In addition—and this seems to us to be of even greater importance here—such skills and attitudes help with individual professional development and with regard to professional participation and personality development in the process of work (Gerholz & Brahm, 2014). The question is how to achieve these objectives. An overview of possible forms of work-related learning and models for conceptualizing work-related learning can provide insights in how workplaces function as learning environments. Furthermore, a closer look on the conceptualization and objectives of the dual VET system can enlighten its impact on preparing apprentices for their new role as skilled workers. However, the dual model of vocational training is only one option through which young adults can be guided to vocational qualification. Since the Industrial Revolution, the market model and the school-based model have also become established in Europe (Greinert, 2005). While the market model (e.g. England) is regulated via the labour market and training companies, the school model (e.g. France) is controlled by the state. In Germany, training companies and the state follow a cooperative approach. Their collaboration is central for the dual model, which has become established for the majority of training occupations. For this reason, we will only discuss the dual model in greater detail.

16.2.1 Learning in Professional Contexts – All Roads Lead to Rome

The topic of workplace learning attracts different research disciplines and subdomains whereby each subject area investigates the topic with different approaches and specific research interests (Tynjälä, 2013). Starting with studies that investigate workplace learning from a learning-theoretical perspective—for instance studies on personality traits or competence and expertise development—the spectrum ranges to studies that take an organizational perspective, e.g. studies on work conditions or knowledge management. Despite the different approaches, there are overlaps and similarities between the research directions, which make it possible to identify valid interdisciplinary characteristics of workplace learning:

First, workplace learning aims to support employees in successfully fulfilling their work tasks. To this end, employees are to be encouraged in their role as learners in order to promote the acquisition and development of work-related competences, skills, and knowledge (Raemdonck et al., 2014). This highlights that workplace learning is primarily an individual-level process designed to achieve personal goals. By continuously targeting and achieving new goals, the sum of these individual learning processes leads to the training of professionalism in a particular occupation (Metso, 2014). Expanding this dynamic developmental perspective, Choi and Jacobs (2011) point out that an individual's development contributes to further development of the whole organization in the long run. Thus, by increasing individual performance as well as organizational performance, workplace learning

creates a win-win situation from which employees and employers can profit (Crouse et al., 2011). Second, a single and individual learning process can take place in a variety of different forms and situations. In order to distinguish such learning processes, the distinction between informal and formal learning has been established across disciplines. Thereby, goal orientation of the learning process and the formal conception of the learning environment are central distinguishing features.

Formal learning typically does not take place in the learner's direct work environment. Rather, they "are separated from their day-to-day work" (Choi & Jacobs, 2011, p. 241) in order to enter learning environments that have been specially designed and prepared for knowledge transfer (Manuti et al., 2015). The aim is to impart knowledge and skills to the learner that enable and promote the completion of specific job duties (Manuti et al., 2015). Concrete learning objectives, which are evaluated at the end of the learning unit, as well as previously defined learning materials and temporal structuring of the learning unit, are typical. Furthermore, learning activities are guided or accompanied by a teacher or trainer (Malcolm et al., 2003). This applies to, for example, formalized settings such as design thinking spaces or project days (e.g. FedEx-Days, 20% time) for creative-disruptive and interdisciplinary development of problem solutions. Besides such offerings that are primarily intended to stimulate the innovativeness and creativity of employees, formal learning offers also include psychologically based training courses or counselling services. Mindfulness training, for example, aims to teach employees how to deal with the demands of agile work environments and to maintain their individual well-being. Counselling services can be provided as training or one-on-one interviews and are designed to support employees in their individual career planning. Through the prior conception and preparation of the learning process, formal learning is strongly influenced by third parties. Thus, the learning process can be determined less by the learner himself/herself. At the same time, the planning and didactic preparation of learning content enables learners to select formal learning activities according to their individual development needs. From the learner's point of view, formal learning can be planned and therefore takes place consciously.

In contrast to formal learning, informal learning "occurs during critical moments of need embedded in the context of practice" (Manuti et al., 2015, p. 5). Informal learning processes therefore usually occur ad hoc, are directly related to the activities of the individual work environment, and aim to solve a current problem situation. Due to the proximity to the work reality of the learner, they can meet the needs of the individual particularly well (Cho & Kim, 2016). This means that work-related knowledge and skills tend to be acquired in passing, during the performance of the task, and thus unplanned, so that learning objectives, duration, and learning materials are not known at the beginning of the learning process (Kyndt et al., 2009). Possible learning situations, which come about mainly through discussions with colleagues and ad hoc support, can be promoted through modern office concepts (e.g. flexible workplaces or coffee corners) and the use of appropriate technologies (e.g. video conferencing). In addition, the learning process is not guided by a teacher or trainer (Eraut, 2004). Rather, the teacher-learner constellation results from the competences, abilities, and experiences possessed by the people involved.

Furthermore, the reflexive moment can be missing, so that the learner is not aware of the acquisition of new content. In this case, Watkins and Marsick (1992) used the term “incidental learning”, which can be seen as a sub-form of informal learning. However, due to their spontaneous nature, informal learning activities promote flexible and contextual learning, thus increasing the practical transfer of the learned content and the immediate resolution of work-related problems. This can increase the flexibility, employability, and adaptability of the individual learner (Manuti et al., 2015).

All forms of learning activities on the continuum from formal to informal learning are important for the individual and organizational development towards professionalism. “Specifically, in a knowledge and information society, collective training or formal education alone limit creativity and professionalism” (Cho & Kim, 2016, p. 407). In order to make optimum use of the potential of learning formats, the question arises which factors determine participation in learning opportunities in professional contexts. Billett’s (2001) model of co-participation at work emphasizes that it is neither the work environment nor the individual learner alone that make learning activities successful. He describes their interplay as a supply-demand model. The supply side is composed of the design of the actual work activities, possibilities for participation in formal interventions as well as the degree and quality of guidance and support offered by the employer. Since workplaces are usually competitive environments, this package of learning opportunities is not equally available for all and, accordingly, there is no guarantee for high quality learning outcomes. Rather, the success of learning and development is determined individually and therefore depends on how individuals use the available offer. Hence, the demand side of his model is composed of human agency, previous knowledge as well as personal experiences and values of the individual employee and learner.

Based on the idea of legitimate peripheral participation (in the communities of practice approach, Lave & Wenger, 1991, learning is defined as the successive growing into a practical community, whereby an initially marginal (peripheral) position is regarded as legitimate), Billett (2002) defines the workplace curriculum as an individual path of practical experience at the respective workplace. The curriculum is not institutionalized but depends on the learner and his or her previous knowledge, talents, interests, etc., and on the practice lived at the respective workplace. The curriculum then arranges the work activities according to increasing complexity and responsibility. Prerequisites for such a concept are the identification of complexity, the anticipation of learning difficulties, and the adequate support of the learners, i.e. the presence of experts and their willingness to offer assistance.

The idea of mutual participation is further specified in Tynjälä’s (2013) 3-P model (see also Gruber & Harteis, 2018).¹ Comparable to Billett’s model, it considers the individual learner and the specifics of the work environment as two

¹The i-PPP model (Integrated-Premise-Product-Process-Model of Gruber and Harteis (2018) as further development of Tynjälä’s 3-P-Model) also considers the effect of individual and contextual factors on learning at work. However, the influence of social aspects is extended to all model components. In addition, the authors assume mutual relationships between all three model components.

separate influencing factors. Together, factors of the learner and learning context constitute the model's input component (presage). In contrast to the co-participation model, the interpretation of these input factors is separated from the individual learner factors and mapped upstream of the actual learning process. The learning process forms the center of the model and can take place in various learning activities on the continuum between formal and informal learning (process). In addition, learning outcomes constitute the third model component. They are distinguished into outcomes at an individual and an organizational level. Finally, Tynjälä shows that the relationship between presage, interpretation, process, and product is not unidirectional. Rather, the achieved learning outcomes lead to changed influencing factors, which in turn affect future learning activities. Furthermore, the learning process is embedded in the sociocultural environment what makes clear that job-related learning activities should always be interpreted against this overarching background. Hence, in contrast to the co-participation model, the 3-P model also takes the social and macroeconomic situation into account, which—as explained at the beginning—can point the way for learning in professional contexts.

In summary, learning in the workplace should always support learners in learning and performing their work tasks. Thereby, the underlying learning process can take many different forms on the continuum between formal and informal learning. In addition, the learning process is embedded in a complex network of learners, learning environment, and socio-cultural environment in which the individual components are mutually dependent.

16.2.2 The Dual Vocational Education and Training System in Germany

The dual vocational education and training (VET) system is the most important sector of occupational education in Germany (Seeber & Seifried, 2019). Approximately 320 job profiles are currently being trained (BMBF, 2020). In order to answer whether it can prepare future employees for the requirements of the vocational context, it is necessary to understand the concept of the dual VET system in Germany as well as its content and objectives. Thus, this section gives a description of the German dual VET system in order to show its potentials for preparing future employees for professional employment.

In contrast to other vocational training concepts, the combination of two learning sites—the workplace and the vocational school—is a special characteristic of the German dual VET system. The corporate training part is structured and organized by the employing company. For this purpose, trainees are hired on the basis of a training contract under private law. When the contract is concluded, the employing company undertakes to provide the trainee with the contents contained in the training regulations. These are formulated for single training occupations on the basis of the Vocational Training Act (BBiG) and the Crafts Code (HwO) and create a uniform national standard for each training occupation (BMBF, 2020). During the

phases at the workplace that dominate the school-based part of education (Cedefop, 2017c, 2019), the company introduces its trainees to current and authentic organizational work processes (BMBF, 2020). The factual and temporal sequence of the corporate training part is regulated by the training plan, which is part of the training contract (BMBF, 2020).

Visiting a vocational school is mandatory within the concept of the dual VET system. In addition to the corporate training part, the vocational school represents the second learning site. Within the framework of the lessons, the trainees are taught both job-related content and general educational content (BMBF, 2020). Consequently, corporate topics can be prepared, deepened, and enriched through schooling. At the same time, the classroom setting enables simultaneous teaching of ethical and moral values and norms that can serve as orientation in the working life of young adults. In order to ensure that school-based and vocational training are interlinked, the contents are taught in vocational action contexts—the so-called learning fields (KMK, 2007). They are based on the framework curriculum, which is designed at the federal state level (KMK, 2007).

At the end of vocational education—usually after three years—trainees must take a final examination/journeyman's examination. It contains practical, written, and oral elements to examine the contents of the training regulations. Graduates are awarded a state-recognized training qualification at the European Qualification Framework level four (Cedefop, 2019), which certifies that they have acquired occupational competence. The competent bodies, usually the Chambers of Commerce and Industry, organize the examination. An independent examination board, composed of representatives of the chambers, training supervisors of employers, and vocational school teachers, conducts the examination.

The overriding objective, which is to be achieved by the described concept of the dual VET system, is to impart occupational competence for dealing with complex work situations (in German: berufliche Handlungskompetenz that means that individuals possess the competence to cope well with professional requirements). It certifies trainees, who have successfully passed their final examination, that they are qualified to act competently in the profession they have learnt (Brockmann et al., 2008). This basic idea of the dual VET system is legally manifested in the German Vocational Training Act. Here, occupational competence is defined as the occupational skills, knowledge, and abilities, which are necessary to execute a qualified occupational activity in a changing world of work. Specific facets of such an occupational competence are described in more detail in the assistance paper for developing framework curricula for state-recognized training occupations, written by the Conference of the Ministers of Education and Cultural Affairs (KMK). Besides activities in the professional context, the definition also includes behaviors in the private and social context. A person is regarded as professionally competent if he or she is able to “behave in an appropriately thoughtful as well as individually and socially responsible manner” (KMK, 2007, p. 10). Consequently, the dual VET system aims to impart vocational competence on the one hand and human and social competence on the other hand. At the same time, and as part of these three competence goals, trainees should acquire methodological competence, communicative

competence, and learning competence in the course of their vocational training (KMK, 2007). Through the acquisition of occupational competence, trainees are to be prepared for their future working life in a variety of ways. By imparting occupational and cross-occupational-field qualifications, trainees are to be enabled to achieve occupational flexibility. Furthermore, their willingness to participate in training and further education activities should increase. In addition, they should learn to take responsibility for their own actions and to shape their private lives in a future-oriented way (Billett, 2011).

To conclude, the German dual VET system is based on a joint responsibility between the public sector and the private sector (e.g. industry, handicraft, trade). In cooperation, they aim to bring vocational education and training into line with socio-political and economic requirements. While the Federal Ministry of Education and Research (BMBF) is responsible for general issues relating to vocational training (e.g. legal issues and the content of the corporate training part), the federal states are responsible for the school-based part of the training (Cedefop, 2019). Employers and trade unions—social partners—act as supportive experts by formulating training regulations and framework curricula. Furthermore, they support the reform of existing and development of new occupational profiles (BIBB, 2017). In addition, the Chambers of Commerce and Industry have an advisory and monitoring function. Exemplary duties are to monitor the corporate training part, to check the training suitability of companies and trainers, and to advise companies and trainees (BMBF, 2020).

16.3 The Dual VET Approach and Its Suitability as a Preparation for Work in the 21st Century

In order to prepare people in vocational training for the requirements of the desired occupational profile, appropriate forms of learning are required. Such forms of learning should “enable people to engage in transformative and innovative rather than in reproductive learning, and in networked and social learning rather than in individual learning, as well as in ethical and value conscious rather than ‘value-free and objective’ learning” (Tynjälä, 2013, p. 12). Moreover, learning formats need to equip trainees with all the relevant knowledge, skills, and competencies critical to fulfil current and future vocational tasks. Accordingly, apprentices must be qualified in two ways: On the one hand, they have to gain occupational competence. On the other hand, they must be taught metacognitive skills in order to remain employable in the long term. How can this be achieved within the framework of the German dual VET system?

The question is particularly interesting because the dual system is not the only form of vocational training in Europe. Even in Germany, some occupations are trained in the school-based system as well (e.g. educators, physiotherapists). For instance, France and Sweden provide initial vocational education in a primarily school-based approach (Cedefop, 2017a). In this case, a selection of basic

occupations are taught in state-financed schools (Greinert, 2004). The contents are prepared according to curricular principles and are oriented towards theoretical, subject-specific approaches to the respective world of work (scientific orientation, Deißinger & Frommberger, 2010). Other countries follow a solely work-based approach in providing VET as further training activity (e.g. UK) (Cedefop, 2017a). The training offered and required is regulated exclusively by the market itself. The same applies in qualitative terms, since the content of the training on offer is also geared to the requirements of the labour market (Greinert, 2004) (functional orientation, Deißinger & Frommberger, 2010). In addition, there are countries where VET is understood as part of lifelong learning so that almost all occupational and educational qualifications can be subsumed under it (e.g. Finland) (Cedefop, 2017a).

The decisive factor and special feature of the German dual VET system is the cooperation of the two learning sites—vocational schools and training companies. The training occupations are based on the basic principles of professionalism, self-administration and learning on the job (Greinert, 2004) and are intended to lead the trainees to a vocational qualification that is based on typical occupational activities (vocational orientation, Deißinger & Frommberger, 2010). With regard to the design of institutional cooperation, which pursues the overarching objective of promoting vocational decision-making competence, the question to the pedagogical function of the respective learning sites and the type, quality, and intensity of cooperation inevitably arises (Euler, 2004, 2015). A distinction is usually made between three intensity levels of learning site cooperation (information, coordination, and cooperation, see Euler, 2004), whereby only the level of cooperation represents a learning site cooperation understood in the true sense. However, studies show that the implementation of learning site cooperation in vocational training practice still needs to be improved (Wirth, 2015). Potential exists especially in the inclusion of real work experience. Integrating trainees' company experiences into the school-based development of learning content, learners can reflect on their own experiences and compare them with those of their peers (Wirth, 2015). In this way, school content can be taught authentically and its relevance for practical problems can be emphasized. By interlinking the two learning sites, it is therefore possible to combine theoretical and practical training. Thus, initial vocational education can be offered in a school-based setting that is aligned with practice-relevant competences and action-based learning accompanied by vocational training in a real work environment. Results of a study with final-year vocational trainees show that trainees' perception of the integration between school-based learning and workplace learning has a positive effect on trainees' generic skill development. Furthermore, trainees perceive more opportunities to learn and contribute in the workplace and actually achieve better learning outcomes the more they feel to be an active member of their workplace community (Virtanen et al., 2012). These findings for Finnish VET students are in line with results from the Cedefop (2017b) opinion survey on vocational education and training in Europe. Compared to general education graduates, VET graduates are more satisfied with their developed sense of initiative, entrepreneurial spirit as well as creativity. Besides, they are generally more satisfied with their work-related competence development. This could be due to the fact that learning in

the vocational context is predominantly problem-oriented and takes place through learning by doing, whereas school learning is typically content-oriented and passive (Endedijk & Bronkhorst, 2014). At the same time, the study results show that school learning more frequently takes place out of curiosity. Thus, it can be assumed that the combination of learning sites brings together their strengths and compensates for limitations.

However, a twin-track approach, based on the acquisition of practical competence at the workplace and more theoretical knowledge at vocational schools, is especially popular within German speaking countries. The aim is to offer young adults a protected framework for vocational orientation and for the transition from the familiar school environment to the largely unknown professional environment they experience during apprenticeship. In order to be able to assess the potential of dual vocational training, its effectiveness must be examined. There are two possible perspectives here: (1) Indicators can be a successful transition into working life or the learning outcomes of trainees. The high completion rate, for example, speaks in favor of a successful transition to employment. More than 90% of trainees pass the final examination. Once VET has been successfully completed, more than three-quarters of trainees are taken on by the training company (BMBF, 2021), which contributes to comparably low youth unemployment in Germany (7.5 % in June 2021, Eurostat, 2021e). However, it should be borne in mind that around a quarter of trainees drop out of training prematurely (BMBF, 2021). This can be due to unsatisfying workplace conditions, a lack of willingness to perform or integrate, and misconceptions of the training occupation (BMBF, 2021). In such cases, changing the training company or learning another occupation can be promising alternatives to discontinuing training. (2) Furthermore, it is of particular interest whether it is possible to achieve the skills required to successfully cope with vocational situations. The competence characteristics of trainees at the end of their training were systematically examined as part of the BMBF's ASCOT (Technology-Based Competence Measurement in Vocational Education and Training) funding initiative. For the first time and due to technology-based instruments for competence diagnostics (mostly simulations), information on the performance of trainees at the end of their training are available for various occupations. The findings point to the fact that higher-level competences such as problem-solving competences and reflexive competences are not consistently achieved (see Seeber & Seifried, 2019 and the references given there). In this respect, from a qualification perspective, it cannot be assumed per se that the dual system can adapt more or less seamlessly to the current requirements of a globalized service and information economy.

Moreover, Seeber and Seifried (2019) identify further critical issues facing the dual VET system: First of all, many vacant training positions and at the same time unsatisfied job searches point to a lack of fit between demand and supply in the labor market. In addition, especially young adults with no or low formal school leaving certificates have problems to get an apprenticeship. This indicates that the dual VET system has become more and more selective and therefore has lost some of its integrative function in terms of school-to-work-transition. Third, despite the degree of high selectivity, a quarter of training contracts are terminated prematurely.

Some training courses are discontinued and others are changed. One reason could be insufficient information regarding the chosen occupational field and the associated occupational requirements at the beginning of the training relationship. Finally, the dual VET system needs to be modernised, starting with job profiles and their teaching and competence objectives extending to the organization of cooperation between the learning sites. For this purpose, the sometimes very differentiated job descriptions should be defined as more complex job descriptions. A stronger cross-occupational orientation can take account of the increasing expansion of professional tasks and requirement profiles and promote vocational flexibility.

Kutscha (2015) also calls for the modernization of job profiles. He considers the traditional concept of specific occupations to be endangered by the academization of the world of work and the increasing dissolution and privatization of employment. The model of “extended modern professionalism” is intended to revise this occupational concept. As a prospective “integrated vocational and educational concept” (Kutscha, 2015, p. 8), it serves as a guideline for quality assurance of VET and learning processes, detached from specific sectors of education. By combining (too) specialised single occupations into core occupations and aligning learning activities with work and business processes, the concept of occupation should be strengthened and the permeability of the education system should increase. At the same time, this creates a basis for continuing vocational training and lifelong learning. It is therefore essential to promote the individual’s ability to act independently and to plan and realize his or her own career opportunities.

An example for merging job profiles is the training occupation “office management assistant” (German: Kauffrau/Kaufmann für Büromanagement), which was created in 2014. This job profile combines the former training occupations of office administrator (German: Bürokaufleute) and office communication assistants (German: Kaufleute und Fachangestellte für Bürokommunikation). By merging the three job profiles, the new training occupation can be trained across all sectors (industry, commerce, skilled trades, public service) (BIBB, 2021b). Evaluation results show that the qualifications needed in day-to-day vocational practice are adequately reflected in the training regulations and learning fields of the framework curriculum. The possibility of acquiring additional qualifications is also assessed positively. Nevertheless, the examination board complains that the first part of the final examination is scheduled too early, and that the elective qualification is weighted too high in the second part of the final examination. As a result, it is hardly possible to fully assess the acquired vocational competence (BIBB, 2021a). Overall, the vocational reform seems to have been successful, as apprentices are offered a wide range of tasks, which opens up employment opportunities in various sectors. At the same time, the trainees’ autonomy and decision-making ability is promoted by the choice of different specialisations and additional qualifications. A similar initiative can be observed in the care sector. The training occupations of geriatric nursing, health and nursing care, and health and paediatric nursing have been combined in the new training occupation of nursing specialist (German: Pflegefachkraft) since January 2020. Choosing the training company and specialisation in the last third of the training program, still allows for a vocational focus according to

individual preferences. In addition, the new training occupation is intended to facilitate the EU-wide recognition of professional qualifications (BMFSFJ, 2021). It remains to be seen whether these potentials of generalist nursing training can be realised.

16.4 Implications and Future Research

If one weighs up the arguments for and against the German dual VET system as an approach to prepare young adults for agile work contexts, the following points are particularly convincing: First, the dual VET system provides a protected framework for young adults (Shavit & Müller, 2000). Within this framework, they are provided with information about working life and the chosen job profile and have the opportunity to orient themselves with regard to their career (Billett, 2011). They are to be supported in their career choice and in mastering the transition from the familiar school environment to the largely unknown vocational environment. In the long run, early experiences in authentic occupational settings are suitable to support trainees in developing a professional identity (Cedefop, 2011). Second, the entire training structure is geared to the overarching objective of occupational competence. Through the explicit orientation of the school-based training parts towards in-company practice (learning field concept) and their mutual adaptation to the special features and advantages of the other part, formal and informal learning activities are combined, so that trainees are supported in the best possible way in preparing for the demands of their future careers (Zitter et al., 2016). Third, VET aims to equip trainees for ongoing professional development. On the one hand, this function is fulfilled by teaching trainees social- and meta-competencies in addition to professional competence. These support trainees in coping with daily work requirements and the future-oriented design of personal employment biographies (KMK, 2007). On the other hand, the VET system offers an opportunity to reorient one's career and thus helps to maintain one's own employability (Billett, 2011). Fourth, the completion of vocational training in the dual system also has a positive effect on the transition to the subsequent working life. The employment rate of graduates of the dual system exceeds that of graduates of general education programmes (Cedefop, 2012). Here, the probability of finding a job is higher regardless of age and gender (Cedefop, 2012). In particular, the employment rate among graduates of the German dual training system exceeds that of graduates of general education and is above the EU average (Cedefop, 2013). Compared with graduates of general education, trainees also find a job more quickly after completing the training programme (Cedefop, 2012, 2017b). Furthermore, they remain in their jobs longer (Cedefop, 2012). This can, above all, be explained by the strong link between their training and the requirements of the labor market, what results in a particularly high fit between the trainees' competences and their future job requirements (Cedefop, 2012).

Nonetheless, there are still some areas of the dual VET system that can be improved. One of these areas is devoted to the question of the competences,

abilities, and skills that trainees should have acquired at the end of their vocational training. The challenge here is to assess not only knowledge and cognitive abilities but also the ability at a performative level. The assessment of their professional competence can only become authentic when the trainees show how they behave in representative professional situations (Wesselink et al., 2018). Another area requiring future research efforts is the processes involved in dual vocational training. On the one hand, this refers to the learning processes that take place in the respective learning sites. On the other hand, learning processes that take place as a result of the cooperation between the two learning sites are of interest. Diary studies are particularly useful for recording processes that are difficult to observe, such as subjective learning outcomes, characteristics of social interactions or work-related problems (Rausch, 2014). Finally, there is a need for further research concerning the quality of training. To this end, indicators need to be defined that can be used to objectively assess various conditions and thus the quality of training. In addition, these indicators must be operationalized and applied in the form of instruments. The item catalogue provided by Böhn and Deutscher (2019), for example, is an instrument that can be used to assess various facets (e.g. framework conditions and work tasks) of vocational training. In conclusion, the German dual VET system should be seen as a protected environment in which young adults are introduced to the demands of working life and have the opportunity to develop a professional identity. However, there is still a need for action with regard to the training of vocational competence and the associated 21st century skills, underlying learning processes, and possibilities for establishing and evaluating a uniform quality standard.

References

- Ananiadou, K., & Claro, M. (2009). *21st century skills and competences for new millennium learners in OECD countries* (OECD Education Working Papers: Vol. 41). OECD Publishing.
- Baethge, M., Buss, K.-P., & Lanfer, C. (2003). *Konzeptionelle Grundlagen für einen Nationalen Bildungsbericht: Berufliche Bildung und Weiterbildung/Lebenslanges Lernen* [Conceptual Basis for a National Education Report: Vocational Education and Training and Further Education/Lifelong Learning.] Reihe: Bildungsreform, Band 7, Bonn und Berlin: Bundesministerium für Bildung und Forschung.
- BIBB. (2017). *Ausbildungsordnungen und wie sie entstehen [Training regulations and how they are developed]* <https://www.bibb.de/dienst/veroeffentlichungen/de/publication/show/8269>
- BIBB. (2021a). *Evaluierung des Ausbildungsberufes Kaufleute für Büromanagement - Ergebnisse und Empfehlungen [Evaluation of the training occupation office management assistant - results and recommendations]*. Retrieved from <https://www.bibb.de/dienst/veroeffentlichungen/de/publication/show/17117>
- BIBB. (2021b). *Informationen zu Aus- und Fortbildungsberufen: Kaufmann für Büromanagement/Kauffrau für Büromanagement (Ausbildung)* [Information on initial and continuing training occupations: Office management assistant (apprenticeship)]. Retrieved from <https://www.bibb.de/de/berufeinfo.php/profile/apprenticeship/239212>
- Billett, S. (2001). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning*, 13(5), 209–214. <https://doi.org/10.1108/EUM000000005548>

- Billett, S. (2002). Workplace pedagogic practices: Co-participation and learning. *British Journal of Educational Studies*, 50(4), 457–481. <https://doi.org/10.1111/1467-8527.t01-2-00214>
- Billett, S. (2011). *Vocational education*. Springer Netherlands.
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012). Defining twenty-first century skills. In P. Griffin, B. McGaw, & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 17–66). Springer.
- BMBF. (2020). Ausbildung & Beruf. Rechte und Pflichten während der Berufsausbildung. [Training & Occupation. Rights and obligations during vocational training.] Retrieved from https://www.die-duale.de/SharedDocs/Downloads/Download/dieduale/de/Neue-Broschuere-Ausbildung-und-Beruf.pdf?__blob=publicationFile&v=2
- BMBF. (2021). *Berufsbildungsbericht 2021* [Report on vocational education and training 2021]. Retrieved from https://www.bmbf.de/SharedDocs/Downloads/de/2021/berufsbildungsbericht-2021.pdf?__blob=publicationFile&v=4
- BMFJSFJ. (2021). *FAQ zur Reform der Pflegeberufe* [FAQ on the reform of the nursing professions]. Retrieved from <https://www.pflegeausbildung.net/ausbildungsinteressierte/faq-zur-reform-der-pflegeberufe.html>
- Böhn, S., & Deutscher, V. (2019). Betriebliche Ausbildungsbedingungen im dualen System – Eine qualitative Meta-Analyse zur Operationalisierung in Auszubildendenbefragungen [Training conditions in VET – A qualitative meta-synthesis for the operationalization in apprentice questionnaires]. *Zeitschrift für Pädagogische Psychologie*, 33(1), 49–70. <https://doi.org/10.1024/1010-0652/a000234>
- Brockmann, M., Clarke, L., & Winch, C. (2008). Knowledge, skills, competence: European divergences in vocational education and training (VET)—The English, German and Dutch cases. *Oxford Review of Education*, 34(5), 547–567. <https://doi.org/10.1080/03054980701782098>
- Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. Norton.
- Cedefop. (2011). *Vocational education and training is good for you: The social benefits of VET for individuals* (Research paper: European Centre for the Development of Vocational Training, Vol. 17). Publications Office.
- Cedefop. (2012). *From education to working life: The labour market outcomes of vocational education and training*. Publications Office. Retrieved from <https://doi.org/10.2801/92129>
- Cedefop. (2013). *On the way to 2020* (Research paper/CEDEFOP, European Centre for the Development of Vocational Training, Vol. 31). Publications Office. Retrieved from <https://doi.org/10.2801/47144>
- Cedefop. (2016). *Future skill needs in Europe: Critical labour force trends* (Cedefop research paper: No 59). Publications Office.
- Cedefop. (2017a). *Looking back to look ahead: Preparing the future of vocational education and training in Europe 2020-30* (Briefing note: September 2017). Publications Office.
- Cedefop. (2017b). *Opinion survey on vocational education and training in Europe*. Publications Office.
- Cedefop. (2017c). *Spotlight on VET: Germany*. Retrieved from https://publications.europa.eu/en/search-results?p_p_id=portal2012searchExecutor_WAR_portal2012portlet_INSTANCE_q8EzsBteHybf&p_p_lifecycle=1&p_p_state=normal&queryText=VET&facet.collection=EU_Pub&language=en&startRow=1&resultsPerPage=10&SEARCH_TYPE=SIMPLE
- Cedefop (2019). VET in Germany. In Cedefop (Ed.), *Spotlight on VET – 2018 compilation: Vocational education and training systems in Europe* (pp. 28–29). Publications Office. Retrieved from <http://data.europa.eu/doi/10.2801/009>
- Chambers, E., Foulon, M., Handfield-Jones, H., Hankin, S., & Michaels, E., III. (1998). The war for talent. *The McKinsey Quarterly*, 3, 44–57.
- Cho, H. J., & Kim, J.-M. (2016). Administrative assistants' informal learning and related factors. *Journal of Workplace Learning*, 28(7), 406–423. <https://doi.org/10.1108/JWL-11-2015-0079>
- Choi, W., & Jacobs, R. L. (2011). Influences of formal learning, personal learning orientation, and supportive learning environment on informal learning. *Human Resource Development Quarterly*, 22(3), 239–257. <https://doi.org/10.1002/hrdq.20078>

- Crouse, P., Doyle, W., & Young, J. D. (2011). Workplace learning strategies, barriers, facilitators and outcomes: A qualitative study among human resource management practitioners. *Human Resource Development International*, 14(1), 39–55. <https://doi.org/10.1080/13678868.2011.542897>
- Dede, C. (2010). Comparing frameworks for 21st century skills. In J. Bellanca & R. Brandt (Eds.), *21st century skills: Rethinking how students learn* (pp. 51–76). Solution Tree Press.
- Deißinger, T., & Frommberger, D. (2010). Berufsbildung im internationalen Vergleich – Typen nationaler Berufsbildungssysteme [Vocational training in international comparison – Types of national vocational training systems]. In R. Nickolaus, G. Pätzold, H. Reinisch, & P. T. Tramm (Eds.), *UTB Pädagogik: Vol. 8442. Handbuch Berufs- und Wirtschaftspädagogik* (1st ed., pp. 343–348). Klinkhardt.
- ELGPN. (2012). *Lifelong guidance policy development: A European resource kit* (ELGPN Tools No. 1). Retrieved from http://www.elgpn.eu/publications/browse-by-language/english/ELGPN_resource_kit_2011-12_web.pdf
- ELGPN. (2015). *Guidelines for policies and systems development for lifelong guidance: A reference framework for the EU and for the commission* (ELGPN Tools No. 6). Retrieved from <http://www.elgpn.eu/publications/browse-by-language/english/elgpn-tools-no-6-guidelines-for-policies-and-systems-development-for-lifelong-guidance/>
- Endedijk, M. D., & Bronkhorst, L. H. (2014). Students' learning activities within and between the contexts of education and work. *Vocations and Learning*, 7(3), 289–311. <https://doi.org/10.1007/s12186-014-9116-x>
- Eraut, M. (2004). Informal learning in the workplace. *Studies in Continuing Education*, 26(2), 247–273. <https://doi.org/10.1080/158037042000225245>
- Euler, D. (2004). Lernortkooperation – eine unendliche Geschichte? [Learning site cooperation—an endless story?] In D. Euler (Hrsg.), *Handbuch der Lernortkooperation. Theoretische Fundierung* (S. 12–24). Bd. 1. W. Bertelsmann Verlag.
- Euler, D. (2015). Lernorte in der Berufsausbildung zwischen Potential und Realität [Learnign sites in vocational training between potential and reality]. *BWP – Berufsbildung in Wissenschaft und Praxis*, 44(1), 6–9.
- Eurostat. (2021a). *Adult learning statistics*. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Adult_learning_statistics
- Eurostat. (2021b). *Fertility statistics*. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php/Fertility_statistics
- Eurostat. (2021c). *Labour market flow statistics in the EU*. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php/Labour_market_flow_statistics_in_the_EU#Labour_market_flows:_transitions
- Eurostat. (2021d). *Mortality and life expectancy statistics*. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php/Mortality_and_life_expectancy_statistics#Slight_increase_in_number_of_deaths_in_2017
- Eurostat. (2021e). *Youth unemployment rate in EU member states as of June 2021 (seasonally adjusted)*. Retrieved from <https://www.statista.com/statistics/266228/youth-unemployment-rate-in-eu-countries/>
- Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, 114, 254–280. <https://doi.org/10.1016/j.techfore.2016.08.019>
- Gerholz, K.-H., & Brahm, T. (2014). Apprenticeship and vocational education: An institutional analysis of Workplace Learning in the German vocational system. In C. Harteis, A. Rausch, & J. Seifried (Eds.), *Discourses on professional learning* (Vol. 9, pp. 143–158). Springer.
- Goller, M. (2017). *Human agency at work: An active approach towards expertise development*. Springer.
- Greinert, W.-D. (2004). Die europäischen Berufsausbildungs “systeme” – Überlegungen zum theoretischen Rahmen der Darstellung ihrer historischen Entwicklung [European vocational training “systems” – reflections on the theoretical framework for presenting their historical development] *Berufsbildung. Europäische Zeitschrift*. Sonderheft Nr. 32, 18–26.

- Greinert, W.-D. (2005). Mass vocational education and training in Europe: Classical models of the 19th century and training in England, France and Germany during the first half of the 20th. Cedefop panorama series: Vol. 118. Luxembourg: Office for Official Publ. of the European Communities.
- Gruber, H., & Harteis, C. (2018). *Individual and social influences on professional learning* (Vol. 24). Springer International Publishing.
- Harteis, C. (2019). Supporting learning at work in an era of digitalization of work. In A. Bahl & A. Dietzen (Eds.), *Work-based learning as a pathway to competence-based education*. Opladen.
- Jääskelä, P., Poikkeus, A.-M., Vasalampi, K., Valleala, U. M., & Rasku-Puttonen, H. (2016). Assessing agency of university students: Validation of the AUS scale. *Studies in Higher Education*, 42(11), 2061–2079. <https://doi.org/10.1080/03075079.2015.1130693>
- Ju, S., Zhang, D., & Pacha, J. (2012). Employability skills valued by employers as important for entry-level employees with and without disabilities. *Career Development and Transition for Exceptional Individuals*, 35(1), 29–38. <https://doi.org/10.1177/0885728811419167>
- Kalleberg, A. L., & Mouw, T. (2018). Occupations, organizations, and Intragenerational career mobility. *Annual Review of Sociology*, 44(1), 283–303. <https://doi.org/10.1146/annurev-soc-073117-041249>
- Kirpal, S. (2007). The individualisation of identification with work in a European perspective. In A. Brown, S. Kirpal, & F. Rauner (Eds.), *Technical and vocational education and training (Identities at work)* (Vol. 5, pp. 285–314). Springer.
- KMK. (2007). *Handreichung für die Erarbeitung von Rahmenlehrplänen der Kultusministerkonferenz für den berufsbezogenen Unterricht in der Berufsschule und ihre Abstimmung mit Ausbildungsordnungen des Bundes für anerkannte Ausbildungsberufe [Guidance on the development of framework curricula of the Standing Conference of the Ministers of Education and Cultural Affairs in the field of vocational education and training for occupation-related instruction at vocational schools and their coordination with federal training regulations for recognised training occupations]*. Bonn. Retrieved from https://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2007/2007_09_01-Handreich-RIpl-Berufsschule.pdf
- Kutscha, G. (2015). Erweiterte moderne Beruflichkeit: Eine Alternative zum Mythos “Akademisierungswahn” und zur “Employability-Maxime” des Bologna-Regimes [Expanded modern professionalism: An alternative to the myth of “mania for academia” and the “employability maxim” of the Bologna regime]. *Berufs- und Wirtschaftspädagogik – online*. (29).
- Kyndt, E., Dochy, F., & Nijs, H. (2009). Learning conditions for non-formal and informal workplace learning. *Journal of Workplace Learning*, 21(5), 369–383. <https://doi.org/10.1108/13665620910966785>
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. *Learning in doing*. Cambridge University Press.
- Malcolm, J., Hodkinson, P., & Colley, H. (2003). The interrelationships between informal and formal learning. *Journal of Workplace Learning*, 15(7/8), 313–318. <https://doi.org/10.1108/13665620310504783>
- Manuti, A., Pastore, S., Scardigno, A. F., Giancaspro, M. L., & Morciano, D. (2015). Formal and informal learning in the workplace: A research review. *International Journal of Training and Development*, 19(1), 1–17. <https://doi.org/10.1111/ijtd.12044>
- Metso, S. (2014). Vocational students’ perspective on organizational factors enhancing workplace learning. *Education + Training*, 56(5), 381–396. <https://doi.org/10.1108/ET-05-2013-0069>
- OECD. (2018). *Education at a glance 2018: OECD indicators*. OECD Publishing.
- OECD (2019). *OECD skills outlook 2019: Thriving in a digital world*. OECD Publishing. Retrieved from <https://doi.org/10.1787/df80bc12-en>
- Raemdonck, I., Gijbels, D., & van Groen, W. (2014). The influence of job characteristics and self-directed learning orientation on workplace learning. *International Journal of Training and Development*, 18(3), 188–203. <https://doi.org/10.1111/ijtd.12028>

- Rausch, A. (2014). Using diaries in research on work and learning. In C. Harteis, A. Rausch, & J. Seifried (Eds.), *Discourses on professional learning* (Vol. 9, pp. 341–366). Springer Netherlands.
- Seeber, S., & Seifried, J. (2019). Herausforderungen und Entwicklungsperspektiven der beruflichen Bildung unter veränderten Rahmenbedingungen [Challenges and development prospects of vocational education and training under changing conditions]. *Zeitschrift für Erziehungswissenschaft*, 22(3), 485–508. <https://doi.org/10.1007/s11618-019-00876-2>
- Seifried, J., Beck, K., Ertelt, B.-J., & Frey, A. (2019). *Beruf, Beruflichkeit, Employability* [Occupation, professionalism, employability]. Wirtschaft – Beruf – Ethik. wbv.
- Shavit, Y., & Müller, W. (2000). Vocational secondary education. *European Societies*, 2(1), 29–50. <https://doi.org/10.1080/146166900360710>
- Suarta, I. M., Suwintana, I. K., Sudhana, I. G. P. F. P., & Hariyanti, N. K. D. (2019). Students and vocational educators perceived on the importance level of employability skills. *Advances in Social Science, Education and Humanities Research*, 383, 201–210. <https://doi.org/10.2991/icss-19.2019.16>
- Tynjälä, P. (2013). Toward a 3-P model of workplace learning: A literature review. *Vocations and Learning*, 6(1), 11–36. <https://doi.org/10.1007/s12186-012-9091-z>
- Vähäsantanen, K., & Eteläpelto, A. (2018). Agency and learning in the work of software Professionals. In C. Harteis (Ed.), *Professional and practice-based learning: Volume 21. The impact of digitalization in the workplace: An educational view* (pp. 161–179). Springer.
- Van Laar, E., van Deursen, A. J. A. M., van Dijk, J. A. G. M., & de Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior*, 72, 577–588. <https://doi.org/10.1016/j.chb.2017.03.010>
- Virtanen, A., Tynjälä, P., & Eteläpelto, A. (2012). Factors promoting vocational students' learning at work: Study on student experiences. *Journal of Education and Work*, 27(1), 43–70. <https://doi.org/10.1080/13639080.2012.718748>
- Watkins, K. E., & Marsick, V. J. (1992). Towards a theory of informal and incidental learning in organizations. *International Journal of Lifelong Education*, 11(4), 287–300. <https://doi.org/10.1080/0260137920110403>
- Wesselink, R., Biemans, H., Gulikers, J., & Mulder, M. (2018). Models and principles for designing competence-based curricula, teaching, learning and assessment. In M. Mulder (Ed.), *Technical and vocational education and training: Vol. 23. Competence-based vocational and professional education: Bridging the worlds of work and education* (1st ed., pp. 533–553). Springer.
- Wirth, K. (2015). Anforderungen dualer Ausbildung an den Lernort Schule – Erfahrungen im Betrieb systematisch einbeziehen! [Requirements of dual training for school as a learning site – integrate company experience systematically!]. *BWP – Berufsbildung in Wissenschaft und Praxis*, 44(1), 14–17.
- Zitter, I., Hoeve, A., & de Bruijn, E. (2016). A design perspective on the school-work boundary: A hybrid curriculum model. *Vocations and Learning*, 9(1), 111–131. <https://doi.org/10.1007/s12186-016-9150-y>

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Chapter 17

Preparing Students for the School-to-Work Transition: A Systematic Review of Research on Secondary School-Based Vocational Education



Eva Vermeire, Nele De Cuyper, and Eva Kyndt 

Abstract The school-to-work transition is a critical step in the careers of vocationally educated graduates. Preparing graduates for this transition could help them obtain a permanent high-quality job. Preparation within the school, focusing on the development of personal resources, is considered essential. Accordingly, the aim of this systematic literature review is to integrate findings concerning vocational outcomes and personal resources and structural factors of secondary vocational education influencing these outcomes. Results of the summative content analysis of 36 articles indicate that obtaining a secondary vocational education degree reduces the risk of unemployment. Jobs filled by these graduates are often fixed-term and require lower levels of skills. Nevertheless, these students seem to be poorly prepared as they do not possess strong personal resources, such as professional functioning and career development skills. Concerning structural factors, attending a public school and following a specific vocational programme both help when finding a job.

Keywords School-to-work transition · Secondary school-based vocational education · Personal resources · Structural factors

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The school-to-work transition is a critical step in the careers of recent graduates, both in the short and the long term (Koen et al., 2012). In the short term, the school-to-work transition has consequences for well-being and life satisfaction (Koen et al., 2012). In the long term, the school-to-work transition impacts earnings, career satisfaction, and career prospects (Koen et al., 2012). The consequences are not only at the individual level, but also at the organisational (e.g., turnover) and the societal level (e.g., economic returns of a healthy labour market) and have, thus, a far-reaching impact (Akkermans et al., 2015). However, this step is not without challenges and can be characterised by periods of unemployment, underemployment, and cycling between insecure positions before obtaining a stable and satisfying job (Akkermans et al., 2015; Lassibille et al., 2001). Not surprisingly, graduates experience this transition as a period of chaos, shock, and uncertainty (Kowtha, 2011).

Preparing students for this critical step could facilitate the transition to the labour market (Akkermans et al., 2015). In this respect, previous research has indicated that personal resources are vital for the school-to-work transition (e.g., Baay et al., 2014a; Kanfer et al., 2001; West et al., 1987). Personal resources or “those entities that either are centrally valued in their own right (e.g., self-esteem, close attachments, health, and inner peace) or act as a means to obtain centrally valued ends (e.g., money, social support, and credit)” (Hobfoll, 2002, p. 307) can help to overcome difficulties and cope with less comfortable experiences (e.g., Baay et al., 2014a; Kanfer et al., 2001; West et al., 1987). Hence, they exert an important influence on the outcomes of the school-to-work transition.

Prior research indicated the contribution of resources in the school to the development of personal resources (Kehrhahn & Peterson, 2014; Lüftenegger et al., 2012; Meyer & Wise, 1982). These resources in the school environment include structural factors (e.g., autonomy, workload, and support) as well as the curriculum (Lüftenegger et al., 2012; Schreiber, 2002). Furthermore, these structural factors also directly influence the school-to-work transition (Baranowska et al., 2011; Bédoué & Giret, 2011; Crawford et al., 1997). Structural characteristics of the school have the potential to implement change in order to facilitate the school-to-work transition and the development of personal resources. Therefore, structural factors in the school environment have the potential to leverage the preparation for the transition to the labour market.

Despite the fact that graduates from secondary vocational education are expected to enter the labour market immediately after graduation (Billett, 2011; CEDEFOP, 2008), concerns arise as to whether education effectively meets the economic and social requirements of the labour market (Pavlova et al., 2017). In this respect, the Indian government, for example, acknowledged the challenge of relevant vocational education at the secondary level in order to adequately prepare students to meet the requirements of the world of work (Pavlova et al., 2017). As such, it seems that graduates from secondary vocational education would probably benefit most from a qualitative preparation for the transition to work given their less favourable position in the labour market, especially in the long term (Kyndt et al., 2012).

In order to qualify them for skilled work, students in secondary school-based vocational education are offered both theory-oriented and practice-oriented courses (Billett, 2011; Corrales-Herrero & Rodriguez-Prado, 2012; OECD, European Union, & UNESCO-UIS, 2015; Shavit & Müller, 2000). Additionally, workplace learning is included in the educational programme as an internship – a sustained period in an organisation to use the practical skills learned during classes in actual practice (Lopez-Mayan & Nicodemo, 2013). This combination of theory and practice within secondary education contributes to the vocational competence (i.e., pieces of integrated knowledge, skills, and attitudes) of these students, which is necessary for adequate functioning on the job (Bartman & Bruijn, 2011). Students need to integrate knowledge learned in theoretical classes with the skills and attitudes learned in practical classes and transfer these integrated pieces of knowledge, skills, and attitudes to the internship environment (Bartman & Bruijn, 2011). Hence, this combination of, on the one hand, theory-oriented and practice-oriented courses in school and, on the other hand, workplace learning in an organisation is potentially crucial for preparing secondary vocational students for entering the labour market.

Considering the facts that immediate outcomes of the school-to-work transition have potential long-lasting consequences for their future career and that graduates from secondary school-based vocational education have a less favourable position on the labour market, more insight into the vocational outcomes of these graduates and how these transition outcomes can be improved is needed. Furthermore, a clear overview of which structural factors of the school help facilitate the school-to-work transition, as well as which personal resources should be fostered and how they are related to the vocational outcomes, is lacking. In this respect, this systematic review investigates (1) what is known about the outcomes of the school-to-work transition, (2) what personal resources contribute to the outcomes of the school-to-work transition, and (3) what structural factors of secondary school-based vocational education contribute either directly or indirectly to the outcomes of the school-to-work transition.

This study focuses on graduates from secondary vocational education situated at ISCED 3 (i.e., upper secondary education) level. This study does not include articles that merely focus on graduates from other secondary tracks or vocational education situated at other ISCED levels. Furthermore, because workplace learning has a central place in the educational programme of secondary school-based vocational education, this systematic literature review will contribute to workplace literature by investigating the outcomes of the school-to-work transition in relation to the structural characteristics of the secondary vocational school.

In the following section, the school-to-work transition and the outcomes of the transition are outlined. Next, the method and results are presented. Finally, the results are discussed and suggestions for future research are provided.

17.1 Conceptual Background

17.1.1 *The School-to-Work Transition*

According to van Daal et al. (2013), the school-to-work transition is defined broadly by Nicholson (1990) as starting within education, towards the period between graduation and finding employment, until the first period at work. This is different from other definitions that are narrower in scope and define this transition solely as the period between graduation from education and finding employment (Vanoverberghe et al., 2008). The broader definition of Nicholson (1990) acknowledges the role of education in the preparation for the school-to-work transition. Furthermore, the model proposed by Nicholson and West (1988) acknowledges the complexity of the transition. The transition is seen as a process in which outcomes are related to individual experiences. This relatedness between individual experiences and vocational outcomes is inherent to the transition to the labour market (Goodwin & O'Connor, 2005). As such, this broader definition is appropriate when capturing the complex reality of the transition from education to work.

According to Nicholson (1990) and Nicholson and West (1988), each transition into a new work role or a new (paid) job comprises four stages: the preparation, encounter, adjustment, and stabilisation stage. During the *preparation stage* people are getting psychologically ready for the transition by creating expectations about the future and by anticipating the upcoming change (Nicholson & West, 1988). The early *encounter stage* starts with the job interview and other formal presentations or meetings as part of the selection process and lasts until the first few weeks of the new job (Matthews, 2002). When the change is integrated and the new worker has found their way in the new organisation, he or she can start settling down into the occupational community during the *adjustment stage* (Nicholson & West, 1988). Once the new worker is less conscious of the adjustment and feels relatively comfortable in their understanding of the new job, the *stabilisation stage* is achieved (Matthews, 2002). The experiences and acquired knowledge and skills resulting from performing in the new work context during this last stage are a preparation for future changes and, eventually, the breeding ground for a new transition (Nicholson, 1990).

Even though the different stages are described as a successive process (Nicholson, 1990), the transition to the labour market is often a non-linear process (Goodwin & O'Connor, 2005). The school-to-work transition is heavily individualised, complex, and fragmented, potentially involving breaks, extended or repeated periods of unemployment, and even return to education after a period in the labour market (Goodwin & O'Connor, 2005). Not surprisingly, recent graduates might cycle between the different stages of the transition process before settling down into a stable job. It is, however, clear that the phase before the first job transition, namely entry to the labour market, can be considered a preparation phase. As such, this study of the transition from education to work focuses on the preparation stage and how this stage contributes to outcomes of the school-to-work transition. More

precisely, the role of personal resources and characteristics of the school (i.e., structural factors), in this first stage of the transition process, is unravelled.

The school-to-work transition is not only heavily individualised, it is also embedded in the context of the country where the transition occurs (Zimmermann et al., 2013). Demographic structure, economic climate, labour market characteristics, active labour market policy programmes, and education and training interact in the transition to the labour market (Zimmermann et al., 2013). With regard to the school-to-work transition, the demographic structure relates to the size of younger cohorts. The economic climate refers to the structure of the economy and the economic growth. Labour market characteristics influencing the school-to-work transition are the minimum wages and regulations with regard to employment protection for permanent and temporary jobs. Active labour market policy programmes refer to the programmes for youngsters who failed to complete general or vocational education. Education and training refer to the formal preparation for the labour market (Zimmermann et al., 2013). Across countries and world regions, education and training is seen as the core factor in determining the chance of successfully transitioning to the labour market because it has a particular role in preparing recent graduates for their school-to-work transition (Quintini et al., 2007; Raffe, 2011; Zimmermann et al., 2013). More precisely, vocational education, compared to general education and pure on-the-job training, increases the chance of achieving a successful school-to-work transition across world regions. Graduates who follow vocational education are taught technical skills in school and require little on-the-job training if the skills taught in school are aligned to the labour market (Quintini et al., 2007; Zimmermann et al., 2013). Furthermore, workplace learning during an internship can help strengthen general employability skills and personal development (Zimmermann et al., 2013). It should be noted, however, that the assumption that knowledge, skills, and attitudes developed in practice settings are more closely related to work requirements compared to knowledge, skills, and attitudes developed in school settings is too easy and too straightforward. It is the alignment of education with the expectations and needs of the labour market that could overcome the hurdles, which stem from the other factors mentioned (Zimmermann et al., 2013). In this respect, Zimmermann et al. (2013) conducted worldwide research on unemployment of graduates stemming from vocational education. Their findings indicated that the school-to-work transition of vocational graduates across the world share many similarities with regard to finding a first job. These similarities across countries allow an integration of findings concerning the school-to-work transition across countries (Raffe, 2011).

17.1.2 Outcomes of the School-to-Work Transition

The transition from school to work can be divided into three types of vocational outcomes: job quantity, job quality, and job stability (Akkermans et al., 2015). *Job quantity* refers to attaining employment and is often used to define a fluent transition

(Akkermans et al., 2015; Taylor, 2005). Finding employment has implications on different levels. First, attaining employment leads to a reduction in depressive symptoms, an increase in self-esteem, and fosters the social network and social inclusion of the new employee (Akkermans et al., 2015; Evans & Repper, 2000; Wald & Martinez, 2003). Conversely, remaining unemployed has a negative influence on future career success (Koivisto et al., 2007). Furthermore, organisations need to recruit talented new employees in order to increase and maintain their competitive advantages (Akkermans et al., 2015). For society, recent graduates attaining employment implies a reduced cost of unemployment (Akkermans et al., 2015).

Job quality refers to the quality of employment in terms of monetary (i.e., earnings) and non-monetary job benefits, such as on-the-job training, promotion opportunities, and task variety (Jencks et al., 1988). Attaining a high-quality job is crucial for young people, as the first employment can determine future career success (Akkermans et al., 2015; Ng & Feldman, 2007). Furthermore, job quality is related to increased mental health, career development, and job satisfaction (Akkermans et al., 2015; Saks & Ashforth, 2002; Stone & Josiam, 2000). In this respect, the correlations of poor job quality are more similar to unemployment compared to adequate employment (Akkermans et al., 2015; Dooley & Prause, 1997).

Job stability refers to the time employees work in the same job (Giannelli et al., 2012). Finding a temporary job represents a less optimal transition because temporary jobs often lack adequate learning opportunities and pay (Akkermans et al., 2015; Yates, 2005).

These three types of outcomes are often examined as state variables and are measured only once in time. In this respect, the moment when the outcomes are measured influences the perception of the outcomes of the school-to-work transition. Scholars find mixed results concerning the outcomes of the school-to-work transition of less-educated graduates. Achieving a secondary vocational education degree lowers the risk of unemployment and offers protection against extended periods of joblessness compared to graduates from secondary general education (Arum & Shavit, 1995). Nevertheless, less-educated graduates seem to experience more difficulties in finding a job and often find jobs of lower quality compared to higher educated graduates (Akkermans et al., 2015; McGinnity et al., 2005). It has been argued that these difficulties could be overcome by preparing these students for the school-to-work transition (Meyer & Wise, 1982).

17.2 Present Study

The transition from secondary vocational education to the labour market is a major step in early careers characterised by periods of unemployment, underemployment, and cycling between insecure positions before obtaining a stable and satisfying job. In this respect, recent graduates should be well prepared in order to achieve an optimal transition in terms of job quantity, job quality, and job stability. This preparation should focus on personal resources related to the transition. Moreover, structural

factors within secondary vocational education should be considered carefully when preparing students for the transition to the labour market. These structural factors could be directly related to the outcomes of the transition or indirectly related via their influence on the development of personal resources affecting the outcomes of the transition process. Because the school is given a more central place in secondary school-based vocational education compared to other pathways of secondary vocational education, this study focuses on graduates from secondary school-based vocational education situated at ISCED 3. Despite the importance of preparing recent graduates for the school-to-work transition, a clear overview of the outcomes achieved, as well as the personal resources and structural factors related to these outcomes, is lacking. Therefore, this systematic literature review focuses on the following research questions (RQ):

- RQ1: *What is known about the school-to-work transition of recent graduates stemming from secondary school-based vocational education in terms of job quantity, job quality, and job stability?*
- RQ2: *What personal resources contribute to the school-to-work transition in terms of job quantity, job quality, and job stability?*
- RQ3: *What structural factors of secondary school-based vocational education contribute either directly or indirectly to the school-to-work transition in terms of job quantity, job quality, and job stability?*

17.3 Method

17.3.1 Literature Search and Selection

The literature was systematically searched for relevant primary studies. As the school-to-work transition is a multidisciplinary field, databases of social sciences, educational sciences, psychology, and economics were included. More specifically, primary studies of this systematic review were searched in ERIC (OvidSP), Social Science Citation Index, Econlit, and FRANCIS. Primary studies focusing on the school-to-work transition were searched by coupling the term 'transition' with all combinations of 'school', 'education', 'college',¹ or 'university',¹ on the one hand, and 'work', 'employment', or 'labo(u)r market,' on the other hand. Furthermore, different combinations were also created by using the infix 'to' instead of the term 'transition'. This search led to 55,835 hits. After deleting all duplicates, 23,844 unique primary studies remained.

¹ These search terms were included because this study is part of a broader project focusing on the transition of students with different vocational educational degrees. Each study has its own focus within the transition. Whereas this study focuses on outcomes of the school-to-work transition, the study of Grosemans, Coertjens, and Kyndt (2017) focuses on learning during the transition from higher education to work.

The selection of primary studies involved several steps and followed the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) which specifies the steps that should be reported for the identification of documents (Moher et al., 2009). These steps are depicted in Fig. 17.1. In the first phase, all studies focusing on the school-to-work transition of vocationally educated graduates were retained. Several exclusion criteria were used in order to prevent bias in the findings obtained: (a) articles not focusing on the school-to-work transition, (b) studies focusing on specific subgroups of students like early school leavers, students with disabilities, and gifted students, (c) studies exclusively focusing on career counselling, (d) primary studies referring to specific reform practices, policy oriented initiatives, and instructional guidelines, (e) descriptive studies, (f)

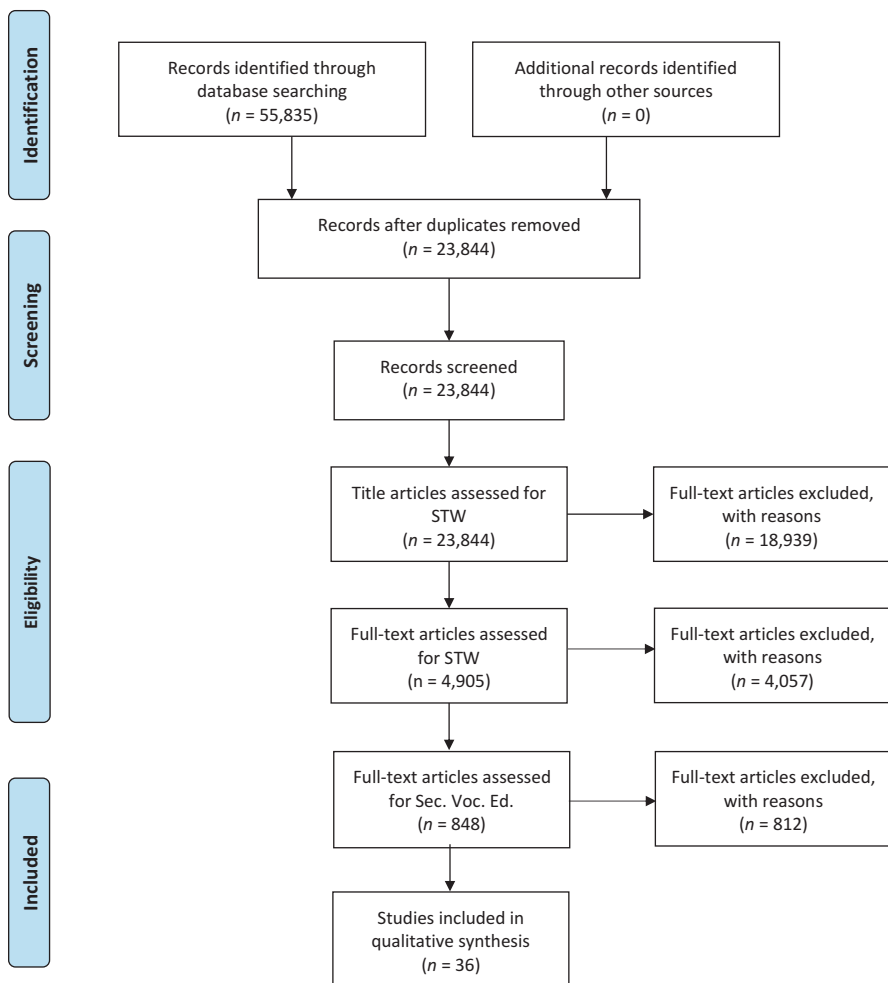


Fig. 17.1 PRISMA flow diagram detailing steps in the search and screening of sources

non-empirical studies, (g) non-peer-reviewed studies, and (h) studies not written in English. Studies that clearly met one of the criteria were excluded. In the case of doubt, the primary study was retained until the next step.

First, primary studies were screened by the title of the manuscript. After this selection, 4905 primary studies remained. The remaining primary studies were screened by their abstract, leaving 1080 primary studies. The 21 studies of which the abstract could not be retrieved were also excluded, leaving 1059 primary studies. Finally, only studies published in the last 25 years were included. Consequently, all studies before 1990 were excluded, resulting in 848 remaining primary studies focusing on the transition from education to work in general.

In the second phase, a further refinement was made to retain only articles focusing on the transition of students from *secondary school-based vocational education* to the labour market. Therefore, the title, abstract, theoretical framework, and/or method section were skimmed. Furthermore, the educational system of the country/countries included was checked to confirm that secondary school-based vocational education was offered. Consequently, articles only focusing on apprenticeships or vocational education of a level other than ISCED 3, and that did not mention anything about secondary school-based vocational education, were excluded. This resulted in a final selection of 36 primary studies concentrating on the transition from secondary school-based vocational education to the labour market. In the last step, the remaining full texts were carefully read and references were traced back.

17.3.2 Critical Appraisal

In order to exclude low quality studies, the selected primary studies were critically appraised according to the guidelines from the Critical Appraisal Skills Programme (CASP, 2013) for qualitative and mixed-method studies and the checklists for quantitative studies based on the criteria of the National Institute for Health and Clinical Excellence (2009). The critical appraisal mainly focused on a clear description of the aims and results of the study, the appropriateness of the research design and recruitment strategy, and ethical issues. The selected studies all had a high or medium quality score and no studies were excluded due to low quality. [Appendix A](#) and [Appendix B](#) include the details of this critical appraisal.

17.3.3 Analyses of Literature

The selected articles were analysed according to the guidelines of Aveyard (2010). In the first step, the characteristics of the study (e.g., country, participants, and methodology) were analysed and inventoried in [Appendix C](#). Next, all studies were explored in-depth and the summative content analyses method was used to categorise relevant findings for the research questions (Aveyard, 2010). Each relevant

passage of text was labelled with a code in order to identify relevant information to answer the research questions. In the last step, the coded findings were analysed across the different studies. This synthesis provided all the information of former studies in order to integrate the findings (Aveyard, 2010).

17.4 Results

Before going into more detail, the general characteristics of the selected articles (e.g. method, sample, research questions) are presented. First, most of the studies ($n = 32$) used quantitative methods to survey the participants. Qualitative ($n = 3$) and mixed methods ($n = 21$) were used to a lesser extent. Second, most studies ($n = 27$) provided information about one of the research questions. Some of the articles ($n = 9$) provided information about two of the research questions, but none of them contained information about all three research questions.

17.4.1 Outcomes of the School-to-Work Transition

The first research question concerns the outcomes of the school-to-work transition according to the following types: job quantity, quality, and stability. Fourteen primary studies provided information on job quantity, thirteen primary studies on job quality, and nine primary studies on job stability. An overview of the results per type of outcome are presented below.

Job Quantity Obtaining a degree from secondary vocational education reduces the risk of unemployment in comparison with the risk faced by graduates who solely possess a secondary general education degree or young adults leaving education without an educational degree (Ainsworth & Roscigno, 2005; Arum & Shavit, 1995; Audas et al., 2005; Bernardi, 2003; Bonnal et al., 2002; Genda & Kurosawa, 2001; Iannelli, 2004; Iannelli & Raffe, 2007; Lopez-Mayan & Nicodemo, 2013; Shavit & Müller, 2000). In this respect, studies show that most graduates from secondary vocational education immediately start with full-time employment (Corrales-Herrero & Rodriguez-Prado, 2012; Soro-Bonmati, 2000). Only a smaller number start working in part-time jobs within three years after graduation (Corrales-Herrero & Rodriguez-Prado, 2012). Furthermore, graduates from secondary vocational education, compared to generally educated graduates, find a first job with relative ease and with fewer difficulties (Baranowska et al., 2011; Lopez-Mayan & Nicodemo, 2013). The ease of this transition is explained by the large number of organisations that recruit new workers directly via the secondary vocational school (Brinton & Tang, 2010).

Job Quality Recent graduates with a secondary vocational education degree are mostly employed in blue-collar jobs (i.e., service and sales workers, skilled

agricultural workers, or craft and related trade workers) compared to graduates of higher levels of vocational education who are mostly employed in white-collar jobs (i.e., managers and professionals, technicians and associate professionals, or clerical support) (Lopez-Mayan & Nicodemo, 2013). Furthermore, compared to graduates with higher levels of education, these graduates often find jobs of lower quality in terms of required skills and job complexity (Shavit & Müller, 2000). Compared to graduates of general education, recent graduates with a secondary vocational education degree have a greater chance of working as a skilled rather than unskilled worker (Shavit & Müller, 2000). Nevertheless, there is no difference in occupational advancement or occupational status (Kim & Passmore, 2016). However, this is nuanced by the findings of Arum and Shavit (1995), who found that secondary vocational graduates can find a high-quality job compared to secondary general graduates, but it depends on the vocational track they followed during secondary school. More precisely, these authors found that the vocational business track provides the greatest chance of gaining higher quality jobs in terms of task variety.

Two aspects of this job quality have been investigated more exhaustively: horizontal, vertical, and gender-related (mis)fit, and wages. More precisely, vertical fit refers to the fit between the level of education obtained by the student and the level of education required by the job. Horizontal fit is the extent of fit between the field of study and the job (Grosemans et al., 2017). For example, a graduate with a plumbing degree who is working as a truck driver does not have a horizontal fit, whereas a graduate with a plumbing degree who is working as a plumber in an organisation has a horizontal fit. Results show that the jobs of secondary vocational graduates are generally not a fit with the vocational background of the graduate, and this misfit persists during their further career (Ainsworth & Roscigno, 2005; Baert et al., 2013; Bédoué & Giret, 2011; Bieri et al., 2016; Lopez-Mayan & Nicodemo, 2013; Paleocrassas et al., 2003). In this respect, a minority of the recent graduates secure a job that fits both the educational level (i.e., vertical fit) and the field of study (i.e., horizontal fit), and approximately half of the recent graduates obtain a job that only fits their educational level. Furthermore, one-third of the recent graduates obtain a first job that does not require any educational level, which has a negative effect on earnings (Lopez-Mayan & Nicodemo, 2013). Crucial for finding a job that fits the educational attainment is the time between graduating from secondary vocational education and finding the first job (Witte & Kalleberg, 1995). The longer it takes to find a job, the higher the chance the graduate starts in position that does not fit with the field of study (Witte & Kalleberg, 1995).

Gender-relatedness may concern the vocational track (i.e., vocational tracks that are two-thirds dominated by either male or female students) or the job. According to Paleocrassas et al. (2003), female vocational tracks have a slightly better horizontal fit rate than male tracks. Yet, men are more likely to work in a gender-typical jobs than women (Bieri et al., 2016).

Regarding wages, graduating from secondary vocational education used to have a negative influence on wages compared to higher levels of education when starting a first job (Cooke, 2003; Crawford et al., 1997). Compared to graduates of secondary general education, recent graduates catch up relatively early in their career

(Cooke, 2003). Furthermore, this negative effect on wages has been neutralised during the last twenty years, indicating that nowadays there is no longer a difference in wages between recent graduates from secondary general and secondary vocational education at the beginning of their careers (Cooke, 2003).

Job Stability Most of the secondary vocational graduates find a job that lasts longer than six months. However, this depends on the vocational track and the employment protection legislation of a country (Lopez-Mayan & Nicodemo, 2013; Verdú et al., 2008; Wolbers, 2007). More precisely, the expected duration of time to find a job that lasts longer than six months decreases by 50% when recent graduates completed a programme in building or manufacturing in Spain (Lopez-Mayan & Nicodemo, 2013) and increases in all countries when employment relations are more regulated (Wolbers, 2007). Furthermore, job (in)stability is influenced by two aspects which are discussed below: type of contract and voluntary turnover.

Concerning type of contract, recent graduates have a higher probability of transitioning into permanent employment compared to graduates from other secondary tracks (Baranowska et al., 2011). However, fixed-term contracts are the norm rather than the exception (Lopez-Mayan & Nicodemo, 2013; McGinnity et al., 2005). This transition from school into fixed-term contracts seems to be influenced by the vocational sector that recent graduates work in and the occupational field to which a vocational track belongs (Brinton & Tang, 2010; Corrales-Herrero & Rodriguez-Prado, 2012). When recent graduates are starting in a fixed-term position, there is a high chance that they are working in the manufacturing sector (Brinton & Tang, 2010) or that they had followed one of the following vocational tracks: chemistry, image and sound, or construction and civil work (Corrales-Herrero & Rodriguez-Prado, 2012). Finally, the transition from fixed-term to permanent contracts is independent of the vocational skills these graduates have acquired during previous fixed-term jobs (Baranowska et al., 2011).

Considering voluntary resignation, recent graduates who obtained a secondary vocational degree are less inclined to leave an employer compared to graduates of secondary general education (Genda & Kurosawa, 2001; Okano, 2004). More precisely, less than one-fifth of the female graduates in the study by Okano (2004) had resigned within the first year after graduation.

17.4.2 Personal Resources Affecting the Outcomes of the School-to-Work Transition

Nine studies investigated the role of personal resources in the school-to-work transition. Five personal resources are important in the transition process: career adaptability, career development skills, professional functioning, social capital and the use of personal contacts, and work motivation. Below, the results are structured into two subsections. First, results concerning personal resources during the preparation of the students for the transition are outlined. Next, the influences of personal resources on the outcomes are presented.

Preparing Final Year Students for Entering the Labour Market First, personal resources influence job search behaviour (i.e., preparatory job search behaviour and job search intentions). More specifically, findings concerning *work motivation* suggest that overall work motivation of secondary vocational graduates (i.e., intrinsic and extrinsic work motivation) is positively related to more preparatory job search behaviour and more job search intentions (Baay et al., 2014b). Moreover, these graduates rely more on their *personal contacts* during the search for a job compared to graduates from higher levels of education (Kogan et al., 2013).

Second, personal resources influence the preparedness for taking occupational decisions. According to Phillips et al. (2002), *career adaptability* positively influences objective (i.e., possessing generalisable work skills and developing a realistic plan for the school-to-work transition) and subjective psychological readiness (i.e., showing optimism about the plan for the school-to-work transition and resilience when facing obstacles). This career adaptability is influenced by the social support from the secondary vocational school felt by the graduate (Han & Rojewski, 2015). Furthermore, secondary vocational graduates achieve a lower score on *professional functioning* and *career development skills* such as knowledge of the world of work, decision-making principles, planning, and exploration, and score significantly higher on career indecision in comparison to higher levels of education (Creed et al., 2010). In this respect, secondary vocational graduates seem to be poorly prepared to make occupational decisions. They make decisions based on scarce career information, poor understanding of the world of work, and insufficient decision-making skills (Creed et al., 2010). However, being prepared to respond to uncertain outcomes in the job search and organisational entry process is positively related with finding employment (Koivisto et al., 2011).

Personal Resources in Relation to Outcomes Job quantity is influenced by personal resources. More precisely, *social capital* (i.e., the resources available because of the social relations) is significantly related to a higher number of job offers before and after graduation (Baay et al., 2014a). Furthermore, once these recent graduates left secondary vocational school, access to working class social capital increases the chances of finding a job, whereas access to lower class social capital decreases the odds of finding a job (Verhaeghe et al., 2015). Finally, social capital has no effect on the status of the occupation according to the International Socio-Economic Index (Verhaeghe et al., 2015).

17.4.3 *Structural Factors in Relation to the Outcomes of the Transition*

The role of structural factors in education in the transition to the labour market was investigated in eight articles. The influence of the structure can be situated at different levels, namely school and programme, which is discussed below in relation to the outcomes of the school-to-work transition.

Structural Factors in Relation to Job Quantity At the level of the educational *school*, Lopez-Mayan and Nicodemo (2013) found that recent graduates find a job more easily when they attended a public school compared to a semi-private school.

Considering the level of the educational *programme*, the findings indicate that the vocational specificity of the programme positively influences the employment status and job attainment (Shavit & Müller, 2000; Wolbers, 2007). The more specific the programme is, the more rapidly these graduates enter into a first job. These findings are in line with the findings of two primary studies that compared secondary school-based vocational education with apprenticeships in relation to job quantity. These primary studies indicate that apprenticeships facilitate the entry into the labour market compared to school-based learning programmes (Baranowska et al., 2011; Bonnal et al., 2002). This can be explained by the findings of Phillips et al. (2002) who identified that objective (i.e., work skills and realistic plan) and subjective (i.e., resilience and optimism about a clear vision) readiness is promoted by work-based learning. However, the findings of one primary study indicate that graduates from apprenticeships, compared with school-based learning programmes, suffer from longer periods of unemployment when they do not immediately find a job (Bonnal et al., 2002).

Structural Factors in Relation to Job Quality The learning programme also influences the quality of the first job. More precisely, recent graduates who followed a school-based vocational programme are less likely to obtain a job that fits the occupation for which they are trained (Bertschy et al., 2009). Nevertheless, these findings are not replicated by Béduwé and Giret (2011) who found no difference between apprenticeships and school-based vocational programmes in vertical or horizontal fit rate. Furthermore, there is no difference in earnings between graduates from school-based learning programmes or apprenticeships (Riphahn & Zibrowius, 2016).

Structural Factors in Relation to Job Stability The learning programme has no influence on job stability. According to Baranowska et al. (2011), neither school-based nor apprenticeship training lowers the relative risk of entering a fixed-term contract.

17.5 Discussion

This chapter contributes to the state-of-the-art of workplace learning by focusing on the preparation of graduates from secondary school-based vocational education for the school-to-work transition. This study began by clarifying the central role and added value of workplace learning during internships for the vocational and professional competence of students in secondary vocational education. Furthermore, the process of school-to-work transition was presented and developed by outlining the different outcomes of the transition. It was stated that the role of personal resources and structural factors of secondary vocational schools cannot be ignored when preparing students for the school-to-work transition. In the following sections, the main findings and implications are highlighted and discussed.

17.5.1 Conclusions and Implications for Practice

The interest of scholars in the school-to-work transition of graduates from secondary school-based vocational education seems to be rather recent. Only four of the selected studies were published between 1990 and 2000, whereas 22 studies were published in the last ten years. Certainly, studies concerning personal resources are rather recent, as they were mostly published in the last five to ten years.

Outcomes of the School-to-Work Transition The school-to-work transition is embedded in the context of the country where the transition occurs. However, in line with Zimmermann et al. (2013) and Raffè (2011), our findings show that the school-to-work transition of secondary school-based vocational graduates across the world share many similarities with regard to finding a first job. Results show that a degree from secondary school-based vocational education serves as a safety net for unemployment in Australia, France, Germany, Hungary, Israel, Italy, Ireland, Japan, the Netherlands, Scotland, Spain, Sweden, Switzerland, Taiwan, the United Kingdom, and the United States and leads, most of the time, to full-time employment in Germany, Italy, and Spain (Arum & Shavit, 1995; Audas et al., 2005; Bernardi, 2003; Bonnal et al., 2002; Corrales-Herrero & Rodriguez-Prado, 2012; Genda & Kurosawa, 2001; Iannelli, 2004; Iannelli & Raffè, 2007; Lopez-Mayan & Nicodemo, 2013; Shavit & Müller, 2000; Soro-Bonmati, 2000).

Outcomes of the school-to-work transition can be divided into three types: job quantity, job quality, and job stability (Akkermans et al., 2015). Compared to graduates with higher levels of education, graduates from secondary school-based vocational education achieve less good outcomes. Even though they find a job quite quickly after leaving secondary school-based vocational education, the quality of the job is often lower compared to jobs obtained by graduates from higher levels of education (Brinton & Tang, 2010; Shavit & Müller, 2000). These graduates received lower earnings compared to other educational degrees, although this gap has become narrower during the last twenty years (Cooke, 2003; Crawford et al., 1997). Furthermore, often these jobs do not fit their educational background and this misfit persists during the graduates' further career (Ainsworth & Roscigno, 2005; Baert et al., 2013; Béduwé & Giret, 2011; Bieri et al., 2016; Lopez-Mayan & Nicodemo, 2013; Paleocrassas et al., 2003). Compared to graduates from secondary general education, secondary school-based vocationally educated graduates achieve better outcomes when transitioning to the labour market. Recent graduates find a more qualitative job in terms of task variety and receive similar wages (Arum & Shavit, 1995; Cooke, 2003). Furthermore, they have a higher probability of transitioning into a permanent contract instead of a fixed contract.

Personal Resources as the Main Focus of the Preparation According to the model of Nicholson (1990), personal resources are important during the preparation stage of the transition process. In this stage, personal resources are necessary to anticipate the upcoming change (Kammeyer-Mueller & Wanberg, 2003; Matthews, 2002). This systematic literature review uncovered that six personal resources which have been investigated (i.e., work motivation, personal contact, career adapt-

ability, professional functioning, career development skills, and social capital) are all positively related to the school-to-work transition. More precisely, the work motivation, both intrinsic and extrinsic, of students stemming from secondary school-based vocational education is related to more preparatory job search behaviour, such as reading about getting a job, and more job search intentions, such as investing more time in job search (Baay et al., 2014b). Furthermore, these students rely on their personal contacts when they are searching for a job (Kogan et al., 2013). The resources available because of their social relations (i.e., social capital) are related to the number of job offers they receive before and after graduation (Baay et al., 2014b; Verhaeghe et al., 2015). Nevertheless, students from secondary school-based vocational education seem to be poorly prepared for the transition as they score low on professional functioning and career development skills (Creed et al., 2010).

Secondary Vocational Education in Relation to the Outcomes of the Transition One of the aims of secondary school-based vocational education is to prepare students for the labour market (Kyndt et al., 2014; Schaap et al., 2012). In this respect, the structural characteristics of the school should be focused on providing the best possible preparation for entering the labour market. This systematic literature review uncovered two levels of structural factors within secondary school-based vocational education which are related to influence of the outcomes of the school-to-work transition: the school and the programme. Whereas the school only seems to be related to attaining a job (i.e., job quantity), the programme is related to all three types of outcomes. A more specific vocational programme facilitates the entrance into the labour market because skills are more closely related to an occupation (Shavit & Müller, 2000; Wolbers, 2007).

The secondary vocational school can play a major role in the alignment of the programme to the needs of the labour market. The combination of theory-oriented and practice-oriented classes in school with workplace learning during an internship adds to the vocational specificity of the programme which is, in turn, related to securing a first job. Consequently, students will only benefit from their preparation if there is a close coordination between theory and practice taught in school and the expectations of the labour market. Furthermore, according to Tynjälä (2008) and Griffiths and Guile (2003), work-experiences should be reconsidered by discussing and re-analysing the experiences gained during the workplace learning component in the light of theory taught at school. This way of working will help students to integrate the skills, knowledge, and attitudes learned during classes with the experiences gained during the internship and will, thus, add to their professional and vocational competence (Baartman & Bruijn, 2011). Furthermore, combining theory taught at school with workplace experiences should overcome the risk of marginalising core subjects, such as mathematics and languages, and should contribute to a proper preparation for the school-to-work transition.

17.5.2 Limitations

Like other studies, this systematic literature review has some limitations. First, although the literature was searched systematically, it remains possible that not all studies concerning the transition were taken into account. The primary studies that were taken into account mentioned or referred to the school-to-work transition. Consequently, studies focusing on specific parts of the transition and that did not mention the transition explicitly may not be included. In this respect, it can be noted that a few studies were included that focused on topics such as job search behaviour and career adaptability, from which can be assumed that they were related to the transition. However, in order to include articles that did not mention the transition explicitly, a large range of search terms was used. Second, some results are based on the findings of only one or two studies. Therefore, the results should be interpreted with caution. Third, the results are based on studies conducted in twenty-seven countries. Despite differences between countries, findings regarding the outcomes of the school-to-work transition share important similarities. However, it is important to be sensitive to the fact that these results could be prone to the demographic structure, economic climate, or labour market characteristics of the country in which the study took place (Zimmermann et al., 2013). Fourth, the school-to-work transition is defined as a complex process which starts within education until the first period at work and in which outcomes are related to individual experiences (Nicholson, 1990). However, outcomes of the transition were measured as a state rather than a trait, as the outcomes were measured only once. This single measure does not consider the complexity of the transition process and did not consider personal experiences. This measurement is, thus, incorrect and volatile. Consequently, the results should be considered with caution. Finally, this systematic review study entails possible publication bias. This study only included published studies as unpublished work is difficult to retrieve.

17.5.3 Implications and Future Research

Implications for theory are related to the elaboration of the transition model of Nicholson (1990). According to this model, each transition comprises four stages: preparation, encounter, adjustment, and stabilisation. Within the preparation stage, psychological readiness is the key concern (Nicholson & West, 1988). Based on the findings of this study, six personal resources could add to the psychological readiness of students stemming from secondary school-based vocational education for the school-to-work transition: work motivation, personal contact, career adaptability, professional functioning, career development skills, and social capital. However, the facilitating role of these personal resources in the other stages of the transition remains uncharted. Furthermore, the preparation stage of the model could be expanded with the structural characteristics of the school found in this study: type of school (i.e., public versus semi-private) and characteristics of the educational programme (e.g.,

vocational specificity). These characteristics might influence the outcomes of the transition process. Notwithstanding these results, the facilitating role of the personal resources and the influence of the characteristics of the school should be further elaborated given the limited number of studies which investigated these two topics.

The findings of this systematic literature review also contain different implications for practice. First, it is important for secondary vocational schools to invest in the development of personal resources. In particular, the development of resources related to career development should receive more attention. Recent graduates from secondary school-based vocational education are poorly prepared for making occupational decisions as they are performing poorly on career development skills compared to higher levels of education (Creed et al., 2010). However, good preparation is necessary because of the implications of the school-to-work transition on the individual, organisational, and societal level both in the short and the long term (Akkermans et al., 2015; Koen et al., 2012). In order to better prepare students, secondary vocational schools could provide more information on possible career paths and on how the labour market operates and/or could invest more in the decision-making skills of these students (Creed et al., 2010). Furthermore, secondary vocational schools could invest in the work motivation of students; for instance, by providing experiences at the workplace (Dornan et al., 2007).

Second, the findings of this systematic literature review showed that secondary school-based vocationally educated graduates often obtain a job which is not a fit with their educational background. This misfit often persists during their further career and might have a negative influence on earnings (Ainsworth & Roscigno, 2005; Baert et al., 2013; Béduwé & Giret, 2011; Bieri et al., 2016; Lopez-Mayan & Nicodemo, 2013; Paleocrassas et al., 2003). In order to overcome this misfit, secondary vocational schools could try to connect with different organisations. Such connections could help recent graduates from secondary school-based vocational education to connect with jobs that fit their educational degree. Furthermore, having contact with different organisations can help to align schooling to the demands of the labour market (Brinton & Tang, 2010). By collaborating with different organisations, recruitment relationships could emerge which could shorten the period of joblessness (Brinton & Tang, 2010). This could, in turn, decrease the chance of vocational misfit (Witte & Kalleberg, 1995). Lastly, by connecting students with different organisations, secondary schools can help enlarge the social capital of final-year students, which affects outcomes of the school-to-work transition (Baay et al., 2014a).

Although the results of this systematic review shed light on the preparation for the school-to-work transition, more research is needed to fill remaining gaps. In this respect, research investigating the transition as a process is rather scarce. Moreover, current research investigated merely linear relations and did not take into account the heavily individualised, complex, and fragmented process which often characterises the transition process (Goodwin & O'Connor, 2005). Therefore, future research should explore all the stages of the school-to-work transition in greater depth. Scholars could interview people who have just transitioned to the labour market to identify more deeply the hindrances and successes recent graduates experienced during the different stages of their transition process (Phillips et al., 2002; Weiss, 1995). In a second step, scholars could investigate how these hindrances and successes are

related to the eventual outcomes of the transition. Additionally, future research should invest more in longitudinal research into the transition process. This type of research can provide insight into the possible dynamics between the different stages and can examine these dynamics in relation to the outcomes of the school-to-work transition (Nicholson, 1990; Ployhart & Vandenberg, 2010). Therefore, longitudinal research will provide more profound knowledge of the school-to-work transition as a process (Grosemans et al., 2017; Nicholson, 1990). Gathering more information on the different stages of the transition process will provide insight into the complexity of transitioning to the labour market. This additional in-depth information will help prepare recent graduates more sufficiently for making this transition.

More profound knowledge of this process could also be gathered by re-examining the outcomes of the school-to-work transition. Although the types of outcomes described by Akkermans et al. (2015) are interesting for examination of the school-to-work transition, they are not sufficient to measure all aspects of the transition. First, the three suggested types of outcomes are objective in nature and might not fully grasp the subjective aspect (Hirschi, 2010). In this respect, subjective elements which could be related to the feelings employees experience regarding their current job, such as job satisfaction or engagement (Hirschi, 2010), should also be taken into account. Furthermore, these objective outcomes are less appropriate to measure experiences during the different stages of the transition process. Therefore, future research should try to reveal different objective outcomes and subjective experiences by measuring the complete school-to-work transition process and, consequently, unravel a more profound theory concerning the transition to the labour market.

Future research could also place greater focus on how recent graduates can be prepared to achieve optimal outcomes. Some studies have already indicated the relation of personal resources with outcomes of the transition process (e.g., Baay et al., 2014a; Creed et al., 2010) and the contribution of secondary vocational schools to the development of these resources (e.g., Baay et al., 2014b). Nevertheless, scholars should explore which personal resources are useful during the school-to-work transition and how secondary vocational schools could foster their development.

Finally, scholars could consider the context when investigating the outcomes of the school-to-work transition. First, Baay et al. (2014b) indicated a relation between ethnic groups' work norms, on the one hand, and work motivation and preparatory job search behaviour and job search intentions during the school-to-work transition, on the other hand. Furthermore, job prerequisites (Finnie, 2004) and job-related variables (Vansteenkiste et al., 2016) could also have an influence on the transition to the labour market. Lastly, characteristics of the demographic structure, economic climate, labour market, and active labour market policy programmes of a country could also influence the outcomes of the school-to-work transition (Zimmermann et al., 2013). In this respect, Wolbers (2007) has already indicated the influence of labour market policies concerning permanent and fixed-term jobs on the ease of the transition to the labour market. Taking into account the context – the social context of the individual, the requirements set by the employers, and the country in which the transition is embedded – when investigating the school-to-work transition, could provide more in-depth insight into favourable and less favourable conditions for achieving optimal outcomes when transitioning to the labour market.

Appendices

Appendix A: Critical Appraisal Qualitative and Mixed Method Studies

Study	Type of study ^a	Was there a clear statement of the aims of the research?	Is a qualitative/mixed methods methodology appropriate?	Was the research design appropriate to address the aims of the research?	Was the recruitment strategy appropriate to the aims of the research?	Were the data collected in a way that addressed the research issue?	Has the relationship between researcher and participants been adequately considered?	Have ethical issues been taken into consideration?	Was the data analysis sufficiently rigorous?	Is there a clear statement of findings?	Overall quality rating
Baranowska et al. (2011)	QL	Y	Y	Y	Y	Y	N	N	Y	Y	H
Okano (2004)	QL	Y	Y	Y	Y	Y	N	N	N	Y	M
Philips et al. (2002)	QL	Y	Y	Y	Y	Y	N	N	Y	Y	H
Verhaeghe et al. (2015)	MM	Y	Y	Y	Y	Y	N	N	Y	Y	H

Note. Each research study was confronted with every question in the checklist and could be only answered with yes (Y) or no (N). Whenever there was no information available around a specific criterion, it was assumed that the researcher did not take it into consideration. Conclusively, every research was given a quality rating. This rating depended on how they scored on the questions:

(L) Low: 0–3 times answered yes

(M) Medium: 4–6 times answered yes

(H) High: 7–9 times answered yes

If the answers in the first three questions were negative, the study should be excluded, and could be identified as fatally flawed

^aQL Qualitative study, MM Mixed method study

Appendix B: Critical Appraisal Quantitative Studies

	Was there a clear statement of the aims of the research?*	Was the research design appropriate to address the aims of the research?	Was the recruitment strategy well described?	Was the sample representative of the population (no selection bias) and was the response rate acceptable?	Was the selection of explanatory variables based on a sound theoretical basis?	Is the questionnaire valid and reliable?	Have confounding factors been considered?	Is there a clear statement of the findings?	Are the findings generalizable to the source population?	Overall quality rating
Study	Criteria for appraising quantitative research									
Ainsworth and Roscigno (2005)	Y	Y	N	Y	Y	Y	Y	Y	Y	H
Arum and Shavit (1995)	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Audas et al. (2005)	N	Y	N	Y	N	Y	Y	Y	N	M
Baay et al. (2014a)	Y	Y	Y	N	Y	Y	N	Y	N	M
Baay et al. (2014b)	Y	Y	Y	N	Y	Y	N	Y	N	M
Bédoué and Giret (2011)	Y	Y	Y	Y	Y	Y	N	Y	Y	H
Baert et al. (2013)	Y	Y	N	Y	Y	Y	Y	Y	Y	H

(continued)

	Was there a clear statement of the aims of the research?"	Was the research design appropriate to address the aims of the research?"	Was the recruitment strategy well described?"	Was the sample representative of the population (no selection bias) and was the response rate acceptable?"	Was the selection of explanatory variables based on a sound theoretical basis?"	Is the questionnaire valid and reliable?"	Have confounding factors been considered?"	Is there a clear statement of the findings?"	Are the findings generalizable to the population?"	Overall quality rating
Study	Criteria for appraising quantitative research									
Bernardi (2003)	Y	Y	N	Y	Y	Y	Y	Y	Y	H
Bertschy et al. (2009)	Y	Y	Y	N	Y	Y	Y	Y	N	H
Bieri et al. (2016)	Y	Y	Y	Y	Y	Y	N	Y	Y	H
Bonnal et al. (2002)	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Brinton and Tang (2010)	Y	Y	N	Y	Y	Y	Y	Y	Y	H
Cooke (2003)	Y	Y	N	Y	Y	Y	Y	Y	Y	H
Corrales-Herrero and Rodríguez-Prado (2012)	Y	Y	N	Y	N	Y	Y	Y	Y	H
Crawford et al. (1997)	Y	Y	N	Y	Y	Y	Y	Y	Y	H
Creed et al. (2010)	Y	Y	Y	N	Y	Y	Y	Y	N	H

Genda and Kurosawa (2001)	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	M
Han and Rojewski (2015)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Iannelli (2004)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Iannelli and Raffè (2007)	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	H
Kim and Passmore (2016)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Kogan et al. (2013)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	H
Koivisto et al. (2011)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	H
Lopez-Mayan and Nicodemo (2013)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
McGinnity et al. (2005)	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	H
Paleocrassas et al. (2003)	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	H
Riphahn and Zibrowius (2016)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	H

(continued)

	Was there a clear statement of the aims of the research?"	Was the research design appropriate to address the aims of the research?"	Was the recruitment strategy well described?"	Was the sample representative of the population (no selection bias) and was the response rate acceptable?"	Was the selection of explanatory variables based on a sound theoretical basis?"	Is the questionnaire valid and reliable?"	Have confounding factors been considered?"	Is there a clear statement of the findings?"	Are the findings generalizable to the source population?"	Overall quality rating
Study	Criteria for appraising quantitative research									
Shavit and Müller (2000)	Y	Y	N	Y	Y	Y	N	Y	Y	H
Soro-Bonmatí (2000)	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Verdú et al. (2008)	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Witte and Kalleberg (1995)	Y	Y	N	Y	Y	Y	Y	Y	Y	H
Wolbers (2007)	Y	Y	N	Y	Y	Y	Y	Y	Y	H

Note. Each research study was confronted with every question in the checklist and could be only answered with yes (Y) or no (N). Whenever there was no information available around a specific criterion, it was assumed that the researcher did not take it into consideration. Conclusively, every research was given a quality rating. This rating depended on how they scored on the questions:

(L) Low: 0–3 times answered yes

(M) Medium: 4–6 times answered yes

(H) High: 7–9 times answered yes

If the answers in the first three questions were negative, the study should be excluded, and could be identified as fatally flawed

Appendix C: Study Characteristics

Author(s)	Year	Country	Participants	Study type	Methodology	Research question		
						RQ1	RQ2	RQ3
Ainsworth and Roscigno	2005	USA	Subsample of the 14489 participants	QN	National Survey	x		
Arum and Shavit	1995	USA	6980 participants	QN	High School and Beyond data set.	x		
Audas et al.	2005	Hungary	3132 participants	QN	Longitudinal data	x		
Baay et al.	2014a	The Netherlands	685 participants	QN	Longitudinal data		x	
Baay et al.	2014b	The Netherlands	591 participants	QN	Survey		x	x
Baert et al.	2013	Belgium	4390 participants	QN	Sonar Survey	x		
Baranowska et al.	2011	Poland	16431 participants	QL	Polish School Leaver Survey (face-to-face interviews)	x		x
Béduwé and Giret	2011	France	2170 participants	QN	Generation 98 Survey	x		x
Bernardi	2003	Italy	7058 participants	QN	Italian Household Longitudinal Survey	x		
Bertschy et al.	2009	Switzerland	642 participants	MM	Longitudinal survey (TREE)	x		
Bieri et al.	2016	Bulgaria	1006 participants	QL	Individual interviews	x		
Bonnal et al.	2002	France	1399 participants	QN	Survey: "Panel mesures jeunes" from the Clercq			x
Brinton and Tang	2010	Japan	749 firms send 969 job announcements to 12 schools	QN	Longitudinal job placement data and interviews with teachers	x	x	
Cooke	2003	Germany	772 participants	QN	Socio Economic Panel	x		

(continued)

Author(s)	Year	Country	Participants	Study type	Methodology	Research question		
						RQ1	RQ2	RQ3
Corrales-Herrero and Rodríguez-Prado	2012	Spain	7612 participants	QN	Survey on Educational-Training and Labour Integration	x		x
Crawford et al.	1997	USA	3043 participants	QN	High School and Beyond Survey (longitudinal)			x
Creed et al.	2010	Australia	692 students	QN	Survey		x	
Genda and Kurosawa	2001	Japan	21000 participants	QN	Survey on Young Employees	x		
Han and Rojewski	2015	South-Korea	3869 participants	QN	National Survey		x	x
Iannelli	2004	Ireland Scotland The Netherlands	16566 participants	QN	Cross-national database	x		
Iannelli and Raffae	2007	Ireland Scotland The Netherlands Sweden	23707 participants	QN	Cross-national database	x		
Kim and Passmore	2016	USA	935 participants	QN	Longitudinal Survey (NLSY)	x		
Kogan et al.	2013	Ukraine Croatia	1977 participants	QN	National Survey (SLS)		x	
Koivisto et al.	2011	Finland	416 participants	QN	Survey		x	
Lopez-Mayan and Nicodemo	2013	Spain	12133 participants	QN	National Survey	x		x
McGinnity et al.	2005	Germany	2500 participants	QN	National Survey (GLHS)	x		
Okano	2004	Japan	21 participants	QL	Individual interview	x		
Paleocrassas et al.	2003	Greece	4986 participants	QN	Survey	x		
Phillips et al.	2002	USA	17 participants	QL	Individual interview		x	x
Riphahn and Zibrowius	2016	Germany	1839 participants	QN	National survey (SOEP)	x		

(continued)

Author(s)	Year	Country	Participants	Study type	Methodology	Research question		
						RQ1	RQ2	RQ3
Shavit and Müller	2000	Australia France Germany Israel Italy The Netherlands Sweden Switzerland Taiwan UK USA	Not specified	QN	Survey	x		x
Soro-Bonmatí	2000	Germany Italy	3746 participants	QN	National Survey	x		
Verdú et al.	2008	Spain	14467 participants	QN	European Union Labour Force Survey 2000	x		
Verhaeghe et al.	2015	Belgium	2179 senior high school students fill out the questionnaire and 1080 high school graduates participated in an interview	MM	Labour market entry and Social Capital Survey		x	
Witte and Kalleberg	1995	Germany	15159 participants	QN	National Survey: GSOEP	x		
Wolbers	2007	Austria Belgium Finland France Greece Italy Luxembourg The Netherlands Portugal Spain Sweden	52651 participants	QN	Cross-national survey: EU LFS 2000	x		

Note: *QL* Qualitative study, *QN* Quantitative study, *MM* Mixed Method study

References²

- *Ainsworth, J. W., & Roscigno, V. J. (2005). Stratification, school-work linkages and vocational education. *Social Forces*, *84*, 257-284. doi:<https://doi.org/10.1353/sof.2005.0087>
- Akkermans, J., Nykänen, M., & Vuori, J. (2015). Practice makes perfect? Antecedents and consequences of adaptive school-to-work transition. In J. Vuori, J. Blonk, R. Price, & H. Richard (Eds.), *Sustainable working lives, aligning perspectives on health, safety and well-being* (pp. 65-86). Springer.
- *Arum, R., & Shavit, Y. (1995). Secondary vocational education and the transition from school to work. *Sociology of Education*, *68*, 187-204. doi:<https://doi.org/10.2307/2112684>
- *Audas, R., Berde, E., & Dolton, P. (2005). Youth unemployment and labour market transitions in Hungary. *Education Economics*, *13*, 1-25. doi:<https://doi.org/10.1080/0964529042000325180>
- Aveyard, H. (2010). *Doing a literature review in health and social care. A practical guide*. McGraw-Hill.
- Baartman, L. K. J., & de Bruijn, E. (2011). Integrating knowledge, skills and attitudes: Conceptualising learning processes towards vocational competence. *Educational Research Review*, *6*, 125-134. <https://doi.org/10.1016/j.edurev.2011.03.001>
- *Baay, P. E., van Aken, M. A., de Ridder, D. T., & van der Lippe, T. (2014a). Understanding the role of social capital in adolescents' Big Five personality effects on school-to-work transitions. *Journal of adolescence*, *37*, 739-748. doi:<https://doi.org/10.1016/j.adolescence.2014.04.015>
- *Baay, P. E., van Aken, M. A., van der Lippe, T., & de Ridder, D. T. (2014b). Personality moderates the links of social identity with work motivation and job searching. *Frontiers in Psychology*, *5*, 1-8. doi:<https://doi.org/10.3389/fpsyg.2014.01044>
- *Baert, S., Cockx, B., & Verhaest, D. (2013). Overeducation at the start of the career: Stepping stone or trap? *Labour Economics*, *25*, 123-140. doi:<https://doi.org/10.1016/j.labeco.2013.04.013>
- *Baranowska, A., Gebel, M., & Kotowska, I. E. (2011). The role of fixed-term contracts at labour market entry in Poland: Stepping stones, screening devices, traps or search subsidies? *Work, Employment and Society*, *25*, 777-793. doi:<https://doi.org/10.1177/0950017011419705>
- *Bédoué, C., & Giret, J. F. (2011). Mismatch of vocational graduates: What penalty on French labour market? *Journal of Vocational Behavior*, *78*, 68-79. doi:<https://doi.org/10.1016/j.jvb.2010.09.003>
- *Bernardi, F. (2003). Returns to educational performance at entry into the Italian labour market. *European Sociological Review*, *19*, 25-40. doi:<https://doi.org/10.1093/esr/19.1.25>
- *Bertschy, K., Cattaneo, M. A., & Wolter, S. C. (2009). PISA and the transition into the labour market. *Labour*, *23*, 111-137. doi:<https://doi.org/10.1111/j.1467-9914.2008.00432.x>
- *Bieri, F., Imdorf, C., Stoilova, R., & Boyadjieva, P. (2016). The Bulgarian educational system and gender segregation in the labour market. *European Societies*, *18*, 158-179. doi:<https://doi.org/10.1080/14616696.2016.1141305>
- Billett, S. (2011). *Vocational education: Purposes, traditions and prospects* (1st ed.). Springer.
- *Bonnal, L., Mendes, S., & Sofer, C. (2002). School-to-work transition: Apprenticeship versus vocational school in France. *International Journal of Manpower*, *23*, 426-442. doi:<https://doi.org/10.1108/01437720210436046>
- *Brinton, M. C., & Tang, Z. (2010). School-work systems in postindustrial societies: Evidence from Japan. *Research in Social Stratification and Mobility*, *28*, 215-232. doi:<https://doi.org/10.1016/j.rssm.2010.01.005>
- CASP. (2013). *Qualitative research checklist: 10 Questions to help you make sense of qualitative research*. Retrieved from <http://www.casp-uk.net/find-appraise-act/appraising-the-evidence/>

²References marked with an asterisk were included in the analysis.

- CEDEFOP. (2008). Initial vocational education and training (IVET) in Europe: Review. European centre for the development of vocational training. Retrieved from http://www.cedefop.europa.eu/EN/Files/IVET_Review_08.pdf
- *Cooke, L. P. (2003). A comparison of initial and early life course earnings of the German secondary education and training system. *Economics of Education Review*, 22, 79-88. doi:[https://doi.org/10.1016/s0272-7757\(01\)00067-x](https://doi.org/10.1016/s0272-7757(01)00067-x)
- *Corrales-Herrero, H., & Rodríguez-Prado, B. (2012). Characterizing Spanish labour pathways of young people with vocational lower-secondary education. *Applied Economics*, 44, 3777-3792. doi:<https://doi.org/10.1080/00036846.2011.581218>
- *Crawford, D. L., Johnson, A. W., & Summers, A. A. (1997). Schools and labor market outcomes. *Economics of Education Review*, 16, 255-269. doi:[https://doi.org/10.1016/s0272-7757\(96\)00076-3](https://doi.org/10.1016/s0272-7757(96)00076-3)
- *Creed, P. A., Patton, W., & Hood, M. (2010). Career development and personal functioning differences between work-bound and non-work bound students. *Journal of Vocational Behavior*, 76, 37-41. doi:<https://doi.org/10.1016/j.jvb.2009.06.004>
- Dooley, D., & Prause, J. (1997). Effects of favourable employment change on alcohol abuse: One and five-year follow-ups in the national longitudinal survey of youth. *American Journal of Community Psychology*, 25, 787-807. <https://doi.org/10.1023/A:1022213229097>
- Dornan, T., Boshuizen, H., King, N., & Scherpbier, A. (2007). Experience based learning: A model linking the processes and outcomes of medical students' workplace learning. *Medical Education*, 41, 84-91. <https://doi.org/10.1111/j.1365-2929.2006.02652.x>
- Evans, J., & Repper, J. (2000). Employment, social inclusion and mental health. *Journal of Psychiatric and Mental Health Nursing*, 7, 15-24. <https://doi.org/10.1046/j.1365-2850.2000.00260.x>
- Finnie, R. (2004). The school-to-work transition of Canadian post-secondary graduates: A dynamic analysis. *Journal of Higher Education Policy and Management*, 26, 35-58. <https://doi.org/10.1080/1360080042000182528>
- *Genda, Y., & Kurosawa, M. (2001). Transition from school to work in Japan. *Journal of the Japanese and International Economies*, 15, 465-488. doi:<https://doi.org/10.1006/jjie.2001.0488>
- Giannelli, G. C., Jaenichen, U., & Villosio, C. (2012). Have labor market reforms at the turn of the millennium changed the job and employment durations of new entrants? *Journal of Labor Research*, 33, 143-172. <https://doi.org/10.1007/s12122-011-9123-8>
- Goodwin, J., & O'Connor, H. (2005). Exploring complex transitions: Looking back at the "golden age" of from school to work. *Sociology*, 39, 201-220. <https://doi.org/10.1177/0038038505050535>
- Griffiths, T., & Guile, D. (2003). A connective model of learning: The implications for work process knowledge. *European Educational Research Journal*, 2, 56-73. <https://doi.org/10.2304/eej.2003.2.1.10>
- Grosemans, I., Coertjens, L., & Kyndt, E. (2017). Exploring learning and fit in the transition from higher education to the labour market: A systematic review. *Educational Research Review*, 21, 21-67. <https://doi.org/10.1016/j.edurev.2017.03.001>
- *Han, H., & Rojewski, J. W. (2015). Gender-specific models of work-bound Korean adolescents' social supports and career adaptability on subsequent job satisfaction. *Journal of Career Development*, 42, 149-164. <https://doi.org/10.1177/0894845314545786>
- Hirschi, A. (2010). The role of chance events in the school-to-work transition: The influence of demographic, personality and career development variables. *Journal of Vocational Behavior*, 77, 39-49. <https://doi.org/10.1016/j.jvb.2010.02.002>
- Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of General Psychology*, 6, 307-324. <https://doi.org/10.1037//1089-2680.6.4.307>
- *Iannelli, C. (2004). School variation in youth transitions in Ireland, Scotland and the Netherlands. *Comparative Education*, 40, 401-425. doi:<https://doi.org/10.1080/0305006042000274863>
- *Iannelli, C., & Raffe, D. (2007). Vocational upper-secondary education and the transition from school. *European Sociological Review*, 23, 49-63. <https://doi.org/10.1093/esr/jcl019>

- Jencks, C., Perman, L., & Rainwater, L. (1988). What is a good job? A new measure of labor-market success. *American Journal of Sociology*, *93*, 1322–1357. <https://doi.org/10.1086/228903>
- Kammeyer-Mueller, J. D., & Wanberg, C. R. (2003). Unwrapping the organizational entry process: Disentangling multiple antecedents and their pathways to adjustment. *Journal of Applied Psychology*, *88*, 779–794. <https://doi.org/10.1037/0021-9010.88.5.779>
- Kanfer, R., Wanberg, C. R., & Kantrowitz, T. M. (2001). Job search and employment: A personality–motivational analysis and meta-analytic review. *Journal of Applied Psychology*, *86*, 837–855. <https://doi.org/10.1037/0021-9010.86.5.837>
- Kehrhahn, M. T., & Peterson, W. L. (2014). *The college-to-career transition: Early career adjustment of first year nurses*. Retrieved from <https://www.ufhrd.co.uk/wordpress/wp-content/uploads/2014/12/Marijke-Thamm-Kehrhahn.pdf>
- *Kim, K. N., & Passmore, D. L. (2016). The benefits of high school experiences on growth in occupational status in US. *International Journal for Educational and Vocational Guidance*, *16*, 113–136. doi:<https://doi.org/10.1007/s10775-015-9290-x>
- Koen, J., Klehe, U. C., & Van Vianen, A. E. (2012). Training career adaptability to facilitate a successful school-to-work transition. *Journal of Vocational Behavior*, *81*, 395–408. <https://doi.org/10.1016/j.jvb.2012.10.003>
- *Kogan, I., Matković, T., & Gebel, M. (2013). Helpful friends? Personal contacts and job entry among youths in transformation societies. *International Journal of Comparative Sociology*, *54*, 277–297. doi:<https://doi.org/10.1177/0020715213509256>
- Koivisto, P., Vuori, J., & Nykyri, E. (2007). Effects of the school-to-work group method among young people. *Journal of Vocational Behavior*, *70*, 277–296. <https://doi.org/10.1016/j.jvb.2006.12.001>
- *Koivisto, P., Vinokur, A. D., & Vuori, J. (2011). Effects of career choice intervention on components of career preparation. *The Career Development Quarterly*, *59*, 345–366. doi:<https://doi.org/10.1002/j.2161-0045.2011.tb00074.x>
- Kowtha, N. R. (2011). School-to-work transition and newcomer socialisation: The role of job-related education. *Journal of Management & Organization*, *17*, 747–763. <https://doi.org/10.1017/s1833367200001152>
- Kyndt, E., Dochy, F., Onghena, P., & Baert, H. (2012). The learning intentions of low-qualified employees: A multilevel approach. *Adult Education Quarterly*, *63*, 165–189. <https://doi.org/10.1177/0741713612454324>
- Kyndt, E., Janssens, I., Coertjens, L., Gijbels, D., Donche, V., & Van Petegem, S. (2014). Vocational education students' generic working life competences: Developing a self-assessment instrument. *Vocations and Learning*, *7*, 365–392. <https://doi.org/10.1007/s12186-014-9119-7>
- Lassibille, G., Navarro Gómez, L., Aguilar Ramos, I., & de la O Sánchez, C. (2001). Youth transition from school to work in Spain. *Economics of Education Review*, *20*, 139–149. [https://doi.org/10.1016/s0272-7757\(99\)00068-0](https://doi.org/10.1016/s0272-7757(99)00068-0)
- *Lopez-Mayan, C., & Nicodemo, C. (2013). The transition from vocational education to work: Evidence from Spain. *Revista de Economía Aplicada*, *23*, 93–130. doi: <https://doi.org/10.2139/ssrn.2383417>
- Lüftenecker, M., Schober, B., van de Schoot, R., Wagner, P., Finsterwald, M., & Spiel, C. (2012). Lifelong learning as a goal – Do autonomy and self-regulation in school result in well-prepared pupils? *Learning and Instruction*, *22*, 27–36. <https://doi.org/10.1016/j.learninstruc.2011.06.001>
- Matthews, C. J. (2002). Becoming a chief librarian: An analysis of transition stages in academic library leadership. *Library Trends*, *50*, 578–602.
- *McGinnity, F., Mertens, A., & Gundert, S. (2005). A bad start? Fixed-term contracts and the transition from education to work in West Germany. *European Sociological Review*, *2*, 359–374. doi: <https://doi.org/10.1093/esr/jci025>
- Meyer, R. H., & Wise, D. A. (1982). High school preparation in early labor force experience. In R. B. Freeman & D. A. Wise (Eds.), *The youth labor market problems: Its nature, causes, and consequences* (pp. 277–348). University of Chicago Press.

- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, 6, e1000097. <https://doi.org/10.1371/journal.pmed.1000097>
- National Institute for Health and Clinical Excellence. (2009). *Methods for the development of NICE public health guidance (2nd ed.)*. Retrieved from <http://www.nice.org.uk/media/2/FB/53/PHMethodsManual110509.pdf>
- Ng, T. W. H., & Feldman, D. C. (2007). The school-to-work transition: A role identity perspective. *Journal of Vocational Behavior*, 71, 114–134. <https://doi.org/10.1016/j.jvb.2007.04.004>
- Nicholson, N. (1990). The transition cycle: Causes, outcomes, processes and forms. In S. Fisher & C. L. Cooper (Eds.), *On the move: The psychology of change and transition* (pp. 83–108). Wiley.
- Nicholson, N., & West, M. (1988). *Managerial job change: Men and women in transition*. University Press.
- OECD, European Union, & UNESCO-UIS. (2015). *ISCED 2011 operational manual: Guidelines for classifying national education programmes and related qualifications*. Retrieved from: <http://unesdoc.unesco.org/images/0023/002323/232343e.pdf>
- *Okano, K. H. (2004). Japanese working-class girls in their first employment: Transition to adulthood. *Journal of Education and Work*, 17, 421–439. doi:<https://doi.org/10.1080/1363908042000292029>
- *Paleocrassas, S., Rousseas, P., & Vretakou, V. (2003). School-to-work transition performance of ‘male’, ‘female’ and ‘neutral’ vocational streams: A gender balance sheet for vocational education graduates in Greece. *Journal of Vocational Education and Training*, 55, 209–222. doi: <https://doi.org/10.1080/13636820300200226>
- Pavlova, M., Lee, J. C.-K., & Maclean, R. (2017). Complexities of school to work transitions. *Educational Research for Policy and Practice*, 16, 1–7. <https://doi.org/10.1007/s10671-017-9211-5>
- *Phillips, S. D., Blustein, D. L., Jobin-Davis, K., & White, S. F. (2002). Preparation for the school-to-work transition: The views of high school students. *Journal of Vocational Behavior*, 61, 202–216. doi: <https://doi.org/10.1006/jvbe.2001.1853>
- Ployhart, R. E., & Vandenberg, R. J. (2010). Longitudinal research: The theory, design, and analysis of change. *Journal of Management*, 36, 94–120. <https://doi.org/10.1177/0149206309352110>
- Quintini, G., Martin, J. P., & Martin, S. (2007). The changing nature of the school-to-work transition process in OECD countries. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1884070>
- Raffe, D. (2011). Cross-national differences in education-work transitions. In M. London (Ed.), *The oxford handbook of lifelong learning* (pp. 312–328). Oxford University Press.
- *Riphahn, R. T., & Zibrowius, M. (2016). Apprenticeship, vocational training, and early labor market outcomes—evidence from East and West Germany. *Education Economics*, 24, 33–57. doi: <https://doi.org/10.1080/09645292.2015.1027759>
- Saks, A. M., & Ashforth, B. E. (2002). Is job search related to employment quality? It all depends on the fit. *Journal of Applied Psychology*, 87, 646–654. <https://doi.org/10.1037/0021-9010.87.4.646>
- Schaap, H., Baartman, E., & de Bruijn, E. (2012). Students’ learning processes during school-based learning and workplace learning in vocational education: A review. *Vocations and Learning*, 5, 99–117. <https://doi.org/10.1007/s12186-011-9069-2>
- Schreiber, J. B. (2002). Institutional and student factors and their influence on advanced mathematics achievement. *The Journal of Educational Research*, 95, 274–286. <https://doi.org/10.1080/00220670209596601>
- *Shavit, Y., & Müller, W. (2000). Vocational secondary education. *European Societies*, 2, 29–50. doi: <https://doi.org/10.1080/146166900360710>
- *Soro-Bonmati, A. (2000). Labour market transitions of youth in Germany and Italy. *International Journal of Manpower*, 21, 206–226. doi: <https://doi.org/10.1108/01437720010335987>
- Stone, J. R., & Josiam, B. (2000). The impact of school supervision of work and job quality on adolescent work attitudes and job behaviors. *Journal of Vocational Education Research*, 25, 532–574. <https://doi.org/10.5328/jver25.4.532>

- Taylor, A. (2005). "Re-culturing" students and selling futures: School-to-work policy in Ontario. *Journal of Education and Work*, 18, 321–340. <https://doi.org/10.1080/13639080500200567>
- Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review*, 3, 130–154. <https://doi.org/10.1016/j.edurev.2007.12.001>
- van Daal, T., Coertjens, L., Delvaux, E., Donche, V., & Van Petegem, P. (2013). *Klaar voor hogere onderwijs of arbeidsmarkt? Longitudinaal onderzoek bij laatstejaarsleerlingen secundair onderwijs* [Ready for higher education or the labour market? Longitudinal research on students in their final year of secondary education]. Garant.
- Vanoverberghe, J., Verhaest, D., Verhofstadt, E., & Omeij, E. (2008). The transition from school to work in Flanders: A duration analysis. *Journal of Education and Work*, 21, 317–322. <https://doi.org/10.1080/13639080802379895>
- Vansteenkiste, S., Verbruggen, M., & Sels, L. (2016). Flexible job search behaviour among unemployed jobseekers: Antecedents and outcomes. *European Journal of Work and Organizational Psychology*, 25, 862–882. <https://doi.org/10.1080/1359432x.2016.1168402>
- *Verdú, C. A., Cortés, L. T., & Rodríguez, M. A. D. (2008). To find or not to find a first "significant" job. *Revista de Economía Aplicada*, 16, 37–59.
- *Verhaeghe, P. P., Van der Bracht, K., & Van de Putte, B. (2015). Inequalities in social capital and their longitudinal effects on the labour market entry. *Social Networks*, 40, 174–184. doi: <https://doi.org/10.1016/j.socnet.2014.10.001>
- Wald, M., & Martinez, T. (2003). *Connected by 25: Improving the life chances of the country's most vulnerable 14–24 year olds*. Stanford University.
- Weiss, R. (1995). *Learning from strangers: The art and method of qualitative interview studies*. Free Press.
- West, M. A., Nicholson, N., & Rees, A. (1987). Transitions into newly created jobs. *Journal of Occupational Psychology*, 60, 97–113. <https://doi.org/10.1111/j.2044-8325.1987.tb00244.x>
- *Witte, J. C., & Kalleberg, A. L. (1995). Matching training and jobs: The fit between vocational education and employment in the German labour market. *European Sociological Review*, 11, 293–317. doi:<https://doi.org/10.1093/oxfordjournals.esr.a036365>
- *Wolbers, M. H. (2007). Patterns of labour market entry: A comparative perspective on school-to-work transitions in 11 European countries. *Acta Sociologica*, 50, 189–210. doi: <https://doi.org/10.1177/0001699307080924>
- Yates, J. A. (2005). The transition from school to work: Education and work experiences. *Monthly Labor Review*, 128, 21–32.
- Zimmermann, K. F., Biavaschi, C., Eichhorst, W., Giuletti, C., Kendzia, M. J., Muravyev, A., ... Schmidl, R. (2013). Youth unemployment and vocational training. *Foundations and Trends® in Microeconomics*, 9, 1–157. <https://doi.org/10.1561/07000000058>

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Chapter 18

Changing Appreciation of Vocational Learning During Work – The Case of the German Apprenticeship System



Karl-Heinz Gerholz and Bernd Gössling

Abstract Apprenticeships are an important way of acquiring vocational skills and competences. However, an individual will decide how and if they participate in vocational learning processes also considering the appreciation of this type of learning. From the perspective of the individual, appreciation depends on the institutional context and the recognition by significant others of learning during work. We will, therefore, analyze changes in the appreciation of vocational learning during work based on institutional and recognition theory taking the apprenticeship system in Germany as an example. We do that referring, firstly, to institutional patterns of the German Vocational and Education Training system as a case study and, secondly, to the current trend of academization with an impact on how participation in apprenticeships leads to recognition. Thus, the chapter shows, how an analysis informed by institutional and recognition theory can explain paradoxical behavior, where opportunities of vocational learning are rejected due to a lack of appreciation.

Keywords Vocational education and training · Recognition · German apprenticeship system · Appreciation · Career choices

18.1 Introduction

Vocational learning at the workplace can be a crucial pathway for the attainment of vocational skills and competences (Eraut, 2000; Lave & Wenger, 1991). The workplace may also be the setting in which the knowledge to be learnt is created in the first place (Avis, 2010). From the perspective of the individual, that gives workplace learning an important role in their professionalization, job satisfaction and income prospects. Apprenticeships are one of such ways of immersing learners in a community of practice in which they learn by participation. Thus, company-based

The original version of this chapter was revised: This chapter was inadvertently published with incorrect affiliation for author Bernd Gössling which has been corrected now. The correction to this chapter is available at https://doi.org/10.1007/978-3-030-89582-2_21

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apprenticeships can be structured forms of workplace learning (Fuller & Unwin, 2003). Learning at the workplace is linked to learning at school – vocational school – in the German apprenticeship system (Deissinger, 2004; Gerholz & Brahm, 2014). Regarding the German apprenticeship system, it becomes clear that despite its high international reputation, the number of participants has been decreasing steadily for the last three decades (Federal Institute for Vocational Education and Training, 2018). While the attractiveness of apprentices is challenged, the retention rate of former apprentices is still extremely high and general job prospects bright, particularly when combined with further vocational education. Here, workers with a vocational degree show a lower unemployment rate and higher income than graduates with a university degree in some sectors (German Employment Agency, 2018). To explain the paradox of declining interest in dual apprenticeships concerning consistent prospects, we argue, a view that is informed by recognition theory can contribute. Thus, the purpose of this article is to analyze the German apprenticeship system regarding the appreciation of vocational learning and profiles. Appreciation aims at the recognition of the qualities of someone; here, the qualities of learning in an apprenticeship leading to a vocational profile. The issue of appreciation of vocational learning has not yet been well researched. Recognition of workplace learning has, up to now, been primarily researched in the context of policies and practices aiming at the recognition of non-formal and informal learning (Werquin, 2010; Annen, 2013). We propose to expand the investigation of recognition further. For this, our analysis draws upon a recognition theory perspective. Based on this view, participation in workplace learning depends on the opportunities it affords, which are framed by the institutional setting, and based on the individuals' decisions, which are related to their formation as subjects and evaluated regarding possible recognition gains. The learning opportunities can, therefore, firstly, be reconstructed based on an institutional theory approach. Institutions can be defined as man-made rules that frame human interactions. They define the rules of the game in a given social system (North, 1991). However, the impact on an individual's behavior in social constructivist tradition does not depend on the institution's inherent logic but on the logic of reflective acting in response to that institution (Berger & Luckmann, 1966). Based on the institutional framework, in Sect. 18.2, we strengthen the concept of recognition as a framework for the analysis. This framework is applied in Sect. 18.3 to scrutinize the German Vocational Education and Training (VET) system regarding its social appreciation. This offers a contribution for a better understanding of paradox phenomena relating workplace learning in apprenticeships (Sect. 18.4 and 18.5).

18.2 Theoretical Framework: Concept of Recognition

Appreciation is defined as “recognition and enjoyment of the good qualities of someone or something” according to the Oxford English Dictionary. From the perspective of the individual, these acts of recognition are important because of their links to identity, self-esteem and the formation of the subject. Based on symbolic

interactionist ideas (Mead, 1934; Berger & Luckmann, 1966), it is dialogues with “significant others,” such as family members, friends, teachers and colleagues, with which individuals negotiate their identities and are recognized as subjects.

Honneth (1995) names three “spheres of recognition,” following the tradition of Hegelian philosophy, named as “love,” “rights” and “solidarity” to get a better understanding of the mechanism that creates the recognition needed for identity formation and self-realization. The type of recognition based on “love” refers to physical and emotional affirmation by family members, close friends and peers that provides basic self-confidence. Here, the condition of self-confidence is the gradual reduction of closeness and belonging while maintaining emotional affection. Thus, the type of ‘love’ can be an affective momentum of recognition in personal relationships. Confidence in enduring love facing temporal separation is the prerequisite for confidence in the social fulfillment of individual needs. It is called basic self-confidence. The underlying relationship is interdependent. The love type of recognition precedes any other form of reciprocal recognition, such as rights.

The type of recognition based on “rights” does not place the particular and individual relationships at the center but the objective moral accountability of a person, which makes someone able to be bearer of equal rights. Moral accountability is understood as the human capacity to limit one’s own freedom of action to the benefit of another’s exercise of freedom. In this type of recognition, mutuality allows the individual to esteem himself, because he or she is also regarded by others. Thus, the type of ‘right’ mentioned is a momentum of recognition in a given legal system. What is considered as a “right” is always based on a historic legal system, which may also deny certain rights through social and legal exclusion. These groups are threatened by a lack of recognition.

The type of recognition which is finally based on “solidarity” does not refer to recognizing a general moral capacity to adhere to rules but to a person’s unique characteristics, traits and abilities. That is the individual form of self-realization and sense of self-esteem for which social appreciation is sought. The recognition of a form of self-actualization as legitimate is negotiated under the scheme of recognition in place in a certain sphere. This type of recognition is, therefore, essential for becoming ‘individualized’ and creating one’s self-esteem. Thus, the type of “solidarity” can be a value-based momentum of recognition in a given social system.

The crucial driving force, from a recognition theory point of view, is the *lack* of recognition. The experience of abuse, deprivation of rights and disrespect brings forth “social struggles for recognition” (Honneth, 1995, 139). The perspective of the institutions and appreciation need to be related to analyze the effect of recognition on individual decisions regarding workplace learning. Consequently, the concept of recognition needs to be expanded.

This highlights the question, under which conditions are humans able to gain recognition that is constitutive for the formation of subject identity. This question can be further elaborated based on traditions of French philosophy and the Rousseauian notion of embeddedness, which carved out the fact that the formation of the subject is already entangled in recognition relationships. In relation to that, Althusser (1970) coined the key term “interpellation” to describe how the subject is constituted by appealing to someone as a subject. This expanded view leads to the

Table 18.1 Types of recognition and their manifestations

Type	Reference frame	Way of appreciation	Schemes of recognition considering apprenticeship
Love	Family, peers, significant other	Affective	(Tacit) premises and assumptions about apprenticeship learning held by primary relatives (“significant others”) and accepted by the individuals
Right	Societal environment	Legal-based	Legal foundations of recognition: Learning resp. qualification standards serving as judgment criteria for granting equivalence or credits, admission and awards (including entitlements)
Solidarity	Community	Value-based	Social appreciation of individual resp. idiosyncratic strengths considering personal achievements

question, in which spheres can appeals from significant others be expected and by which schemes of recognition are these guided. It is not the characteristics of the interpellation itself which evolve determining force in the process of subject formation, it is the order of institutions. In negotiating abilities, communication and power (Foucault, 1982), institutions shape individual biographies and determine how recognizability is socially communicated. Individuals are addressed within these institutionalized forms of communication, for example, at school or at their workplace. Learners are addressed in diverting ways within different spheres and institutional contexts; ways which imply partly opposing calls for action (Table 18.1).

18.3 The German Apprenticeship System and Its Institutional Patterns Concerning Recognition

Taking the German VET system as an example of workplace learning requires the highlighting of some particularities. In this system, apprenticeships combine learning at the workplace (about 3.5 days a week) with school-based learning (about 1.5 days a week). In this combination, apprenticeships are not just seen as a training opportunity but as an educational endeavor targeted to more than the acquisition of skills needed at the workplace, including the development of apprentices as personalities in a holistic sense. Furthermore, the vocational profiles acquired by the apprentices are understood as nonacademic work types that are, to a certain level, professionalized. Accordingly, vocational profiles include work autonomy that require the planning and organizing of one’s own work processes that goes beyond the responsibility workers have in Tayloristic production designs. The educational part in a VET system (including workplace learning) serves as the prerequisite for the recognition of this type of learning in the wider educational system, for example, by recognizing it as a credit towards formal qualifications or as an admission to further VET or higher education.

The German VET system is a historically developed system with strong institutional patterns, most of which are not in the form of legislation but as collectively shared interpretations of how to value and regulate learning within apprenticeship. In this wide understanding, institutional patterns define the ‘rules of the game’ in the dual apprenticeship system. The concepts of vocations (Sect. 18.3.1), corporatism (Sect. 18.3.2) and action orientation (Sect. 18.3.3) can be mentioned as the main institutional patterns (Gerholz & Brahm, 2014; Ertl & Sloane, 2004; Deissinger, 1996). All institutional patterns enjoy a strong public and, at times, implicit appreciation. In the following, a deeper analysis is made of the institutional patterns concerning Honneth’s recognition theory.

18.3.1 *Concept of Vocations*

The concept of vocation is a central element in the dual system and comprises a competence profile that fits a functional area across the boundaries of several companies in the employment system (Gerholz & Brahm, 2014). The concept of ‘vocation’ is used in different ways in the literature. Two meanings generally describe vocation: (a) Vocation is an occupation or employment to earn money or (b) vocation means a personal history to which an individual is drawn and engaged in intentionally (Billet, 2011; Estola et al., 2003; Gerholz & Brahm, 2014).

(ad a) Perspective of the employment system: The vocational education system and the working fields in the employment system are structured across vocational profiles. Thus, an interconnection between the apprenticeship, vocational profile and (future) working field of the trainees can be specified. The concept of vocation is generally recognized in the employment system and the companies as well as in society. Thus, an individual who qualifies in a vocational profile during an apprenticeship can use this profile in the labor market (Kutscha, 2010). However, an individual with a vocational profile has not only developed company-specific skills, but it is more a bundle of institutionally balanced competences for requirements in a specific vocational field (Billet, 2008; Deissinger, 1996). This is also called the allocation function of the concept of vocation, in that the bundle of competences aligns with specific requirements in the employment system.

(ad b) Perspective of the individual development: The apprenticeship also comprises the development of an individual’s identity and personality through the vocational field and profile respectively (e.g. Mulder, 2017). This refers to the second dimension of vocation, that the vocational profile fits the interest and capacities of an individual and contributes to their development, i.e. the vocation of an individual depicts competences regarding a vocational field and the personality of the individual (Gerholz & Brahm, 2014). Paragraph 1 (3) of the German Vocational Training Act, for instance, points out that this is to prepare individuals in a vocational profile and act in society by fostering the necessary skills, knowledge and competence.

Both approaches – the employment perspectives and individual development – form a unit that is represented through the concept of vocation. The latter transcends the educational and employment system for valuing learning and working in the sense of a societal sentiment (Gerholz & Brahm, 2014).

18.3.2 Corporatism

Duality is an overriding principle in the dual system. This represents, in addition to the learning environments, the workplace and the vocational school, and also on a legislative and regulation level, that the market and state system elements are combined. Bearing this in mind, the corporatism reflects this duality: Development, decision and monitoring processes in the dual system are organized in a corporative structure with four main stakeholders: The state, represented by the state and the federal states, the companies as the employers and the unions as the employee representatives. The Federal Institute for Vocational Education and Training is an intermediary agency that moderates these processes (Gerholz & Brahm, 2014).

On the policy level of the dual system, the legal foundations' apprenticeship provision and framework curricular are relevant. The apprenticeship provision defines the skills to be developed during the apprenticeship in a vocational profile and regulates the vocational training part in the companies. These provisions are developed corporately between the stakeholders mentioned and are obligatory for all companies. The framework curricula are also legally binding for the training part in the vocational schools. These have the status of recommendations and must be further defined for the vocational schools in the different federal states; educational matters outside companies are an assignment of the federal states in Germany. Therefore, school and enterprise representatives, who act as sovereign entities on a legal level, engage in a process of matching enterprise-related apprenticeship provisions and the school-related framework curricula.

The organization and monitoring processes are also organized in the cooperative structure. Here, the state delegates the regulatory mandate to the so-called competent authorities, such as chambers (e.g. chamber of trade, chamber of crafts), as the self-administrating bodies of the economy. The competent authorities are responsible for the administration, organization and monitoring of the vocational training process in the companies. Beyond that, the competent authorities supervise the organization of the examinations and award the vocational qualifications (Ertl & Sloane, 2004; Kutscha, 2010). Supervisory boards administrate, organize and monitor the vocational training process for the vocational schools as a responsibility in the federal state.

The coordination processes between the stakeholders follow the principle of consensus. It is a specific form of negotiation of policy decisions in the dual system (Kutscha, 2010). The idea is that all decisions regarding the dual system should be made in consensus between the stakeholders. The principle of consensus concretizes the institutional pattern of corporatism on the operational level. It ensures that the training process in vocational education is commonly accepted. During the

corporatism, all stakeholders can bring their interests and aims into the vocational educational processes, however, they must find a consensus between all during negotiation. Therefore, the need for consensus has the risk of time lags and halts due to negotiations between the societal partners (Ertl & Sloane, 2004).

The corporatism with the principle of consensus is a non-parliamentarian way of political decision-making incorporated in German political culture (Voelzkow, 2009). Since the committees on a policy and organizational level have legislative and regulatory power in their specific jurisdiction, they are relevant for the individuals' recognition regarding "rights." A key example is the final decision for an apprenticeship provision made in the Board of the Federal Institute for Vocational Education and Training. The stakeholders in this board are jointly represented together with the state.

18.3.3 Action Orientation

Action orientation can be mentioned, a concept that parallels, for example, competence-based VET in other countries such as the Netherlands (Biemans et al., 2004) and Australia (Mulcahy, 2000), as a third institutional pattern. It is summarized under competence-based education in the international discourse (e. g. Mulder, 2017). However, action orientation is implemented under distinct context conditions, which makes it unique in detail (Deissinger & Hellwig, 2005). This principle is intended to guide learning processes during apprenticeship (Gerholz & Brahm, 2014). The central assumptions are grounded in ideas expressed by Dewey, who argues that learning implies experience in the sense of making a connection between actions and their consequences: "To learn from experience is to make a backward and forward connection between what we do to things and what we [...] suffer from things in consequence" (Dewey, 1966, 140). Fictitious problem situations in the curriculum are not sufficient, because the differentiation between real-life experience and classroom learning is a substantial problem in an increasingly complex society (Dewey, 1916). This is similar to the competence-based education approach that learning processes should be aligned with the needs in a society, an economic sector or community (Mulder, 2012).

There is the assumption in the competence-based and action orientation approach that learning and acting have a structural identity. The trainee is exploring a learning object that represents a specific working process (e.g. programming a programmable logic controller or working on an incoming invoice) in an acting process. There is a change in the individual's skills during this process (Dilger & Sloane, 2007). Thus, it is a dual process involving an execution of the working process and an acquirement of skills (Czycholl, 1996). Working and learning are interdependent, therefore, individuals learn through acting in goal-directed activities (Billet, 2001).

The institutional pattern of action orientation in the dual system has also been a common collectively shared principle for many decades. In-company trainers, for example, confront apprentices with realistic and authentic problem situations or, more precisely, working processes in a specific vocational field. Thus, workplace

learning enables learning in an authentic environment. The trainers design the learning environment in the real context for the trainees. That fits the interests of the employer, so that the trainees will be prepared for the future working fields in a realistic context and contributes to the personality development of the apprentice simultaneously.

18.3.4 The Institutional Patterns Concerning Recognition

The institutional patterns in the German VET system can be analyzed concerning recognition of the vocational profiles acquired. We use Honneth's concept for this with the three distinguished types of recognition: 'Love,' 'right' and 'solidarity'. We argue that the value attributed to workplace learning also depends on the scheme of recognition; the respective institutional setting should be considered because it establishes a sphere of recognition.

18.3.5 Concept of Vocations

It is significant for the type of *love* that a vocational profile gains recognition by close relatives and the family. Nevertheless, a vocational profile based on workplace learning never gained much recognition within families of upper social classes. Children whose parents attended higher education institutions are usually expected to preserve their social status through studying and entering an academic profession; about 75% of them chose to study (Stifterverband, 2014). Contrarily, within traditional worker families, training in a vocational profile has been acknowledged as a valuable achievement, where, based on traditional identification with vocational learning and work, academic pathways were irrelevant or even rejected (Theling, 1986).

The legal recognition of vocational profiles (*rights type of recognition*) confers to work in an occupation in the employment system. Here, the allocation function of vocations represents that the acquired bundle of competences in a vocational profile aligns with specific requirements in the employment system. Furthermore, the vocational profile acquired entitles the bearer to further vocational training, a progression route largely separated from academic education. In this sense, learners in the world of work who gain a formal qualification (vocational profile) gain much the same rights as bearers of an academic qualification. The difference, however, is that while parity of esteem is generally accepted, the vocational and academic pathway are not seen as identical and are, therefore, hardly permeable from the perspective of a learner (Spöttl, 2013). These permeability barriers remain, even though the National Qualifications Framework in Germany views vocational and academic degrees at the same level of competence (Gössling, 2016).

Self-actualization through apprenticeship can be socially appreciated (*solidarity type of recognition*), for example, in the form of career prospects that go beyond securitized rights. Indeed, an apprenticeship may be the pathway into a management position, and this corridor is welcomed by the social partnership of trade unions and employer associations. However, in the business world, careers based on accomplishments through workplace and vocational learning have become less frequent (Hartmann, 2017), despite the support received from advocacy groups of VET.

18.3.6 Corporatism

Corporatism is a way of political decision-making based on the principle of consensus incorporated in German political culture. The decisions made by means of consensus among the relevant stakeholders generally gain a broad social acceptance. This is particularly important, because the committees on a policy and organizational level have legislative and regulatory power in their specific jurisdictions; they are relevant for the individuals' recognition in the *rights type* of recognition. A key example is the final decision for an apprenticeship provision made in the board of the Federal Institute for Vocational Education and Training. The stakeholders are represented on this board. Whether vocational profiles may serve as a reference point for recognition of subject formation and identity also depend on these decisions. Furthermore, stakeholders participating in corporate structures are also influencing the general discourse on social values due to their power and, thereby, indirectly influencing how an individual may gain recognition in the *solidarity type* of recognition. In addition, institutional foundations are created for schemes of recognition regarding the corporate pattern that may be referred to by significant others recognizing the individual in the *love type* of recognition.

18.3.7 Action Orientation

Action orientation, as a central pattern for the design of the learning process, is anchored in the training regulations, such as the apprenticeship provision. Therefore, a recognition in the *type of right* can be described. A pedagogic concept which leads to the traineeship in companies exists with the pattern of action orientation. Concurrently, learning is organized with this pattern through the working process that fits the aims of the employer. Therefore, both aims, economic and pedagogic criteria, can be reached. Regarding the *type of love*, action orientation appreciates a recognition by the social environment, such as the trainers and colleges. Whether the apprentices' action will receive social appreciation (*solidarity type* of recognition) or not depends on factors which are not completely transparent for novices to this community of practice. Thus, insecurity can be experienced regarding what will gain recognition in the sphere of workplace learning. Learners perhaps also enter

the workplace with negative experiences made previously during internships, when they, for example, experience lack of interest by others or have to do dull work, which may happen not only to interns from general schools but also to apprentices. The anticipation of experiences like this may be regarded as a threat to their recognition as a fully valued subject and their identification as an equal member of the community of practice.

Table 18.2 summarizes the phenomenon of recognition operationalized by the types ‘love,’ ‘right’ and ‘solidarity’ of apprenticeship in the German dual system. This shows an analysis through which institutional pattern recognition could arise.

Table 18.2 Type of recognition in the German apprenticeship system

Sphere of appreciation / institutional pattern	‘Love’	‘Right’	‘Solidarity’
Concept of vocation	The value a vocational profile may have in gaining recognition from family members and close friends depends on how vocations are evaluated in the social environment (social inequality).	Those who finish an apprenticeship with a vocational profile as a formal qualification turn into bearers of rights, similar to academic graduates, but may experience permeability issues and legal exclusion.	Self-actualization through workplace learning during the apprenticeship (and beyond) can be the foundation of career options.
Corporatism	There is no direct influence of the corporate decision-making processes on the appreciation in the sphere of love. However, family members and important peers may appreciate the individual by appealing to categories (e.g. vocational profiles) created in a corporate field.	Decisions on vocational profiles in corporate committees determine how someone needs to qualify to be a bearer of the rights of a graduate in a vocational program (including workplace learning).	Following the principle of consensus, a collectively shared set of values may be supported that can be the basis of mutual appreciation.
Action orientation	Trainers and colleges at the workplace may turn into significant others whose affirmation of the apprentices’ learning and working may enhance self-confidence as the most basic form of recognition.	Action orientation as a central principle for the learning process is anchored in the apprenticeship regulations. Apprentices are entitled to this type of learning.	Apprentices are an active part of the community of practice. Autonomy of action provides opportunities for extraordinary performance that may find social appreciation.

18.4 Public Appreciation Concerning Societal Changes

The German dual system, similar to any other system, responds to changes in society and the employment system. Changes in these fields also effect the process of recognition, especially regarding the three types: ‘Love,’ ‘right’ and ‘solidarity.’ In the following, we want to illustrate this using the phenomenon of academization. Consequently, we carve out the dynamics of public appreciation that was described theoretically in Sect. 18.2.¹

The German qualification system is historically characterized by two main pathways from education to work: The vocational and the academic educational system. Most young people traditionally chose the vocational education system, especially the dual system combining practical training at the workplace and theoretical training at vocational schools (Wolter & Kerst, 2015). There has been a shift to the academic way of skill formation in the last two decades. There were 582,000 new apprentices in the dual system and 315,000 first-year students in the higher education system in 2000. The year 2013 can be described as a turning point, because 507,000 young people started in the higher education system and 497,000 started an apprenticeship in the dual or VET system (Autorengruppe Bildungsberichterstattung, 2014). The convergence between the vocational and higher education systems shows a trend toward academization. The reason for this change is less a higher interest in education, especially in academic education, but more a rationale motive. Academic degrees receive a higher appreciation in society and open more educational opportunities (Euler, 2015). The effects of an academic degree are generally higher regarding personal income, career and professional positions in contrast to a vocational educational degree. However, the income achieved based on an academic degree with relatively high reputation may be less than the income achieved by vocational profiles with a lower reputation. That is especially the case in technical vocational profiles and for those who have gained further vocational training (see Sect. 18.1 for employment statistics). Moreover, working processes are increasingly characterized by skills on higher competence levels, which are, most of the time, considered as academic skills, therefore, the concept of vocations retains less of a social bonding function in work processes (Baethge & Wolter, 2015).

However, it can be observed that the traditionally separated progression routes of vocational and higher education have been approaching each other in the last few decades. On the one hand, New policy regulations have been established in the last decade to open up paths of higher education to young people with a vocational qualification but without a corresponding certificate that gives them access via the traditional way to higher education (Wolter, 2014). On the other hand, dual study programs are emerging increasingly in the higher education sector. Similar to the dual system in the vocational education sector, dual study programs combine academic learning with workplace learning. The phases of learning at the higher

¹An analysis of the changes in recognition due to current developments would also be important for digital transformation, migration and other socioeconomic trends.

education institution develop an academic knowledge, alternating with practical phases at the workplace and company, to provide the practical skills. Dual study programs usually lead to a bachelor's degree (Wolter & Kerst, 2015).

Consequently, the traditional balance between vocational and higher education system is being eroded. This implies changes towards the recognition of a vocational profile acquired in the dual system. It generally seems that an academic degree compared to a vocational degree in the dual system is also finding increased acceptance as a reference point for the recognition of educational achievements in families with nonacademic backgrounds (*type of love*) and opening more ways of educational permeability (*type of right*). However, the current dynamic is ambiguous. For instance, companies appreciate the type of dual studies especially during the part of workplace learning that enables practical skills. Besides that, a consequence of the academization is, that the companies have a lack of traditional vocational profiles or blue colour worker. A recent study shows, that an increasing number of companies in Germany introduce dual study programs to attract ambitious school graduates that are looking for academic learning opportunities, even though the training companies would prefer them to participate in their vocational training programs (apprenticeships), which are however not as attractive to well-performing candidates as in the past (Kuhlee & Irmischer, 2018). Nevertheless, it is challenging to put the academic degrees in order to the workplace logic in the companies. A vocational profile guarantees a bundle of competences for a specific field of working (allocation function, see Sect. 18.3). Academic degrees do not have the specific function and are more anchored in a vocational field but not in a specific vocational profile. Therefore, on the part of the company vocational profiles and the skill formation the dual system still has a high recognition in the sense of type of solidarity.

18.5 Conclusion

The intention of this chapter was to present a theoretical concept to understand processes of social appreciation and recognition in vocational education. It was illustrated by the example of the Germany dual system as a vocational system with a high international reputation. Honneth's theoretical concept served as an interpretation scheme to aid the understanding of the processes. Bearing this in mind, recognition for vocational learning in the German apprenticeship system according to the "love" type of recognition depends on the social environment. Social climbers especially switch between different spheres and, following that, between different schemes of recognition. For the formation of the identify as a self, individuals must negate to which interpellation of significant others they intend to adhere. Here, the plausibility of family members and, potentially, colleagues in the work environment, in some part replacing family members as significant others for subject formation and identity, may be a key factor.

Legal recognition in the form of credits and admission determines the “rights” type of recognition. In the case of the German apprenticeship system, some major adjustments have been put in place over recent decades. An apprenticeship (initial vocational training) combined with some years of work experience is recognized as a university entrance qualification (KMK, 2014). Furthermore, up to 50% of a study program can be recognized for prior learning, including workplace learning (KMK, 2008). These measures are based on the parity of the esteem of VET as education. Recognition, however, is not based on qualities or standards of the workplace but of the formal system of (higher) education. In one way, this type of scheme of recognition may undermine the recognizability of workplace learning. From another point of view, this way of legal recognition may also be seen as something that strengthens the recognition of workplace learning, because the follow-up option makes an apprenticeship more attractive, perhaps as an intermediate stop, and, thus, may be more appreciated.

Regarding the social appreciation of what has been accomplished through workplace learning, it depends on what employees are confident of doing for their self-actualization and on the promotion policy of employers to express valuable recognition of workplace learning. There are no or limited legal restrictions to these policies in most vocational fields. The stakeholders representing employee and employer interests (social partners) support this vocational career path unanimously. However, this type of recognition decreases in practice. Whether this trend continues or this type of recognition will be strengthened is in the hands of the employees and employers themselves. Recognition is also relevant for individual decision-making processes in other sectors of the educational system, such as schools and universities.

As expected, recognition frames individual choices and behavior; we find it important to analyze how appreciation of workplace learning is generated and changing. While we examined this taking the German dual apprenticeship system as an example, we are convinced that the appreciation of workplace learning is highly relevant to better understand its place and function within education and training.

References

- Althusser, L. (1970). Ideology and Ideological State Apparatuses (notes towards an investigation). In L. Althusser (Ed.), *Lenin and philosophy and other essays*. Translated from the French by Ben Brewster. NLB.
- Annen, S. (2013). Recognising non-formal and informal learning: Typology and comparison of selected European approaches. *Literacy Information and Computer Education Journal (LICEJ)*, 4(1), 928–937.
- Autorengruppe Bildungsberichterstattung (2014). Bildung in Deutschland 2014. Online: <https://www.bildungsbericht.de/de/bildungsberichte-seit-2006/bildungsbericht-2014/pdf-bildungsbericht-2014/bb-2014.pdf>. (12-02-2021)
- Avis, J. (2010). Workplace learning, knowledge, practice and transformation. *Journal for Critical Education Policy Studies*, 8(2), 165–193.

- Baethge, M., & Wolter, A. (2015). The German skill formation model in transition: From dual system of VET to higher education? *Journal of Labour Market Research*. <https://doi.org/10.1007/s12651-015-0181-x>
- Berger, P. L., & Luckmann, T. (1966). *The social construction of reality: A treatise in the sociology of knowledge*. Penguin.
- Biemans, H., Nieuwenhuis, L., Poell, R., Mulder, M., & Wesselink, R. (2004). Competence-based VET in the Netherlands: Background and pitfalls. *Journal of Vocational Education and Training*, 56(4), 523–538.
- Billet, S. (2001). *Learning in workplace. Strategies for effective practice*. Crows Nest.
- Billet, S. (2008). Emerging perspectives on workplace learning. In S. Billet, C. Harteis, & A. Eteläpelto (Eds.), *Emerging perspectives of workplace learning*. Sense Publishers.
- Billet, S. (2011). *Vocational education. Purposes, traditions and prospects*. Springer.
- Czychołł, R. (1996). Handlungsorientierung in der beruflichen Bildung. In B. Bonz (Ed.), *Didaktik der Berufsbildung. Beiträge zur Pädagogik für Schule und Betrieb* (pp. 113–131). Germany.
- Deissinger, T. (1996). Germany's Vocational Training Act: Its function as an instrument of quality control within a tradition-based vocational training system. *Oxford Review of Education*, 22(3), 317–336.
- Deissinger, Thomas (2004). Apprenticeship cultures: A comparative view. In *University vocational awards council apprenticeship conference*, pp. 43–58.
- Deissinger, T., & Hellwig, S. (2005). Structures and functions of competence-based education and training (CBET): A comparative perspective. Online: http://kops.uni-konstanz.de/bitstream/handle/123456789/12147/Structures_and_Functions_of_Competence_based.pdf (02-03-2020).
- Dewey, J. (1916). *The school and society*. PhilPapers.
- Dewey, J. (1966). *Democracy and education*. Free Press.
- Dilger, B., & Sloane, P. F. E. (2007). Die wirklich vollständige Handlung – Eine Betrachtung des Handlungsverständnisses in der beruflichen Bildung unter dem Fokus der Selbstregulation. In F.-W. Horst, J. Schmitter, & J. Tölle (Eds.), *Wie Mosel Probleme löst: Lernarrangements wirksam gestalten* (pp. 66–103). Eusl.
- Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work. *British Journal of Educational Psychology*, 79, 113–136.
- Ertl, H., & Sloane, P. F. E. (2004). The German training system and the world of work: The transfer potential of the Lernfeldkonzept. *bwp@ Berufs- und Wirtschaftspädagogik online* 7(2004). Online: http://www.bwpat.de/7eu/ertl_sloane_de_bwpat7.pdf (02-12-2019).
- Estola, E., Erkkilä, R., & Syrjälä, L. (2003). A moral voice of vocation in teachers' narratives. *Teachers and Teaching: Theory and Practice*, 9(3), 239–256.
- Euler, D. (2015). Zur (Neu-)bestimmung des Verhältnisses von Berufs- und Hochschulbildung. *Zeitschrift für Berufs- und Wirtschaftspädagogik*, 111(3), 321–332.
- Federal Institute for Vocational Education and Training. (Ed.). (2018). *VET data report Germany 2016/2017. Facts and analyses to accompany the Federal government report on Vocational education and training – Selected findings*. Online: https://www.bibb.de/dokumente/pdf/2018_12_11_vet_data_report_germany_2016_2017_bf.pdf (03-12-2019).
- Foucault, M. (1982). The subject and power. In H. L. Dreyfus & P. Rabinow (Eds.), *Michel Foucault. Beyond structuralism and hermeneutics*. Harvester.
- Fuller, A., & Unwin, L. (2003). Learning as apprentices in the contemporary UK workplace: Creating and managing expansive and restrictive participation. *Journal of Education and Work*, 16(4), 407–426. <https://doi.org/10.1080/1363908032000093012>
- Gerholz, K.-H., & Brahm, T. (2014). Apprenticeship and vocational education: An institutional analysis of workplace learning in the German vocational system. In C. Harteis, J. Seifried, & A. Rausch (Eds.), *Discourses on professional learning* (pp. 143–158). Springer.
- German Employment Agency. (2018). *Current wage statistics*. <https://statistik.arbeitsagentur.de/Navigation/Statistik/Statistik-nach-Themen/Beschaefigung/Entgeltstatistik/Entgeltstatistik-Nav.html> (03-01-2020).

- Gössling, B. (2016). All new and all outcome-based? The German qualifications framework and the persistence of national governance approaches. *Journal of Education and Work*, 29(5), 540–561. <https://doi.org/10.1080/13639080.2014.998181>
- Hartmann, M. (2017). The international business elite: Fact or fiction? In *New directions in elite studies* (pp. 39–53). Routledge.
- Honneth, A. (1995). *The struggle for recognition: The moral grammar of social conflicts* (J. Anderson, Trans.). Polity Press.
- KMK, Germany conference of ministers of education. (2008). *Anrechnung von außerhalb des Hochschulwesens erworbenen Kenntnissen und Fähigkeiten auf ein Hochschulstudium* (II). Online: https://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2008/2008_09_18-Anrechnung-Faehigkeiten-Studium-2.pdf (03-12-2019).
- KMK, Germany conference of ministers of education. (2014). *Synoptische Darstellung der in den Ländern bestehenden Möglichkeiten des Hochschulzugangs für beruflich qualifizierte Bewerber ohne schulische Hochschulzugangsberechtigung auf der Grundlage hochschulrechtlicher Regelungen*. Bonn. Online: https://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2014/2014_08_00-Synopse-Hochschulzugang-beruf_Qualifizierter.pdf (03-12-2019).
- Kuhlee, D., & Irmscher, M. (2018). Duales Studium vs. duale Ausbildung: Zur Diskussion um die Relevanz dualer Studienangebote unter Berücksichtigung der Unternehmensperspektive. *bwp@ Berufs- und Wirtschaftspädagogik online*, 34, 1–24.
- Kutscha, G. (2010). Berufsbildungssystem und Berufsbildungspolitik. In R. Nickolaus, G. Pätzold, H. Reinisch, & T. Tramm (Eds.), *Handbuch Berufs- und Wirtschaftspädagogik* (pp. 311–321). UTB.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.
- Mead, G. H. (1934). *Mind, self and society*. University of Chicago Press.
- Mulcahy, D. (2000). Turning the contradictions of competence: Competency-based training and beyond. *Journal of Vocational Education and Training*, 52(2), 259–280.
- Mulder, M. (2012). Competence-based education and training. *Journal of Agricultural Education and Extension*, 18(3), 305–314.
- Mulder, M. (2017). *Competence-based vocational and professional education. Bridging the worlds of work and education*. Springer.
- North, D. C. (1991). Institutions. *Journal of Economic Perspectives*, 5, 97–112.
- Spöttl, G. (2013). Permeability between VET and higher education – A way of human resource development. *European Journal of Training and Development*, 37(5), 454–471.
- Stifterverband für deutsche Wissenschaft. (2014). *Hochschul-Bildungs-report 2020*. Online: <https://www.stifterverband.org/hochschul-bildungs-report-2020-bericht-2014> (03-03-2020).
- Theling, G. (1986). Vielleicht wär' ich als Verkäuferin glücklicher geworden. In *Arbeitertöchter und Hochschule*. Westfälisches Dampfboot.
- Voelzkow, H. (2009). Neokorporatismus. In U. Andersen & W. Woyke (Eds.), *Handwörterbuch des politischen Systems der Bundesrepublik Deutschland* (pp. 460–464). VS.
- Werquin, P. (2010). *Recognition of non-formal and informal learning: Country practices*. Internet: <http://www.oecd.org/dataoecd/22/12/44600408.pdf> (10-05-2020).
- Wolter, A. (2014). Eigendynamik und Irreversibilität der Hochschulexpansion – Die Entwicklung der Beteiligung an Hochschulbildung in Deutschland. In U. Banscheraus et al. (Eds.), *Übergänge im Spannungsfeld von Expansion und Exklusion*. Bielefeld.
- Wolter, A., & Kerst, C. (2015). The 'academization' of the German qualification system: Recent developments in the relationships between vocational training and higher education in Germany. *Research in Comparative & International Education*, 10(4), 510–524.

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Chapter 19

Research on Workplace Learning in Times of Digitalisation



Christian Harteis

Abstract The article explores the particular quality of changes introduced through the latest wave of digital transformation of workplaces. It has effects on workflow processes, on distribution of work and tasks, and the mode of distributing working tasks, e.g. through cyber-physical systems. Hence, the changes in work are manifold and require changes in vocational education and training as well as in workplace learning. These changes reveal new challenges for research on workplace learning. Finally, conclusions for future workplace learning research will be developed.

Keywords Digitalisation · Self organisation · Distribution of labour · Automation

Workplace learning research has developed as a broad and heterogeneous field that focuses on professional learning and development. However, its origins begin with research on the field of learning and instruction aimed at improving formal education in school settings. During the 1980s, criticism on the lack of effectiveness of educational institutions emerged. Teaching in schools was considered only to develop inert knowledge that could not support students in solving practical problems. Resnick (1987) addressed this issue in her widely acknowledged paper and identified significant differences between learning in school and learning outside schools (such as in the workplace). Early studies of workplace learning were conducted to identify crucial characteristics of learning at work so that they could be integrated into classroom settings. During the 1990s, novel concepts of business organisation became popular, whereby the detailed regulation of work processes was reduced and responsibility and decision-making power were transferred throughout the hierarchy of employees. Hence, individual employees and individual experiences and capabilities became more important than in previous Tayloristic standardised mass production contexts. As learning through and for work became a

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C. Harteis et al. (eds.), *Research Approaches on Workplace Learning*,

Professional and Practice-based Learning 31,

https://doi.org/10.1007/978-3-030-89582-2_19

relevant topic for both the economy and society, research on workplace learning began to focus on work activities and the origin of their learning potential (Gruber & Harteis, 2011).

An international community of educational researchers established a broad and heterogeneous field of workplace learning research, even though economic and national systems of vocational education and training have developed very differently. For some time, the issue of digitalisation has presented prescient developments in the field of work and employment. A major goal of this paper is to examine more closely the impact of changes that result from the digitalisation of work, work processes, and the organisation and distribution of work. Different consequences will be discussed with regard to automation, opportunities for remote working, and for vocational education and training. Accordingly, the consequences of workplace learning become more important than ever. These are explored before conclusions for research on workplace learning are drawn.

19.1 Digitalisation of Work: A New Quality for the Technical Saturation of Work Processes

It is true that the recent digitalisation of work is a widely-discussed topic reflecting on the future development of economic and employment systems. However, the (often implicit) conceptions of digitalisation may widely vary across differing perspectives. Whereas one may refer to the way work processes are saturated with digital technology, others may refer to remote forms of work organisations, such as through cloud-based regulations. Another view might refer to the implementation of cyber-physical systems that integrate humans and computers on equal terms. It is already apparent that such a rough distinction of conceptions reveals very different positions that describe the future development of work. Consensus is only to be found in the conviction that digitalisation will inevitably affect all areas of work.

19.1.1 Digitalisation as Automation of Workflow Processes

Early business organisation concepts such as the Tayloristic approach and Ford's belt production defined standard processes that might otherwise have been automated by steam or electrical power (Charles, 2000). Since the 1960s and 1970s, the invention of computers has resulted in the automation of standard workflow processes. Hence, automation is a well-established development—at least in the field of industrialised work (Noble, 2017). These concepts of business organisation focus on the precise distribution of work in standardised stages that often do not require extensive preparation or education. In organisations that apply this approach, workers are not considered as individuals with (work) experiences; rather, they are considered part of the workflow in light of their function.

As noted in the introduction, the 1990s witnessed an approach whereby business organisations established the deregulation of work processes. Workers were no longer expected to execute standard tasks but should follow ‘fuzzy’ tasks and make decisions. Hence, their individual capabilities and experiences became valued characteristics in the workplace (Marsick, 2006; Marsick & Watkins, 2015).

This brief summary of developments reveals that technological intervention and change are well-known phenomena that have thus far been widely (and successfully) adopted in workplace settings (Applebaum, 1992). Concurrently, the demand for vocational education and training as well as workplace learning increased with the organisational developments taking place during the 1990s, which led to a need for research on workplace learning.

Automation and its consequent rationalisation of work continues to be the focus of discussion in relation to employment losses. In the well-known (but controversially received) study on the impact of digitalisation on employment in different vocational sectors, Frey and Osborne (2017) predicted significant losses in the area of routine work in business administration (an area of skilled employment). However, when particular jobs become obsolete (because of replacement by digital tools), new jobs and new job profiles arise. An examination of international references on the development of employment reveals that employment levels increased during times of automation and rationalisation (on average) in all Western developed countries (Eurostat, 2019). In addition, the share of skilled work within employment systems increased. Today—even allowing for the unknown effects of the COVID-19 pandemic crisis—experts expect a lack of skilled workforce in Europe for the coming decades.

For individuals whose workplace may be affected by automation, the question whether they receive an opportunity for vocational education and training to qualify themselves for new job profiles required within digitalised workplaces will arise.

19.1.2 Platform-Organised Work: Crowdwork

Crowdwork is a competition-based form of work organisation. Employers (or purchasers) can announce calls for bids to a group of people involved through Internet platforms by defining a task and waiting for proposals or even final products. Respondents to a bid compete against each other for the assignment. It could be said that this principle already underpins the logic of public bidding and is an existing feature of intra-organisational quality management processes (for example, for calls for suggestions for improvement). However, an Internet platform enables significantly increased speed and efficacy and provides a means of communicating with a large audience simultaneously (Durward et al., 2020; Howcroft & Bergvall-Kåreborn, 2019).

Opinions of crowdwork are ambiguous. It has advantages for enterprises because they can outsource particular tasks, which enables them to utilise expertise without contributing anything to its development or its maintenance through human resource

development. For crowdworkers, it is viewed positively as it provides the opportunity to autonomously decide which bid to invest effort and thus control individual work duties and working time. Negative views focus on precarious payment and a lack of social security.

Given the particularly competitive time-pressured scenario of crowdwork platforms, opportunities for workplace learning may therefore be restricted. However, no empirical research exists thus far on this issue, besides studies that reveal that much digital crowdwork is performed by highly (academically) qualified persons (e.g. Deng & Joshi, 2016).

19.1.3 Workflow Processes Based on Cyber-Physical Systems

An important new feature of the recent digitalisation of work is the (equal) integration of humans and things (such as machines, computers, tools, and software) into decentralised networks (Harteis, 2018; Jeschke et al., 2017). Ongoing rapid innovations permanently improve sensors, conductors, and self-acting switches in the technical domain such that memory no longer presents a significant problem. As software and algorithms continue to improve, it is possible that networks and computers can react on-time in response to human input. Hence, the interaction of humans with computers (or robots) has gained importance in the workplace in industry, administration, and service workplaces (Pandey & Gelin, 2018).

Fundamental to cyber-physical systems (CPS) is the operation of a virtual image of real-world (physical) processes with all its human and technical interfaces. These cyber-physical devices (CPDs) represent all these interfaces—human or machine—within the virtual image of real-world processes. The control of workflow processes is conducted within the virtual image, which also enables simulation of processes and their effects. This then steers the real-world processes through its machine interfaces. For a human worker, this may become opaque if a current work task results from either a human- or machine-generated decision. For example, an Uber taxi-driver simply receives an order but is probably unaware of the underlying algorithms that allocated the order when considering alternative available drivers.

The digital representation of interfaces within the cyber-physical system (including their linkage between the physical world and the virtual image) are called *digital twins* (Tao et al., 2018). The crucial concern of a digital twin is how effectively, appropriately, or completely it reflects the characteristics of interfaces in the physical world. If they are machines, it may be easier to represent all their characteristics within the digital twins. However, in relation to humans, digital twins be no more than models of humans; thus, tremendous reductions. Which characteristics such a model will consider to either include or reject depends crucially on the developer's anthropological idea of 'human'. In addition, the question remains how best to represent human competences and learning within software systems.

19.2 Consequences: Changes in Work

Digitalisation brings changes to work at both organisational and technological levels, which means that workers face new tasks as well as new tools. The question of which consequences arise in terms of the requirements for qualifications arises. Here, the current discourse comprises several scenarios and kinds of remote working. Finally, consequences for vocational education and training are reflected upon.

19.2.1 *Scenarios of Digitalised Work*

Two different scenarios resulting from the digital transformation of work dominate the discourse (Dworschak & Zaiser, 2014; Fischer et al., 2018; Harteis et al., 2022), as follows:

- *Automation scenario.* This scenario describes the continued automation of work that omits human work (except what is either too cheap or too complex to apply automation). For example, such work may include alternating simple work steps that can be executed more cheaply by humans (because humans do not require retooling). Work that might be too complex to be automated may involve dealing with uncertainty. Otherwise, all work tasks formally carried out by humans will be automated where economically and technically possible.
- *Tooling scenario.* This scenario describes the development of digital machines that assist humans to expand their given capabilities. Working tasks that may be dangerous or that exceed workers' capabilities will be carried out by machines (or humans assisted by digital machines). Work tasks that require creativity or other kinds of mental resources specific to humans will still be carried out by workers. Being assisted by digital machines, it is claimed that workers in this scenario are enabled to use their mental capacities in a more effective and efficient way.

The question remains which of these scenarios will become reality, because the digital transformation of work is still in its early stages. It is quite probable that a range of changes will occur across different companies, workplaces, and areas of employment (Frey & Osborne, 2017; McAfee & Brynjolfsson, 2017). There is a similar ongoing question whether human capacities will increase or decrease. Experiences from earlier phases of automation and rationalisation of work indicate an increase of skilled work (e.g., Autor et al., 2003; Zuboff, 1988). However, we do yet not know if these experiences can be transferred to the current digital transformation.

19.2.2 Flexible Work Organisation: Distance Working and Working Remotely

The emergence of the COVID-19 pandemic has accelerated the switch from office- to home-working for many employees, and consequently enable opportunities for videoconferencing that reduces (or even removes) otherwise time-consuming and expensive travel. Digitally-controlled work processes do not necessarily require workers' physical presence and can be controlled remotely; hence, the digitalisation of work leads to a wide variety of opportunities to reorganise work and to transform traditional beliefs about work related to being present in a particular space.

Early studies on the experiences of remote and home working indicate that opportunities for working remotely are unequally distributed across occupations and qualification levels, and that experiences are quite heterogeneous (IAB, 2020). This means that distance work is not necessarily more effective, nor does it automatically reveal a higher level of workers' satisfaction. Additionally, we do not know so far which side effects come along with a permanent absence from a common workspace.

19.2.3 Vocational Education and Training

Transformations in the way we work have always presented a challenge for vocational education and training. As work requirements change, workers' preparation for work needs to adapt. In countries with highly developed systems of vocational training (such as Germany), training regulations have always adapted according to technological change. For example, motor mechanics have until more recently been the typical workers in garages; however, due to increasing digitalisation of a car's infrastructure, the occupation is now that of a car mechatronic and the vocational training features components of information technology.

19.3 Consequences for Workplace Learning

Vocational education and training has always reacted and will react to changes in work organisation and work requirements. However, digital transformation occurs much quicker than former technological developments have done (Brynjolfsson & McAfee, 2016). It is probably impossible for training programs to provide complete preparation for workplace requirements. Moreover, from an educational perspective, it may even be even doubtful whether vocational training *should* aim for complete preparation. It may be more promising to develop general capabilities that are more or less independent from concrete requirements. For example, self-regulation and learning capabilities (Gruber & Harteis, 2018) are considered crucial

components of employability and competitiveness in European policy (CEC, 2000; Halttunen et al., 2014). Hence, workplace learning becomes more important because employers and workers should be able to solve challenges through digitalised work on the ground just at the moment when the challenge arises (Harteis et al., 2022). In the following, three major issues are discussed from an educational point of view: Self organisation, the demarcation between work and privacy, and the peril of new digital divides.

19.3.1 Self Organisation as the Core of Workplace Learning

Workplace learning comprises all activities undertaken during work with the aim of gaining knowledge and developing capabilities to cope with work requirements (Malloch et al., 2011). Hence, workplace learning implies that an individual (appropriately) perceives learning demands and that the social and material environment at work provides sufficient learning resources. Both aspects cannot be taken for granted, and a crucial issue here is an individual's self-regulation capabilities, since digital transformation does not follow a curriculum nor provide a teacher. Thus, successful workplace learning requires a certain level of self-regulatory capabilities. These cannot be taken for granted but they need to be developed. Employees with a higher level of education exhibit far better preconditions for workplace learning than those at a lower level. In addition, this kind of 'Matthew effect' can also be found regarding the support of workplace learning, whereby the level of occupation influences workplace learning support through the social and material environment (Harteis et al., 2015).

The argument here is not that workplace learning opportunities are restricted to a particular group of advantaged employees. Moreover, it is even probable that one cannot avoid not to learn in any situation. However, the question remains whether digital transformation creates learning requirements that are not accessible to all employees.

19.3.2 Peril of the Digital Divide

Educational systems in Europe select (with differing degrees of virulence) people into an employment system that offers different qualities of occupations. The respective inequity of this distribution is a core problem for the education system. There is evidence that any pre-existing disadvantage in education continues in later employment situations. Digitalisation may now lead to new forms of disadvantage and establish a digital divide.

Theoretical frameworks on workplace learning, such as the offer-usage model (Billett, 2001), Tynjälä's PPP model (Tynjälä, 2013), the i-PPP model (Gruber & Harteis, 2018), or the job-demand-control model (Karasek, 1979) all claim that

workplace learning requires social and material support. As previously stated, such support is unequally distributed among employees in such a way that a skilled workforce receives more support than an unskilled workforce (Fischer et al., 2018; Harteis et al., 2015).

A side effect of digitalisation is an attempt to shift training units to digital learning platforms. However, access to such human resource development implies the availability of (expensive) digital devices. It is evident that the peril of a digital divide arises because socio-economically disadvantaged employees are less likely to work regularly with digital learning devices and have less access to digital equipment in the home.

19.3.3 Demarcation Between Work and Privacy

The first part of this section discussed new opportunities to organise digitalised work. Approaches that aim to arrange flexible and remote work will lead to the new distribution of working time. Through optimistic interpretations, an opportunity to reconcile work and private need is recognised, which can realise a good work-life balance. However, the more flexibly that work is organised the more important it is that employees have flexible, on-call availability on standby. Evidence from emergency services (that regularly organise their human resources in a standby system) reveals that employees experience standby time at home differently compared to leisure time, which can cause psycho-hygienic problems (e.g. Miryala & Chiluka, 2012).

Experiences from the current wave of distance working from home reveal challenges where the private space becomes the work environment. Studies on teachers who usually work at home to prepare their teaching indicate particular challenges in demarking working time from family life.

As soon the private space becomes the work environment, the private home also becomes the space of workplace learning. Formally, the employer is obliged to provide all necessary equipment for working from home; however, in reality not all employees receive full support. To organise social support for workplace learning may be more difficult than in the regular workplace within a company building where an organisation's expertise can be gathered.

19.4 Consequences for Researching Workplace Learning

The digital transformation of work—as outlined in the previous paragraphs—will raise new questions and challenges for research on workplace learning. More broadly, these questions will touch upon well-established perspectives of educational research but will set new focuses. Such focuses of workplace learning research may address the achievement of objectives, effectivity, and efficiency, and inclusion versus segregation.

19.4.1 *Achievement of Goals Perspective*

A crucial question for investigating the achievement of goals refers to what purposes and goals that workplace learning *should* achieve. This is perhaps independent from the issue of whether either the upskilling or the down skilling hypothesis will become reality: Is it considered a success if employees only learn to accomplish their work tasks without understanding the wider context in which those individual tasks are located? Or does a reference criterion for successful workplace learning refer to the development and maintenance of expertise implying individual agency and sovereignty over work activities? If pursuing the idea of expertise, the goal of workplace learning would be to enable workers and employees to make informed decisions and choices at work and to support their emancipation from tacit and hidden structures that limit their sovereignty. This idea draws upon the classical motivational approach of De Charms (1977) that distinguishes pawns and origins as two different roles an individual can assume. Pawns experience themselves as poorly effective within their environment, whereas origins experience themselves as highly effective. This approach connects to recent theoretical concepts of workplace and professional learning that refer to work agency (e.g., Eteläpelto et al., 2013; Harteis & Goller, 2014). To define expertise and work agency as goals of workplace learning makes high claims, because the fundamental prerequisites of work agency are highly self-regulatory capabilities and a deep understanding of the circumstances at work (Goller, 2017) that enable workers and employees to make deliberate choices at work (Eteläpelto et al., 2013).

Considering the discussed effects of the digital transformation in the workplace, it may become necessary for workers and employees to develop novel understandings of their tasks, functions, or job profiles. Hence, a discourse on educational consequences of digitalisation of work reveals conceptual change as an important goal of work-related learning (Harteis et al., 2020). Conceptual change as a well-established theoretical construct of research on learning and instruction in primary and secondary education (Vosniadou, 2013) has not thus far entered into workplace learning research. It is highly probable that digitalised work will require fundamental adaptations that completely eradicate well-established schemata and mental models.

Each of these selected possible goals of workplace learning describe theoretical constructs that require a high degree of effort to access them empirically. All of these are latent constructs that require either careful operationalisation or verbalisation through subjects. The challenge for verbalisation is reported by Simons (2xxx): Adults are often unaware of their workplace learning, refer to school settings when thinking and talking about learning, and are usually unfamiliar with the constructs discussed in workplace learning research.

19.4.2 Effectivity and Efficacy Perspective

The issues of effectivity and efficacy of workplace learning raise questions on the appropriateness of the means of workplace learning. Tynjälä (2013) extended Brigg's Presage-Process-Product (PPP) model of workplace learning by differentiating factors of workplace learning on the basis of a literature review. Tynjälä's article provides insight on the variety of preconditions of workplace learning. Gruber and Harteis (2018) presented an integrated (i-PPP) model explaining that the distinction of presages, processes, and products of workplace learning is just an analytical perspective. In reality, each of these factors may be a presage and at the same time a product of workplace learning. Hence, on the basis of existing research, we know a lot about circumstances of workplace learning.

However, little attention so far is directed towards issues of effectivity and efficacy of workplace learning. There are tentative suggestions that people may learn undesirable things through their work practices (e.g., Tynjälä, 2013; Gruber & Harteis, 2018); however, there is little attention on this issue in existing empirical research—although much research in the area of industrial sociology reveals that members of an organisation quickly develop informal practices that may even contradict formal structures of an organisation (references). The negotiation of such practices can be considered an interesting phenomenon of workplace learning.

As the discussion on the digitalisation of work has revealed, digitalisation transforms the work environment as well as implementing new tools for workplace learning. Thus, digitalisation generates new reasons for and new means of workplace learning. To provide relevant contributions to the discussion about the digital transformation of work, educational research should widen its perspective to issues of effectivity and efficacy. The issue of effectivity raises questions of whether and how far workers manage to achieve their learning goals, while the issue of efficacy raises issues regarding the effort of workplace learning. Both perspectives are highly relevant in education because they determine success and failure of workplace learning, and they determine who will (and will not) cope with digital transformation, which leads to the last relevant focus of workplace learning research.

19.4.3 Inclusion Versus Segregation Perspective

Similar to the question of whether the digitalisation of work will lead to higher or lower qualification requirements, it is still unclear whether the digital transformation will widen the perspective for employment or sharpen social segregation. As previously discussed, digital tools may assist humans and widen their spectrum of activity (for example by providing physical assistance, as described in the tooling scenario). Such a scenario enables workers to perform a richer field of activities and (at best) to compensate for existing limitations, which would realise an inclusive employment setting. However, Western employment systems are strongly segregated in terms of the risk of unemployment and workplace learning support being

highly correlated with workers' qualification level: Those who work in sophisticated jobs are more likely to receive support for learning and development than those who work in elementary jobs (Harteis et al., 2015). Digitalisation of work may also lead to an increase of such segregation (such as the automation scenario).

This will become an important area of workplace learning research for investigating issues of educational fairness in digitalised workplaces.

19.5 Discussion

This chapter so far explored the changes of work and workplaces through digitalisation and discussed consequences for workplace learning and educational research on workplace learning. As learning is an internal mental process that is not to access directly in empirical research, literature on workplace learning widely describes circumstances of workplace learning but seldomly focuses learning processes themselves. This final paragraph develops conclusions for future workplace learning research with regard to theoretical and methodological challenges.

19.5.1 *Integration of Theoretical Perspectives*

Billett (2009) stated that educational research often follows a narrow view of a particular theoretical perspective. This results in cognitive research that neglects the socio-material environment and sociocultural research approaches that overlook the individual. Thus, such strict and narrow perspectives diminish crucial aspects of the complex work environment and workers' mental processes of learning. Even if it is impossible to grasp the full reality, it may be important to integrate different perspectives, as Eraut (2004) suggested.

In addition, interdisciplinary approaches may broaden our insight on workplace learning. It is remarkable that management research or work psychology investigates human resource development but often considers learning a dichotomous variable (i.e., learning: yes or no; Griffin et al., 2018). Merging their analytic approaches with educational concepts of learning may lead to more comprehensive analyses of workplace learning.

19.5.2 *Development of Novel Methods*

The fast progress of software and hardware devices has already been discussed and applies to research applications. There is on the one hand the implementation of new procedures of data analysis (such as machine learning and data mining), and on the other hand the development of different sensors, which have made a variety of highly specialised measures available for workplace learning research (i.e.,

cardiovascular measures, infrared eye-tracking, EEG). Today, the application of these measurements are—compared to the early 2000s—easy and cheap (Harteis et al., 2018).

While many researchers became acquainted with these new measurements and started to analyse learning with online measurements in the broad area of educational research, such analyses of workplace learning processes are still lacking. This raises two challenges for workplace learning research:

- *Generating acceptance in the field.* As mentioned repeatedly, establishing field access is a particularly challenging task for researchers on workplace learning because such research activities always stand in conflict with the achievement of working tasks and productivity. A possible solution may be to increase acceptance by workers (as well as management) in companies for monitoring of work and learning processes with online measures (e.g., eye-tracking, skin sensors). Again, this may raise additional issues of data privacy. An alternative might be to develop laboratory settings that represent the work environment in laboratory conditions that are then free from any conflict with work achievement. Thus, the application of virtual reality or augmented reality may offer promising tools.
- *Understanding process data.* The nature of data produced in traditional educational research (e.g., using questionnaires or interviews) fundamentally differs from data generated through online measures such as eye-tracking or EEG. These measures reflect longitudinal data in a frequency of milliseconds, and thus produce tens of thousands of data about relatively short processes. It is a major challenge for researchers to understand the nature of data generated through online measures to be able to apply these measurements appropriately for workplace learning research. Researchers need to be aware not to lose access to the state-of-the-art in online measurement.

19.6 Conclusion

The digitalisation of educational research reveals the necessity to integrate theoretical concepts and develop novel methods of data collection. Workplace learning is usually a phenomenon that continues throughout an employee's full period of work, and its theoretical concepts focus a different timeframe than novel measurements gathering data at the level of milliseconds. Future research needs to integrate these different conceptual perspectives. There are differences with regard the precision of data that different theoretical frameworks require: for example, understanding the importance of emotions for workplace learning may require less precise data—as long as the pure occurrence of an emotion and its indication in heart rate or skin resistance data is accepted as a relevant indicator. However, understanding visual expertise and pattern recognition may require a high level of precision because it refers to complex physical behaviour that may even remain at a subconscious level. There is clearly no standard solution how best to go forward but many integrated and interdisciplinary attempts are necessary to address these novel challenges of workplace learning research.

References

- Applebaum, H. A. (1992). *The concept of work: Ancient, medieval, and modern*. State University of New York Press.
- Autor, D. H., Levy, F., & Murnane, R. J. (2003). The skill content of recent technological change: An empirical exploration. *The Quarterly Journal of Economics*, 118(4), 1279–1333.
- Billett, S. (2001). *Learning in the workplace: Strategies for effective practice*. Allen & Unwin.
- Billett, S. (2009). Conceptualizing learning experiences: Contributions and mediations of the social, personal and brute. *Mind, Culture, and Activity*, 16(1), 32–47.
- Brynjolfsson, E., & McAfee, A. (2016). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. W.W. Norton & Company.
- Charles, M. (2000). Divisions of labour. Social groups and occupational allocation. *European Sociological Review*, 16(1), 27–42.
- Commission of the European Communities (CEC). (2000). *Residency conclusions*. Lisbon, European Council, 23 and 24 March 2000. Available online at http://www.europarl.europa.eu/summits/lis1_en.htm
- De Charms, R. (1977). Students need not be pawns. *Theory Into Practice*, 16(4), 296–301.
- Deng, X. N., & Joshi, K. D. (2016). Why individuals participate in micro-task crowdsourcing work environment: Revealing crowdworkers' perceptions. *Journal of the Association for Information Systems*, 17(10), 3.
- Durward, D., Blohm, I., & Leimeister, J. M. (2020). The nature of crowd work and its effects on individuals' work perception. *Journal of Management Information Systems*, 37(1), 66–95.
- Dworschak, B., & Zaiser, H. (2014). Competences for cyber-physical systems in manufacturing – First findings and scenarios. *Procedia CIRP*, 25, 345–350. <https://doi.org/10.1016/j.procir.2014.10.048>
- Eraut, M. (2004). Informal learning in the workplace. *Studies in Continuing Education*, 26(2), 247–273.
- Eteläpelto, A., Vähäsantanen, K., Hökkä, P., & Paloniemi, S. (2013). What is agency? Conceptualizing professional agency at work. *Educational Research Review*, 10, 45–65.
- Eurostat. (2019). *Eurostat regional yearbook*. European Union.
- Fischer, C., Goller, M., Brinkmann, L., & Harteis, C. (2018). Digitalisation of work: Between affordances and constraints for learning at work. In D. Ifenthaler (Ed.), *Digital workplace learning. Bridging formal and informal learning with digital technologies* (pp. 227–249). Springer.
- Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, 114, 254–280.
- Goller, M. (2017). *Human agency at work: An active approach towards expertise development*. Springer VS.
- Griffin, M., Learmonth, M., & Piper, N. (2018). Organizational readiness: Culturally mediated learning through Disney animation. *Academy of Management Learning & Education*, 17(1), 4–23.
- Gruber, H., & Harteis, C. (2011). Researching workplace learning in Europe. In M. Malloch, L. Cairns, K. Evans, & B. O'Connor (Hrsg.), *The SAGE handbook of workplace learning* (S. 224–235). Sage.
- Gruber, H., & Harteis, C. (2018). *Individual and social influences on professional learning. Supporting the acquisition and maintenance of expertise*. Springer.
- Halttunen, T., Koivisto, M., & Billett, S. (Eds.). (2014). *Promoting, assessing, recognizing and certifying lifelong learning: International perspectives and practices*. Springer.
- Harteis, C. (Ed.). (2018). *The impact of digitalization in the workplace*. Springer.
- Harteis, C., & Goller, M. (2014). New skills for new jobs: Work agency as a necessary condition for successful lifelong learning. In T. Halttunen, M. Koivisto, & S. Billett (Eds.), *Promoting and recognizing lifelong learning: International perspectives and practices* (pp. 37–56). Springer Academic.

- Harteis, C., Billett, S., Goller, M., Rausch, A., & Seifried, J. (2015). Effects of age, gender, and occupation on perceived workplace learning support. *International Journal of Training Research*, 13(1), 64–81.
- Harteis, C., Kok, E., & Jarodzka, H. (2018). The journey to proficiency: Exploring new objective methodologies to capture the process of learning and professional development. *Frontline Learning Research*, 6(3), 1–5.
- Harteis, C., Goller, M., & Caruso, C. (2020). Conceptual change in the face of digitalization: Challenges for workplaces and workplace learning. *Frontiers in Education*, 5(1), 1–10. <https://doi.org/10.3389/educ.2020.00001>
- Harteis, C., Goller, M., & Gerholz, K.-H. (2022). Digitalization of work: Challenges for workplace learning. In L. Cairns, M. Malloch & B. O'Connor (Hrsg.), *The SAGE handbook of learning and work* (S. 329–341). Sage.
- Howcroft, D., & Bergvall-Kårebom, B. (2019). A typology of crowdwork platforms. *Work, Employment and Society*, 33(1), 21–38.
- IAB (2020). *Wie Corona den Arbeitsalltag verändert hat* [How corona changed daily working life]. IAB Kurzbericht 13(2020). IAB.
- Jeschke, S., Brecher, C., Meisen, T., Özdemir, D., & Eschert, T. (2017). Industrial internet of things and cyber manufacturing systems. In S. Jeschke, C. Brecher, H. Song, & D. B. Rawat (Eds.), *Industrial internet of things* (pp. 3–19). Springer.
- Karasek, R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, 24, 285–308.
- Malloch, M., Cairns, L., Evans, K., & O'Connor, B. (Eds.). (2011). *The SAGE handbook of workplace learning*. Sage.
- Marsick, V. (2006). Informal strategic learning in the workplace. In J. N. Streumer (Ed.), *Work-related learning* (pp. 51–69). Springer.
- Marsick, V. J., & Watkins, K. (2015). *Informal and incidental learning in the workplace*. Routledge.
- McAfee, A., & Brynjolfsson, E. (2017). *Machine, platform, crowd: Harnessing our digital future*. W.W. Norton & Company.
- Miryala, R. K., & Chiluka, N. (2012). Work-life balance amongst teachers. *The IUP Journal of Organizational Behavior*, 11(1), 37–50.
- Noble, D. (2017). *Forces of production: A social history of industrial automation*. Routledge.
- Pandey, A. K., & Gelin, R. (2018). A mass-produced sociable humanoid robot: Pepper: The first machine of its kind. *IEEE Robotics & Automation Magazine*, 25(3), 40–48.
- Resnick, L. (1987). Learning in school and out. *Educational Researcher*, 16(9), 13–20.
- Tao, F., et al. (2018). Digital twin-driven product design framework. *International Journal of Production Research*, 56, 1–19.
- Tynjälä, P. (2013). Towards a 3-P model of workplace learning: A literature review. *Vocations and Learning: Studies in Vocational and Professional Education*, 6, 11–36.
- Vosniadou, S. (2013). Conceptual change in learning and instruction: The framework theory approach. In S. Vosniadou (Ed.), *The international handbook of research on conceptual change* (2nd ed., pp. 11–30). Routledge.
- Zuboff, S. (1988). *In the age of the smart machine: The future of work and power*. Basic Books.

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Chapter 20

Workplace Learning from the Organizational Point of View



Päivi Tynjälä

Abstract The focus of this chapter is on workplace learning from the organizational point of view. The chapter reviews multi-disciplinary and inter-disciplinary research literature on learning organization starting from the seminal works by Argyris and Schön, and Senge, and continuing with the studies of the development of measuring characteristics of learning organization by Marsick and Watkins. The relationship between individual and organizational learning is discussed. Also concepts other than learning organization have been used in research studies in order to describe learning taking place in organizations. The concepts such as knowledge creation, expansive learning and innovative knowledge communities are examined. Finally, the emerging ecological approach and the concept of ecosystems from the learning organization perspective is discussed. The review shows that in all of the main lines of research in the field, individual- and organization-level learning are seen to be highly interdependent and indivisible. Chronologically, we can see movement from intra-organizational examination toward inter-organizational and networked learning, and very recently toward the concept of ecosystem. Altogether, the theories of organizational level learning discussed in this chapter provide different perspectives and diverse conceptual tools to understand learning that goes beyond individual cognitive activity. It is expected that, in the future, research on learning organizations will continue to be relevant and further enriched by other concepts and models such as those presented in this chapter. The direction of the research seems to extend from intra-organizational studies toward research on wider networks or ecosystems of organizations and the interconnections between them.

Keywords Workplace learning · Organizational learning · Learning organization · Knowledge creation · Innovative knowledge communities · Ecologies of learning

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20.1 Introduction

This chapter reviews past and present research on workplace learning from the organizational point of view and raises some emergent perspectives as well. When learning is examined on the organizational level, two main streams can be identified: *organizational learning* and *learning organization*. At first glance, these concepts look similar, but there are actually certain differences between these two lines of research (Chiva & Alegre, 2009; Örtenblad, 2013; Tsang, 1997; Visser, 2016; Watkins & Marsick, 2003). The concept of organizational learning is often associated with normative, prescriptive and practice-oriented approaches aiming at developing learning organizations, while the latter concept usually refers to more scientific and descriptive approach, directed at analyzing characteristics of learning organization. In this chapter, the main focus is on research on the concept of the learning organization. Furthermore, studies representing other theoretical frameworks will be reviewed. Learning at the organizational level has been conceptualized with several additional and more specific concepts, such as that of knowledge creation in companies (Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998), expansive learning (Engeström, 1987, 2011), and innovative knowledge communities (Hakkarainen et al., 2004). Recently, the concepts of ecologies of learning (Barnett & Jackson, 2019; Kemmis & Heikkinen, 2012) and ecosystems of learning (e.g., Virolainen & Heikkinen, 2019) have emerged as new ways to describe the interdependence between social practices related to learning in different contexts, such as learning in organizations. These different conceptualizations and their interrelationships are examined and discussed in this chapter.

The concept of Communities of Practice (CoP) by Wenger (1998; see also Lave & Wenger, 1991) has had a remarkable influence on research concerning learning taking place in organizations. The interpretations and meanings of the concept have several nuances (see Cox, 2005), but originally it referred to social communities with shared goals, mutual engagement and joint ventures. These communities are described as informal in nature. In early studies of informal communities of practice, the focus was on employees' identity development (Wenger, 1998), while, in more recent works, the CoPs have also been seen as a tool for management in organizations (Wenger et al., 2002). However, the concept of communities of practice itself does not refer to organizations per se, which, by definition, imply a formal structure, rules and practices. Therefore, in this chapter, the discussion will skip over the studies on CoPs. Despite this, it is worth keep in mind that this concept has been useful for research on workplace learning (Cairns, 2011), and it can be seen as a bridge from cognitively and individually oriented learning research toward studies where learning is seen as participation in social practices. This, in turn, is also at the core of the concept of the learning organization—although discussed in different terms.

The first prominent works related to learning at the organizational level were published by Argyris and Schön (1978, 1996), Senge (1990) as well as Watkins and Marsick (1993), and all of these have had a remarkable impact on subsequent

studies. In the next sections, these origins of organizational learning research are briefly reviewed. After that, other theoretical frameworks related to learning in organizations and between organizations are discussed, followed by conclusions and a glance toward the future.

20.2 Learning at the Organizational Level: Argyris & Schön and Senge

Among the first authors investigating learning at the organizational level were Argyris and Schön (1978, 1996). In their seminal work, organizational learning was seen as “the detection and correction of error”. Here, an error refers to a problematic situation. Learning starts when action strategy fails to produce the kind of outcomes or consequences expected. This discrepancy leads to a problematic situation, which calls for collaborative reflection and inquiry by the members of the organization (Argyris & Schön, 1978, 1996). In order to bring about change throughout the whole organization, not only in individuals, it is important that organizational rules, practices, procedures, policy plans and strategy statements are in line with supporting corrective actions, and guide daily actions. Organizational learning also requires media by which individual ideas or personal perspectives are shared, and public maps and organizational memory are constructed. In this way, individual and organizational learning become linked.

Argyris and Schön (ibid.) made a distinction between what they called *single-loop learning* and *double-loop learning*. The former refers to learning where people in an organization correct errors by using a new strategy without questioning governing variables, that is, the underlying rules or values of the activity. In the latter, people subject the underlying beliefs, values or rules to critical scrutiny, which may lead to a transformation of the policies, norms or objectives of the organization. In other words, in single-loop learning, the organization’s values, norms and strategies are taken for granted, whereas, in double-loop learning, they are questioned and transformed if needed. Readers familiar with Mezirow’s (1991) theory of transformative learning may see a similarity between double-loop learning and transformative learning, which involves a fundamental perspective transformation concerning the underlying premises and worldview of an individual. The concept of transformative learning is typically used in research relating to adult learning at the individual level, while both single- and double-loop learning relate to the perspectives of organizations.

Intervention studies focusing on how organizations can bring about double-loop learning have identified different learning climates within organizations. In organizations where a so-called *Model O-I learning climate* (Argyris & Schön, 1978, 1996) dominates, collaborative reflection and learning are often inhibited by routines, blocked communication, blame for errors, and a lack of trust and respect between employees and managers. In contrast, the *Model O-II learning climate*

within an organization encourages open communication, trust and respect, and a decorous attitude toward errors (see also Visser & Van der Togt, 2016). Argyris and Schön (ibid.) see the latter learning climate as a prerequisite to double-loop learning. Subsequent and more recent studies on collaborative climate (e.g., Sveiby & Simons, 2002; Thamhain, 2013) and trust (e.g., Kramer & Tyler, 1996; Seppänen et al., 2007) have confirmed this assumption about the significance of the atmosphere for learning in organizations.

While the tools for converting individual learning into organizational learning in the model by Argyris and Schön include collaborative reflection, shared maps and organizational memory, Senge (1990) adds *systems thinking* to the core of what constitutes a learning organization. In his book—*The Fifth Discipline*—Senge (1990) presents the five central elements or “disciplines” of a learning organization:

1. Personal mastery, which refers to individuals’ proficiency in their work and includes the continuous clarifying and deepening of their personal vision, focusing their energies, developing patience, and trying to see reality objectively.
2. Mental models, that is, our assumptions and generalizations that influence how we understand the world and how we take action.
3. Building a shared vision of the future that fosters individuals’ genuine commitment rather than compliance.
4. Team learning involving dialogue and thinking together. According to Senge (1990, p. 8), it is the teams rather than individuals who make up a learning unit in organizations.
5. Systems thinking, which is “the fifth discipline” and a core strategy integrating the other four elements. Senge describes holistic systems thinking as a cornerstone of the learning organization and as “the art of seeing the forest and the trees” (1990, p. 127).

In Senge’s thinking, individual, collective and organizational learning are interdependent and intertwined. The shared vision of the staff or team members integrates personal visions and mastery into a common purpose. Similarly, in dialogues of team learning, individuals’ perceptions, attitudes and knowledge (mental models) are shared and reflected upon. The outcome may be the creation of something that goes beyond existing ways of thinking and doing. Recognizing and understanding the interdependency and complexity of things, that is, systems thinking, is needed on individual, team and organizational levels. An organization is seen as product of how its members think and interact.

In Senge’s theory, the fifth discipline—*systems thinking*—is the core element that integrates the other four. In the measurement tool by Marsick and Watkins (2003), systems thinking is operationalized as making systemic connections and creating embedded systems to capture and share knowledge, and, according to their studies, their findings support Senge’s argument. Marsick and Watkins (2003) reported that, in their study, empowerment and team learning loaded with other individual-level variables, suggesting that they formed a cluster that was separate from the organizational-level system variables. Their conclusion was that an

organizations' learning culture can be found in individuals' minds, and that the aforementioned dimensions comprising a learning organization are necessary but not sufficient conditions for promoting learning.

In his later work, Senge (Senge et al., 2012, p. 558) envisioned education for developing actors for an "interdependent world", and suggested that the following educational practices are needed to nurture "systems citizens": systems thinking and understanding complexity; reflection; collaboration and building learning partnerships; communicating and listening; design thinking; sense of self: aspiration, self-motivation, self-control, and sense of efficacy. Most of these practices have recently been converted to what are called 21st century skills (Binkley et al., 2012), future work skills (Institute for Future, 2011), and learners' competences (Fadel et al., 2015). The idea of systems thinking can also be seen as a forethought of emergence of systems theories in the fields of education and organizational development.

Recently, Bui (2019) has revisited Senge's learning organization concept from a theoretical perspective and examined its application in practice. According to this work, building a learning organization requires special attention to be paid to two groups of factors: (1) Individual factors such as personal values, vision and experiences, spiritual growth, individual background, intrinsic motivation, and individual learning; and (2) Organizational factors including, for example, leadership, organizational culture, communication, reflective practice, interpersonal trust, training and development. Bui (ibid.) believes that by working with these factors, in order to develop Senge's five disciplines, leads to innovation and the success of the organization.

20.3 Measurement of Learning Organization Characteristics: Watkins and Marsick

Watkins & Marsick (2003), basing their theory on informal and incidental learning (Marsick & Watkins, 1990, 1997) and the idea of organizational learning (Argyris & Schön, 1996), have emphasized the significance of creating a climate and culture that nurtures learning both at the individual and organizational level. They stress the close relationship between individual and organizational learning, and they note that "individual learning is related to organizational learning though not equal to it and potentially (though not necessarily) interdependent with it". They consider a learning organization to be one that has the capacity to respond fast and in new ways to challenges it meets, and, at the same time, to remove blocks to learning. They stated that there are many measurement tools for diagnosing the characteristics of organizations from the learning point of view, but that these are mostly informed by practice rather than research (Gephart et al., 1996). For this reason, they developed a research-based instrument to measure shifts in an organization's learning climate and culture.

The instrument, called Dimensions of the Learning Organization Questionnaire (DLOQ; Marsick & Watkins, 2003), consists of the following constructs related to the processes and practices supporting learning: (1) Creation of continuous learning opportunities for employees; (2) promoting inquiry and dialogue through questioning, feedback and experimentation; (3) encouraging collaboration and team learning; (4) creation of systems to capture and share learning; (5) empowering people toward a collective vision; (6) connecting the organization to its environment; and (7) providing strategic leadership for learning. Furthermore, the instrument includes two dimensions related to key results of an organization: financial performance and knowledge performance.

The study by Yang (2003) showed that all seven dimensions of learning culture measured with the DLOQ instrument were significantly related to organizational performance variables. For example, about two-thirds of the variance in financial performance could be attributed to the variables measured with the instrument. Yang (*ibid.*) points out that, naturally, there are also other variables than those included in the study that can explain performance outcomes, such as the size of the organization, competition and market niche. In another study, Hernandez (2003) found that the learning organization environment was associated with the transfer of tacit knowledge and, in turn, that the transfer of tacit knowledge had a positive influence on performance.

In recent years, several other studies have reported similar positive impacts of learning organization characteristics on different kinds of outcome factors. For example, Ngah et al. (2016) examined the effect of knowledge management capabilities on organizational performance in Dubaian public sector organizations and found there to be a positive association. In a case study by Gagnon et al. (2015), the learning organization factor was found to contribute to nursing work in a positive way. In a study by Song et al. (2018), a positive relationship was found between the learning organization culture in Korean workforce institutions and teachers' self-efficacy as well as work engagement, which, in turn, was positively associated to job performance. Furthermore, a study conducted in the Malaysian public sector (Sulaiman et al., 2015) reported that staff of the examined organization perceived organizational learning as a strategy to improve the performance of the department in the future.

The DLOQ has also been used in higher education contexts to examine whether universities can be regarded as learning organizations. Voolaid and Ehrlich (2017) asked the staff of two Estonian universities to answer the questionnaire, and their main result was that the organizational learning rate was above average. Similarly, Holyoke et al. (2012) found learning organization characteristics in colleges and universities in Washington and Idaho (USA), but that there were differences between men and women in how they perceived learning opportunities (see also Gouthro et al., 2018). Also, the staff members of 4-year private institutions reported a more positive learning culture than did their colleagues in other types of higher education institutions.

Marsick and Watkins (2003) stress that even more interesting than the relationship between the dimensions of learning organization and organizational

performance is the finding that people-related variables influenced system variables, and these, in turn, had an influence on performance variables through strategic leadership supporting learning. They also point out the finding that the only variable that directly predicted knowledge performance was the variable measuring whether the organization had created systems to capture and share knowledge.

Different kinds of methods have been used in order to support learning organization related activities and processes, such as knowledge sharing. Yoo and Huang (2016) examined whether an e-learning system accelerates the process of companies becoming learning organizations. In their study of three Korean companies, in two of the companies e-learning systems facilitated the development of the organizations whereas no effect was found in the third one. A study on learning organizations in Indian higher education institutions (Chavla & Lenka, 2015) examined the antecedents to and consequences of becoming a learning organization, and it was found that resonant leadership, knowledge management, intrapreneurship and total quality management had a moderate impact on the learning organization characteristics.

In sum, theories by Argyris and Schön (1996), Senge (1990), as well as Marsick and Watkins (2003), and their concepts such as single- and double-loop learning, systems thinking and learning culture have had a remarkable impact on subsequent studies focusing on how organizations can bring about learning. One example of recent studies utilizing all of these frameworks is a study by Jaaron and Backhouse (2017), who examined applying the systems thinking approach to activate double-loop learning in banking and social care services. In order to bring about systems thinking, they used a specific procedure called the Vanguard Method (Seddon, 2003), where employees are to first analyze their current working system, then plan changes, and finally implement new solutions. The data were collected and analyzed with the mixed-methods approach, including the DLOQ, and interviews, observations, and documents. The findings showed that the Vanguard Method was positively related to creating double-loop learning in organizations through the activation of three factors, namely: systematic-operations improvement, organizational capacity development, and outside-in mode of working. All of these are embedded in the seven dimensions of the DLOQ.

Bak (2012) reported a case study of a UK higher education institution based on Senge's five characteristics of learning organizations. In the department studied, these characteristics were found to a limited extent and there were differences between academic and administrative members of the faculty as well as between newcomers and established staff members. The learning organization framework has also had an influence on a recent publication by the Organization for Economic Co-operation and Development (OECD, 2018). This document characterizes schools as learning organizations according to seven characteristics: (1) shared vision focused on learning by all students; (2) continuous professional learning by staff; (3) team learning and collaboration among all staff; (4) culture of inquiry, exploration and innovation; (5) systems for collecting and exchanging knowledge and learning; (6) learning with and from the external environment; and (7) modeling and growing learning leadership.

Sternberg (2015) has examined universities as learning organizations from the creativity point of view. His three-part model of institutional creative change is a tool for assessing universities' capability to move creatively into the future. The first part of the model, prerequisites, concerns universities' actual ability to change in a creative way and the belief in this ability. The second part deals with the institution's desire to change creatively, its desire to appear to change creatively, and its actual and potential creative quality. The third part of the model consists of mediating variables, such as the legitimacy of the creative-change agent, the credibility of the creative-change agent, the ownership of creative change, the rate of creative change, and the cultural compatibility of the creative change.

20.4 The Relationship Between Individual and Organizational Learning

In the literature of organizational learning and learning organization, individual learning and learning at the level of the organization are intertwined and overlap. Changes in an organization and in learning by employees are seen as interdependent. For example, Pedler, Burgoyne and Boydell (1991, p. 58) defined a learning company as “an organization that facilitates the learning of all its members and continuously transforms itself”. The close reciprocal relation between the individual and the organization is similarly emphasized in Billett's (2002a, b) notion of workplace learning as an interdependent process between how a workplace affords opportunities to participate in diverse practices and how employees choose to respond to these affordances.

Tynjälä and Nikkanen (2009, pp. 130–132) describe the interrelationship of individual and organizational learning in their model of the origin and processes of innovations in a project developing networks of vocational institutes and workplaces. In this model:

1. Work communities provided an environment characterized by (a) open communication, (b) equality, (c) innovative activities, (d) utilization of external help, and (e) effective leadership and management.
2. In such an environment, individuals were able to express new ideas and carry out small experiments, usually in collaboration with colleagues and collaborative networks.
3. Project organization—using leadership, funding resources and external contacts—organized forums for discussions, which made it possible to share knowledge and disseminate the results of the experiments.

Thus, innovative practices in this project were brought about through the interaction of all three types of actors, that is, individuals, work communities, and the development project organization. The authors concluded that individual learning can be

transformed into organizational learning when open communication and the formation of networks are intentionally promoted by the leadership.

Studies on the effects of learning organization environments have seldom examined its association to or effects on emotional aspects of individuals' learning and working. An exception is a study by Lau et al. (2017), who examined employees' perceptions of organizational culture and affective commitment through the perceptions of a learning organization in the Malaysian private sector. They found that all of the dimensions of organizational culture and what constitutes a learning organization had a significant positive correlation to affective commitment. The respondents' perceptions of learning organization mediated the relationship between the organizational culture and affective commitment. Respect for people, as a characteristic of organizational culture, and empowerment, as a learning organization characteristic, had the strongest associations with affective commitment.

20.5 Knowledge Creation and Innovative Knowledge Communities

Also concepts other than organizational learning and learning organization have been used in order to describe learning taking place beyond individuals. In their book entitled *Networked Expertise*, Hakkarainen et al. (2004) introduced the concept of the *innovative knowledge community* to depict communities that pursue creating new knowledge and transforming their practices. They present three examples of theoretical models representing innovation-seeking activities: *expansive learning* (Engeström, 1987, 2004, 2011), *knowledge building* (Bereiter & Scardamalia, 1993; Bereiter, 2002), and *knowledge creation* (Nonaka & Takeuchi, 1995). While empirical studies utilizing the concept of knowledge building have been mainly conducted in educational contexts and for student learning, the concepts of knowledge creation and expansive learning are applied in organizational contexts. In the following sections these two approaches are briefly presented.

20.5.1 Knowledge Creation in Organizations

One central research line in organizational studies has focused on knowledge creation, which is seen as a highly social process. Nonaka et al. (2000; see also Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998) have examined how organizations create, utilize and manage knowledge in a dynamic way. Their model of knowledge creation consists of three components: (1) SECI process: socialization, externalization, combination, and internalization; (2) 'ba', that is, shared space of knowledge creation; and (3) knowledge assets.

According to the model by Nonaka and colleagues the core of the knowledge creation process consists of the interaction and conversion taking place between explicit and tacit knowledge. This conversion takes place in organizations through four modes comprising the SECI process: *Socialization* is a process where tacit knowledge, that is, implicit knowledge acquired through experience, accumulates and remains implicit in nature. This kind of tacit knowledge acquisition takes place, for example, when apprentices or newcomers observe and imitate more experienced colleagues. In other words, they are socialized into existing practices. In the process called *Externalization*, tacit knowledge is explicated and thus converted into explicit knowledge. Making tacit knowledge explicit happens through conversations, meetings, dialogues and writing, for instance. As examples of this, Nonaka and his colleagues (ibid.) mention concept creation in developing new products and quality control circles where employees discuss practices on the basis of their experience over the years in order to make improvements. The third mode of knowledge conversion, *Combination*, takes place when explicit knowledge is collected from different sources and transformed into a more complex compilation of explicit knowledge. Modern information and communication technologies and networks facilitate these processes of exchanging information and documents. For instance, the annual report of an organization represents explicit knowledge combined from smaller pieces of explicit knowledge. *Internalization*, the fourth mode of knowledge conversion, is a process where explicit knowledge is embodied into tacit knowledge within individuals. This process can often be characterized by ‘learning by doing’, that is, enriching one’s understanding and developing know-how as a side effect of working. When internalized tacit knowledge is shared with others in everyday work practices, a new spiral of knowledge creation can start through new socialization processes. Thus, the SECI process is described as a spiral in which knowledge creation is an expanding process with new knowledge triggering a new spiral of knowledge creation.

Knowledge creation always takes place in a specific context, time and place. Knowledge creation requires time and space for thinking and interaction with others. Nonaka and Konno (1998; see also Nonaka et al., 2000) use the Japanese concept of *ba*, which refers to shared space for emerging relationships, comprised of both time and place. In the knowledge creation model, *ba* is a shared space and time where knowledge is created and shared. Thus, knowledge creation takes place through the interaction between individuals, or between the individuals and their environments. *Ba* may also consist of mental and virtual spaces, not only physical ones.

Nonaka and his colleagues (2000) distinguish between four types of *ba*, based on which mode of knowledge conversion, type of interaction, and type of media are used. Socialization requires interaction between individuals and face-to-face communication, and the type of *ba* for socialization is called *Originating ba*. There, people share their experiences, emotions and mental models. Typical to this *ba* is that boundaries between individuals are transcended by sympathizing and empathizing with other people. Externalization, that is articulating tacit knowledge into explicit knowledge, takes place in *Dialoguing ba* (formerly referred to as *Interacting*

ba, Nonaka & Konno, 1998). It is a place for collective interaction, sharing knowledge, and conceptualizing experiences. *Systemizing ba* (formerly referred to as *Cyber ba*, *ibid.*) is defined by virtual interactions, and it provides a context for the combination process where explicit knowledge is transformed into more complex forms. Along with the development of information and communication technologies, this type of *ba* has become ever more important for disseminating knowledge. The fourth mode of knowledge conversion, the internalization of explicit knowledge into tacit knowledge, is supported in *Exercising ba*, where explicit knowledge is applied, used and reflected in action.

An essential element in the knowledge creation model by Nonaka and his colleagues (2000) is what they call *knowledge assets*. They define *assets* as “firm-specific resources that are indispensable to create values for the firm” (*ibid.*, p. 20). The knowledge assets may be experiential, conceptual, systemic, or routinized. In the knowledge creation process, these resources may be either inputs or outputs, or moderating factors. As an example, the authors point to trust among the members of an organization. Such trust is brought about as an output of collaboration in the knowledge creation process, and, at the same time, it functions as a moderating factor of the process by affecting how the *ba* is working as a context for knowledge creation.

In sum, the knowledge creation process progresses like a spiral growing out of the SECI process in shared spaces, using knowledge assets. The role of dialectical thinking, top managements’ articulation of the organization’s knowledge vision, and the middle management’s energizing *ba* are emphasized (Nonaka et al., 2000). The created new knowledge then becomes the basis for a new spiral.

20.5.2 *Expansive Learning in Organizations*

The theory of *expansive learning* by Engeström (1987, 2011) is based on the ideas of the Russian cultural-historical school and *activity theory* (Engeström, 2011; Engeström & Sannino, 2010). The core of the activity theory is the *human activity system*, described as a triangle consisting of sub-triangles (Engeström, 1987, p. 78). One element of the model is the *Subject*, which refers to actors in a certain activity, that is, individuals or groups. Activity always has an *Object* that it is directed at and will ultimately be transformed into *Outcomes* of the activity with the aid of various *Instruments*. An individual’s activity takes place in a *Community*, directed by a certain *Division of labor* and *Rules*, that is, written or unwritten codes for how things are to be done.

Engeström (1987, 2004, 2011) depicts expansive learning as a cycle consisting of specific actions. The first phase of the learning cycle, *Questioning*, begins when employees start to criticize, question or reject established practices. This indicates that there is a need for change. The second action, *Analysis*, involves people examining reasons or causes of the situation. The analysis may aim to trace the origins of the problematic practice, or it may focus on picturing inner systemic relations of the

situation. The learning cycle continues with *Modelling* the new solution and *Examining* and testing the new model, and, after necessary adjustments, with *Implementing* the new model. The cycle concludes with the action of *Reflecting* on the whole process, plus, finally, with *Consolidating* and generalizing the new practice. The basic idea of the earlier described Vaguard Method (Seddon, 2003; Jaaron & Backhouse, 2017) is similar to the expansive learning cycle, but the latter is a more detailed model with a different theoretical background.

The theory of expansive learning has been used as a framework in numerous empirical studies in various organizations and fields (for reviews, see Engeström, 2011; Engeström & Sannino, 2010). One branch of studies involves intervention studies under the concept of Change Laboratory. In these studies, the group of researchers and staff members of the pilot unit of an organization get together in weekly meetings and follow-up sessions a few months later. The intervention involves introducing specific tasks requiring certain expansive learning actions. The purpose of the intervention is to intensify and accelerate the expansive learning cycle. Different problem situations or critical incidents of work practices are documented and the data are used as a stimuli for reflection and analysis. Customers, patients or other stakeholders may be invited to join the sessions in order to participate in the analysis of specific cases. The researchers facilitate the sessions and introduce conceptual tools and models as additional stimuli (e.g., Ahonen & Virkkunen, 2002; Virkkunen & Ahonen, 2011; Pihlaja, 2005; Teräs, 2007).

The main idea in expansive learning is that the people, together, construct and implement a new concept, object or practice to enhance their collective activity (Engeström, 1987, 2011). While, in his early studies on expansive learning, Engeström focused on transformations taking place in one single work unit or organization, in his more recent works (Engeström, 2004, 2011) activity systems are also seen to be inter-organizational or network-based. He has examined co-configuration, the type of work requiring collaboration and what he calls *negotiated knotworking*. This kind of working is characterized by a pulsating movement of tying, untying and retying together otherwise separate threads of activity. People working in separate organizations come together for a shared purpose, negotiate meanings and solve problems, and then they continue with other partners in other projects but may get together again later on. Engeström argues that this way of working is a significant new form of current expert work within and between organizations. In contexts involving co-configuration and knotworking, expansive learning processes are even more demanding, requiring boundary crossing between organizations (e.g., Engeström, 2004, 2011; Dochy et al., 2011a, b).

Fuller and Unwin (2004, 2011) have used the concept of expansive learning in a different way to describe differences between organizations in their approaches to workforce development. They presented a continuum with *expansive workplaces* on one end and *restrictive workplaces* at the other end. While the former represent organizations where people have plenty of opportunities to participate in diverse activities and communities of practice, the latter refers to workplaces with limited learning opportunities. An expansive workplace makes sure that employees have time for reflection and support their career progress, whereas a restrictive workplace

values learning only with regard to the existing job. In expansive organizations, managers serve as facilitators rather than as controllers and they value innovation and learning. In contrast, management in restrictive workplaces tends to be controlling, and old practices are often valued over innovations. The distinction between expansive and restrictive organizations can be used as a useful tool to evaluate organizations' approaches to supporting learning.

In activity theory studies, the unit of analysis is the activity system rather than an individual. However, Engeström and Kerosuo (2007, p. 340) remind us that the systemic view on its own is insufficient. Thus, they state that it is necessary within the activity system to take into account also individual persons and groups who have their own aims, agendas and emotions. Activity theory and the theory of expansive learning can be seen as representing a form of systems theory approach, approaching learning as a holistic system consisting of interdependent parts rather than as an activity of independent individuals.

20.6 Ecological Approach and Ecosystems in Learning Organization Research

In many human and social scientific fields, the ecological approach has recently emerged as a new way to examine human activity in its complicated interconnections and relations. Originally, as a field of biology, ecology examined the relations between living organisms and their environment. A central concept in ecology is the one of the ecosystem, which Ostroumov (2002, p. 141) defined as follows: "Ecosystem is the complex of interconnected living organisms inhabiting a particular area or unit of space [and time] together with their environment and all their interrelationships and relationships with the environment." In research on education and human development, Bronfenbrenner (1979, 1994, 2005) was the first one to apply the concept of ecology to describe complicated, multilevel and interrelated environments in individual development. His ecological model consisted of four interrelated and nested systems: 1) *Microsystem* including the individual's immediate social and physical environment such as family, friends and neighbourhood area; 2) *Mesosystem* consisting of two or more microsystems together; 3) *Exosystem* that has only indirect influence on the individual's development, such as educational policy; and 4) *Macrosystem* consisting of the ideologies and attitudes of the culture (Bronfenbrenner, 1979). Later, Bronfenbrenner (1986) added another level he named *Chronosystem*, which refers to socio-historical time and conditions that influence all of the other systems.

In this millennium, the concepts of ecology in general and ecosystem in particular have gained popularity in several disciplines. For example, in the field of economics, the concept of the business ecosystems (Moore, 1996) has been widely used, and concepts such as the e-learning ecosystem (e.g., Ouf et al., 2017), social learning ecosystem (e.g., Huntington & Bryant, 2014), and blended learning

ecosystems (e.g., Nikolaidou et al., 2010) have emerged in the field of educational technology. The concept has also been applied in educational policy analysis (Weaver-Hightower, 2008).

Kemmis and Heikkinen (2012) have applied ecological principles by Capra (2004) to describe ecologies of practices in the field of teacher development. These principles include *Networks*, *Nested systems*, *Niche* (this item was added by Kemmis & Heikkinen), *Interdependence*, *Diversity*, *Cycles*, *Flows*, *Development*, and *Dynamic balance*. Kemmis and Heikkinen argue that these principles can be applied to any social practices as well as to biological environments. For example, educational organizations are now more than ever networking with other organizations such as workplaces in public and private sectors. Therefore, it is important to examine how the networks are constructed on individual, unit and organizational levels, and whether the networks are dependent on individuals (which would make them vulnerable) or are embedded in basic operations and structures. The second ecological principle states that practices are interwoven, forming nested systems. Thus, an individual actor or an organization are not ‘independent’; instead, they are dependent on the structures, legislations and agreed principles that apply to the whole network or ecosystem. Interdependency between nested systems means that anything taking place in any part of the system can have an influence on the other parts. Thus, dependencies within the ecosystem mean that a rupture or problem in a specific part could affect surrounding practices or procedures. Individual components should be seen in relation to the system as a whole. Any practices related to the development of an organization’s learning capacities derive from, interrelate with and are interdependent on other practices, such as management and leadership practices. Together, these form nested systems. An ecology of practices features a diversity of practices which may have overlapping functions that can also replace one another. In biological ecosystems, the food chain is an example of cycles, and similar cycles can be seen in social practices. In nature, flows of energy can be seen, for example, in solar energy converting into chemical energy through photosynthesis. In the same vein, in organizations there are flows of information and command chains. Development as a characteristic of a biological ecosystem has its counterpart in social ecosystems of practices, since practices have a tendency to develop through stages over time. In biological ecosystems, the niche is where an individual organism fits, providing the conditions to survive. Similarly, in the economy, there may be market niches for certain products or services, and in social communities there may be niches for certain kinds of practices. As a whole, the ecological principles are characterized by a holistic approach, and organizations, as parts of larger ecosystems, are seen in the context of their interconnections with their surroundings.

Recently Barnett and Jackson (2019) published a compilation examining learning from the ecological perspective. While its main focus is on higher education, its chapters—in line with ecological thinking—connect education to its wider context, including work, society and the world at large. Learning and education are seen as practices that are interrelated with other practices. Jackson and Barnett (2019, p. 6) argue that ecological thinking and considerateness are “necessary to build a resilient

and sustainable society that cares about the whole world and not just itself.” As a conclusion, their book portrays a vision of society as a learning ecology characterized by open access to information and knowledge, collective learning, active citizenship, creative spirit—all in all: *societal learning*.

In the compilation mentioned above, Evans (2019) examines learning ecologies at work. She makes a distinction between three scales of activity—*macro*, *intermediate*, and *individual* levels—that look similar to Bronfenbrenner’s ecological systems. The *macro* level refers to wide social and economic structures as well as institutions that may either facilitate or prevent learning at the workplace. The *intermediate* level consists of activities and characteristics of the work environment that expand or restrict learning opportunities (see Fuller & Unwin, 2004). At the *individual* level, workers’ past experiences, dispositions and current situation play an important role in their work and learning. All three levels are interconnected and thus influence one another.

In Finland, universities of applied sciences (UAS) have recently applied the concept of ecosystems in a large research and development project called eAMK (eUAS), which develops the digital provision of education, enabling students to choose studies across institutional boundaries within the national UAS network. At the same time, the aim is to offer students more possibilities for work-based learning and combining work and studying. Thus, here the use of the concept of ecosystems seems to refer to the need to understand the interconnected wholeness of learners’ diverse learning environments both in formal organizations and in informal contexts, and to strengthen the connections between them. The project is funded by the Finnish Ministry of Education with the purpose of strengthening partnerships between education and work, reducing study times, and promoting the transition from higher education to work. Virolainen and Heikkinen (2019) have examined this initiative from the perspective of the actor-network theory and discussions on ecosystems of learning. They concluded that, with certain reservations, both theoretical frameworks offer useful tools to analyze the networks between educational institutions and workplaces. Their literature review shows, however, that so far the studies featuring these approaches have focused more on other subjects.

While the concepts of learning ecologies and ecosystems provide promising tools to understand educational organizations’ networking with other organizations, thus far other concepts have been used more to examine the characteristics of these potential ecosystems. For example, Billett et al. (2007) examined ten longstanding social partnerships in Australia and identified the following five principles and practices that seemed most likely to assist both the formation and development of partnerships: building and maintaining: (i) shared purposes and goals; (ii) relations with partners; (iii) capacities for partnership work; (iv) partnership governance and leadership; (v) trust and trustworthiness. Although the researchers here did not base their work on organizational learning theories or on the ecosystem concept, it is easy to see similarities between these principles and the characteristics of learning organizations (e.g., Senge, 1990; Marsick & Watkins, 2003) as well as the principles of ecosystems (Capra, 2004; Kemmis & Heikkinen, 2012). For instance, shared goals and trust are explicitly present in the learning organization measurement tool

by Marsick and Watkins (2003), and partnerships themselves represent networks and nested systems, which are the main characteristics of ecosystems.

There are some other concepts and research lines that have conceptual connections to the concepts of learning organizations and learning ecosystems or ecologies of learning. For example, the concepts of *learning cities* and *learning regions* are based on the idea of highly networked organizations and actors in certain geographical regions that, through collaboration, aim for economical growth, sustainable development or the promotion of social welfare. Yorks and Barto (2015) state that “diverse institutions that comprise cities and regions can function as organizational learning mechanisms in the 21st century. Learning cities themselves can also be conceptualized as societal learning organizations.”

20.7 Conclusions

This review of research on workplace learning at the organizational level has shown that, in recent decades, the span of related studies has been extended and the field has been enriched in terms of conceptual variety. While the first scholars in the field (such as Argyris & Schön, 1978; and Senge, 1990) relied, as starting points, on concepts and ideas related to the learning of individuals and the relationship between individual and organizational learning, more recent research lines have focused more on the cultural features of organizations. However, in all of the main lines of research in the field, individual- and organization-level learning are seen to be highly interdependent and indivisible, although the organizational characteristics are the principal focus. As Senge (1990, p. 7) put it: “An organization’s commitment to and capacity for learning can be no greater than that of its members”; or (1990, p. 139): “Organizations learn only through individuals who learn. Individual learning does not guarantee organizational learning. But without it, no organizational learning occurs.” In addition to the relationship between individual and organizational learning, other common elements between different lines of research can be identified. Shin et al. (2017) have crystallized a bulk of research on the development of sustainable learning organizations into five elements and processes, namely: establishing and communicating a clear sense of direction and purpose, empowering employees at all levels, accumulating and sharing internal knowledge, gathering and integrating external information, and challenging the status quo as well as enabling creativity.

Table 20.1 presents the main research lines of studies on learning organizations and related theoretical concepts. From the overview in the table, it can be seen that, in recent years, the context and focus of studies have expanded from individual organizations to considering the work and activities taking place in networks consisting of several organizations, and to even constellations referred to as ecosystems. This development can be seen to reflect similar trends in learning research in general: Studies on individuals’ learning from the cognitive point of view have extended toward more socio-cognitive and further to socio-cultural perspectives.

Table 20.1 Main research lines, scholars and concepts in studies of learning at the organizational level

Main research lines	Main scholars and concepts
Organizational learning and Learning organization	Argyris and Schön (1978, 1996): Single-loop and double-loop learning; theories-in-use/espoused theories; reflection; learning climate; organizational memory Senge (1990, 2012; Senge et al., 2012): Five disciplines: mental models, personal mastery, shared vision, teamwork, systems thinking Watkins & Marsick (2003): Learning organization dimensions: continuous learning opportunities, dialogue and inquiry, team learning, systems to capture and share learning empowerment, connectivity to the environment, strategic leadership for learning
Expansive learning/ Expansive workplace	Engeström (1987, 2004, 2011): activity system; learning actions: questioning, analysis, modelling, examining, testing, implementation, reflecting, consolidation; knotworking Fuller & Unwin: expansive vs restrictive workplace
Knowledge creation	Nonaka and Konno (1998): explicit and tacit knowledge; SECI process: socialization, externalization, combination, internalization; <i>ba</i> (learning space)
Networked expertise	Hakkarainen et al. (2004): innovative knowledge communities
Learning ecologies and Ecosystems of learning	Bronfenbrenner (1979, 1986, 1994, 2005): ecological systems: micro-meso-macro-chronosystems Barnett: <i>Learning ecologies</i>

In sum, the theories of organizational level learning discussed in this chapter, together, provide different perspectives and diverse conceptual tools to understand learning that goes beyond individual cognitive activity. As we have seen, they include similar elements but also different concepts directing attention to various characteristics of learning at the workplace. Chronologically, we can see movement from intra-organizational examination toward inter-organizational and networked learning, and very recently toward the concept of ecosystem. However, systems thinking, peculiar to ecological and ecosystem theories, was already present in Senge's model of the learning organization. In the same vein, activity theory represents a similarly holistic view, emphasizing the interconnectedness of different parts of the whole.

Compared to other branches of workplace learning research, studies focused on the organizational level represent more multidisciplinary and interdisciplinary lines of research, and they provide a knowledge base that is useful for other lines of workplace learning research as well (Tynjälä, 2013). Methodologically, the studies on learning at the organizational level have followed both quantitative and qualitative approaches as well as mixed methods, thereby providing not only measurement tools but also rich and deep conceptual models to understand workplace learning in a broader context.

According to Hoe (2019), interest in the learning organization concept has been growing among researchers, especially in the fields of health care and education; and the research plays an important role in improving organizational culture, innovation capacity, and performance. Similarly, Bui (2019) argues that the concept is

still relevant to organizational management and development in the 21st century. Thus, we can expect that, in the future, research on learning organizations will continue to be relevant and further enriched by other concepts and models such as those presented in this chapter. The direction of the research seems to extend from intra-organizational studies toward research on wider networks or ecosystems of organizations and the interconnections between them.

References

- Ahonen, H., & Virkkunen, J. (2002). Shared challenge for learning: Dialogue between management and frontline workers in knowledge management. *International Journal of Information Technology and Management*, 2(1–2), 59–84.
- Argyris, C., & Schön, D. (1978). *Organizational learning: A theory of action perspective*. Addison Wesley.
- Argyris, C., & Schön, D. A. (1996). *Organizational learning II: Theory, method and practice*. Addison-Wesley.
- Bak, O. (2012). Universities: Can they be considered as learning organizations? A preliminary micro-level perspective. *The Learning Organization*, 19(2), 163–172.
- Barnett, R., & Jackson, N. (Eds.). (2019). *Ecologies for learning and practice. Emerging insights, sightings, and possibilities*. Routledge.
- Bereiter, C. (2002). *Education and mind in the knowledge age*. Erlbaum.
- Bereiter, C., & Scardamalia, M. (1993). *Surpassing ourselves: An inquiry into the nature of expertise*. Open Court.
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012). Defining twenty-first century skills. In P. Griffin, B. McGraw, & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 17–66). Springer.
- Billett, S. (2002a). Workplace pedagogic practices: Co-participation and learning. *British Journal of Educational Studies*, 50(4), 457–483.
- Billett, S. (2002b). Toward a workplace pedagogy: Guidance, participation, and engagement. *Adult Education Quarterly*, 53(1), 27–43.
- Billett, S., Ovens, C., Clemans, A., & Seddon, T. (2007). Collaborative working and contested practices: Forming, developing and sustaining social partnerships. *Journal of Education Policy*, 22(61), 637–656.
- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press.
- Bronfenbrenner, U. (1986). Ecology of the family as a context for human development: Research perspectives. *Developmental Psychology*, 22, 723–742.
- Bronfenbrenner, U. (1994). *Ecological models of human development*. In *International Encyclopedia of Education* (Vol. 3, 2nd ed.). Elsevier SIVUT.
- Bronfenbrenner, U. (2005). The developing ecology of human development: Paradigm lost or paradigm regained. In U. Bronfenbrenner (Ed.), *Making human beings human: Bioecological perspectives on human development* (pp. 94–105). Sage.
- Bui, H. T. M. (2019). Senge's learning organization: The development of the learning organization model. In A. Örterblad (Ed.), *The Oxford handbook of the learning organization* (pp. 35–49). Oxford University Press.
- Cairns, L. (2011). Learning in the workplace: Communities of practice and beyond. In M. Malloch, L. Cairns, K. Evans, & B. O'Connor (Eds.), *The SAGE handbook of workplace learning* (pp. 73–85). Sage.
- Capra, F. (2004). *The hidden connections: A science for sustainable living*. Anchor.

- Chavla, S., & Lenka, U. (2015). A study on learning organizations in Indian higher educational institutes. *Journal of Workplace Learning*, 27(2), 142–161.
- Chiva, R., & Alegre, J. (2009). Organizational learning capability and job satisfaction: an empirical assessment in the ceramic tile industry. *British Journal of Management*, 20(3), 323–340.
- Cox, A. M. (2005). What are communities of practice? A comparative review of four seminal works. *Journal of Information Science*, 31(6), 527–540.
- Dochy, F., Engeström, Y., Sannino, A., & van Meeuwen, N. (2011a). Inter-organisational expansive learning at work. In F. Dochy, D. Gijbels, M. Segers, & P. van den Bossche (Eds.), *Theories of learning for the workplace. Building blocks for training and professional development programs* (pp. 125–147). Routledge.
- Dochy, F., Gijbels, D., Segers, M., & van den Bossche, P. (Eds.). (2011b). *Theories of learning for the workplace. Building blocks for training and professional development programs*. Routledge.
- Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Orienta-Konsultit.
- Engeström, Y. (2004). The new generation of expertise. Seven theses. In H. Rainbird, A. Fuller, & A. Munro (Eds.), *Workplace learning in context* (pp. 145–165). Routledge.
- Engeström, Y. (2011). Activity theory and learning at work. In M. Malloch, L. Cairns, K. Evans, & B. O'Connor (Eds.), *The SAGE handbook of workplace learning* (pp. 86–104). Sage.
- Engeström, Y., & Kerosuo, H. (2007). From workplace learning to inter-organizational learning and back: The contribution of activity theory. *Journal of Workplace Learning*, 19, 336–342.
- Engeström, Y., & Sannino, A. (2010). Studies of expansive learning: Foundations, findings and future challenges. *Educational Research Review*, 5, 1–24.
- Evans, K. (2019). Learning ecologies at work. In I. R. Barnett & N. Jackson (Eds.), *Ecologies for learning and practice. Emerging insights, sightings, and possibilities* (pp. 163–176). Routledge.
- Fadel, C., Bialik, M., & Trilling, B. (2015). *Four-dimensional education: The competencies learners need to succeed*. Center for Curriculum Redesign.
- Fuller, A., & Unwin, L. (2004). Expansive learning environments. Integrating organizational and personal development. In H. Rainbird, A. Fuller, & A. Munro (Eds.), *Workplace learning in context* (pp. 126–144). Routledge.
- Fuller, A., & Unwin, L. (2011). Workplace learning and the organization. In M. Malloch, L. Cairns, K. Evans, & B. O'Connor (Eds.), *The SAGE handbook of workplace learning* (pp. 46–59). Sage.
- Gagnon, M., Payne-Gagnon, J., Fortin, J.-P., Parée, G., Côté, J., & Courcy, F. (2015). A learning organization in the service of knowledge management among nurses: A case study. *International Journal of Information Management*, 35(5), 636–642. <https://doi.org/10.1016/j.ijinfomgt.2015.05.001>
- Gephart, M. A., Marsick, V. J., Van Buren, M. E., & Spiro, M. S. (1996). Learning organizations come alive. *Training and Development*, 50(12), 34–45.
- Gouthro, P., Taber, N., & Brazil, A. (2018). Universities as inclusive learning organizations for women? Considering the role of women in faculty and leadership roles in academe. *Learning Organization*, 25(1), 29–39.
- Hakkarainen, K., Palonen, T., Paavola, S., & Lehtinen, E. (2004). *Communities of networked expertise: Professional and educational perspectives*. Elsevier.
- Hernandez, M. (2003). Assessing tacit knowledge transfer and dimensions of a learning environment in Colombian businesses. *Advances in Developing Human Resources*, 5(2), 215–221.
- Hoe, S. L. (2019). The topicality of the learning organization: Is the concept still relevant today? In A. Örterblad (Ed.), *The Oxford handbook of the learning organization* (pp. 19–32). Oxford University Press.
- Holyoke, L. B., Sturko, P. A., Wood, N. B., & Wu, L. J. (2012). Are academic departments perceived as learning organizations? *Educational Management and Leadership*, 40(4), 436–448.
- Huntington, B., & Bryant, J. A. (2014). *Integrating technology and medica and the social learning ecosystem. The evolving state of formal learning*. Routledge.

- Institute for Future. (2011). *Future work skills 2020*. http://www.iftf.org/uploads/media/SR-1382A_UPRI_future_work_skills_sm.pdf. Assessed 12 Sept 2016.
- Jaaron, A. A. M., & Backhouse, C. J. (2017). Operationalising “double-loop” learning in service organisations: A systems approach for creating knowledge. *Systemic Practice and Action Research*, 30, 317–337.
- Jackson, N., & Barnett, R. (2019). Introduction: Steps to ecologies for learning and practice. In R. Barnett & N. Jackson (Eds.), *Ecologies for learning and practice. Emerging insights, sightings, and possibilities* (pp. 1–15). Routledge.
- Kemmis, S., & Heikkinen, H. (2012). Future perspectives. Peer-group mentoring and international practices for teacher development. In H. Heikkinen, H. Jokinen, & P. Tynjälä (Eds.), *Peer-group mentoring for teacher development* (pp. 144–170). Routledge.
- Kramer, R., & Tyler, T. (1996). *Trust in organizations: Frontiers of theory and research*. Sage.
- Lave, J., & Wenger, E. (1991). *Situated learning. Legitimate peripheral participation*. Cambridge University Press.
- Lau, P. Y., McLean, G. N., Hsu, Y.-C., & Lien, B. Y.-H. (2017). Learning organization, organizational culture, and affective commitment in Malaysia: A person–organization fit theory. *Human Resource Development International*, 20(2), 159–179.
- Marsick, V. J., & Watkins, K. E. (1990). *Informal and incidental learning in the workplace*. Routledge.
- Marsick, V. J., & Watkins, K. E. (1997). Lessons from informal and incidental learning. In J. Burgoyne & M. Reynolds (Eds.), *Management learning: Integrating perspectives in theory and practice* (pp. 295–311). Sage.
- Marsick, V. J., & Watkins, K. E. (2003). Demonstrating the value of an organization’s learning culture: the dimensions of the learning organization questionnaire. *Advances in Developing Human Resources*, 5(2), 132–151.
- Mezirow, J. (1991). *Transformative Dimensions of Adult Learning*. Jossey-Bass.
- Moore, J. F. (1996). *The death of competition: Leadership & strategy in the age of business ecosystems*. Harper Business.
- Ngah, R., Tai, T., & Bontis, N. (2016). Knowledge management capabilities and organizational performance in roads and transport authority of Dubai: The mediating role of learning organization. *Knowledge and Process Management*, 23(3), 184–193.
- Nikolaidou, M., Sofianopoulou, C., Alexopoulou, N., & Anannostopoulos, D. (2010). The blended learning ecosystem of an academic institution in Greece. *International Journal of Web-Based Learning and Teaching Technologies*, 5(3), 14–35.
- Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1), 14–37.
- Nonaka, I., & Konno, N. (1998). The concept of “ba”: Building a foundation for knowledge creation. *California Management Review*, 40(3), 40–54.
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company. How Japanese companies create the dynamics of innovation*. Oxford University Press.
- Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba, and leadership: A unified model of dynamic knowledge creation. *Long Range Planning*, 33, 5–34.
- OECD. (2018). *Developing schools as learning organisations in Wales, implementing education policies*. OECD Publishing. <https://doi.org/10.1787/9789264307193-en>
- Ouf, S., Abd, E., Mahmoud, S., Salama, S. E., & Helmy, Y. (2017). A proposed paradigm for smart learning environment based on semantic web. *Computers in Human Behavior*, 72, 796–818.
- Ostroumov, S. A. (2002). New definitions of the concepts and terms ecosystem and biogeocenosis. *Doklady Biological Sciences*, 383, 141–143.
- Örtenblad, A. (2013). What do we mean by ‘learning organization’? In A. Örtenblad (Ed.), *Handbook of research on the learning organization: Adaptation and context* (pp. 22–34). Elgar.
- Pedler, M., Burgoyne, J., & Boydell, T. (1991). *The learning company: A strategy for sustainable development*. McGraw-Hill.

- Pihlaja, J. (2005). *Learning in and for production: An activity-theoretical study of the historical development of distributed systems of generalizing*. University of Helsinki. Department of Education.
- Seddon, J. (2003). *Freedom from command and control: a better way to make the work work*. Vanguard Education.
- Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. Doubleday.
- Senge, P. M. (2012). The systems citizen. Education for an interdependent world. In P. Senge, N. Cambron-McCabe, T. Lucas, B. Smith, J. Dutton, & A. Kleiner (Eds.), *Schools that learn. A fifth discipline fieldbook for educators, parents, and everyone who care about education*. Crown Business.
- Senge, P., Cambron-McCabe, N., Lucas, E., Smith, B., Dutton, J., & Kleiner, A. (2012). *Education for an interdependent world. In schools that learn. A fifth discipline fieldbook for educators, parents, and everyone who care about education*. Crown Business.
- Seppänen, R., Blomqvist, K., & Sundqvist, S. (2007). Measuring inter-organizational trust – A critical review of the empirical research 1990–2003. *Industrial Marketing Management*, 36(2), 249–265.
- Shin, H. W., Picken, G. C., & Dess, G. G. (2017). Revisiting the learning organization: How to create it. *Organizational Dynamics*, 46, 46–56.
- Song, J. H., Chai, D. S., Kim, J., & Bae, S. H. (2018). Job performance in the learning organization: The mediating impacts of self-efficacy and work engagement. *Performance Improvement Quarterly*, 30(4), 249–271.
- Sternberg, R. J. (2015). A model of institutional creative change for assessing universities as learning organizations. *Creativity Research Journal*, 27(3), 254–261.
- Sulaiman, W., Mahbob, M. & Sannusi, S. (2015). Social capital and the learning organization: Transformation in Malaysian public sector. *Journal of Asian Pacific Communication*, 25(2), 208–219. <https://doi.org/10.1075/japc.25.2.04wan>
- Sveiby, K.-S., & Simons, R. (2002). Collaborative climate and effectiveness of knowledge work – An empirical study. *Journal of Knowledge Management*, 6(5), 420–433.
- Teräs, M. (2007). *Intercultural learning and hybridity in the culture laboratory*. University of Helsinki. Department of Education.
- Thamhain, H. (2013). Building a collaborative climate for multinational projects. *Procedia – Social and Behavioral Sciences*, 74, 316–328.
- Tsang, E. W. K. (1997). Organizational learning and the learning organization: A dichotomy between descriptive and prescriptive research. *Human Relations*, 50(1), 73–89.
- Tynjälä, P. (2013). Toward a three-P model of workplace learning: A literature review. *Vocations and Learning*, 6(1), 11–36.
- Tynjälä, P., & Nikkanen, P. (2009). Transformation of individual learning to organizational and networked learning in vocational education. In M.-L. Stenström & P. Tynjälä (Eds.), *Towards integration of work and learning* (pp. 117–135). Springer.
- Virkkunen, J., & Ahonen, H. (2011). Supporting expansive learning through theoretical-genetic reflection in the change laboratory. *Journal of Organizational Change Management*, 24(2), 229–243.
- Virolainen, M., & Heikkinen, H. L. T. (2019). Vocational education and training institutions' collaboration with the world of work from the perspective of actor networks and ecosystems of learning. In L.M. Herrera, M. Teräs, & P. Gougoulakis (Eds.), *Vocational education and training: The world of work and teacher education. emergent issues in research on vocational education and training 3* (ss. 67–97). Premiss.
- Visser, M. (2016). Organizational learning capability and battlefield performance. *The British Army in World War II. International Journal of Organizational Analysis*, 24(4), 573–590.
- Visser, M., & Van der Togt, K. (2016). Learning in public sector organizations: A theory of action approach. *Public Organization Review*, 16, 235–249.

- Voolaid, K., & Ehrlich, Ü. (2017). Organizational learning of higher education institutions: The case of Estonia. *Learning Organization*, 24(5), 340–354.
- Watkins, K. E., & Marsick, V. J. (1993). *Sculpting the learning organization*. Jossey-Bass.
- Watkins, K. E., & Marsick, V. J. (2003). Summing up: Demonstrating the value of an organization's learning culture. *Editorial. Advances in Developing Human Resources*, 5(2), 129–131.
- Weaver-Hightower, M. B. (2008). An ecology metaphor for educational policy analysis. *Educational Researcher*, 37(3), 153–167.
- Wenger, E. (1998). *Communities of practice. Learning, meaning and identity*. Cambridge University Press.
- Wenger, E., McDermott, R., & Snyder, W. M. (2002). *Cultivating communities of practice*. Harvard Business School Press.
- Yang, B. (2003). Identifying valid and reliable measures for dimensions of a learning culture. *Advances in Developing Human Resources*, 5(2), 152–162. <https://doi.org/10.1177/1523422303005002003>
- Yoo, S. & Huang, W. (2016). Can e-learning system enhance learning culture in the workplace? A comparison among companies in South Korea. *British Journal of Educational Technology*, 47(4), 575–591 <https://doi.org/10.1111/bjet.12240>
- Yorks, L., & Barto, J. (2015). Workplace, organizational, and societal: Three domains of learning for 21st-century cities. *New Directions for Adult and Continuing Education*, 145, 35–44.

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Correction to: Changing Appreciation of Vocational Learning During Work – The Case of the German Apprenticeship System



Karl-Heinz Gerholz and Bernd Gössling

Correction to:
Chapter 18 in: C. Harteis et al. (eds.), *Research Approaches on Workplace Learning, Professional and Practice-based Learning* 31, https://doi.org/10.1007/978-3-030-89582-2_18

The original version of the book was inadvertently published with incorrect affiliation of Prof. Bernd Gössling. This has been corrected to University of Innsbruck, Innsbruck, Austria.

The updated version of this chapter can be found at
https://doi.org/10.1007/978-3-030-89582-2_18

© Springer Nature Switzerland AG 2022
C. Harteis et al. (eds.), *Research Approaches on Workplace Learning*,
Professional and Practice-based Learning 31,
https://doi.org/10.1007/978-3-030-89582-2_21

C1

Index

A

- Academics, 15, 22, 52, 69, 82, 100, 102, 131, 133, 139, 141, 160, 210, 222, 231, 248, 258, 259, 266, 267, 270, 333, 406, 408–410, 435
- Action/activity theory
 - reflective action, 13
- Adaptivity
 - action adaptivity, 221
- Agency
 - work, viii, 4, 6–16, 19, 21, 22, 35, 36, 40, 159, 163, 165, 168, 172, 193, 423
- Apprentice/apprenticeship, ix, 60, 168–170, 292, 313, 333, 336, 339, 350, 351, 356, 358, 359, 375, 380, 399–411, 438
- Assessment, ix, x, 59, 124, 127, 128, 131, 192, 214, 215, 272, 289, 305, 306, 308–317, 327–330, 334, 338, 339, 361
- Authenticity, 310, 311, 313
- Automation, 138, 150, 416–417, 419, 425

B

- Behaviour
 - agentic, 7, 8, 11
 - reflective, 261
- Briefing
 - debriefings, 212
- Broadening task, 335

C

- Capability, 53, 204, 220, 261, 307, 314, 415, 417, 419–421, 423, 434, 436
- Career
 - choices, 140, 360
- Change, vii–x, 3, 6–8, 11, 13, 16, 17, 19, 20, 22, 30, 37, 38, 40, 80, 87, 91, 94, 99, 102, 104, 128, 133, 138, 140–144, 158, 159, 164, 165, 171, 179, 185, 191–193, 202–204, 208, 209, 211, 213, 220, 223, 241, 242, 244, 245, 247, 248, 260, 261, 282, 284, 285, 288, 289, 291, 292, 294–296, 322, 325, 327, 331, 348–350, 368, 370, 381, 405, 409–410, 416, 417, 419–420, 423, 425, 431, 435, 436, 439, 440
- Citation analysis, 47–71
- Coach, 146, 222, 289, 340
- Collaboration, 15, 33, 52, 140, 144, 181, 182, 192, 193, 202, 203, 214, 232, 260, 265, 268, 274, 316, 328, 351, 433–436, 439, 440, 444
- Commitment, 14, 30, 32–34, 36, 37, 40, 50, 100–103, 142, 322, 323, 325–326, 333, 432, 437, 444
- Communication, 50, 128, 138, 149, 190, 191, 206, 227, 243, 247, 248, 265–267, 311, 329, 330, 336, 338, 359, 402, 431–433, 436–439
- Competence
 - assessment, 306, 308–317
- Confidence, 36, 104, 208, 209, 225, 335, 401

- Contributor/contribution
 inter-psychological contribution, 166
 intra-psychological contribution, 160, 162
 Conversational, 242, 271, 315, 341, 438
 Cooperation, 190, 284, 288, 356, 357,
 359, 361
 Creativity, 20, 138, 150, 202, 207, 208, 293,
 352, 353, 357, 419, 436, 444
 Culture, ix, 7, 30, 33, 48, 51, 53, 56, 57, 61,
 68, 70, 128, 132, 140, 142, 146, 148,
 149, 158, 163, 164, 186, 191, 193, 240,
 263, 264, 268, 273, 275, 287, 288, 323,
 328, 329, 334, 336, 405, 407, 433–435,
 437, 441, 445
- D**
- Decision
 making, 53, 128, 258, 330, 341, 342,
 405, 407
 Deliberate practice, 118, 121
 Development
 career, 6, 137, 143, 144, 148–150, 192,
 348, 349, 352, 372, 378, 379, 381,
 383, 384
 expertise, viii, 15, 118, 119, 132, 187,
 193, 351
 human resource, 21, 42, 350, 417, 422, 425
 organisational, viii, 13, 19, 43, 107, 144,
 147, 148, 261, 275, 379, 384
 personal, viii, 38, 52, 141, 149, 150, 159,
 161, 162, 164, 169, 171, 172, 184, 193,
 221–223, 261, 349, 351, 353, 368, 371,
 372, 378, 379, 381, 383–385
 Diaries
 diary method, 52, 361
 Digitalisation, 324, 415–426
 Dual system, 356, 358, 360,
 403–405, 408–410
- E**
- Education
 vocational, vii, ix, 37, 78, 139, 145, 150,
 229, 305–307, 310, 350–360, 368–373,
 375–384, 399, 404–407, 409, 410, 416,
 417, 419, 420
 Emotion, 14, 34, 36, 38, 39, 41, 43, 48, 50–53,
 59–62, 131, 142, 151, 228, 230, 292,
 294, 426, 438, 441
 Employee, 7, 10, 11, 13, 15–19, 21, 30, 32, 34,
 35, 38–43, 57, 62, 63, 78, 79, 90, 92,
 95–98, 138, 142, 146–148, 150, 181,
 220, 222, 225–227, 229, 230, 232, 283,
 286, 316, 339, 348–354, 372, 385, 392,
 404, 411, 415, 420–423, 426, 430, 431,
 434–440, 444
 Employer, 11, 102, 306, 309, 348–350, 352,
 353, 355, 356, 378, 385, 404, 406, 407,
 411, 417, 421, 422
 Environment
 learning, 6, 10, 13, 15, 35, 41, 105, 106,
 118, 141, 142, 146, 148, 150, 207, 223,
 230, 247, 260, 265, 275, 314, 316, 324,
 327–330, 341, 350, 351, 353, 354, 358,
 360, 361, 369, 406, 421, 424–426,
 434, 443
 working, 105, 106, 142, 148, 150,
 202, 316, 329, 350, 358, 360, 361,
 405, 426
 ePortfolio, 328
 Error, viii, 48–63, 65, 66, 68–71, 202, 287,
 288, 290, 341, 431, 432
 Evaluation, 68, 206, 221, 223, 225, 228,
 289, 359
 Experience
 experiential learning, 48, 52, 54, 79
 Expertise, vii, viii, 11, 13, 15, 16, 30, 32, 50,
 52, 53, 57, 118–122, 124, 125, 127,
 128, 131–133, 139, 143–145, 147–151,
 170, 171, 179, 184, 185, 187, 188,
 190–193, 202, 208, 210, 231, 244,
 247, 249, 273, 322, 323, 326, 328,
 332, 338, 340, 351, 417, 422,
 423, 426, 437, 445
 Expert, 51, 53, 57, 58, 118, 119, 124–128,
 132, 143, 146, 148–150, 166, 170, 172,
 184, 187, 188, 190, 191, 206, 210, 231,
 260, 261, 323, 326–328, 340, 353, 356,
 417, 440
 Eye-tracking, viii, 120, 122, 123, 126–129,
 131, 132, 227, 426
- F**
- Factors
 contextual, 5, 7, 8, 53–54, 56, 62, 68, 80,
 150, 211, 220, 227
 situational, 7, 8, 147, 148
 Fear, 36, 127
 Feedback, 6, 11, 17, 18, 50, 52, 127,
 131, 146, 182, 192–193, 202, 207,
 212, 214, 244, 287, 288, 292,
 316, 317, 434

G

Gender, 63, 94, 95, 100, 104, 187, 225, 246,
284, 287, 326, 360

Guidance, 10, 11, 56, 146, 166, 167, 171, 260,
267, 326–327, 334, 336, 337, 340, 341,
349, 353

H

Hierarchy, 11, 284, 287, 311, 317, 415

I

Identity

professional identity negotiations, 30,
31, 35–41

Individual, viii, ix, 4–22, 30–40, 42, 47–71,
78, 80, 83, 91, 104–106, 137–139,
141–146, 148–151, 157–173, 179–187,
191–193, 202, 203, 209–211, 214, 223,
228–232, 239–249, 258–263, 265, 266,
268, 272–275, 283–288, 290, 292, 295,
305–310, 314–316, 322, 324, 326,
327, 334, 340, 341, 348–356, 359,
360, 368, 370, 383–385, 391, 392,
399–405, 407, 408, 410, 411,
415–418, 421, 423, 425, 431–433,
436–439, 441–445

Innovation, 19, 147, 158, 159, 163, 165, 167,
181, 186, 187, 192, 213, 258–260, 262,
266–268, 270–272, 274, 275, 282, 286,
292, 293, 324, 418, 433, 435, 436,
441, 445

Interaction, 9, 10, 14, 30, 39, 41, 42, 52, 68,
79, 106, 124, 140, 143, 146, 149, 150,
158, 162, 164, 166, 172, 180–184, 187,
188, 190, 191, 193, 194, 202, 203, 212,
224, 228, 240–245, 247–249, 259, 260,
263, 265, 266, 268, 272–275, 286, 288,
291, 292, 294, 295, 312, 315–317, 324,
326, 332, 341, 342, 361, 400, 418, 436,
438, 439

Interdependence, 10, 160, 163, 173, 184,
240, 265, 294, 430, 442

J

Job

control, 102
demands, 384
quality, 357, 359, 371–373, 376, 377, 380,
381, 400

quantity, 80, 371–373, 376, 379–382
stability, 371–373, 376, 378, 380, 381

K

Knowledge

conceptual, 138, 145, 162, 170, 171, 259,
260, 262, 264, 274, 307, 439, 445
declarative, 180
domain-specific knowledge, 118, 119,
263, 332
inert knowledge, vii, 415
knowledge communities, 430, 437–441
knowledge creation, 140, 258–275, 289,
339, 430, 437–441
knowledge management (KM), 351,
434, 435
negative, 52, 58, 62, 64, 68,
194, 207
procedural, 162, 170–172, 180, 307
tacit, 53, 146, 168, 186, 261, 434, 438

L

Labour

division of labour, vii, 267

Learning

affordance, 4, 12, 14, 39, 118, 133, 146,
222, 224, 231, 436
context, 4, 5, 7–11, 13–16, 21, 22, 35,
51–54, 56, 68, 71, 79, 80, 94, 105,
107, 108, 119, 139–144, 148–151,
173, 185, 192, 206, 209, 211, 214,
220, 221, 225, 228–232, 241, 258,
260, 261, 263, 264, 275, 281–296, 306,
310, 317, 324, 328–331, 333, 335, 342,
350, 352–355, 358, 360, 371, 400, 405,
406, 415, 423, 430, 434, 437,
440, 442–445
continuous, 78, 137, 140, 145–147, 149,
179, 211, 220, 223, 224, 226,
317, 434, 435, 445
culture, ix, 7, 48, 51, 53, 56, 57, 68, 70,
140, 142, 146, 148, 149, 158, 163, 186,
191, 193, 240, 263, 264, 272, 273, 287,
288, 290, 293, 323, 328, 329, 334,
433–435, 437, 445
demand, vii, 10, 21, 22, 39, 118, 132,
137, 148, 149, 166, 221, 222, 294,
307, 322, 349, 350, 352, 358,
360, 361, 417, 421
ecologies of, 430, 442, 444

Learning (*cont.*)

environment, vii, ix, 4, 6–8, 10, 13, 15, 16, 19, 35, 37, 39, 41, 79, 80, 105, 106, 118, 119, 141, 142, 146, 148–151, 179, 190, 191, 207, 214, 215, 223, 225, 227, 230–232, 247, 258, 260, 264, 265, 275, 286, 309, 317, 324, 327–330, 341, 350–354, 357, 358, 360, 361, 369, 404, 406, 407, 410, 421–424, 426, 434, 435, 437, 442, 443, 445

from errors, viii, 47–71

experience, 10, 11, 14, 20, 37, 39, 52, 70, 140, 142, 146–148, 159–162, 166–169, 172, 202, 207, 221, 224, 225, 230, 241, 264, 352, 353, 357, 358, 360, 405, 408, 415, 433, 443

experiential, 48, 52, 54, 79

formal, vii, x, 10, 11, 13, 39, 51, 53, 56, 79, 105, 107, 108, 139, 140, 143–146, 148–151, 182, 207, 222, 225, 289, 306, 307, 309, 314, 322, 323, 329–331, 335, 338, 339, 352–354, 358, 360, 371, 402, 411, 415, 430, 443

future of, viii, 342

informal, vii, 11, 39, 48, 53, 54, 68, 70, 79, 105, 107, 108, 139, 143–151, 169, 182, 193, 222, 225, 226, 232, 306, 314, 323, 324, 327, 329, 331, 338, 339, 352–354, 360, 400, 430, 433, 443

learning management system (LMS), 267

lifelong, 133, 221, 322, 325, 349, 357

mediating, 141, 167, 172, 185, 186, 264, 334, 436

occupational, 13, 15, 144, 158–160, 163–165, 167–169, 172, 173, 190, 306, 307, 309, 355–357, 359, 360

organisational, 7, 17, 31, 34, 40, 103, 106, 108, 275, 285, 286, 288, 290, 294, 296, 322, 333, 334, 337, 417

potential, 6, 10, 11, 16, 22, 31, 39, 65, 118, 138, 142, 148, 191, 192, 205, 209–211, 215, 225, 248, 258, 261, 264, 274, 275, 284, 289, 290, 339, 353, 357, 358, 360, 416, 436, 443

process, viii–x, 4, 11–13, 19, 22, 35, 39, 41, 49, 52, 56, 68, 70, 78, 80, 81, 105, 106, 118, 137, 139–146, 148–151, 158–170, 172, 173, 182, 183, 186, 187, 192, 202–207, 209–213, 220–228, 230–232, 240–242, 245–247, 249, 260–265, 272–275, 282, 284–287, 289–291, 293, 294, 296, 305, 307, 309, 314, 316, 317, 324, 329, 331, 339, 340, 351, 352, 354, 355, 359,

361, 380, 402, 404, 405, 407, 408, 410, 415, 416, 424–426, 434–436, 440, 444

professional, viii, ix, 4, 5, 9–16, 21, 22, 30, 31, 34, 35, 37, 39–41, 43, 57, 118, 119, 124, 132, 137–151, 179–194, 213, 220–227, 229–232, 258, 261, 263, 272, 289, 306, 307, 314, 317, 322–342, 351, 353–355, 358–361, 380, 382, 415, 423, 435

self-regulated, 16, 141, 220–227, 229, 329

space, 138, 146, 170, 240, 263, 334, 336, 338, 339, 352, 422

team, ix, 48, 51, 53, 182, 202–213, 225, 228, 229, 240, 241, 245, 246, 248, 249, 258, 261, 262, 272, 274, 275, 284–289, 291–295, 322, 341, 432

technology-enhanced, ix, 324, 331, 332

vocational, x, 13, 31, 137–139, 144, 149, 293, 308, 309, 312, 314, 315, 317, 339, 349, 350, 355, 356, 359, 361, 380, 382, 399–411, 436

Legitimate peripheral participation (LPP), 51, 353

Literature review, 47–71, 77–108, 369, 373, 381–384, 424, 443

M

Management, vii, 14, 31, 35, 42, 48, 54, 64–66, 69, 70, 100, 102–104, 118, 122, 124, 127, 128, 130, 142, 146, 202, 206, 261, 323, 324, 330, 334, 339, 341, 348, 349, 359, 407, 417, 425, 426, 430, 435, 436, 439, 441, 442, 446

Matthew effect, 421

Medical/medicine, 69, 139, 214, 231, 240, 261, 315, 342

Mental model/picture, 39, 70, 204, 209, 210, 240, 242, 246, 423, 432, 438, 445

Mentoring, 10, 39, 79, 108, 146, 149, 289

Monitoring, 18, 19, 52, 53, 125, 128, 131, 221, 222, 227, 228, 341, 356, 404, 426

Motivation
learning, viii, 61, 78–82, 85, 93–108, 124, 334, 335

N

Network
social network analysis, ix, 181, 182, 193, 249, 250, 259

Norm, 33, 49, 51, 163, 243, 247, 284, 327, 333, 355, 378, 385, 431

Novice, 11, 51, 118, 124, 125, 127, 128,
130–132, 143, 150, 168, 228,
340, 407

O

Observation, vii, 41, 61, 104, 130–132, 159,
167–169, 209, 226, 260, 267, 292, 295,
308, 317, 435

Occupation

occupational competence, 160, 306, 355,
356, 360

Organisation

learning organisation, 282, 286, 289
organisational learning, 293
organisational practice, 19

Outcome, x, 17, 22, 36, 40, 41, 49, 52, 53, 56,
59, 68, 70, 78, 79, 103, 127, 129, 141,
143, 158–160, 163, 167, 169–173, 181,
183, 193, 202, 204, 207, 212–214, 220,
223–225, 229, 231, 239–242, 249, 264,
266, 272, 273, 275, 282–287, 289–291,
293, 294, 296, 330, 338, 353, 354, 357,
358, 361, 368–373, 376–385, 431, 432,
434, 439

P

Personal

factors, 162

Personality, 8, 15, 17, 19, 37, 53, 59, 66, 100,
101, 103, 104, 127, 160, 163, 225,
349–351, 402, 403, 406

Potential, 17, 20, 42, 132, 138, 147, 160, 171,
202, 214, 248, 259, 266, 284, 325, 342,
354, 368, 369

Practice

cultural, 158, 263

social, 51, 141, 144, 159, 168, 171,
180, 230, 231, 263, 306, 317, 329,
400, 430

Premises, 22, 160–163, 209, 402, 431

Proactivity, 13, 16–18, 20–22

Profession

professional agency, 9, 15, 35, 36, 40

professional competence, 12, 360,
361, 380

professional development, 140, 144

professional growth, 137–151, 179

professional learning, 16, 30, 57, 118, 119,
124, 132, 138, 140, 142, 145, 179–183,
185–194, 220–232, 258, 259, 263, 275,
289, 322–342, 353, 355, 435

professional vision, 120, 132

R

Recognition, ix, 35, 146, 169, 209, 210, 244,
275, 306, 309, 310, 322, 326, 327, 335,
338, 360, 400–411, 426

Reflection

reflection-in-action, 338, 340

reflection-on-action, 147

Reflexivity

social, 206

task, 210

Reliability, 48, 66, 70, 130, 312

Resource, vii, 9, 12, 14–16, 18, 19, 38–40, 53,

66, 80, 120, 147, 150, 181, 184–187,

190, 192, 193, 223, 230, 245, 259,

263–265, 269–273, 288, 324, 328, 330,

334–341, 350, 368, 369, 371–373,

378–385, 419, 421, 422, 436, 439

Responsibility, 7, 32, 33, 36, 52, 147, 202,

220, 222, 223, 228, 239–241, 283,

284, 328, 341, 348, 353, 356, 402,

404, 415

S

School-to-work transition, 358, 367–385

Self-direction, 21

Self-regulation, ix, 16, 18–20, 49, 53,
219–232, 335, 420, 421

Simulation, 41, 59, 206, 210, 264, 289, 310,

311, 313, 330, 331, 336, 358, 418

Situational adaptivity, 208, 213

Skill, vii, 10, 32, 38, 53, 83–85, 87–93, 100,

118–121, 123, 125, 128, 137–140,

143–145, 148–151, 158, 168, 169, 172,

190, 192, 207, 214, 215, 220, 241–243,

286, 292, 306–310, 322, 323, 325, 328,

333, 336, 341, 348–352, 355–358, 361,

369–371, 375, 377–380, 382–384, 399,

402–405, 409, 410, 433

Social

constructivism, 144

influence, 240, 242–250

networks, 13, 179–194, 242, 243,

247–249, 372

social network analysis (SNA), ix, 181,

182, 193, 249, 250, 259

socio-technical design, 335

Solution database, 55, 108, 373, 392

Socialisation, 35, 146, 163, 262

Strategy

inquiry, 431

Structural Equation Modelling (SEM)

multilevel, 295

Subjectivity, 161, 168, 209, 265, 266

T

- Teacher, viii, 13, 15, 34, 37, 38, 62, 79, 82,
117–133, 139–144, 159, 172, 181, 183,
184, 188, 189, 228, 257–275, 289, 317,
326–327, 330, 332, 336, 339, 352, 355,
391, 401, 421, 422, 434, 442
- Team, viii, ix, 33, 48, 142, 181–183, 190,
202–215, 228, 229, 231, 239–250,
257–275, 281–296, 316, 334, 337, 338,
349, 432, 434, 435, 445
- 3-P Model, 53, 56, 68, 353, 354
- Trainee, 51, 60, 81, 83–85, 89–94, 107, 108,
349, 354–361, 403, 405, 406
- Training, vii–x, 6, 10, 11, 37, 39, 41, 48, 54,
58, 77–108, 124, 131, 132, 138, 142,
144, 148, 185, 214, 220, 225, 289, 305,
309, 311, 322, 323, 325–326, 329, 330,
333, 334, 338, 339, 348–361, 371, 372,
380, 400, 402, 404–407, 409–411, 416,
417, 419, 420, 422, 433
- Transfer, 85, 100–104, 107, 121, 128, 147,
186, 315, 352, 353, 369, 434
- Trust, 7, 8, 36, 149, 193, 209, 246, 431–433,
439, 443
- 21st-century skills, 348, 361, 433

V

- Validity, 66, 80, 102, 118, 128, 294, 296, 306,
308, 312, 317
- Value, 9, 10, 13, 14, 19, 30, 32–34, 36, 37, 39,
43, 51, 91, 99, 104, 107, 140, 142, 147,
150, 159, 161, 162, 164, 166, 169–172,
180–182, 185, 188, 191–193, 205–206,
241, 246, 247, 258, 264, 265, 267, 271,
272, 274, 275, 285, 323, 328, 334, 349,
353, 355, 356, 380, 403, 406–408, 431,
433, 439, 441
- Vocation
vocational education, 403
vocational system, 410
vocational training, 403

W

- Work
characteristics, viii, 4, 8, 14, 34, 79, 80,
150, 151, 172, 187, 224, 226, 227, 240,
263, 265, 283, 284, 287–289, 292,
294–296, 308, 309, 339, 349–351,
354, 361, 371, 383, 385, 415, 417,
434, 443
- domains, 12, 15, 16, 21, 35, 36, 41, 54,
120, 159, 160, 169, 171–173, 227, 263,
273, 282, 283, 285, 286, 288, 293, 296,
309, 311, 314, 315, 322, 324, 333, 340,
341, 418
- environment, 8, 12, 17, 30, 33, 34, 37, 42,
43, 51, 187, 259, 422, 425
- experience, ix, 9, 13, 20, 32, 34, 37,
42, 119, 146, 147, 160, 161, 170,
171, 187, 225, 227, 271, 283, 284,
286, 309, 335, 340, 353, 357, 370,
383, 384, 411, 416, 417, 419, 420,
422, 423, 438
- performance, 6, 11, 17, 19, 34, 40, 70, 79,
148, 150, 158, 159, 171, 209, 222, 226,
232, 246, 248, 258, 282, 284–286, 293,
307, 309, 311, 312, 314, 328, 341, 351,
352, 434
- structure, vii, 10, 11, 19, 22, 30, 145,
147, 148, 182, 264, 273, 275, 285,
287, 288, 292, 315, 322, 324, 334,
335, 338–341, 360, 371, 383, 385,
423, 424, 443
- work-related learning, 70, 221, 351, 423
- Workplace
pedagogy, 42, 51
practice, viii, x, 10–12, 21, 22, 31, 35,
37, 42, 43, 51, 54, 118, 144, 146,
148, 150, 159, 164, 165, 167, 169–172,
180, 181, 220, 224, 228, 230, 260,
289, 306, 309, 314, 315, 317, 324,
329, 331, 333, 341, 353, 357, 371,
384, 399, 400, 407, 411, 424, 430,
436, 440, 441