Professional and Practice-based Learning

Christian Harteis
Andreas Rausch
Jürgen Seifried *Editors*

Discourses on Professional Learning

On the Boundary Between Learning and Working

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Professional and Practice-based Learning

Volume 9

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Professional and practice-based learning brings together international research on the individual development of professionals and the organisation of professional life and educational experiences. It complements the Springer journal *Vocations and Learning: Studies in vocational and professional education*.

Professional learning, and the practice-based processes that often support it, are the subject of increased interest and attention in the fields of educational, psychological, sociological, and business management research, and also by governments, employer organisations and unions. This professional learning goes beyond, what is often termed professional education, as it includes learning processes and experiences outside of educational institutions in both the initial and ongoing learning for the professional practice. Changes in these workplaces requirements usually manifest themselves in the everyday work tasks, professional development provisions in educational institution decrease in their salience, and learning and development during professional activities increase in their salience.

There are a range of scientific challenges and important focuses within the field of professional learning. These include:

- understanding and making explicit the complex and massive knowledge that is required for professional practice and identifying ways in which this knowledge can best be initially learnt and developed further throughout professional life.
- analytical explications of those processes that support learning at an individual and an organisational level.
- understanding how learning experiences and educational processes might best be aligned or integrated to support professional learning.

The series integrates research from different disciplines: education, sociology, psychology, amongst others. The series is comprehensive in scope as it not only focusses on professional learning of teachers and those in schools, colleges and universities, but all professional development within organisations.

Christian Harteis • Andreas Rausch
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Editors

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Editors
Christian Harteis
Institute of Educational Science
University of Paderborn
Paderborn, Germany

Jürgen Seifried
Economics and Business Education II
University of Mannheim
Mannheim, Germany

Andreas Rausch
Department of Business Education
and Educational Management
University of Bamberg
Bamberg, Germany

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Series Editors' Foreword

The relation between learning and working has changed during the history of work. Early traditions of occupational preparation such as those for craftswork in medieval times featured restricted access and clear structures of learning opportunities within the practice of work. Learning was considered as inevitable quality of and prerequisite to conduct work appropriately, and it was also considered inherent to working practices – at least when mastery plays a role. This view on the relation between learning and working dominated for centuries before industrialisation, when mass production brought about change. A goal for the work organisation within industrialisation was to structure work in a way that does not necessarily require specific education and learning, but is independent from workers' capacities as much as possible. During this phase of economic development, the separation between planning and executive work activities was established. The relation between learning and work changed in a way that intentional learning became necessary for just a small group of supervisors, but was not necessary for the mass of workers, whose role was to merely execute specific tasks. This distinction remained the main perspective until the peak of automatized mass production was reached in the second half of the twentieth century. In the late twentieth century, business concepts became popular which returned to the appreciation of workers' individual capacities. Hence, the relation between learning and working was reconsidered and these relations are still under review and being reordered. For instance, increasingly learning in post-school education is coming to include work experiences as part of this broader reconsideration. Similarly, researchers began to develop interest in work-related learning processes. This interest was, firstly, to address problems in the educational systems, but later also with specific interest on employees' learning at their workplaces.

This volume aims at contributing to these reconsiderations. It does so by offering analyses of the relation between learning and working comprising theoretical and empirical research from specific perspectives and different countries. The first part of this volume comprises six contributions that analyse conditions of employees' learning in the context of regular daily work. All focus different aspects of learning

processes which can be considered as by-product of working practices. The second part of the book comprises six contributions exploring work processes that particularly are designed for learning purposes. The third part of this volume discusses methodological issues of investigating work-related learning empirically. A concluding chapter reflects opportunities of distinguishing learning and working analytically and discusses the relation between them as reflected in the contributions to this volume.

This volume provides insights into recent research on professional and practice-based learning by bringing together researchers from diverse theoretical and methodological paradigms that together reflect the current state of the discourses on professional learning.

Griffith, Australia — Stephen Billett
Regensburg, Germany — Hans Gruber
Paderborn, Germany — Christian Harteis
March 2014

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Contributors

Alexander Baumgartner Dipl.-Hdl., Dipl.-Bw. (BA) is research assistant at the Chair of Economics and Business Education II, University of Mannheim, Germany. His main research interests are: dealing with errors, error climate, and professional competences of company trainers in VET.

Dr. Stephen Billett is Professor of Adult and Vocational Education in the School of Education and Professional Studies at Griffith University, Brisbane, Australia, and also an Australian Research Council Future Fellow. Stephen has worked as a vocational educator, educational administrator, teacher educator, professional development practitioner and policy developer within the Australian vocational education system and as a teacher and researcher at Griffith University. Since 1992, he has researched learning through and for work and has published widely in the fields of vocational learning, workplace learning and conceptual accounts of learning for vocational purposes.

Dr. Taiga Brahm is Assistant Professor for Educational Development at the University of St. Gallen (Switzerland). Her research interests include vocational education and training, students' development of attitudes and resilience as well as education for sustainable development. She is responsible for various research and development projects in vocational and higher education.

Dr. Sarojni Choy is a Senior Lecturer of adult and vocational education at the Griffith University, where her responsibilities include teaching graduate and post-graduate courses in adult and vocational education, and supervising postgraduate student research. She is the Higher Degree Research convenor in the School of Education and Professional Studies at Griffith University. Her research and writing activities focus on the foundations of adult learning, workplace learning, employment-based training, continuing education and training, and workforce capacity building. She is competent in both quantitative and qualitative research methods. Dr. Choy has extensive experience in adult and vocational education research.

Jennifer Cleland Ph.D. is Professor of Medical Education Research (the John Simpson Chair) in the College of Life Sciences and Medicine, University of Aberdeen, UK. Her research focus is on selection and performance in medicine. Other research interests include medical careers decision making and nontechnical skills teaching, and learning and evaluation across the healthcare professions. She is Chair of the Association for the Study of Medical Education (ASME) and Vice-Chair of the Association of Medical Education Europe (AMEE) Research Committee.

Kaija Collin Ph.D. is Adjunct Professor and holds a post of University Researcher at the University of Jyväskylä, Department of Educational Sciences. Currently her research interests are focused on workplace learning, professional identity and agency and inter-professional collaboration and work practices in various work environments.

Anna Liza Daunert M.A., M.A. is currently working as a research associate and instructor at the Institute of Educational Science at the University of Paderborn, Germany. She is also writing her dissertation on critical thinking in the context of work-related decision-making and professional learning in which she explores the use of ePortfolios. Her research interests include critical thinking, professional learning and development, knowledge management and learning in the workplace, effective eLearning and blended learning as well as assessment and evaluation. She successfully completed her M.A. Degree in Education at the University of the Philippines as well as her M.A. Degree in Educational Science at the University of Freiburg, Germany. She has worked as a private tutor, pre-school teacher and as a social sciences instructor in traditional and blended learning settings in the Philippines.

Vincent Donche Ph.D. is Associate Professor of Research Methods in Education at the Institute For Education and Information Sciences of the University of Antwerp, Belgium. His current research interests include student learning, teacher learning, professional learning and educational measurement.

Darryl Dymock is a senior research fellow in the School of Education and Professional Studies, Griffith University, Brisbane, Australia, and he also teaches in the Adult and Vocational Education (AVE) program. His research interests include workplace learning, adult and vocational education history, older workers' learning, and community adult literacy provision. Outside of AVE he writes non-fiction books and short stories.

Anneli Eteläpelto Ph.D. is a Professor (adult education) at the Department of Education, University of Jyväskylä. She has widely published in international and national refereed forums, edited and co-edited books on professional and work-related learning, identity, agency, creativity, and expertise development. Professor Eteläpelto is currently leading a research project 'Promoting professional agency in education and health care work' (PROAGENT) funded by the Academy of Finland and The Finnish Work Environment Fund.

Laurent Filliettaz Ph.D. is Associate Professor of Adult Education at the University of Geneva in Switzerland. He holds a Ph.D. in linguistics and has conducted research over the years in areas such as pragmatics, interactional sociolinguistics or discourse analysis. Laurent Filliettaz is currently leading several research programs sponsored by the Swiss National Science Foundation (SNF) and promoting applied linguistics methods in the field of vocational education and training. Laurent Filliettaz is the co-editor of a book series in French devoted to research in education (Raisons Educatives, De Boeck). He is also Associate Editor of the journal *Vocations and Learning* (Springer).

Christoph Fischer M.A. is a research associate and Ph.D. candidate at the University of Paderborn, Germany. He studied Education at the University of Passau in Germany. His research interests include workplace learning and learning culture. In his Ph.D. he investigates the relationship of the perception of workplace environments and epistemic beliefs.

Panu Forsman M.Ed. is Doctoral Student at the Department of Education, University of Jyväskylä (Finland). His main research interest is on the investigation of agency and creativity at work contexts.

Dr. Karl-Heinz Gerholz is Junior Professor for Higher and Vocational Education at the University of Paderborn (Germany). His research interests comprise counseling learning and service learning in vocational and higher education as well as organisational structures and development in educational institutions. He is responsible for diverse research projects which are mostly third-party funded.

David Gijbels Ph.D. is Associate Professor of Learning and Instruction at the University of Antwerp (Belgium). His research focuses on learning and assessment in (higher) education and in the workplace. He is currently Editor-in-chief of the journal *Educational Research Review*.

Michael Goller Dipl.-Hdl. is a research associate and Ph.D. candidate at the University of Paderborn, Germany. He studied Business and Human Resource Education at the University of Jena (Germany) and the University of Kent at Canterbury (UK). His main research interests comprise workplace learning and expertise development. In his Ph.D. he investigates the relationship of employees' work agency and their professional development processes.

Kai Hakkarainen Ph.D. is Professor of Educational Research at the Department of Education, University of Turku. With his colleagues, Hakkarainen has, for 20 years, carried out learning research based on psychology and cognitive science at all levels, from elementary to higher education. Many investigations have included a strong theoretical component, and have addressed how learning and human intellectual resources can be expanded using collaborative technologies based on the information and communication technologies. During recent years, Hakkarainen's research activity has expanded toward investigating personal and collective learning processes taking place in knowledge-intensive organizations, including innovative private corporations and academic research communities.

Dr. Christian Harteis is Professor of Educational Science, Educational Management and Research on Further Education at the University of Paderborn (Germany). His research interests are related to issues of workplace and professional learning, intuition, and learning from errors. He acts, together with Stephen Billett, as Editor-in-Chief for the journal *Vocations and Learning: Studies in Vocational and Professional Education*.

Eva Kyndt Ph.D. is Assistant Professor of Human Resource Development and Management at the Center for Research and Professional Learning and Development and Lifelong Learning, University of Leuven, Belgium. In her research she focuses on workplace learning, approaches to learning, professional development and the transition from school to work. She is currently the coordinator of the Special Interest Group Higher Education of EARLI and the advisory editor education of Procedia – Social and Behavioral Sciences.

Joseph Leaman BMBS studied medicine at Peninsula Medical School (UK). He is currently working as a junior doctor in Raigmore hospital, Inverness, while pursuing an interest in medical education in the workplace.

Steffi Maes M.Sc. studied Education and Training Sciences at the University of Antwerp (Belgium). She cooperated in the chapter during her internship at the University of Paderborn in the research team of Christian Harteis.

Bridget N. O'Connor Ph.D. is Professor of Higher Education and Business Education at New York University's School of Culture, Education, and Human Development. She is a co-editor of *The Sage Handbook of Workplace Learning* (2011), and co-author of several college-level textbooks related to organizational learning and technology. Her current research interests revolve around knowledge transfer. She is a past chair of the American Educational Research Association's Special Interest Group, Workplace Learning.

Patrick Onghena Ph.D. is Professor of Educational Statistics, Methodology of Educational Science Research Group, KU Leuven (Belgium). His main research interests are: applied data-analysis, meta-analysis, randomization tests, single-case experimental design, and mixed methods research.

Tuire Palonen Ph.D. is Senior Research Fellow at the Centre for Learning Research and Department of Teacher Education at the University of Turku, Finland. She is also Adjunct Professor for the University of Jyväskylä. During her career, she has been interested in expertise research and social network analysis, focusing on the investigation of workplace learning and communication inside work organizations. This work is partly done by the Turku University spinoff company, Spindel. She is partner of the company.

Linda Price Ph.D. is a Professor of Engineering Education at the Engineering Faculty in Lund University in Sweden and a Senior Lecturer in Educational Technology at the Institute of Educational Technology at the Open University, UK. She researches pedagogically-driven uses of educational technology in a range of

contexts in higher education. Her recent research focuses on investigating and developing models of scholarly practices using technology.

Dr. Andreas Rausch is a post-doctoral researcher in the team of Prof. Dr. Detlef Sembill at the University of Bamberg, Department of Business Education and Educational Management. His research interests include problem solving, workplace learning, social interaction and emotions in the workplace as well as methodological issues such as diary methods and the measurement of problem-solving competences.

Thomas Schley Dipl.-Hdl. is a research associate and Ph.D. student at the Chair of Business Education and Educational Management at the University of Bamberg (Germany). His current research focuses on problem solving, reflection and learning in Vocational Education and Training (VET) and in workplaces.

Dr. Jürgen Seifried is Professor of Economic and Business Education at the University of Mannheim (Germany). His current research interests include learning from errors at school and at work, workplace and professional learning as well as evaluation of teacher education and the professional development of teachers in vocational schools.

Raymond Smith Ph.D. is a Lecturer and researcher in the field of adult and vocational education at The School of Education and Professional Studies, Griffith University, Australia. His research focuses on learning in and through work as a socio-personal and organisational process. A particular emphasis is on how individuals contribute to and shape the practices in which they engage and related concerns of continuing education and training, human resource development and lifelong learning.

Dr. Katrin Temmen received her Diploma in Electrical Engineering in 1993 and Ph.D. in Electrical Engineering in 1998 from the University of Dortmund. Since 2010, she has been an Associate Professor and Head of the Department of the Didactics of Technology in the College of Electrical Engineering in Paderborn, Germany. Her research interests include education in vocational schools and the didactics of further education in the field of engineering.

Mark A. Tyler is a Senior Lecturer in the School of Education and Professional Studies, Mt Gravatt Campus of Griffith University. His expertise is in the area of adult and vocational education. His research interests are related to workplace learning, teacher identity, critical spirit (the dispositions of critical thinkers), workplace mentoring, and collaborative capacity building. Mark is currently investigating older adult learning and digital engagement.

Piet van den Bossche Ph.D. is Associate Professor of Learning in Organizations at the University of Antwerp (Belgium) and at Maastricht University (the Netherlands). His current research centers on professional learning in collaborative environments. He is chief editor of the book series *Advances in Business Education and Training* and associate editor of *Educational Research Review*.

Marianne van Woerkom Ph.D. is Associate Professor at the Department of Human Resource Studies, Tilburg University, The Netherlands. Her research interests include team learning and team performance, workplace learning, positive psychology and the strengths-based approach, coaching, and critically reflective work behaviour.

Chapter 1
Discourses on Professional Learning: On the Boundary Between Learning and Working

Christian Harteis, Andreas Rausch, and Jürgen Seifried

Abstract Research on workplace learning brings learning and working together and investigates the relationships between working and learning. Working and learning are determining factors of human activity, but are they in conflict with each other or is there a coincidence of working and learning? Where are the boundaries between working and learning and how can they be characterised? When discussing the boundary between learning and working, three questions arise: (1) How do boundaries become apparent? (2) Why should we cross these boundaries? (3) How can we cross these boundaries? This reader comprises attempts to approach these questions.

1.1 How Do Boundaries Become Apparent?

In the Middle Ages, learning and working were closely linked. Master craftsmen worked and lived together with novices under one roof, and the guilds, a special kind of a professional organisation, ruled the work life of their members. This framework worked well for centuries, but latest with the beginning of the nineteenth century, the upcoming industrialisation and specialisation as well as social and political changes brought the guild system to its limits. Guilds became inefficient to promote new ideas and to ensure the quality of the products, respectively the skills of the craftsmen or merchants (Ogilvie, 2004). Thus, new approaches to organise

C. Harteis (✉)
Institute of Educational Science, University of Paderborn,
Warburger Straße 100, 33098 Paderborn, Germany
e-mail: charteis@mail.uni-paderborn.de

A. Rausch
Department of Business Education and Educational Management, University of Bamberg,
Bamberg, Germany

J. Seifried
Economics and Business Education II, University of Mannheim, Mannheim, Germany

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learning and working arose. In the early decades of the twentieth century, at the peak of industrialisation, Taylor (1911/1998) introduced his approach of scientific management. He followed the idea of detailed planning and structuring of work processes by introducing a high extent of division of labour into units as small as possible. The entire organisational structure of Taylor's approach was based on stability of demands and on the precision of planning processes. Ford optimised this way of business organisation by implementing automised production steps when introducing the machine-assisted production of the legendary Model-T car (Tin Lizzy) within the Ford production plant at Detroit. He became a pioneer of mass production enabled by technically supported assembly lines. Both, Taylor's and Ford's, approaches of business organisation consequently separated planning of work from executing work. The aim was to keep singular working steps as simple as possible in order to avoid that participating production demands preparation and learning of the workers. The crucial moment here is the complete exchangeability of all components (including workers) and the simplicity of the assembling (Womack, Jones, & Roos, 1990). Not only was workplace learning considered to be unnecessary because there was only 'one best way' for working; moreover, any kind of autonomous problem solving was strictly forbidden and often penalised. Certainly, many potential for improvements was ignored due to this solely top-down management. Work and learning were considered as separated issues without any interrelation. Still today, we discover workplaces, in which the potentials for combining learning and working lie idle. However, one could raise the question, why is this a problem?

1.2 Why Should We Cross the Boundaries Between Working and Learning?

Market saturation and technology developed quickly during the second half of the twentieth century and overrode all assumptions of stability of demands. In consequence, approaches of business organisation – at least at the last decade of the twentieth century – considered an increasing complexity of products and production, customisation and the international relocation of mass production. The latter initiated a shift towards a sector of high-quality services within highly developed economies. These developments lead to an expansion of formal initial vocational education and further education during the late twentieth century. Moreover, the idea of organisational learning became more and more popular (e.g. Brown & Duguid, 1991; Cyert & March, 1963; Senge, 1990). However, working and learning still remained separated – going along with time lags for course development, problems of knowledge transfer (e.g. inert knowledge) and high costs. Altogether, there are two motivations to cross the boundaries between learning and working: (a) Nowadays complex tasks and problems are to be solved and, thus, in nowadays workplaces highly developed competences are required and (b) not all of these competences can be acquired in school, respectively training settings far away from

workplaces. On the other hand, solely learning from practice and experience without reflection seemed to be insufficient, too. There is evidence that a *deliberate* practice (Ericsson, 2006; Ericsson, Krampe, & Tesch-Römer, 1993) that crosses the border of learning and working becomes important in order to enable skill acquisition and expert performance.

Against this background and with a view on the recent and ongoing discussion about lifelong learning and the establishment of contemporary business concepts, which aimed at meeting the demands of permanent change by implementing flexible work structures, the legitimate interest on workplace learning has been continually increasing in recent years. Current approaches emphasise the learning potential of workplaces, combining the application of competence (i.e. working) and its acquisition (i.e. learning). Of course, even under these paradigms of integration and overcoming the boundary between working and learning, workplaces do not automatically promote learning. It is rather an educational challenge to design workplaces as environments of rich learning potential without neglecting business demands. Despite the huge heterogeneity of workplaces across countries, branches, enterprises, etc., research indicates some general characteristics of workplaces supporting learning as well as barriers to learning in the workplace. Complexity, significance, integrity and a variety of assigned work tasks as well as scope of action, interaction and feedback within its processing – to name only a few – turn out to be crucial work characteristics that may support learning during work. Learning and working, in this sense, are both to be considered as two common aspects of an individuals' activity. Consequently, this volume is dedicated to the third question that we raised:

1.3 How Can We Cross the Boundary Between Learning and Working?

The contributions to this volume explore theoretical and empirical analyses on the boundary between working and learning in various contexts and with various methodological approaches. The rationale of this book introduces two different analytic perspectives of analysing professional learning: (1) focusing learning processes occurring in the context of daily work and (2) organising and analysing workplaces as learning environments. Complementary, (3) methodological issues are to be raised reflecting recent opportunities for analysing work and learning. A resuming final chapter (4) provides a general discussion of this book's contributions in terms of the interrelation between learning and working. This volume, hence, provides insight into recent research on professional learning. It aims at bringing together different theoretical as well as methodological approaches and contributing to the scientific discourse on workplace learning and professional learning. The following thumbnail sketches provide an overview on the content of this reader.

1.4 Part I: Analytic Perspective 1, Learning in Work Contexts

In the first contribution of this volume, *Fischer* and *O'Connor* highlight the significance of an organisation's learning culture, ways of measuring it and interrelations with the individual epistemological beliefs of an organisation's members. They conclude that fostering strong learning cultures within an organisation relies on understanding and respecting individual epistemological beliefs.

Goller and *Billett* discuss how employees develop high levels of performance at work and how workplaces can be seen as learning environments. Based on the idea of agentic behaviour at work, they address the relevance of work experience in the sense of deliberate practice as foundation for work performance. In this sense, agency is seen as individuals' general capacities for and dispositions towards making intentional choices, taking the initiative and controlling the success of their actions. Therefore, personal agency is seen as a catalyst for professional development.

The study reported by *Forsman*, *Collin* and *Eteläpelto* focuses on the manifestations of professional agency and collaborative creativity in team meetings. They investigate how different kinds of professional agency are related to collaborative creativity and followed an ethnographic approach by conducting observations of team meetings of the human resource department of a Finnish health-care district. The findings indicate professional agency is practised in various ways in team meetings, reflecting different habitual practices and power relations. Additionally, the atmosphere of the organisational environment strongly influences the development of professional agency.

Billett proposes an account of learning at and for work comprising the collective contributions of social and brute mediating factors and individuals' processes of mediating those contributions. That is, an account of individuals' learning and development accommodating both the inter- and intra-psychological contributions and the relations between them. The contribution also seeks to redress the concern that in recent times, the mediation of individuals' knowledge has become overly associated with proximal social influences on human cognition as well as those of signs, symbols and artefacts within Vygotskian-inspired social constructivism. He explores that understanding processes of mediation more fully requires a consideration of both inter-psychological and intra-psychological processes, and how their contributions are brought together in advancing workers' learning and development.

Baumgartner and *Seifried* highlight the importance of a workplace's error climate as an indicator for the possibilities and constraints that shape learning from errors in the workplace. To investigate the effect of the error climate on individuals' reaction to errors, a questionnaire study in the hotel and restaurant industry that surveyed 830 apprentices in the German dual vocational education and training (VET) system was conducted. The findings show that the perceived error climate and the individual self-concept of professional development predict the apprentices' reaction to errors.

The final contribution of part I – provided by *Schley* and *van Woerkom* – gives an overview of the meaning of reflection and reflective behaviour in work teams.

In dynamic, quickly changing environments, routines and rule-based workflows reach their limits. Especially when it comes to unique tasks and new experiences in the workplace, the need for reflection becomes clear. The authors discuss individual reflection and the connection to both team and organisational reflection. They conclude by stressing the limitations and challenges of reflective behaviour in teams.

1.5 Part II: Analytic Perspective 2, Work as Learning Environment

In the opening contribution to the second part of this volume, *Gerholz* and *Brahm* provide an institutional analysis of the German dual VET system. In doing so, they identify and discuss the concept of vocations and occupational competence on the macro-level, the principles of consensus and corporatism on the meso-level and the maxim of action orientation on the micro-level of the VET system.

The chapter provided by *Tyler*, *Choy*, *Smith* and *Dymock* reports an interview study on how 86 Australian employees experience, perceive and expect changes at their workplaces, as they are broadly discussed in context of globalisation and technological change. The findings suggest that the most appropriate setting for individual learning in response to change appears to be the workplace itself, which in turn has implications for the way such learning is organised.

Gijbels, *Harteis*, *Donche*, *Van den Bossche*, *Maes* and *Temmen* conducted a quantitative study with a convenience sample of 48 students enrolled in engineering programmes who spent an internship at industry. They investigate how job characteristics of the workplace (such as job demands, job control and social support) are related to individual differences in the process of learning in the workplace during internships and how these contribute to the perceived competences reported by the students themselves.

Goller and *Harteis* investigate the agentic behaviour of doctoral students by means of an interview study. The study focuses on how PhD students can take an active approach towards their academic development and performance. Proactive networking, negotiation of external demands and deliberate information and feedback seeking arise as important indicators of professional agency in academic contexts.

In their paper, *Cleland*, *Leaman* and *Billett* highlight the possibilities for and constraints of learning through practice in general and, in particular, the significance of practice-based experiences for fostering domain-specific occupational knowledge and professional development. The authors report the findings from an interview study investigating practice-based learning processes of doctors undergoing initial and continuing medical training in the UK. The data indicate that practice experiences go beyond just exercising; they have specific desirable qualities and make contributions to the professional development of the new doctors.

Daunert and *Price* present e-portfolios as a tool for fostering professional learning in terms of self-directed, reflective and collaborative learning. The authors discuss the meaning, purpose and uses of e-portfolios from both a technical and a learning perspective and highlight the connection between e-portfolios and professional learning and development plans. Advantages and challenges associated with the use of e-portfolios are also considered.

1.6 Part III: Methodological Issues

The methodological part of this volume opens with a contribution from *Kyndt* and *Onghena*. The authors argue for the use of multivariate techniques to overcome the complexity of studying the relation between work and learning. They focus on structural equation modelling (SEM), offering both an introduction to the theoretical rationale and a practical guide for applying this promising method.

Palonen and *Hakkarainen* focus on social network analysis (SNA) as a tool for investigating socially distributed dimensions of expertise. They provide a theoretical introduction, methodological considerations and a review of SNA studies that highlight the influence of network positions, different roles and the network structure itself.

Under a methodological perspective, the contribution of *Filliettaz* puts forward that video analysis should be seen as a rich and relevant methodological resource for describing how interactional participatory practices emerge, unfold and transform in the conditions of professional practice. Such a qualitative approach helps to understand the importance of participation and guidance in vocational and professional learning as it occurs in the workplace.

Finally, *Rausch* provides a systematic overview of the manifold options when using diaries in research on work and learning. Exemplary implementations of diary instruments are presented and future perspectives of the diary method and related measures are discussed. By discussing benefits and pitfalls of the method, this contribution aims at helping and encouraging other researchers to use diaries in their research.

1.7 Part IV: Conclusion

With this final and concluding chapter within this reader, *Billett* discusses how many of the contributions to this book on the boundary between learning and work infer, emphasise or directly state that interdependencies between societal and personal factors shape how individuals work and learn but also of the relations between working and learning. Hence, when taken as a central explanatory concept, interdependencies seem ubiquitous to much of the discussions, theorisations and accounts of work and learning and the boundaries between them within this volume.

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Part I
Analytic Perspective 1 – Learning in Work Context

Chapter 2
Informal Learning in Workplaces: Understanding Learning Culture as a Challenge for Organizational and Individual Development

Christoph Fischer and Bridget N. O'Connor

Abstract Organizations rely on new knowledge. Carriers and creators of knowledge are the members of the organizations. These individuals have to do the actual learning and acquire new knowledge. The organization can only support the individuals in their learning processes. One way to do this is to create an organizational culture that supports and values learning. It is called learning culture. Learning culture represents the organization's view and its values concerning learning. The differences between this organizational learning culture and the individual's views on learning are the focus of this chapter. First, we describe and define the concept of "learning culture" as an environment that encompasses what an organization can offer in the way of structured and unstructured learning affordances. Included in this section is a discussion of two instruments that have been used to measure learning culture as well as the results of studies that have relied on such measures. The second section discusses the internal foundations or the epistemic beliefs that shape the individuals' understanding on what knowledge is and how to obtain it. In our conclusion section, we attempt to put the two sections together in a way that may help us better study and support an organization's learning culture.

2.1 Introduction

Modern concepts of business management assert that employees, with their knowledge and competencies, are crucial resources of an enterprise. What employees do influences organizational innovation and the organization's ultimate performance

C. Fischer (✉)
Institute of Educational Science, University of Paderborn, Paderborn, Germany
e-mail: chr.fischer@upb.de

B.N. O'Connor
School of Culture, Education and Human Development,
New York University, New York, NY, USA
e-mail: bridget.oconnor@nyu.edu

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(López-Nicolás & Meroño-Cerdán, 2011). Thus, organizations are well advised to support and strategically plan the learning and development of all employees (Zack, 1999). Although the employee himself or herself is the main contributor to organizational learning (Sonntag & Stegmaier, 1999), an individual learning alone is no guarantee that knowledge will be transferred to a group or the organization. Individually acquired knowledge is ideally converted to knowledge that can be shared by all members of the organization (Nonaka & Takeuchi, 1995) to develop a true learning organization. To reach the goal of high organizational performance, every employee needs to acquire and share new knowledge.

This need for gaining knowledge and sharing it throughout the organization suggests a need to examine the learning affordances of the organization. This may also require the coordination and restructuring of the work itself, which may be altered when new ways of thinking about or doing work is affected (Hofstede, 2001, p. 376). Equally important is ensuring that the individual feels empowered to create his or her own learning spaces. To enhance the knowledge of an organization, the organization has to develop the knowledge of all its members, make it easy for them to learn and share what they have learned, and allow an individual to use new knowledge in a manner that is in the employee's and the organization's best interests.

Obviously, the organization itself cannot and should not strategically plan the learning process for every member of the organization on an everyday basis. As knowledge creation, sharing, and using are done by individuals, a more feasible strategy is to support individuals in what they are doing, to ensure that they know their work is valued, and to encourage them to continue learning. This strategy encourages the employee to gain new knowledge and at the same time allows the employee to determine what he or she needs to learn as well as how to best transfer any new knowledge into new organizational know-how. Of course this needs highly committed employees (Randall, Fedor, & Longenecker, 1990) who independently pursue the process of knowledge creation.

How individuals actually learn – their learning behavior and actions – together with the values and norms concerning learning and knowledge creation in an organization is called its learning culture. In an ideal world, the values and norms of employees would mirror the values and norms of the organization in general. An ideal situation is where an individual's learning style or strategy matches what the organization offers. Thus, the organization's attitude and actions toward supporting a learning environment consist of offering learning affordances that motivate employees and ensure that they learn. From the individual's point of view, every effort of the organization toward learning, be it formal or informal, reflects the organization's learning culture. Therefore, examining an organization's learning culture is a good way to predict organizational performance (Kalyar & Rafi, 2013; Song & Kolb, 2012). In other words, an organization that wants to enhance its success is well advised to focus on understanding, developing, and nurturing its learning culture (Long & Fahey, 2000). Such an approach takes learning out of the commodity definition and, as Fenwick (2001) suggested, can encourage employee self-reflection on his or her organizational role. The result is, ideally, an individual who is not only motivated to learn and has the wherewithal to ensure that any new knowledge is shared

throughout the organization. Unfortunately, the world is not ideal. The organization's encouragement and learning options cannot represent every individual's norms concerning learning. So an organization's specific attempts to enhance the possibilities for the individual to learn may not be a match for what the individual wants to learn or how he/she wants to learn it. This may be caused by an individual's experiences and understanding of the need for continuous learning.

The differences between organizational learning culture and the individual's views on learning are the focus of this chapter. First, we describe and define the concept of "learning culture" as an environment that encompasses what an organization can offer in the way of structured and unstructured learning affordances. Included in this section is a discussion of two instruments that have been used to measure learning culture as well as the results of studies that have relied on such measures. The second section discusses the internal foundations or the epistemic beliefs that make an individual want to learn and be self-empowered to learn. In our conclusion section, we attempt to put the two sections together in a way that may help us better study and support an organization's learning culture.

2.2 What Is a Learning Culture?

Every organization has its own culture that is based on the shared values, norms, and attitudes that shape the behavior of the members of the organization (Hofstede, 2001). Hofstede describes organizational culture as "[the] collective programming of the mind which distinguishes the members of one organization from another" (Hofstede, 2001, p. 391). In his theory of organizational culture, Hofstede posits that the foundations of organizational culture are the values that are shared by its members. The values themselves are not visible but are crystallized in behavior. He suggests that the behavior of the members of a culture is not the only visible component of a culture as culture also appears in rituals that are considered normative behavior in a community. Culture includes a historical context, stories about its leaders, and activities and symbols that capture the values of the organization (Hofstede, 2001). These practices, as Hofstede calls them, are the visible part of the culture of an organization, but are not yet the culture itself. Since they are based on the aforementioned values, data describing these values has to be processed, which is again value-laden and can lead to misinterpretation. Practices are difficult to describe and quantify so their validity is in question as well as their reliability.

Each member of the organization has his or her own set of values that shape individual behavior. Of course it is simple to assume that all of these values are the same throughout the organization. In fact, groups in the organization often form subcultures, which can be differentiated from each other based on their set of shared values (Hofstede, 1998, 2001). Other times, values are not shared at all. So an organization has members with a multitude of behavior-shaping values that are shared only to a certain extent (Hofstede, 1989). While some suggest that the strength of an organization's culture can be seen as the coherence or consistence of the shared

values among the organization's members (Denison, 1990; Gordon & DiTomaso, 1992), we suggest that acceptance of diversity itself is a shared value.

When assessing the culture of an organization, one has to determine what the constructs are that measure that culture. The learning culture, which focuses on the learning behavior of individuals and the learning affordances offered by the organization, is part of an overall organizational culture (Sonntag, Schaper, & Friebe, 2005). Similar to Hofstede's theory of organizational culture, Sonntag et al. (2004) suggested that an organization's learning culture is the expression of the value of learning to the organization. On one hand, the learning culture is depicted as the actions that support learning in the organization itself and the experiences that every member of this organization is able to make. This is the outside view on learning, one that shows what relevance learning has in the everyday working life. On the other hand, learning culture is depicted as the way members of the organization perceive and interpret their learning environment, which influences their behavior (Sonntag et al., 2005). This is the inside view on the possibilities to learn and the learning that is done in this organization. In fact, in some circles, the term *learning culture* is used interchangeably with *the learning organization*.

To understand learning culture, it proves helpful to examine the parts that learning culture consists of. On a very basic level, affecting all the activities that involve learning, an organization's learning culture is based on shared norms, values, and attitudes toward learning. Led by these intrinsic tenets, the culture manifests itself on the strategic level as the environment and affordances that are needed for sustainable support of all learning. The practices of individuals, groups, and the organization itself form the interactive part of the learning culture that is dependent on the shared values, norms, and attitudes (how learning should happen) as well as it is dependent on the affordances (learning opportunities that are offered) (Sonntag, Stegmaier, Schaper, & Friebe, 2004). Thus, the theoretical concept of learning culture combines individual, group, and organizational knowledge creation, collection, and dissemination with the strategies that should foster learning and the attitudes toward continuous learning. A challenge here is to consider Hofstede's distinction between values and practices (Hofstede, 2001). The manifestation of values toward practices concerning learning needs to be interpreted by members of the organization; again, this could lead to a misunderstanding or misinterpretation of the values that affect learning.

The effects that learning culture have on the organization and its members complete the picture of learning culture. Similar to organizational culture, learning culture has been shown to have an impact on major organizational goals, in particular, the overall performance of an organization (Gordon & DiTomaso, 1992; Yang, 2003). However, for the human resource development of an organization, which centers on individual learning and productivity, individual learning and productivity may not be the most important (although very welcome) outcome of understanding learning culture. Marsick and Watkins (2003) suggested that knowledge capital, defined as "the value a customer or potential buyer places on a firm over and above its book value" (p. 137), may be the ultimate goal. They offer the example of Coca Cola, which sells products but has "its real value in its intimate knowledge of markets,

customers, and competitors" (p. 137). Research on learning culture has shown that a supportive learning culture influences job satisfaction, loyality, ethical behavior (Camps & Majocchi, 2010), and commitment to the organization (Egan, Yang, & Bartlett, 2004; Hsu, 2009; Jo & Joo, 2011). Such outcomes lead to higher knowledge-sharing behavior (Casimir, Lee & Loon, 2012; Randall, et al., 1990; van den Hooff & de Ridder, 2004). Thus, an effective learning culture has a self-energizing effect and is important for human resource development (HRD) (Jo & Joo, 2011). The goal of improving or creating a supportive learning culture is to foster knowledge creation and its transfer in an organization (Sonntag, 2002). And as the concept of learning culture can cover every learning activity in the organization, it encompasses individual, group, and organizational learning strategies (Sonntag et al., 2005).

2.2.1 How Can a Learning Culture Be Measured?

To be an instrument of HRD, learning culture has to be comprehensible and measurable. Unfortunately, however, the organization's norms, values, and attitudes often have an unconscious influence on behavior and are therefore hard to discern (Sackmann, 1992; Sonntag et al., 2005). Furthermore, norms, values, and attitudes may have varying influence on different levels of learning. To respond to this problem, we offer a discussion of two instruments designed to measure an organization's learning culture that were created by researchers in Germany as well as the United States.

In Germany, Sonntag et al. (2005) developed the Lernkulturinventar (LKI). Through this instrument, Sonntag et al. attempted to operationalize the manifestation of norms, values, and attitudes on different levels of the organization. They distinguish among three levels of action: normative, strategic, and operative. Further, they differentiate individual, group, and organizational learning. Finally, since learning culture is not only practices but also the individual's perception and the organization's guidance on that behavior, discrete groups in the organization have distinct interests in understanding, developing, and supporting the learning culture. Moreover, depending on their organizational role, individuals may have specific responsibilities to shape the learning environment of the organization; examples are managers, senior executives, and the human resource development staff.

Based on many individual, group, and organizational learning theories (e.g., self-regulated learning, cooperative and collaborative learning, and organizational learning based on Argyris and Schön (1978), Nonaka and Takeuchi (1995), and others), Sonntag et al. (2005) deduced general conditions of workplaces that foster or hinder learning. Examples for these conditions are structural and formal conditions that foster learning like flat hierarchies and working hours arrangement that allows time for learning. They say that if these conditions are present in an organization, then the values, norms, and attitudes of the members of the organization are favorable for learning. Sonntag et al. suggested that this is an expression of a strong or good learning culture, whose goal is competence development, knowledge cre-

ation, and the transfer of learning. Sonntag et al. posited that learning culture not only exists, but can be measured through these conditions. The individual's view on learning, however, cannot be measured with this instrument. It is best used to collect data on how learning happens at the time of the survey and implies that a certain set of shared values existed that led to this point. The LKI neglects that "[v]alues are feelings with arrows to them," as Hofstede noted (2001, p. 6). So, the individual's feeling toward how learning should happen (perhaps otherwise than it happened) and based on that the shared feeling how learning should be has moved out of focus here. It is replaced by deductions from learning theories on the conditions that foster learning.

Researchers in the United States suggested that creating a learning culture and becoming a learning organization is all about understanding learning and change at the individual, group, and organizational level (Marsick & Watkins, 2003). Moreover, like Sonntag et al. (2005), any instrument used to measure such learning needed to be grounded in research, not just practice. Marsick and Watkin's *Dimensions of the Learning Organization Questionnaire* (DLOQ) measures "important shifts in an organization's climate, culture, systems, and structures that influence whether individuals learn" (2003, p. 133). Based on the literature and case studies, they suggested that learning takes place when there is a need for new solutions to problems or challenges or when events in either the internal or external environment call for action. They purported that learning and development can be informal and incidental as well as structured. Moreover, it is the informal and incidental learning that often contributes the most to the creation of a learning organization, and this happens when the learning environment, an organization's culture and climate, "shapes and supports desired results that in turn get measured and rewarded" (p. 134).

The DLOQ's questions at the individual level include asking whether or not individuals are empowered to learn from their mistakes, can identify what they need to know, can help each other learn, are rewarded for their learning, and if they are encouraged to question their superiors. Questions at the group level include determining the degree of trust members have with each other as well as their superiors in reorganizing themselves and that their recommendations will be acted upon. At the organizational level, questions include the degree to which organizational communications enable employees to have information in a timely manner, if the organization rewards risk takers, if it gives individuals control over their learning goals, and if it considers employee morale. To measure the learning culture at the organizational level, respondents are asked to offer their views on the performance of their organization – productivity, time to market, customer satisfaction, etc. And with an understanding that responses may differ depending on organizational role, years of service, and demographic data, such questions are also included (Marsick & Watkins, 2003). Thus, the DLOQ's basis is learning theory.

Marsick and Watkins, in reviewing the outcomes of many studies that have used the DLOQ, came to the conclusion that "the learning culture is found in the minds and hearts of the people […] and the dimensions of the learning organization (continuous learning, team learning, empowerment, and promoting dialogue and

inquiry) are necessary but not sufficient conditions for promoting learning" (2003, p. 141). This understanding is the gateway for the premise that it is the individual who should be targeted in any investigation of an organization's learning culture.

2.2.2 Why Focus on the Individual?

If working conditions manifested by a strong learning culture are positive, one would expect to find highly committed employees (Bigalk, 2006). However, Gordon and DiTomasos (1992) found that a strong culture was not represented by a specific predetermined behavior or values. There is no best possible culture that every organization should strive to create. A strong culture is represented by consistent values that fit the organization's situation. Similar to the organizational culture, a strong learning culture should not be characterized by conditions that favor a preconceived notion, but by conditions that support the learning habits of individuals in the organization. Commitment, particularly affective commitment, "develops as the result of experiences that satisfy employees' needs and/or are compatible with their values" (Meyer & Allen, 1991, p. 70). Notable here is that commitment is dependent on the experienced fulfillment of the needs of the employee. So conditions that meet the needs of the employee, here specifically the learning needs, should, as Bigalk (2006) suspected, lead to a higher commitment.

Such an individual-focused approach is necessary because job commitment is individual, and the individual himself/herself should be the driver and the target of learning. Moreover, the learning experiences that are compatible with the individual's values influence affective commitment. In the case of developing the learning culture, the learning environment that coalesces to the individual's values concerning learning may result in higher commitment (Meyer & Allen, 1991). So when focusing on developing a learning culture that supports commitment, affordances should be flexible, contributing to an environment that gives optimal learning possibilities not just from a theoretical point of view but on an environment that meets the learning requirements of the individual employee and that grants learning experiences that are in sync with the employee's values concerning learning. Thus, the learning environment has to be as flexible as the variation of the individuals which are in this environment.

That said, in one study, contrary to expectations, data showed that working conditions were not significantly correlated to employee learning and commitment to the organization. However, a significant correlation was found between the perceived learning supportiveness of the workplace and the employee's commitment to the organization (Bigalk, 2006). So while working conditions are important, organizational commitment depends on the specific individual's needs and values. It is the individual who determines whether or not the organization's culture supports his or her individual needs and goals. So when trying to improve the learning culture of an organization, one has to measure not only the conditions of the workplace but also how and why they are perceived as good for learning. The

question that arises, then, is "how can we know if the learning culture is a match for an individual's needs and values?" Understanding epistemic beliefs may be the route to answering this question.

2.3 What Role Do Epistemic Beliefs Have in Understanding an Individual's Motivation to Learn?

In any investigation of learning culture, an underlying challenge is to first define the term *knowledge*, as well as the term *learning* (van Egmond, Kühnen, & Li, 2013). When researchers try to describe whether or not a workplace is supporting learning, they base their investigation on any of a variety of organizational and individual learning theories. In their research, they often ask individuals to describe and assess their working environment regarding its support of their learning needs. All employees have some type of mental picture as to how they learn new ideas and strategies and how these new ways of thinking about work processes are shared with others; this is known as their mental model. Such mental models are the basis of the concept of epistemic beliefs. Epistemic beliefs are a set of beliefs about the nature of knowledge, what knowledge is, and how it can be obtained (Hofer, 2001; Schommer, 1990).

Since Schommer's work in 1990, a multidimensional approach to the assessment of epistemic beliefs has been widespread (Hofer, 2001). The approaches posit that everyone has a mental model of how they learn. When one thinks about knowledge or learning, one has to have an idea of what knowledge is and how it can be obtained. However, people think about their beliefs somewhat differently. Schommer attempted to solve this issue by creating a multidimensional model that differentiated between simple and more sophisticated viewpoints on the dimensions of certainty of knowledge, simplicity of knowledge, speed of learning, learning as an innate ability, and the role of authority in creating knowledge (Hofer, 2001; Schommer, 1990). Simple viewpoints would be to think that knowledge is certain, simple, and given by experts or higher-ups in the organization. Learning would be seen as fast and an innate ability. Sophisticated viewpoints would see knowledge as uncertain, complex, and generated by the individual. Learning would be considered to be slow and an ability that can be acquired (Schommer, 1990). Of course, this assumes that those beliefs are not fixed but (can) develop over time (Hofer, 2001; Kienhues, Bromme, & Stahl, 2008; Schommer, 1990), which is a goal in our educational systems (Schommer, 1990). In fact, most of the studies on epistemic beliefs have focused on learners in academic settings. Although school-based researchers tried to check for domain specificity (Schommer, 1990), Elby and Hammer (2001) argued that the context of the investigated subjects was always neglected.

The learning context or environment can be seen through various lenses. The overarching question is whether the environment shapes the learning (behaviorism) or if the individual shapes the environment. Evidence exists that individuals react differently in one context than in others. A good example of this is the individual whose individual ethical behavior is quite different at work than at home. On the other hand, when asked to respond to questions designed to determine whether or

not CEOs were predisposed to engage in unquestionable business practices, findings showed that it was the individual, not the environment, that determined responses (Morris, Rehbein, Hosseini, & Armacost, 1995). Perhaps it is the case that individuals acquire knowledge "by considering its social context, where the individual depends on others for true beliefs" (Dewitt, 2012, p. 235). Perhaps it is one's existent beliefs about what is right and what is wrong. Either way, participation in a learning environment that fosters community plays a role in the evolution of one's epistemic beliefs.

Elby and Hammer (2001) claimed that the learning context and its requirements shape the epistemic beliefs of the learner. They say that sophisticated epistemic beliefs are not always productive or always correct. So in some contexts, "naive" beliefs may be more appropriate than sophisticated beliefs. But context can also be seen in a bigger picture as Jehng, Johnson, and Anderson (1993) suggested that the social context may be extremely crucial – that epistemic beliefs are acculturated. The context suggests differences on an organizational (e.g. university) as well as an international level (Haerle & Bendixen, 2008; Muis & Sinatra, 2008; Quian & Pan, 2002; Schommer-Aikins & Easter, 2008).

In an investigation of how epistemic beliefs impact e-learning in the workplace, the emphasis was on understanding individuals' attitudes toward technology and the degree to which such epistemic beliefs influenced whether or not they used the technology (Harteis, Gruber, & Hertramph, 2010). In studying 256 employees in a wide range and level of positions and organizational type, it was found that epistemic beliefs did not impact the amount of time employees spent in e-learning, but did impact the quality of that learning. In discussing their findings, these researchers suggested that the time spent in e-learning may depend on the affordances the organization offers as to technology and e-learning devices rather than just their epistemic beliefs toward e-learning (Harteis et al., 2010).

Additionally, research findings describing cultural differences on epistemic beliefs show that groups of students of different cultural backgrounds, examined in one context, differ (Bråten, Gil, Strømsø, & Vidal-Abarca, 2009) as well as students' epistemic beliefs in different contexts (Hofer, 2006). This means that, based on the concept of epistemic beliefs, everyone in a given context has specific beliefs about what knowledge is and in what way he or she can obtain and share it. This individual view on the nature of knowledge influences the choice of learning strategies (Lin, Liang, & Tsai, 2012) depending on what the individual thinks which fits best. Also, the learning success of various learning techniques is influenced by the epistemic beliefs of the learner (Elby & Hammer, 2001; Schommer, Crouse, & Rhodes, 1992). A learning strategy that fits the beliefs of the learner results in better learning outcomes (Elby & Hammer, 2001; Franco et al., 2012; Windschitl & Andre, 1998). Thus, it is not surprising that the perception of the learning environments is very individualistic (Yang & Tsai, 2008). Likewise, when the perception depends on the individual, at the group level, no complete or accurate picture arises. Some will say that their environment fosters their learning: some will say the environment hinders their learning. This is not based on an unequal treatment of the individuals, but solely on their perceptions as individuals. To get the benefits of highly committed employees through a strong learning culture, this individual views on learning should be taken into account.

2.4 What Might We Conclude from This Discussion?

A strong learning culture is an environment that can ensure that individuals, groups, and the organization can quickly and effectively respond to changes and demands that are both internal and external to the organization. Organizations are constantly reorganizing, developing new products, and reacting to industry upswings and downswings. A strong learning culture can support the individual's need for continuous learning in a dynamic environment as well as enable individuals to work together to ensure that the organization itself is flexible and responsive. A cycle of learning and relearning ensures the development of new knowledge and its dissemination.

Researchers are challenged, however, in obtaining measures of an organization's learning culture because it so difficult to adequately describe and equally difficult to get a real picture of culture. Perhaps it is because we aren't sure exactly what to measure. Perhaps it is difficult because individuals' epistemic beliefs, which influence the handling of knowledge on a very basic and individual level, are usually ingrained, always difficult to define, and never perfectly implicit and can change given a specific context. That said, any research that focuses on understanding an organization's learning culture has to also focus on understanding the individual learner's epistemic beliefs.

But even with the limitation that individuals themselves may not have perfect insight into their own learning preferences, the support they receive from others in the organization, or how the organizational results fall from their efforts, it is useful to use measures of culture as a means of gauging a changing environment (Marsick & Watkins, 2003). Learning itself has been defined as change – so understanding the perceptions of those in the workplace toward their own beliefs about themselves and their organization provides useful data.

Since individual beliefs build the basis of understanding what knowledge is and how it can be obtained, divergent beliefs in an organization lead to different ways of influencing the learning culture and also various ways of perceiving and making use of it. Misreading data or clues could result in communication errors when implementing or creating strategies of knowledge creation, reviewing learning goals, or assessing workplace conditions that foster learning. This is a particular issue as such tasks are often performed by human resource development professionals or line managers but affect the choices employees make in whether or not to learn, how to learn, and what to learn. So these actions are based on the value system of one group but results are dependent on the value-laden interpretation of another group – the employees. When employees form subgroups in an organization, their subcultures can make them distinguishable from other employees (Hofstede, 2001). However, in one study, organizational subcultures fit "amazingly well" (Hofstede, 1998, p. 9) with identifiable working habits linked to other subcultures of an organization.

Understanding job responsibilities and the organizational level of individuals (subcultures) is of special interest in researching learning culture because professionals, managers, and first-line employees often have distinct differences as to their learning preferences. A "one learning culture for all" is not the best response. That said,

while some formal or informal learning affordances fail due to communication errors, sometimes, there are simply a multitude of ways of understanding of what knowledge is depending on the individual's role in that organization.

While we can assume that members enter an organization with somewhat mixed epistemic beliefs, once they are part of the organization, a kind of equilibration of beliefs seems to happen. So, as they adapt to the values of the organizational culture and its values of learning, it is possible that shared epistemic beliefs can organically emerge. Research on shared epistemic beliefs is very rare; however, Haerle and Bendixen (2008), in a research of epistemic beliefs in elementary schools, came up with the term "epistemic climate" to describe this phenomenon, which was later on defined by Feucht (2010) as "a context encompassing different epistemic factors […] and processes […] that interact and influence a person's epistemology" (p. 57). A study by Muis and Duffy (2013) revealed the influence of the epistemic climate on the development of epistemic beliefs of students. A similar effect in organizations has not yet been shown, but it is sound to assume that also the organizational context has an effect on the members of the organization.

That said, today's global organization cannot possibly expect to have individuals with the same epistemic beliefs. The organization cannot overlook the importance of diversity in thought and the need to develop ways to ensure that any employee's diverse views and beliefs are not simply pushed aside. Members of marginalized groups including women and minorities are sometimes left out when learning opportunities are not available to them (Butler, 1999; Proubert, 1999). And in the global economy, there's no room for such discrimination. Learning support strategies, like the learners themselves, need to be flexible. As Johnson wrote, those who are developing learning affordances "have ethical determinations to make about the nature and purpose of knowledge, competing values, balancing the needs of the individual and the organization, control over access to learning and curriculum, and their duty to either challenge or support the social order" (Johnson, 2011, p. 465).

Therefore, creating learning opportunities that are flexible, offer individuals options, and are congruent with the individual employee's epistemic beliefs is the first step in creating a strong learning culture that is the foundation for employee innovation and commitment. The next challenge is to ensure that strategies are developed to ensure that what an individual learns can be transferred to group and organizational levels. It is only when affordances support both individual needs and organizational goals that true organizational learning occurs. After all, as Marsick and Watkins said, "a learning culture is found in the minds and hearts of the people" (2003); understanding "the people" is priority one.

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Chapter 3
Agentic Behaviour at Work: Crafting Learning Experiences

Michael Goller and Stephen Billett

Abstract A key priority for research on professional development is elaborating how employees become and remain high-performing workers who are able to effectively respond to the changing requirements of their work. This chapter focuses on how workers develop such high performance at work. It is proposed that current accounts of professional expertise development lack a consideration of the variety and breadth of work-relevant experiences necessary to generate expertise, including employees who deliberately contribute to that development. Although deliberate practice as originally conceptualised by Ericsson et al. (1993) may not be readably identifiable in work contexts, certainly analogous processes and other agentic efforts shape the quality of workplace learning. It is illuminated how employees can deliberately influence their expertise development by seeking additional work experiences and proactively securing information and feedback.

3.1 Professional Development at Work

A key priority for research on professional development is elaborating how employees become and remain high-performing workers who are able to effectively respond to the changing requirements of their work. This outcome is of interest from both individual and workplace perspectives. Employees who are occupationally competent and effective in their daily work activities often enjoy high levels of work satisfaction and well-being (e.g. Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Ryan & Deci, 2000). Also, high levels of work-related skills and occupational

M. Goller (✉)
Institute of Educational Science, University of Paderborn, Paderborn, Germany
e-mail: michael.goller@upb.de

S. Billett
Professor of Adult and Vocational Education, School of Education and Professional Studies, Griffith University, Brisbane, Australia
e-mail: s.billett@griffith.edu.au

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knowledge are most likely to secure long-term employment and employability (OECD, 2012a, 2012b) and promotion and work-related progression (Eby, Butts, & Lockwood, 2003; Ng, Eby, Sorensen, & Feldman, 2005). So, individuals have much to gain from sustaining their occupational capacities through professional development activities. From the workplace perspective, a skilled and adaptable workforce that is responsive to such changes is central to sustaining its continuity. Global economic developments over the last few decades in combination with steadily decreasing product and process life cycles have led to increased competition and emphasised the need for skilled work forces (Green, 2007). Market shares are not only product of long-term technological advantages but high levels of organisational flexibility that permits and supports adapting to changing demands for goods and services. Consequently, highly competent employees can offer a sustainable competitive advantage for their workplaces (Barney & Wright, 1998). Hence, these factors emphasise the importance of employees' professional development from both the enterprise and workers' perspectives.

Based on both cognitive and sociocultural accounts of learning, empirical evidence suggests that ongoing engagement with domain-specific activities, such as those comprising an occupation, is necessary to become and remain competent in work-related activities (Ericsson, 2006b; Ericsson, Krampe, & Tesch-Römer, 1993; Dreyfus & Dreyfus, 2005). Hence, given that workplaces are the key sites for the provision of these experiences, it is important to understand how such occupational capacities can be secured by workers through their work-related activities. However, within cognitive accounts, investigations into expertise have mainly been concerned with identifying what distinguishes novices from experts and how individuals can reach an above-average performance to advise how these qualities can be learnt and developed further by individuals (Ericsson, 2006a; Gruber, 1999). Many of these investigations conclude that expertise can be conceptualised as an outcome of experiences encountered within particular domains of activities, such as an occupation (Ericsson, 2006b). Although concerned with learning as an inherently social process, Lave and Wenger (1991) came to similar conclusions. They observed how individuals come to participate in domain-specific practices and progress towards playing increasingly central roles as their developing capacities permit. However, in their account, domain specificity refers as much to the circumstances of practice as to the abstracted conception of an occupation, as Billett (2001a) identified empirically. Occupational expertise and competence development are, therefore, commonly seen as arising through engagement in domain-specific practices in which novices progressively become more competent through active learning processes, within particular set of circumstances of practice.

Although lengthy periods of experience in specific domains of activities are necessary to attain expert performance, the provision of such experiences alone is not sufficient to develop these capacities. It also requires deliberate efforts and engagements by individuals to excel in a specific domain of activities (Ericsson et al., 1993). These authors hold that only through the identification of and engagement in tasks that are beyond the individual's current performance levels qualities of expertise can be engendered through extending the scope of their domain-specific

knowledge. Such developmental activities are referred to as engaging in 'deliberate practice'. This suggests that beyond what experiences are afforded to individuals, how they elect to engage with them is central to the development of expertise.

Not surprisingly, some studies (Dunn & Shriner, 1999; Sonnentag & Kleine, 2000; Van de Wiel, Szegedi, & Weggeman, 2004; Van de Wiel & van den Bossche, 2013) have tried to transfer findings about deliberate practice into workplace activities. Although the results are ambivalent, most findings indicate that employees do not report engaging in deliberate practice at work (cf., Van de Wiel & van den Bossche, 2013). This finding might mostly be associated with workplace activities and interactions being ordered through different means than ideally structured domains as in textbooks (see also Strasser & Gruber, 2004), and therefore, the problem-solving activities individuals engage in such environments may well constitute what in other circumstances would be taken as having the qualities of deliberate practice (see Sect. 3.2 for a deeper discussion of these claims). Certainly, research on expertise and deliberate practice arose mainly from empirical studies of well-structured domains of activities, such as sports, chess and music. Such activities have clear performance standards, and the tasks comprising those activities are relatively idealised: constrained and rule-bound (Strasser & Gruber, 2004). In many workplaces, however, performance standards are aligned with the actualities of work activities and outcomes that can be highly situated. High performance at work, therefore, is likely to be characterised through the capacity to meet a range of situated work demands that define the task and what constitutes its successful completion. Hence, experts can be characterised as individuals that demonstrate above-average work performance reliably over a long period of time (cf., Ericsson, 2006b; Gruber, 1999) in the whole range of work-relevant activities, but whose performance measures are highly situated.

It follows that this chapter focuses on how workers develop such high performance at work. It is proposed that current accounts of professional expertise development lack a consideration of the variety and breadth of work-relevant experiences necessary to generate expertise, including employees deliberately contribute to that development. Although deliberate practice as originally conceptualised by Ericsson et al. (1993) may not be readably identifiable in work contexts, certainly analogous processes and other agentic efforts shape the quality of workplace learning (e.g. Harteis & Goller, 2014). In making this case, this chapter is structured as follows: The next section overviews research on expertise development. It proposes that concept and enactment of deliberate practice as it was originally found in games and activities abstracted from situated performance requirements might not easily be transferred into work domains. The following section then clarifies the characteristics of work domains and the kinds of work experiences likely to be necessary to meet the requirements of workplaces' daily demands. Following these considerations, it is explained how some workplaces can afford particular practices as part of their everyday activities, yet others might not. The next two sections are used to illuminate how employees can deliberately influence their expertise development by seeking additional work experiences and proactively securing information and feedback. The chapter concludes with a summary of these factors.

3.2 Work Experience as Foundations for High Work Performance

As noted, extensive and intensive experience is necessary to establish high performance in professional occupations (Gruber, 1999). Neither training activities nor favourable predispositions, such as high general intelligence, explain expertise development as convincingly as effortful engagement in domain-related experiences. Although those factors may help individuals to build expertise, it can take years of extensive and varied experience in a certain domain of activities to reach high performance or expert levels. However, the duration of experiences alone is an insufficient measure. Instead, it is the quality of experiences individuals have and how they respond to them that is central for developing domain-specific expertise (Ericsson, 2006b). That is, the kinds of work activities and social interactions individuals engage in during this time are central to this development. Empirical results about insurance agents, for instance, show that the scope of insurance cases handled in the past explains expertise levels far better than tenure, i.e. years of work experience (Sonnentag & Kleine, 2000). Similar findings have also been reported for nurses (Benner, 2004) and software programmers (Sonnentag, 1995).

Typically, novices do not have access to all domain-relevant practices when they commence in a workplace. Lave and Wenger (1991) presented accounts across different domains in which newcomers start by engaging in activities that need only a very restricted skill set and where possible failure contains less risk. Only after novices have learnt to accomplish those peripheral tasks are they allowed to engage in more demanding practices. To reach the core of the community, these novices have to take over and effectively perform activities that are increasingly central to the performance of the workplace. Expertise, therefore, develops incrementally through participation and gradual mastering of work practices (Billett, 2001a, 2001b).

Dreyfus and Dreyfus (1988, 2005) propose a five-stage linear model to explain expertise development as the gradual transition from one stage to another through ongoing experiential learning, as described above. In the first stage, *novices* actions might be mainly based on rules learnt through instruction. Like a computer, novices follow simple step-by-step activities perhaps without fully understanding the reasons behind their actions. After encountering a sufficient number of similar situations, *advanced beginners* (Stage 2) learn to recognise certain contextual cues that characterise the situation. Based on those cues, learners come to regulate their actions based on maxims. Such maxims are contextualised rules that use the already constructed knowledge about the task and the situation as in ‘shift up when the motor sounds like it’s racing’ (Dreyfus & Dreyfus, 2005, p. 783). Ongoing experience allows learners to refine already learnt maxims and to construct new maxims. At Stage 3, *competent individuals* have experienced an extensive range of different domain-relevant activities and situations. Because these individuals may still not have comprehension of relevant situational characteristics, they may experience difficulties remembering relevant cues to identify similar situations they subsequently encounter. To manage those cues, competent individuals adopt approaches

to progressing with their work and learning and may consciously seek to differentiate situations and discern appropriate actions. However, the confinement to a constrained set of situational aspects and features can lead to misjudgements or misclassifications in their work activities. Individuals then apply actions and problem-solving strategies that may be suited to similar but different problem situations. At Stage 4, *proficient performers* have learnt to discriminate amongst sets of domain-specific situations and accompanying responses. 'Action becomes easier and less stressful as the learner simply sees what needs to be done rather than using a calculative procedure to select one of several possible alternatives' (Dreyfus & Dreyfus, 2005, p. 786). However, proficient performers have still to rely on rules and maxims in deciding how to respond to particular situations. Only at the fifth and final stage individuals develop *expertise* allowing them to act seemingly intuitively to problem situations without using rules or maxims. Hence, experts activate appropriate knowledge and problem responses not by relying on rules or maxims but rather on the fast retrieval of scripts connected to special situations or cases they have encountered earlier. Although this model of development is idealised and simple in its linear form and has been criticised (Dall'Alba & Sandberg, 2006), it offers a representation of how such progression might be realised in occupations such as nursing (e.g. Benner, 2004). What it may require is being located in a particular circumstance of practice.

The issue remains about how and what individuals learn through domain-related experiences. Using a cognitive approach, Gruber (1999) explains expertise development as acquisition of episodic knowledge through engagement in domain-related activities and the subsequent construction of procedural knowledge. Hence, expertise development is the incremental construction of knowledge of and meaning about the domain that arise as a legacy of engaging in these kinds of experiences. In the past, different cognitive models have been proposed to explain aspects of this process. Kolodner's (1983) dynamic memory model has been offered to explain how individuals store experienced situations and how information to appropriately react in certain situations is later effectively retrieved from memory. Anderson (1982) almost conversely explains how the repetitive engagement with similar tasks leads to a gradual honing of problem-solving capacities within a certain domain. In another model, Boshuizen (2004) explains how conceptual knowledge about a domain gets encapsulated within daily work experience allowing seemingly spontaneous and effective responses to daily work problems. Taken together, those models offer explanations of how individuals build up expertise through ongoing experience within domains of activities.

In her model of dynamic memory, Kolodner (1983) proposes that experiences are encoded in memory as script-type knowledge. Those scripts are retrieved in stereotypical situations and determine the individual's actions. Generalised scripts (the so-called episodic memory organisation packets) are constructed through recurrently encountering of similar episodes. Based on the similarities of those episodes, prototypical reaction patterns are formed. However, sometimes it is necessary to recognise the idiosyncrasy of situations to act appropriately. That is why significant deviations from previously encountered situations are indexed based on

the significance of their differences from previously encountered situations and activities. These indexes permit the fast retrieval of appropriate behavioural patterns for the encountered situation. Kolodner's model, therefore, explains how the ongoing experience of both similar and novel situations supports the construction of episodic knowledge that can be used to construe and respond to what is subsequently experienced.

Anderson (1982) describes the effect of experience on learning in a three-stage model. In the first stage, an individual encounters an episode and constructs declarative or conceptual knowledge about the situation. Through further engagement with situations comprising similar activities or problems, this conceptual knowledge gets compiled into procedures (second stage). In the third stage, this conceptual knowledge is refined through further experience. This proceduralised and refined knowledge permits fast and ultimately automatised reactions to familiar problem situations. This model, therefore, explains how repeated experience of analogous problems permits the individual to seemingly automatically respond in new domain-relevant situations.

In her knowledge encapsulation theory, Boshuizen (2004) explains how medical professionals develop expertise through the combination of conceptual knowledge and daily work experience. The repetitive treatment of similar medical cases requiring the application of certain clinical knowledge leads to the construction of encapsulated forms of knowledge. Those forms of knowledge combine conceptual and clinical knowledge to the so-called illness scripts that allow direct activation when patients with similar problems are encountered (see also Boshuizen & Schmidt, 1992; van de Wiel, 1997). Again, this model explains how domain-related experiences are stored in memory through episodic means and can later be retrieved to respond to new problem situations. However, this model also explains the role of conceptual and procedural knowledge constructed through experiences in educational and work settings can be combined and leads to procedural capacities of the kind required by experts.

So, across these accounts, the combination of experience iteratively and actively being engaged with is used to explain the incremental development of expertise. Although slightly different in all three aspects, these three models make the same final point: ongoing domain-related experience leads individuals to construct domain-specific knowledge that permits the quick application of appropriate actions to problem situations (Table 3.1 for a summary of the three models). Drawing on representations of episodic knowledge permits the recall and utilisation of what is known to similar, and potentially, dissimilar situations (Kolodner, 1983). The appropriate script-type knowledge permits individuals to a seemingly spontaneous reaction to current situations (cf. also Boshuizen, 2004). Through this process, working memory capacity becomes freed up and higher levels of relevant situational characteristics can be processed (Ropo, 2004). So, experts cannot only appropriately react to domain-related situations because of their extensive experience, but they can also interrogate the characteristics of a problem situation at a considerably deeper and wider level and fashion appropriate responses.

Table 3.1 Summary of models explaining learning from experience

	Kolodner	Anderson	Boshuizen
Cognitive structure	Episodic memory organisation packets; indexes	Declarative knowledge; procedural knowledge	Integrated network of conceptual knowledge; illness scripts
Cognitive processes	Storage of encountered episodes; formation of prototypical reaction pattern Indexing of significant deviations; retrieval of appropriate reaction pattern	Declarative encoding (storage of declarative knowledge); compilation of declarative knowledge; tuning (refinement of procedural knowledge)	Accumulation, validation and integration of conceptual knowledge; knowledge encapsulation; integration of conceptual and episodic knowledge to illness scripts
Explanatory power	How experiences are stored in memory, how they are cognitively processed, and how they are used to react in problem situations	Repetitive engagement in tasks lead to gradual improvement of problem-solving skills	Conceptual knowledge is indirectly utilised in encountered problem situations through the activation of episodic knowledge (illness scripts)

However, the plain experience of episodes at work may not automatically lead to knowledge recall and reconstruction. In particular, Kolodner's (1983) model emphasises the important role of reflection or introspection in the knowledge construction process. Experiences have to be cognitively analysed about their causes, their differences from earlier experiences and the outcomes of those experiences. Without cognitive engagement (i.e. introspection) with the experienced situation, learners can neither generalise scripts nor construct indexes permitting the retrieval of appropriate behavioural patterns for subsequent situations.

After a number of years of experience within a domain of activities, most people accomplish reasonable performance levels (Ericsson, 2006b). However, not all individuals reach the expertise stage that allows them to exhibit continuing superior performance within the domain (Dreyfus & Dreyfus, 1988; Ericsson, 2006b). For instance, just being engaged in domain-related activities and practices does not ensure the transition from stages 4 to 5 or even from 3 to 4. This lack of transition might, for example, be the case if individuals do not engage in introspection. Other reasons for this lack of transitions might be that the engagement in rather repetitive and routine activities does not allow further competence improvements (Ericsson, 2006b). Such activities may not secure rich learning outcomes of the kind required for expertise in the long run. Access to activities that allow individuals' further progression on the expertise ladder may even follow the 'Matthew Effect' (e.g. Rigney, 2010). Organisations often fill positions that afford sufficient learning opportunities with high performers or employees with potential for high performance. On the other hand, high performers may deliberately look out for challenging situations

and positions that allow them to engage in learning-relevant activities and practices. In this way, such individuals that already have high levels of expertise are provided with experiences that permit them to further improve their performance.

Through their inquiries, Ericsson and colleagues (e.g. Ericsson, 2006b; Ericsson et al., 1993) found that high-level performers have been significantly more often engaged in domain-relevant activities compared with their less expert counterparts. However, high-level performers may also have invested more time and effort into qualitatively more demanding activities. Concentrating consiously on activities that have been still outside their current performance may permit them to gradually improve their domain-relevant skill sets. Such deliberate practice, therefore, comprises these individuals' intentional and effortful engagement in challenging activities in ways directed to improve their performance. In its narrow definition, a key element of deliberate practice is learners engaging in activities to consciously improve performance and secure a desired level of performance. The important point here is individuals' conscious efforts to go beyond their existing levels of knowledge and skills to further develop their performance (Bereiter & Scardamalia, 1993).

As foreshadowed, some studies (e.g. Dunn & Shriner, 1999; Sonnentag & Kleine, 2000; Van de Wiel et al., 2004; Van de Wiel & van den Bossche, 2013; Van de Wiel, van den Bossche, Janssen, & Jossberger, 2011) investigated whether employees engage in deliberate practice at work and whether this engagement can be used to explain expertise development at work. The empirical results are highly ambivalent and provide an equivocal picture. For instance, Van de Wiel et al. (2004) investigated the impact of deliberate practice on the expertise development of strategy and organisational consultancies. They interviewed 23 consultants about their engagement in deliberate practice and self-regulated learning activities (e.g. reading professional literature, participating work-related courses) at work. The interviews quantified the number of participants that engaged in each activity and the time spent and/or the frequency of engagement in those activities. The participants were then grouped regarding their expertise level (top vs. average). Although a range of activities were classified as deliberate practice, the only activity that distinguished average from top performers was the amount of intentional reading of scientific literature (Cohen's $d > 1$). Apart from this single factor, the study found no other evidence that intentional practice at work influences the development of expertise. However, in another study on insurance agents ($n = 100$, interview study with the following quantification of current and cumulative time spent on activities), Sonnentag and Kleine (2000) identified a significant positive relationship between time spent on deliberate practice and performance ($\beta = .29$) after controlling for years of experience, the number of insurance cases handled, and time spent on activities supporting daily tasks ($R^2 = .24$). 'Above-average' performers reported engaging more often in intentional practice than average counterparts. The cumulative amount of past deliberate practice seemingly had no significant effect on performance. In their more recent study of competent physicians ($n = 45$), Van de Wiel and van den Bossche (2013) found no evidence that they engaged in activities that could be classified as intentional activities expressly aimed to develop further their medical competence. Similar to earlier studies, Van de Wiel and van den Bossche used

semi-structured interviews to obtain information about the activities these medical practitioners engaged in at work. These interviews were later analysed and each reported activity was classified as either deliberate practice or not.

Apart from the ambivalent outcomes of the efficacy of engaging in deliberate practice on professional development, it is questionable how the activities investigated in the studies above really qualify as deliberate practice in its original definition. Dunn and Shriner (1999), for example, mitigate their positive findings by indicating that school teachers ($n = 136$) do not deliberately engage in practices that are repeated to improve performance. Instead, they engage in activities that are necessary for their normal teaching duties. Van de Wiel and van den Bossche (2013) arrive at the same conclusion: medical practitioners are more concerned with delivering high-quality medical care instead of investing time in intentionally learning through practice. Work-related learning emerged from medical practitioners everyday engagement in work tasks rather than from activities that could be categorised as the kinds of intentional learning activities referred to by Ericsson and his colleagues. It is, therefore, questionable whether deliberate practice in its original narrow definition has explanatory power for elaborating the development of expertise at work. However, these findings do not mean that employees lack the potential to affect their own professional development. Based on the analysis of the characteristics of workplaces as domains of activities and interactions, in the following sections, we will show that intentional efforts that influence the development of expertise are enacted quite differently as proposed in Ericsson's concept of deliberate practice. Certainly, workplaces are ill-structured and complex domains that require a variety of responses to complete tasks, and these responses may well serve similar purposes to deliberate practice, albeit in analogous ways.

So, as foreshadowed, many findings of expertise development and the relevance of deliberate practice come from research in well-structured domains of activities (e.g. Ericsson, 2006b). Those domains, such as chess, music or sports, (i) are characterised by clear comparable performance standards and (ii) comprise a small number of well-defined activities, and (iii) the exhibition of high-level performance is often constrained to relatively infrequent occurring situations like tournaments, concerts, etc. Time that is not spent in performance-relevant situation is usually used to prepare for such rather singular events or to relax from the efforts of the last performance. Activities in workplaces often differ from such domains in significant ways.

First, in many forms of work, clear performance standards (i.e. set goals or solutions) are missing (Van de Wiel et al., 2011). Although failure to accomplish a task is often obvious, the evaluation of the quality of completed tasks might not always be that straightforward. For instance, in professional work such as teaching, consulting, etc., comparable cases may not occur frequently (Strasser & Gruber, 2004). Another problem is the division of labour that can make interindividual comparison at work difficult. Without clear performance standards and tangible and appropriate role models, employees may not know about their current performance level or skill deficits that might need improving. Furthermore, many employees experience a certain role ambiguity at work (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964; Katz & Kahn, 1978). So, even if performance standards are existing and known about, they

might differ across working roles and circumstances. In such a case, employees may receive conflicting information about their performance levels at work.

Second, employees often face limited time frames at work requiring constant engagement in performance-relevant activities (Van de Wiel et al., 2011). Work activities structure around deadlines and externally set requirements. This is why daily work life may quite often lead to a 'its good enough' attitude (Jensen, 2007) because of the pragmatic rationale that work tasks have to be completed and within resource and time constraints. It is usually not possible to set aside special time that is only reserved for professional development purposes or relaxation. Instead, these need to arise through work activities in which they engage.

Third, workplaces are often defined by their situationally particular activities and practices. Being a software developer, for example, means that everyday work activities may consist in using different programming languages, participation in work meetings, planning for new projects and coordination with customers and other departments (e.g. Sonnentag, 1995; van den Berg, 1998). Work domains and their requirements for performance are not so narrowly defined as the typical domains investigated in expertise research (Ropo, 2004). They can rather be conceptualised as complex of interrelated subdomains (Strasser & Gruber, 2004; van den Berg, 1998).

At work, performance is characterised as the capacity to meet the whole range of work demands of a certain workplace. As such the nature of expertise is quite situated (Billett, 2001a). Hence, development of expertise requires extensive experience in all relevant domain-related practices and even possibly in the circumstances where they are enacted. Empirical results confirm this proposition. Sonnentag (1995), for instance, could show that the variety of past experiences of programmer could significantly explain their work performance. Experts seem to have a greater variability in their professional expertise. Studies on nurses and medical practitioners make similar conclusions (Benner, 2004; Van de Wiel & van den Bossche, 2013). As noted, the characteristics, i.e. the variety and complexity, of experienced cases are highly relevant for the quality and pace of competence development.

Using the arguments made above, we can advance the following propositions. Workplace activities are not wholly comparable to well-structured domains (e.g. music, sport, chess) that have been used extensively in expertise research. Workplaces, instead, are best characterised as ill-structured domains (e.g. Strasser & Gruber, 2004). It is, therefore, not surprising that employees do not engage in deliberate practice at work as per the definitions advanced above that refer to well-structured domains. As clear performance standards are often lacking, many employees might not be aware of own performance deficits that prevent to reach the next expertise stage. However, even if employees know their performance gaps, limited time frames and pragmatic demands often prevent the engagement in activities not part of their daily work life. Another reason might be the heterogeneous activities that employees have to engage in at work. At work, it is usually not enough to perfectly master a single activity. For employees, it is more important to excel in a range of activities and repeatedly. Hence, rather than a conscious process of engaging in deliberate practice, the nature of work tasks provides what elsewhere is seen as the need to construct activities through which deliberate practice can be enacted.

Such a demand to engage in a diverse set of tasks and activities prevents the identification of both performance gaps and appropriate activities that can be characterised as deliberate practice.

3.3 Workplaces as Learning Environments

As noted, extensive engagement in domain-specific work activities is necessary for developing occupational expertise at work. Both the variety and the complexity of activities shape the form of that development.

The kind of workplaces and how they are defined depend on the purpose and function of the specific organisation, the organisation's structure and the particular requirements for division of labour (Billett, 2001b). Another important factor is the social and cultural practices prevalent in a particular workplace (Billett, 2001a). The practices and activities within a workplace are unique to some extent. Factors like the local economic situation, specific market demands, available personnel or workplace rules affect how social and cultural practices are shaped (cf., Billett, 1995). Work domains are, therefore, not abstract entities that are easily comparable over different situational contexts (Billett, 2001a). Instead, they are highly situated practices that afford particular kinds of activities and interactions to those who work in them.

However, the access to work affordances that permit engagement in certain activities and practices is also likely to be governed by several other factors. Quite often a set of competences or qualifications and tenure are necessary preconditions to carry out certain tasks. Lave and Wenger (1991), for example, describe tailors that are only allowed to engage in sewing of high-quality clothes after the skills of fabric cutting, sewing clothes with lower requirements for finish and cleaning processes are mastered. Such task restrictions often have a pragmatic rationale. Only experienced workers are allowed to engage in activities where mistakes in work processes can have serious financial or in certain situations even health consequences in order to avoid them (see also Gherardi, Nicolini, & Odella, 1998).

These affordances are also distributed on the basis of personal factors like race, gender, employment status or personal relations with other employees or customers (Billett, 2001b; Tanggaard, 2006). In certain work contexts, the engagement in certain practices is a privilege reserved for managers or supervisors. In research on hairdressers, Billett (2001a), for instance, observed that even senior personnel were denied the experience of managing stock, if it was a practice within the salon for this task to be restricted to the owner. In this instance, employees were explicitly denied to engage in activities concerning inventory management whereas that occurred routinely in others.

On the other hand, workplaces often provide employees with certain degrees of freedom regarding their daily work life. Not all work processes are wholly predefined. Apart from very constrained workplaces (e.g. assembly lines), employees have autonomy to decide how to handle tasks or how to tackle problems. How those degrees of freedom are utilised to gain work experiences depends mainly on the

employees themselves. Gustavsson (2007) illustrates the scope of decision-making that permits employees to elect how they engage in certain activities or not. In her study, she found evidence that industrial operators 'create access to participate in events and problems. The operators emphasize that they can, if they want to, learn more by participating in problem situations in their work' (p. 459).

For understanding expertise development in work domains, it is also crucial to note that workplace practice often restrict the access to work practices and activities (Billett, 2001a). Although some workplaces afford a rich set of activities that permit them to engage in a wide range of activities that are typical for a work domain, others may not. In such cases, employees that engage only in those work practices and activities afforded by the workplace might be constrained in their development process.

3.4 Taking an Active Approach Towards Expertise Development at Work

As has been proposed, situational and contextual factors shape to a large degree what activities and interactions employees engage in at work. However, following from the above, we also have to account for the personal agency that affects how individuals elect to engage with them (Billett, 2001b, 2004). This agency can be understood as individuals' general capacities and dispositions to make intentional choices, initiate actions based on these choices and exercise control over their sense of selves and work environments (Harteis & Goller, 2014). Exercising agency at work, therefore, means taking initiatives and seizing opportunities as well as taking control over work situations and resisting external forces (Eteläpelto, Vähäsantanen, Hökka, & Paloniemi, 2013). At work, personal agency might, for example, be manifested by decisions to participate in or reject certain work practices (Billett, 2004; Gustavsson, 2007), to deliberately change workplace descriptions (Wrzesniewski & Dutton, 2001) or to intentionally seek feedback about own performance (Ashford & Cummings, 1983, 1985). Certainly, exercising personal agency at work permits employees to influence their own professional development processes (cf. also Harteis & Goller, 2014) through active engagement in activities and interactions and the degree and direction of their intentionality, which extends to introspection.

Workplace affordances need to be understood as shaping individuals' engagement with the available activities and practices. Whether and how individuals actually engage with activities and interactions afforded by their workplace depend both on their motivation and energy to engage in demanding activities (cf., Greeno, 1994). In what way individuals exercise their personal agency may well be strongly aligned to their professional identities and subjectivities (e.g. Billett, 2006; Holland, Lachicotte, Skinner, & Cain, 2003). Some of Gustavsson's (2007) industrial operators, for example, may have decided to engage in problem situations because they needed to learn how to handle similar problems in the future. Other operators, conversely, may elect not to engage in similar activities because they have not accepted them as part of their responsibilities or professional identity.

So, the exercise of personal agency can lead to a greater array of learning opportunities at work (Harteis & Goller, 2014). Individuals can – to a certain extent – intentionally or deliberately elect what kind of experience they engage in at work. This engagement is perhaps at its most crucial when there is a need to learn demanding knowledge that is effortful, such as engaging in activities with which employees are unfamiliar (i.e. nonroutine). So, efforts to craft new learning experiences might be manifested by adding new tasks or activities to individuals' work schedule, by deliberately participating in problem situations that are not primarily part of one's own work or by deliberately changing one's own approach to tackle familiar work problems and activities. Jensen (2007) calls this behaviour a 'move beyond the necessity' (p. 497) of the daily job. Although such efforts are deliberate in their intent, they do not qualify as deliberate practices as originally defined.

To give an example of such activities, consider a car mechanic working in a local garage. The mechanical repair work is usually divided between all mechanics working in a shift. Most of her colleagues prefer to repair certain kind of cars (make, type, etc.) if possible. Instead, she intentionally uses every opportunity to repair unfamiliar types of cars as well as such those with which she is familiar. In another situation, she volunteered to temporarily replace a sick colleague at the garage's storage facility. This opportunity allowed her to get insights into the processes behind ordering spare parts that were needed to replace broken car pieces at the garage. Her agentic behaviour allowed her to build upon a broad range of work experience. It is not only that her variety of experiences helps her to adequately react on new situations at the garage, but she also came to understand why certain parts for replacement are difficult to source. This knowledge sometimes helps her to order parts from different manufacturers or to explain to customers why the repair process will take a little bit longer.

Empirical evidence about such deliberate efforts to craft learning experiences is mainly based on qualitative studies. Based on 15 semi-structured interviews with viticulture workers, Bryson, Pajo, Ward and Mallon (2006) claim that agentic and proactive employees can shape and maximise the developmental potential afforded by workplace activities. Both employees on lower and higher hierarchical levels created learning opportunities by taking initiative. At management level, such efforts, for instance, consist of initialising new projects. Manual workers used more individual-specific strategies to craft new experiences. Bryson et al. (2006) report a case where a worker took the opportunity to work in another department for a short time to broaden their knowledge similar to our example.

Similar findings have been reported for nurses (Berings, Gelissen, & Poell, 2005, 2007). The authors found nurses regarded activities labelled as 'job rotation' and 'broadening tasks' as highly relevant development opportunities. Both categories were extracted from interviews with 20 Dutch nurses. The first category comprises activities that aim at temporary job changes. Examples here include temporarily working in other departments or taking over other employees' work. The second category comprises more general changes connected to the individual's own work. Examples are the long-term adoption of other employees' work or the general search for new challenging situations. In a quantitative follow-up study, the authors

found that learning by adding new tasks (i.e. combining both categories 'job rotation' and 'broadening tasks') has a positive effect on perceived development of nurses ($\beta = .18$) controlling factors like years of nursing experience, searching for information and learning through cooperation ($R^2 = .12$) (Berings, Poell, Simons, & van Veldhoven, 2007).

Similarly, Berg, Wrzesniewski and Dutton (2010) interviewed employees from for-profit and non-profit organisations about their job crafting behaviour. In some of their 33 interviews, they found evidence of some employees deliberately seeking out opportunities for learning by altering the scope or nature of tasks as well as taking on additional tasks or establishing new relationships with colleagues in other departments. In one interview, for instance, a customer service representative explains: 'I have taken initiative to form relationships with some of the folks who fulfill orders. … That's not my area but I was really interested in how that worked and wanted to learn. … I have learned a lot from them, and that's helped me in my job' (p. 166). Focusing on their self-regulated learning, Slotnick (1999) interviewed 32 medical practitioners about their everyday workplace learning. Based on these interviews, he found evidence that medical practitioners deliberately scan their environment for possible situations to participate in and learn through. In particular, such situations with the potential to secure new learning are considered most worthwhile. These situations offer opportunities to prepare for future situations at work.

Most studies described here explicitly link experience with developmental purposes. Nevertheless, the motivation to engage in the intentional learning referred to above can also be linked to motives such as asserting control over their own job to avoid alienation from work, creating a positive self-image, to fulfil the need for social relatedness or to fulfil the need to experience causation and to be self-determined (DeCharms, 1968; Deci, 1980; Deci & Ryan, 1985; Wrzesniewski & Dutton, 2001). Other possible motives are the fight against daily boredom (Berg et al., 2010; Dikkers, Jansen, de Lange, Vinkenburg, & Kooij, 2010) and hopes that additional professional experience helps to stimulate one's own career progression (Fried, Grant, Levi, Hadani, & Slowik, 2007).

However, the personal motives behind the agentic efforts might not be highly relevant for its effect on expertise development in the first place. As argued in Chap. 2, the recurrent engagement in mundane and repetitive activities does not allow further expertise development. In order to get professionally competent, the employee needs experience in the whole range of activities that define a workplace. If the workplace does not afford access to relevant activities, the individual has to become agentic and proactive. It is, therefore, not important whether individuals focus intentionally on their development in the first place. It is more important that the individual gets the chance to be involved in relevant practices. However, we have also argued that introspection is necessary to learn from those experiences. The next section describes how individuals can deliberately foster their learning processes.

3.5 Proactive Information and Feedback Seeking

Successful engagement in new activities may require certain kinds of information about these activities and how to become competent with them. For engaging, individuals may need information about what is technically required to perform well at the new tasks and practices (e.g. technical information) as well as what performance expectations and standards are connected to the activity (e.g. referent information) (Morrison, 1993b). During the engagement with new practices, individuals may want more information on how they are performing (e.g. appraisal information, feedback) (Ashford & Cummings, 1983; Morrison, 1993b). However, it is reasonable to assume that not all workplaces afford access to necessary information without a certain initiative from employees themselves.

If the kinds of activities and interaction needed to learn the knowledge required for work are not provided automatically, employees have to take initiative to secure them. In general, individuals can engage in two different information-seeking strategies. First, while *monitoring* their environment, individuals try to deliberately obtain informational cues from the situation. Such cues can arise from behaviours of others as well as directly from work tasks (Ashford & Cummings, 1983; Morrison, 1993a). Supervisors might, for example, nod in approval while reviewing the outcome of a task. The failure to accomplish a task, on the other hand, might be directly visible through an inappropriate outcome. Second, the individual can engage in *inquiry* strategies by directly asking other individuals about their work behaviour or by directly looking for information in written material (Ashford & Cummings, 1983; Morrison, 1993a).

Technical and referent information are of particular significance in situation that are new and unfamiliar for the individual. To accomplish new tasks, individuals have to obtain information they require, what constitutes successful completion of the task and what relevant standards concerning time, quantity and quality apply for the novel tasks. Knowledge about such information should, in general, permit them to reach higher performance levels at work and quicker mastery of new tasks. Particularly in situations where that kind of information are not easily accessible, employees that are engaging proactively information seeking should be better off than more passive colleagues. Empirical studies confirm this proposition. In her longitudinal study on accountants ($n = 240$), for instance, Morrison (1993a) found significant evidence that both the deliberate inquiry about technical information ($r = .18$) and the deliberate monitoring of referent information ($r = .23$) are positively related to performance. In another study on accountants ($n = 135$) engaging in tasks for the first time, Morrison (1993b) found additional evidence that task mastery is significantly positively related to the frequency of inquiry about technical information from supervisors ($\beta = .19$).

After the comprehension of the procedures and quality standards behind the new task, the employee needs information about its efficacy and mastery of the new activity. Such feedback or appraisal information is crucial to understand how well standards are met and how actions are perceived from others (Ashford & Cummings,

1983). Furthermore, feedback provides information about the progress of mastery as well the current level of performance (Ilgen, Fisher, & Taylor, 1979).

Feedback is especially important because it inherits the potential to initiate introspection. As proposed above, introspection on new experience is a fundamental condition for learning. Although novel situations can act as starting points for introspection, it can be initiated through external feedback (Høyrup, 2004). Certainly, in situations where performance standards are not obvious and criteria to judge performance are not easily visible, feedback from other individuals can assist trigger introspection. As such, when feedback is not automatically provided, individuals deliberatively engaging in feedback-seeking strategies should have advantages regarding their professional development when compared with individuals not actively seeking feedback. However, even in situations where feedback is constantly provided by external sources, self-sought feedback has higher development potential. As Ashford and Cummings (1983) are arguing: '…it may well be that the implications for acceptance of feedback and the desire to respond in line with the feedback are different in the case where feedback is actively sought than if it is information passively received' (pp. 379–380). The proposed relationship between the tendency to seek feedback and performance as well as task mastery has been empirically confirmed. Feedback seeking is a good predictor of high work performance and task mastery (Ashford & Tsui, 1991; Morrison, 1993a, 1993b; Renn & Fedor, 2001).

3.6 Summary and Conclusion

Drawing mainly on results of expertise research, this contribution argued that work experience is a fundamental precondition for expertise development. Through the ongoing engagement with work-related activities and practices, individuals are able to construct well-organised, goal-oriented and quite often highly proceduralised knowledge about a certain domain. This knowledge allows individuals to act seemingly intuitive, fast and highly adequate to encountered problem situations and therefore to appropriately meet the demands of their domain.

Workplaces can best be described as being ill-structured domains. At work, performance is characterised as the capacity to meet a heterogeneous set of work demands. To build expertise, employees require intensive and extensive experience in all those relevant domain-related practices across a high variety of circumstances where they usually are enacted. However, not all workplaces provide access to the range of domain-related practices required to be learnt for effective performance. In this case, employees might be constrained in their development process.

To overcome such limitations, employees have to exercise agency. By taking initiatives, seizing opportunities and taking control over work situations employees are able to take an active approach towards their professional development. Individuals might, for example, craft new learning experiences by deliberately participating in problem situations that are not part of their daily work, by deliberately

changing work routines or by deliberately changing their job descriptions. Other agentic strategies that affect the professional development are proactive information and feedback seeking. Both strategies provide information about work-related activities as well as the individual's current performance with those activities.

Although those activities are deliberate in their core, they can hardly be termed intentional practices in the concept's original meaning. Ericsson (2006b) described deliberate practice as unpleasant, repetitive activities that aim to improve domain-relevant skill sets by concentrating on current performance sets. Empirical evidence about the effect of deliberate practice on expertise research mainly originates from research in well-defined domains. However, as noted, workplaces have to be characterised as complex and ill-defined domains. It is, therefore, not surprising that some studies found that employees do not engage in any kind of deliberate practice and other studies found highly ambivalent results of the effect of deliberate practices on expertise development at work. Hence, further research is required on the effect of deliberate efforts on professional development. However, such research should not use the concept deliberate practice in its original narrow definition. A focus on efforts like experience crafting behaviours or information and feedback-seeking activities seems to be more promising. Rather than being deliberate epistemological practices on the part of the workers, such practice opportunities arise through the very nature of the workplace itself. Instead, using precepts and methods associated with learner initiating deliberate practice may underestimate or entirely miss the kinds of agentic efforts occurring in workplaces.

Although many studies confirmed our propositions about the effect of agentic efforts of employees on their professional development, a stronger empirical foundation has to be built up. We need empirical insights why employees engage in such efforts, what situational and/or individual factors affects the crafting of experiences as well as the information and feedback seeking and what situational and/or individual factors mediate or moderate the effect of agentic efforts on professional development processes. A triangulation approach using a mixture of qualitative and quantitative methods might be best suited for this task.

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Chapter 4
The Practice of Professional Agency and the Emergence of Collaborative Creativity in Developmental Staff Meetings

Panu Forsman, Kaija Collin, and Anneli Eteläpelto

Abstract In this study, we focused on the manifestations of professional agency and collaborative creativity in team meetings. We aimed to investigate how different kinds of professional agency are related to collaborative creativity. We used an ethnographic approach, collecting observational data from the team meetings of the Human Resource Department of a Finnish Health Care District during 2009–2010. We found that professional agency is practised in various ways in team meetings, reflecting different habitual practices and power relations. In addition, it appeared that the nature of the professional agency practised affected the emergence of collaborative creativity. An environment with a high degree of freedom and a conversational atmosphere supported the practice of professional agency and the emergence of collaborative creativity. By contrast, a tradition of regulation and non-conversational practices acted as obstacles to agency and creativity.

4.1 Introduction: The Contemporary Work Environment Demands Active Agency

In the field of work and work-related learning, professional agency and creativity have received increasing scholarly attention (Billett, 2009; Collin, Paloniemi & Mecklin, 2010; Eteläpelto & Lahti, 2008; Eteläpelto, Heiskanen & Collin, 2011; Eteläpelto, Vähäsantanen, Hökkä, & Paloniemi, 2013; Paloniemi & Collin, 2010; Sawyer, 2006, 2007). Despite this, there is a lack of understanding of the role of professional agency or of how it is related to collaborative creativity at work.

P. Forsman, M.Ed. (✉) • K. Collin, Ph.D. • A. Eteläpelto, Ph.D.
Department of Education, University of Jyväskylä, Jyväskylä, Finland
e-mail: panu.forsman@jyu.fi; kaija.m.collin@jyu.fi; anneli.etelapelto@jyu.fi

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This chapter aims to contribute to discussion on how professional agency is manifested amid changing work conditions. It also examines how different kinds of professional agency are related to manifestations of collaborative creativity at work. In the study reported here, ethnographic enquiry was used to investigate the connections between professional agency and collaborative creativity in staff meetings. We shall focus on the meetings of work teams and consider how professional agency and collaborative creativity are manifested in developmental meeting situations.

In discussions on working life, it has been noted that contemporary work demands high-level competencies (e.g. Giddens, 2007). In addition, the role of creativity has been emphasized in work environments (e.g. Florida, 2002, 2005, 2008; Florida & Tinagli, 2004). Creativity is seen as particularly important in work environments characterized by rapid and continuous structural and cultural changes and demanding novel solutions (Puccio & Cabra, 2010). In these environments, the traditional once-in-a-life-time transition from school to work has changed into a continuous process of renegotiating roles/identities (Beach, 2003), a process in which creativity enables the necessary flexibility (see Runco, 2004) for transitions at the individual, work community, and work organizational levels. Here we recognize that such transitions and negotiations have occurred throughout human history; nevertheless, we see the vastness and intensity of contemporary changes (see Gratton, 2011; also Järvensivu & Alasoini, 2012; Alasoini, Järvensivu & Mäkitalo, 2012) as making it particularly urgent to address agency and creativity in organizational development.

In Finland, and in Europe more broadly, there have been many projects to improve work processes, organizational forms, working methods, and the management of human resources. The common aim has been to support competitiveness, and changes in the work environment have, generally speaking, been bound up with this aim (e.g. Alasoini, 2011; Alasoini, Heikkilä & Ramstad, 2012). Here it is important to recognize that different organizational disciplines and cultures involve differing demands for creativity and innovation. Nevertheless, in general, the flexibility associated with creativity has led to new individual and communal patterns, making them a part of everyday lives (Runco, 2004). All in all, it can be claimed that the transitions in question have been bound up with agency and creativity, which can be viewed as forming the foundation of innovation and change.

To understand professional agency and collaborative creativity in a changing work context, we examined how they were manifested in concrete developmental work situations. Thus, we focused on staff meetings within a development process associated with workplace reform, involving the renegotiation and restructuring of tasks, duties, and services. Agency is here understood at the general level, as a process in which, through internal conversations, the different capacities and resources that individuals possess are used to enable action (see Archer, 2012). Creativity is understood as a systemic product or process with novelty, value, and appropriateness (Csikszentmihalyi, 1996; Kozbelt, Beghetto & Runco, 2010; Sawyer, 2006,

2007; Richards, 2010). In the present case, we considered processes of collaborative creativity, while bearing in mind that creativity may range from everyday manifestations of creativity to more acknowledged, unique, or far-reaching creative thinking (Kozbelt et al., 2010). Recently, creativity has often been seen as a component of agency, being something that is increasingly needed in working life where routine actions no longer suffice (see Archer, 2012).

In this chapter, the focus is on practised agency and on everyday creativity. An investigation into different kinds of staff meetings and meeting practices was used to shed light on how agency and creativity are manifested in developmental situations. We see the relationship between practised agency and creativity as intertwined, and in the study presented here, we sought to elaborate the relation between these. The aim was to illustrate the different types and manifestations of professional agency and, further, to investigate how these relate to the *emergence of collaborative creativity*. Manifestations of professional agency were investigated through observable engagement in individual and collective procedures during staff meetings. Collaborative creativity was examined via the discourse exchanges in these meetings, in so far as they exhibited novelty, value, and appropriateness in either process or product. The findings and interpretations of this study are here supported by vignettes, tables, and discursive excerpts.

According to the assumed interdependence between agency and creativity, neither would be sufficient alone in the changing work environment, making it all the more important to look at these phenomena together. In the following section, we address the messy and abstract concepts of agency and creativity.

4.2 Professional Agency and Collaborative Creativity in a Work Organization

Agency and creativity are abstract and complex concepts (e.g. Archer, 2003, 2007; Eteläpelto et al., 2013; Giddens, 1984; Kaufman & Sternberg, 2010; Miell & Littleton, 2004; Runco, 2004; Sawyer, 2006). Agency has been defined in different ways, for example, as the power to act within surrounding structures, the power to do something, or power over something (e.g. Archer, 2003; Eteläpelto et al., 2013; Giddens, 1984), while creativity is often assessed through novelty, value, and appropriateness (Kozbelt et al., 2010). Rather than focusing on its most overt or exceptional eminent levels, creativity is here considered on an everyday level, with the likelihood that collaborative creativity will exceed individual creativity in respect of emergent processes or products (Kozbelt et al., 2010). According to Richards (2010), everyday creativity is by no means a trivial aspect of life; rather, it is an important and recurrent phenomenon which includes almost all occasions on which originality is present to any degree. Below, we seek to offer some theoretical clarity on the concepts of agency and creativity as they relate to the present study, considering also the relationship between them.

4.2.1 *Agency as Active Engagement Rather than Passive Drifting*

Professional agency is not fixed or stable; rather, it is dynamic in nature and capable of temporal and situational changes (see Hitlin & Elder, 2007). A wider discussion of agency would include notions of freedom and the volition of a self-aware reflexive agent, one that is integrally and inseparably connected to the surrounding society (see Archer, 2000; Taylor, 1985; Wallace, 2006). Human agency can be conceptualized as a temporally embedded process of social engagement which draws on the past and which involves habits, routines, and experience. Nevertheless, agency is also oriented towards the future through the imagination of alternative possibilities and towards the present, operating within the contingencies of the moment in a dynamic interplay between the internal and the external – one in which the individual is neither completely free nor determined (Emirbayer & Mische, 1998). This connectedness clouds people's experiences of freedom through a variety of regulatory systems (including social stratification), which subordinate them. In general, agency is always temporal and situational, and thus in continuous change, given that the environment is never stable and that time cannot be arrested. Social actors can be embedded with a number of different temporalities at once, but are primarily oriented towards only one in any given situation, even if the actors are able to move and change their temporal orientations (Emirbayer & Mische, 1998).

One simple way to define agency is to regard it as a socioculturally mediated capacity to act (Ahearn, 2001). It entails dimensions (e.g. routine, purpose, and judgement) (Emirbayer & Mische, 1998) and has numerous other connections (e.g. with the self and one's identity or professional identity). It is visible through its external interpretations in social situations. There are different types of agency: *existential, pragmatic, identity,* and *life course*; these enable differentiation between routine and novel situations, and short- and long-term commitments (Hitlin & Elder, 2007). Determination of the differences between the orientations and the types of agency can be based on situations in which traditions, routines, and habits are interrupted or are deemed to be insufficient, bearing in mind that the ability of people to act emerges from the a morphogenetic process between the individual and his or her surrounding structures (Archer, 1982, 1996, 2000). The nature of people's relational interpretations depends on their internal reflexive conversations (Archer, 2003, 2007, 2010, 2012), and these affect their ability to function – including their ability to act, based on previous experiences. Differences in orientations (Emirbayer & Mische, 1998) and in types of agency (Hitlin & Elder, 2007) differ within a given temporal and situational moment, establishing an agentic interplay with social structures. It is important to distinguish between *modes* of agency (i.e. passive *drifting* and active *engagement*) and the *sense* of agency, since agency is not an act itself, but something that is largely connected to experienced possibilities in everyday life (Archer, 2007, 2012; Clegg, 2005, 2006). For Archer (2003, 2007, 2012) the more passive mode of agency refers to individuals to whom things happen, whereas the more active mode of agency refers to individuals who *make* things happen and who

enable environmental transformation. Furthermore, through this transformative underpinning, which entails an imaginative aspect or application of experiences, the transformative, structure-changing nature of agency – intertwined with creativity – involves the ability to see things differently and to see diverse possibilities, as these enable intentional change.

4.2.2 Structure, Power, and Professional Agency

Professional agency is practised in the work environment of organizations, and it arises from the interplay of the technology, social structures, cultures, and physical structures embedded in and contributing to it (Hatch, 1997). Complex organizations and work environments are divided into different areas of expertise and hierarchical levels. Within these, power is relational, and it exists between social actors in different forms (involving, e.g. rewards, norms, and knowledge) and locations (involving, e.g. authority, personal characteristics, expertise, and opportunity) (Hatch, 1997, pp. 282–283). Thus, even in a simple organization, the power relations can be complex – and to some extent, tacit or unrecognized. In organizational research, structure refers to the relationships between the parts of an organized whole, including almost anything – from the physical (e.g. buildings and their parts, or the human body) to social realms – and necessitates hierarchy as a description of the official distribution of authority among organizational positions (Hatch, 1997, pp. 163–164). It is often important to understand the interaction between different areas and levels, since the efficiency and functioning of a systemic organization depends on its parts and practitioners – and their interplay.

In the social structure of an organization, differentiation can be described in terms of *mechanistic, organic,* and *bureaucratic* forms. Mechanistic organizations are complex, formal, and centralized. Organic organizations, for their part, are relatively simple, informal, and decentralized. Organic structures give employees more responsibility (i.e. discretion) in tasks and decision-making, while mechanistic structures include carefully defined tasks, rules, and procedures with limited participation in decision-making. In bureaucratic structures, decisions are pushed to low levels (i.e. decentralized) but are hemmed in by strict rules and procedures that prevent discretion (Hatch, 1997, pp. 169–170). These different structural forms represent the places where general human agency and professional agency are practised. Social structures constrain activities but at the same time are created by them. Furthermore, structures do not merely constrain but also enable interaction. Thus, it may be important to look at (superficially minute) changes, and the ever-present dynamics and structures should not be seen as fixed and immovable objects (Hatch, 1997, p. 181). In one of its aspects, the interest lies in the process of practising professional agency and in how the structural circumstances are related to this.

Professional discourses can limit, or act as resources for, individual action, giving rise to different power relations. Power is inseparable from the subject's practice of agency, as agentic individuals need to have the capability to influence or intervene in

an event (Eteläpelto et al., 2013). Similarly, agency can appear as resistance towards structural powers (Casey, 2006; Fenwick & Somerville, 2006; Vähäsantanen & Eteläpelto, 2009) or the adoption of a more critical stance towards changes (Fenwick, 2006; Vähäsantanen & Eteläpelto, 2009; Vähäsantanen & Billett, 2008) with respect to activities deemed preferable by the employer, as in the development of new work practices (Littleton, Taylor & Eteläpelto, 2012; Paloniemi & Collin, 2010). The subject-centred sociocultural approach to professional agency at work implies conceptualizing and analytically understanding agency as practised and manifested when professional subjects and/or communities exert influence, make choices, and take stances in ways that affect their work and/or their professional identities. Within this approach, professional agency is always exercised for certain purposes and within historically formed sociocultural and material circumstances, and it is constrained and resourced by these circumstances (Eteläpelto et al., 2013). Professional agency, as an individual or collective enterprise, involves participation and collaboration within the work community (Collin, Paloniemi, et al., 2010; Collin, Sintonen, Paloniemi & Auvinen, 2011; Eteläpelto & Lahti, 2008) or within the whole work organization (Hökkä, Eteläpelto & Rasku-Puttonen, 2012; Sawyer, 2006).

Despite this, the influences pertaining to agency are not connected merely to the organization in which agency is practised. On a practical level, agency is connected with human capabilities and competencies and on an embodied level, with health and well-being (see Archer, 2003). The subject is relatively autonomous, since personal concerns originating from the natural, practical, and social orders of an individual's reality are realized through active and reflective consideration (i.e. construction) (Archer, 2012). However, despite this relative autonomy, the contextual constraints, structures, and resources of agency affect individuals in their working lives – depending on their internal reflective conversations (i.e. interpretations) (Archer, 2012). Active subjects can reimagine or reorientate their objectives to improve their work practices through individual actions (Casey, 2006), but cannot escape power, even when changes and shifts emphasize flexibility and productivity (Edwards & Nicoll, 2006). The practice of professional agency depends on the interpretations arising from individuals' internal conversations (Archer, 2003). These interpretations are not fixed or deterministic, but have creative potential.

4.2.3 Collaborative Creativity Resulting from Multiple Contributions

There have been several handbooks on creativity (e.g. Kaufman & Sternberg, 2010; Sternberg, 1999), books on group creativity (e.g. Sawyer, 2003) or collaborative creativity (e.g. Miell & Littleton, 2004), and descriptions of societal change and creativity (e.g. Florida, 2002, 2008; Sennett, 2008), including creativity as an everyday phenomenon (Richards, 2007). However, there is no all-inclusive definition or theory of creativity. Contemporary research has emphasized collaborative (Miell & Littleton, 2004) and systemic views (Csikszentmihályi, 1996; Sawyer, 2006) of

emergent creativity. As also noted above, the demands of the contemporary environment have underlined the importance of everyday creativity in society, which, in the present study, is considered to be the foundation for more eminent manifestations of creativity and innovation (see Richards, 2007, 2010).

Creativity can be assessed as a product or a process. Here, we focus on creativity as a process of idea generation (Rank, Pace & Frese, 2004) rather than as an innovative product (which can be seen as deriving from creativity) (De Dreu, Nijstad & Baas, 2011; Puccio & Cabra, 2010; Rank et al., 2004). In operational definitions of creativity, one would include considerations of novelty, value, and appropriateness (see Kozbelt et al., 2010, also Amabile, 1983), or originality and meaningfulness (Richards, 2010), or, in general terms, notions of novelty and quality in relation to something (Sternberg & Kaufman, 2010). For its part, the collaborative creative process in team discussions has been operationalized in terms of the emergence or creation of new ideas, the expression of alternative ideas, the disclosure of contradictions and opposing views, and the construction of an elaborated understanding of the topic (Eteläpelto & Lahti, 2008). In the present study, creativity was understood as systemic in nature (Csikszentmihályi, 1996), and it was explored through its emerging collaborative manifestations (Sawyer, 2006; Kozbelt et al., 2010). The aim was to address creativity from minimalist levels up to larger syntheses derived from smaller elements. Novelty and originality were assessed loosely, in relation to knowledge from previous conversations and to participants' indications within conversations. These indications were such as to convey the notion that an aspect, form, or composition of an idea or opinion was in some respect new in the situation. At the same time, an assessment was made of the quality (i.e. value, appropriateness) of an idea, in relation to the subject at hand, and in terms of having some real-life correspondence with the agenda and goals of the department in question (see Sternberg & Kaufman, 2010). Here one should bear in mind that creativity relies on sociocultural factors which emphasize its practical nature. Hence, a large part of professional creativity is connected to social practices and to the development of these.

Creativity can be seen as mediated through and as being positively connected to the practice of professional agency (see Miell & Littleton, 2004; Sawyer, 2007), especially through the imagining of alternative possibilities (i.e. taking up a future orientation) (Emirbayer & Mische, 1998). In the present study, creativity is addressed, first of all, in terms of its everyday manifestations. We sought to grasp the smallest elements of the reality of the collaborative creativity occurring in the team meetings, seeing such meetings as situations in which idea generation is likely to occur.

4.3 Research Task and Questions

Empirical research is lacking on the manifestations, resources, and constraints pertaining to profession agency and collaborative creativity in contemporary work, and on how creativity and agency are related to each other. The present study sought

to achieve a better understanding of the practice of professional agency and its manifestations in the meetings of work teams embodying different power structures. Using an ethnographic research framework, we aimed to investigate different kinds of meeting practices and to make a comparison between the meeting situations in terms of the manifestations of professional agency and the consequent emergence of collaborative creativity. We decided to conduct a process analysis focusing on the temporal shifts within different kinds of meeting discourse and on how these shifts were distributed between the participants. We believed that this would shed light on how the official and unofficial power structures – embedded, for example, in the agenda of the meetings – constrained and resourced the practice of professional agency and collaborative creativity. In the present chapter, empirical examples are used to illustrate how agency shifted in the course of the meetings in question, transforming the power relations of the employees along situational and temporal trajectories. Our investigations also covered the relationship between professional agency and manifestations of collaborative creativity in meeting conversations. Agency was here identified through observable acts and behaviours, while collaborative creativity was seen as manifested through the expansion of novel and productive ideas. These various manifestations of agency and creativity became apparent via the discursive displays occurring in staff meetings. We sought to combine all these aspects in order to give a comprehensive view of group interactions in relation to the participants' professional agency and emergent collaborative creativity.

Our research questions were specified as follows:

1. What kinds of professional agency are practised in the various staff meetings?
2. How does the practice of professional agency relate to the emergence of collaborative creativity?

Based on the findings, we shall discuss the conditions that may be necessary for the practice of professional agency and for the emergence of collaborative creativity in meeting situations.

4.4 Methods: Ethnographic Research, Data, and Analysis

This study followed an ethnographic framework, using data collected during the period 2009–2010. The data were collected over a period of fifteen months through regular observations of daily organizational practices (e.g. meetings, social encounters), the shadowing of individual employees, thematic interviews, and written organizational documents. Our analyses focused on observations from staff meetings and on the professional agency practised in these meetings in connection with emergent collaborative creativity.

In the ethnographic framework we adhered to, data collection and analysis were considered to be parallel aspects of the research process, with that process itself being viewed as an interaction between the researcher and the subject (Burgess, 2006; Hammersley, 2005; Hammersley & Atkinson, 2007). During the

pre-fieldwork period, I as researcher (first named author) negotiated access to the target organization and held discussions with leaders and managers. I then conducted initial observations and gained insights into the structural and functional features of the organization. The aim in ethnographic research is to go to the subject and to participate in his or her everyday life, in order to see the reality as it is presented to the subjects in the case and to reveal cultural meanings and practices through this process (Hammersley & Atkinson, 2007, 20). During my observations, and in the course of subsequent employee shadowing, I had the opportunity to engage in conversations with the employees in order to gain details and to correct my original perceptions. As researcher I can thus be described as an "active member-researcher" (see Angrosino, 2008).

The data used here consisted of field notes and jottings made during my observations of the organization. The field notes and jottings were supplemented by time-stamped audio recordings from staff meetings and negotiation situations, seeking thus to ensure optimal coverage of the data (see Hammersley & Atkinson, 2007). In utilizing these data in the analysis, data triangulation was applied; thus my notes were compared with recordings and when possible particularized (see Patton, 2002). In this way, the data analysis formed layers, starting from a contextual description and moving towards more complex interpretational entireties. This became visible, for example, in the illustrations that originated from jottings in the notes – notes that themselves were reinforced and validated by comparison with recordings and transcripts made in and from the same situations.

Although the first level of analysis started with the initial contact and continued in parallel with the data collection, a more traditional phase of analysis commenced with a thorough organization of the data. The key analytical focus was directed at members' participation, engagement, and positive contribution towards the theme of the meeting (i.e. the agenda). From this, the investigation advanced to an intensive review of the recurring themes. This resulted from a rigorous reading of the data and enabled synthesis building plus a theoretical explanation of what had occurred in the situations investigated (see Beach, 2005). These observational categories were then further elaborated and refined in the light of items regarded as manifesting, on the one hand, original/novel ideas (i.e. creative work) and, on the other hand, habits/routines (i.e. noncreative work). The focus was primarily on the level of "small" manifestations of everyday creativity. Note, however, that such manifestations do not exclude the possibility of more noteworthy or far-reaching (i.e. eminent) manifestations of creativity. Note also that a high degree of sensitivity is required to identify manifestations that are usable in this kind of analysis. When doing ethnographic observations and analysis, tolerance is essential as through this sensitivity can rise (Hammersley, 2005).

In the present study, the transcripts of the field notes and jottings amounted to over 50 sheets and included several additional illustrations. There were over 25 h of recordings, with transcripts made from the relevant parts. These were segments focusing on informal and formal interactions and negotiation situations in the everyday life of the organization. They also included the meetings in question.

4.5 The Context of the Study

The strength of an ethnographic enquiry lies in detailed observation and in "thick" description of a highly mediated environment such as the natural conditions of a contemporary work environment (see Soukup, 2013). Description is the first level of analysis, and the one that stays closest to the data (Davies, 2008). It produces knowledge of normal events, situations, processes, and cultures, accumulating analytical value and giving ethnographic research its genuine interest (Beach, 2005). Sections 5.1 and 5.2 below describe the research context. Based on observations, there are descriptions of the differences between the teams and the meeting practices. Vignettes (i.e. thick descriptions based on several meetings) are used to further clarify the practices in question.

4.5.1 Organizational Structure and General Description of the Organizational Culture

The organization in question was the human resources department of a Finnish healthcare district, hereafter referred to as "the department". The hierarchy in the department followed a direct line from director to employee level, and it included three divisions (see Fig. 4.1). The employees of the different divisions represented expertise from the fields of education, employment, and recruitment. In addition to these divisions, the department also had an integrated managerial team responsible for executive control and direction, and offering interactions beyond divisional boundaries. Otherwise, the divisions had few overlapping tasks and duties. This meant that the individuals at employee and worker level were often aware of only their own and their working partners' tasks and duties, while individuals at a higher level – who had administrative tasks – possessed wider knowledge of the different

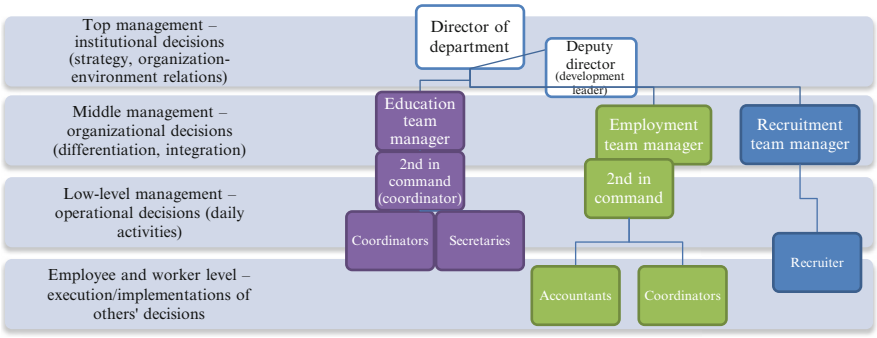

Fig. 4.1 Organizational structure of the human resources department

Table 4.1 The main differences between the forms, tasks, and duties of the teams

Managerial team	Education team	Employment team
Higher status	Lower status	Lower status
Organic form	Organic form	Bureaucratic form
Heterogeneity (differences in work and education backgrounds)	Heterogeneity (differences in work and education backgrounds)	Homogeneity (relatively low education, similar work history)
Executive tasks, duties, and power (i.e. *high discretion*)	Creative tasks and duties with *high discretion* on a personal level	*Highly regulated* and fixed repetitive routine tasks and duties
Decision-making	Problem-solving and educational administration	Calculating salaries, accounting, etc.

divisions. Essentially, the power in this department was located high up in the chain of command and sat with only a few individuals.

In the division of work, two classic forms of power distribution were particularly evident. In the education and managerial teams, individual discretion was permitted, while the employment team followed a work tradition of rigorous regulation and control (see Hatch, 1997). This division was understandable, given the nature of the work practised in these teams, where expertise ranged from education to accounting and from individual contributor (i.e. administrative worker) levels to professional (i.e. specialist) levels and executive positions. At the same time, these different levels and areas of expertise had distinct practices, traditions, and interrelations (i.e. history), and this affected the organizational form. The staff meetings of the recruitment team were excluded from this investigation due to the small size of the group (two members), as compared with the managerial, employment, and education teams (comprising 8–10 members). Thus, the data used for this research emanated from the staff meetings of three teams only: *management, employment,* and *education*. The differences between these teams are outlined in Table 4.1.

Staff meetings offered the opportunity to investigate professional agency and collaborative creativity in the different teams. The selection allowed the researchers to examine professional agency (at the executive and employee levels) in an organic organizational form and to look at it (at the employee level) in a bureaucratic organizational form.

4.5.2 The Different Types of Team Meetings

All three teams showed similarities and differences in their meeting procedures and practices. Nevertheless, in general terms they followed a traditional structure in which the chairperson (i.e. the team leader or other high-ranking member) controlled the agenda and the ensuing discussion. There were similarities also in addressing the same demands for the development of work and work practices, necessitating the

renegotiation and restructuration of tasks, duties, and services. Staff meetings were called when necessary, usually about every 2 weeks. The basic recurring issues on the agenda were the division of existing tasks and duties and the presentation of new or changing ones. Developmental goals were addressed in almost all the staff meetings to some extent, but one meeting a month focused on the developmental process. Within the meetings, the normal pattern was that developmental issues were first brought up. These involved recognizing and describing existing practices, processes, and work divisions, with the individual responsibilities pertaining to them. Thereafter, the meetings took up questions of restructuring, including making changes in order to benefit work practices. In simple terms, the questions addressed were: What do we do? And could or should we do it differently?

The *managerial team* meeting exhibited low hierarchical diversity and mixed expertise, with all those present having some executive powers. This team had active and participatory conversational meeting practices; experts from different areas engaged in dialogue with the aim of finding solutions to problems. The meeting of the *education team* also exhibited conversational features, and the agenda involved problem-solving. The conversational practices, too, aimed at problem-solving and at establishing future procedures. The third meeting type, observed in the case of the *employment team*, was characterized by a manager-driven procedure, not dissimilar to that of the education team. However, the meeting type here was more hierarchical in its procedures. The team followed bureaucratic structure and division of employment. This aspect was reflected also in the control and regulation of the meetings: the format tended to be one of a managerial monologue with minimal employee participation, resulting in unidirectional practices. It was noticeable that the managers of both the education and employment teams utilized conversational practices within the meetings, which started off with informal coffee conversations. However, only the educational team continued in this talkative vein during the meeting itself. In the employment team, the meetings followed a more traditional meeting format, with the chair having the main voice and leading the meeting as a whole.

Regarding conversation practices, the managerial and education teams presented broadly similar conversational practices, while in the employment team conversation was not engaged in. The managerial and education teams were expected to refine the services they offered throughout the organization and to discuss restructuration of their work, including the responsibilities of individual employees in relation to existing tasks and duties. In accordance with these expectations, the meetings expected personal input from each individual, adhering to a developmental frame which emphasized a bottom-up strategy. The characteristics of the staff meetings are shown in Table 4.2.

The following vignettes demonstrate the typical content of the meetings and seek to crystallize the meeting types of all three teams. These vignettes are based on observational data and on field notes from the overall data. In arriving at these vignettes, the first phase was one of familiarization with the meeting data, followed by intensive reading of transcripts of the meetings, and listening to recordings of the meetings. This made it possible to produce thematic material which was, in third phase, condensed into three different vignettes providing a “thick” description.

Table 4.2 The meeting characteristics of the teams observed

	Managerial team	Education team	Employment team
Hierarchy	Executive status and low diversity	Employee status and mixed diversity	Employee status with low diversity
	Low regulation	Low regulation	High regulation
Agenda focus	Problem-solving Decision-making	Problem-solving and development of practices	Distribution of information, duties, and tasks
Conversation	Dialogue	Dialogue	Monologue
Interaction	Active	Active	Passive
	Bidirectional	Bidirectional	Unidirectional
	Selective participation and engagement	Engaged	Obedient
Practices	Conversational	Conversational	Advice dependent

Vignette 1. Self-Directed Executives in Managerial Meetings

The meetings of the managerial staff were regular, and diverse topics were discussed, ranging from development issues to strategic decisions requiring input from the different divisions. These meetings took place in different locations and displayed conversational characteristics. The chair (i.e. the leader of the meeting) presented the agenda, and the executives controlled the conversation according to their expertise. There was considerable variation in the agenda. The discussion moved continuously between the different areas of expertise, or else combined separate areas (e.g. employment and recruitment). Although expertise directed engagement with the agenda, individual managers were able to offer opinions on matters outside their own areas of expertise. Nevertheless, the meetings did from time to time show passive participation at an individual level: if, for example, a key discussion took place regarding employment contracts, only the employment services personnel and top management would be interested. The other managers would concentrate on other things and appear "absent" from the discussion (i.e. unengaged or unavailable).

Vignette 2. Conversational Professional Agency in the Education Team Meetings

Even though the education team was scattered across different locations, there was active interaction between the team members in the staff meetings. The staff meetings presented an opportunity for the staff to meet their co-workers from different locations, and thus the meetings also served a social purpose. The meetings were usually arranged around a large table in a room that was filled with chatter from the outset. Everyone had a cup of coffee or tea and shared personal anecdotes in an amiable fashion. The conversation in the minutes before the actual meetings touched on everyday topics. After a lengthy period of free conversation, the manager of the education unit asked for everyone's attention and started the meeting. The conversation continued in a seemingly effortless manner: there was dialogue between several staff members participating in the agenda, and this kept the communicative atmosphere alive from the beginning to the end of the meeting.

Vignette 3. The "Obedient" Non-conversational Practices of the Employment Team

The employment team meetings were held regularly in the break room. The meetings were arranged so that they took place after the morning coffee break, thus apparently inviting continuity from normal social interaction. The workers appeared to be obedient and punctual, keeping their papers in front of them and taking notes if shared information demanded it. The meetings were held every two weeks and served mainly as checkpoints for monthly procedures. Within the meetings, new or changing regulations and rules were made known and explained. Meetings were also used to reallocate duties and tasks through discussion when this seemed necessary or possible (these being matters that involved reallocation rather than transformation). Usually the informal coffee-table talk (with the atmosphere of a "break") took place before the meetings, and in this phase the conversation tended to touch on everyday topics. Participation in these informal conversations differed according to the topics in question, but it was notably more active than in the formal part of the meetings. This free conversation was followed by a presentation of the agenda by the employee unit manager. The agenda was thoroughly presented and commented on by the manager while the others listened, appearing obedient and attentive to the monologue. In fact, "monologue" is an apt descriptive term for these meetings, since there was rarely any interaction, actual conversation, or dialogue. Normally there were some questions concerning specification or clarification, but beyond that, the information flow was fairly unidirectional.

4.6 Findings

This section is structured according to the research questions. First of all, we shall consider the professional agency exhibited in the staff meetings and then the relationship between agency and collaborative creativity in the meetings.

4.6.1 Professional Agency in the Staff Meetings

In order to answer the first research question (*What kinds of professional agency are practised in the staff meetings?*), we analysed the engagement practices in the meetings, looking at participants' observed engagements in typical staff meetings in each work team. In assessing the engagement, both verbal and nonverbal participation was considered. Furthermore, in analysing the meetings, we focused on temporal changes in the engagements: in so doing we analysed agency shifts and how these shifts were related to the practices and procedures of the different teams.

We took engagement shifts to represent instances of professional agency. We chose illustrations that would demonstrate the everyday practices and procedures

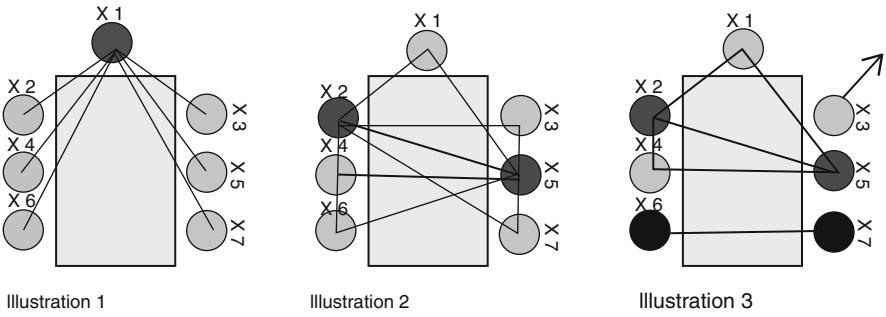

Fig. 4.2 Situational and temporal orientations in three successive situations in a typical meeting in the managerial team. X1–X7 refer to the participants at the meetings. *Black* and *dark grey circles* denote active engagement. Connecting lines indicate participants whose interactions are linked to each other. The *arrow* at X3 in Illustration 3 indicates nonengagement (Attention directed away from the meeting)

of the different groups. The different meeting types showed varying conditions for the practice of professional agency. Hence, we analysed the meetings to find consistent patterns of procedures and practices representing individuals' engagement with the meeting agendas. It became clear that professional engagement (as a manifestation of professional agency) significantly shifted during the meetings. These shifts were most clearly visible in the meetings of the education and managerial teams, which were characterized by high autonomy (i.e. low regulation). The shifts in professional agency in the meetings of the managerial and employment teams illustrate differences with respect to the topic at hand.

4.6.1.1 Professional Agency in the Staff Meetings of the Managerial Team

Professional agency is accessible through visible and observable actions. Thus, posture, positioning, attention, interruption, participation, and note taking were interpreted as indicating forms of agency. Shifts in agency position reflected temporal and situational changes in professional power connected to the nature of the employee's expertise. This aspect was also visible in statements that illustrated the confirmatory, propositional nature of meetings in which decisions were expected from the chair or other responsible individual (or group). Agency positioning was further strongly evident in the practices aimed at solution finding and decision-making. The shifts indicated possibilities for individuals to present their ideas and opinions – even opinions contrary to the mainstream thinking of the meeting. For the managerial team, examples of these shifts are shown in Fig. 4.2, which show typical meetings in order of chronological progression. Dark grey circles show the location of active professional agency at a given temporal and situational moment. Light grey represents mere passive engagement. The numbering (X1–X7) indicates different individuals.

Illustration 1 (Fig. 4.2) displays a situational and temporal moment in which the attention and focus are fully directed at one individual (X1). This kind of moment was common at the beginning of the meetings, when the chairperson was presenting the agenda. As the times and situations progressed, the location of active professional agency changed. These changes transformed the nature of the meeting from a monologue to a dialogue, as the participants were enabled to engage with the agenda. This is illustrated in Illustration 2, in which specific knowledge is shared with participants X2 and X5, while the others merely follow the conversation. Illustration 3 depicts a moment in which several overlapping active agents exhibit the self-directed nature of the managerial team. This moment is similar to the previous one, in so far as X2 and X5 still possess active professional agency directed towards the agenda; the difference lies in the situational change by which X6 and X7 have used their autonomy to engage with a separate agenda of their own. At the same time, X3 appears to be unengaged. Situationally and temporally, the topic in the third illustration appears of interest to only four participants; two of them are the individuals practising active professional agency directed at the agenda, while two are (distinct) interested individuals.

These situational moments seem to present a differentiation in the levels of engagement. Temporal and situational aspects affect the individuals' positions in the meetings, since professional activities and meetings have structural properties that direct the situational action. Areas of expertise seem to empower individual employees, as shown by the active professional agency of X2 and X5 in illustrations 2 and 3.

In Fig. 4.2, the actions taken by the participants show that autonomous professionals are relatively free to determine their own actions, within the obvious social limitations (i.e. structures), and to adapt themselves to these limitations if this fits the situational or temporal frame at given moments. Participants can direct their attention to general parts of the meeting and later divide it between the relevant parts of the agenda by shifting their engagement between the team and individual tasks. Different locations and opportunities for active professional agency present possibilities that offer meaningful engagement in moments that might otherwise be wasted (i.e. when the subject/topic derived from the agenda is not connected to the individual's area of expertise or practice). Engaged individuals take an active part in the conversations, and they develop ideas and opinions in collaboration with others.

4.6.1.2 Professional Agency in the Meetings of the Employment Team

An analysis of the engagements in the meetings of the employment team showed no significant temporal and situational changes in individual engagements – unlike the more autonomous staff meetings of the managerial and education teams. The temporal and situational variations in the employment team are illustrated in Fig. 4.3. Illustration 4 depicts the moment where the manager (Y1) announced general information (i.e. the meeting agenda, plus new procedures or practices). At this point, the employees listened quietly and, it seemed, obediently. Here, the engagement is indicated with light grey, although the actual visible activity or participation was minimal (see also Vignette 3). This is similar to the first situation of the managerial team

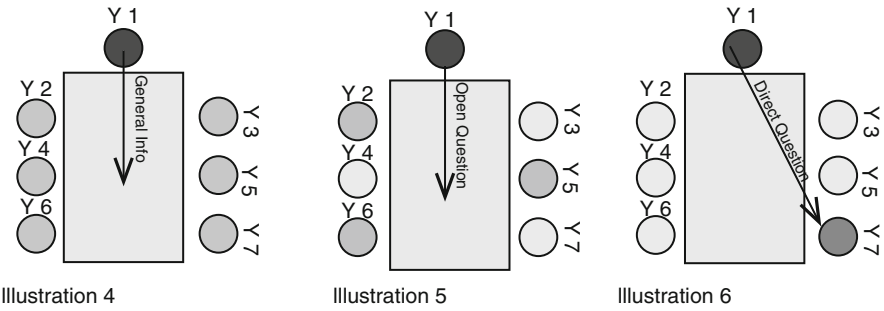

Fig. 4.3 Situational and temporal orientations in three successive situations in a typical meeting of the employment team. Y1–Y7 refer to the participants. *Black* and *dark grey circles* denote the most active engagement. The *arrows* indicate the direction of attention

(see Fig. 4.2), with the exception that there is a more amenable atmosphere in the employment team. Indeed, the atmosphere is best portrayed by analogy with a traditional school class in which the teacher talks and the pupils listen. In the second situation (Illustration 5), the manager directed an open question to the whole group. Such situations appeared to be aimed at eliciting a dialogue, but they seldom led to anything beyond a bland "yes" or similar utterance. In the third situation (Illustration 6), the manager sought an answer to a specific question that might require one participant's expertise.

The employment team seemed passive, and the situations did not seem to call for dialogue. This meeting practice will be further elaborated in Sect. 6.2.2 in which examples (Excerpts *Employment 1–3*) are taken from an hour-long meeting in which there were only six brief conversational exchanges. Five of the conversations spanned only one or two sentences or words, and the main participants in the longest (five minutes) conversation were the manager and the deputy manager. The meeting and negotiation situations usually consisted of the voice and opinions of the manager. However, this did not appear to reflect a deliberate authoritarian stance by the manager, who attempted to elicit responses from the participants and who appeared to recognize a real need for conversation. In the interviews conducted later, there were references to the previous manager, who had been an authoritarian figure with strong views and who had been considered knowledgeable by the group. It could thus be inferred that there had been no call for active participation in the past. This could imply that a tradition of regulation, including rigid routines and repetitiveness at work, might tend to inhibit professional engagement.

4.6.1.3 Comparative Summary of the Major Differences

Our analysis indicated that professional engagement differed from active to passive, involving either engaged or withdrawn interaction. The managerial and education teams, which exhibited more autonomy and self-direction, had relative freedom in their practices and procedures, with correspondingly more individual engagement

Table 4.3 The agency practised in the managerial, education, and employment team meetings

	Managerial team	Education team	Employment team
Nature of professional engagement	Active Selective In a state of flux Agenda dependent	Active Continuous	Passive Obedient Receptive Withdrawn Occasional
Resources of professional power	Status Expertise	Expertise	Status Authority
Product	Shared opinions Shared ideas	Shared opinions Shared ideas	Managerial decisions Unidirectional knowledge distribution

and participation. This was contrary to the highly regulated work tradition of the employment team, in whose meetings professional agency appeared to be restricted. In the highly regulated team, engagement was minimal, and the interactions tended to be unidirectional (see Table 4.3).

There are notable similarities between Table 4.1 (a description based on a first-level analysis) and Table 4.3. The latter presents the active professional agency that was visible through individual engagements in the teams that produced ideas and opinions. It was these ideas that served as the basis for collaborative creativity, which is addressed below.

4.6.2 Professional Agency Related to Collaborative Creativity

The second research question (*How does the practice of professional agency relate to the emergence of collaborative creativity?*) was addressed through a closer examination of the meeting situations in which professional agency was manifested. We selected situations which had produced creative outcomes, focusing on the previous engagements, interactions, and circumstances observed in the meeting practices.

4.6.2.1 Idea Development Through Active Engagement

The managerial team presented a tendency towards collaborative idea development through active engagement. This can be seen in Excerpts 1–3, which were derived from a single staff meeting. The creativity observed here is often at small level, but it does contain the possibility to develop towards something more exceptional. In this meeting, the agenda aimed to reformulate, clarify, and name key products offered by the department to its parent organization. In the Excerpt *Managerial 1*,

one can observe the simplicity of influential opposing opinions. This is an example of idea development arising from engagement activity, leading towards collaborative creativity via systemic emergence from mundane fragments. Without this kind of mundane semantic refinement, the entire agenda could run the risk of misdirecting the engagement. Furthermore, the original and novel aspects of this refinement can build up towards more exceptional creative properties, acknowledged and followed up by participants.

Excerpt *Managerial 1*

Refining the naming of things – presenting differing views on the agenda
X2: Isn't it employee seeking, not job seeking?
X5: [YES] Job seeking is what employees do. [NOT US]
(*Confirmatory utterances*)

Confirmatory practices are ways of expressing active participation (resulting from engagement with the topic) and of supporting the engagement of others. The opening of Excerpt *Managerial 1*, which expresses a differing opinion, engages with the topic. In so doing it expresses active professional agency (see X2 above). This kind of conflicting presentation of an original problem (in this case, the naming of a certain recruiting process) can lead to the development of something new. Even though in this case it was merely a matter of rephrasing, it nevertheless presents low-level everyday collaborative creativity, which had value for the later discussion. Without this refinement, further development of the problem would not have achieved the same result. Confirmatory discursive practices served here as an indication of appropriateness and value, presumably supporting the further expression of ideas and opinions, with further scope for the imagination. The novelty was merely at a situational rather than an individual level; after all, there was no claim that the proposed rephrasing represented something new in itself. However, it should be noted that the semantic refinement had been preceded by a somewhat unfruitful discussion and the redefinition was needed if the discussion was to proceed. It seems reasonable to suggest that this process would not take place without situational and temporal shifts in active professional agency (i.e. engagement with a topic derived from the agenda and with the input presented to it). Everyday creativity occurs through small, even subjective, remarks and rediscoveries before it can become more eminent. The properties offered by individuals redirected the conversation in a productive manner.

In Excerpt *Managerial 2*, the emerging notion consisted, first of all, of a clarification of the agenda, followed by identification of the actual process guidelines that were missing, even though some general guidelines for personnel planning existed.

Excerpt *Managerial 2*

Rediscovery – clarifying a matter that develops the agenda
X2: Is it also your intention to find the things that we are missing at this point? Or to only see what we have?
X1: Yes, that is it.
X2: Well, I think that we have the personnel planning part, but then, well, it comes to mind that [we have only] the general recruiting guideline …
X1: Yes, it is … (*pauses for few seconds*) … and "Recruiting guidelines for personnel planning" …

By means of realization, X1 was able to reformulate the problem and to offer an answer clarifying agenda with conception based on his or her understanding of existing practices. This led to the identification and later reformulation of recruiting guidelines. Depending on the engagement with the topic at hand, openings of this kind can lead to notions of new needs, involving emergent considerations that might otherwise be ignored or overlooked. This kind of questioning represents a conversational atmosphere in which freedom is present. Emergent products appear during conversations, sometimes through casual remarks or jokes. This can be seen in Excerpt *Managerial 3*. The outcome here is the emergence of an important realization, namely, awareness of problems in the recruiting procedure. The joke might have been left unsaid in a non-free or highly regulated or controlled situation.

Excerpt *Managerial 3*

Freedom – ideas emerging from free expression (e.g. jokes)
X4: There have been many examples of unsuccessful recruitments, not from us, but if you think of doctors in Finland.
X2: (*Laughing*) Yes.
X5: Well, there we see how important this is.

A combination of different inputs is the most important element of emergent collaborative creativity in meetings. These excerpts illustrate only low-level everyday creativity, which is nevertheless important in work communities. In Excerpts 1–3, there were only four active participants in the main conversation – thus paralleling the illustrations in Fig. 4.2. There can be numerous reasons for individual participation, and there can also be errors in interpretations (bearing in mind that in the excerpts chosen for this chapter the interpretations were drawn only from external observations). Nevertheless, the activation of individuals seems to take its direction

from the topics under discussion, situational cues, and temporal aspects. In the managerial team, there were no visible judgements directed at the inactive meeting attendees, not even if team members interacted in an overlapping manner (as seen with X6 and X7 in the third illustration in Fig. 4.2 and in X4's joke in Excerpt 3). The multiple shifts in the conversation of the managerial team were similar to those of the education team, with its conversational style of interaction; however, they ran counter to the interactional style of the more regulated and controlled employment team. Below, we shall illustrate the shifts and discursive interactions of the employment team, in which regulation, routine, and repetitive tasks were the norm.

4.6.2.2 Passive or Limited Participation Restraining Creative Production

The following excerpts are from a meeting of the employment team. In this case an earlier procedure had been changed, and this evoked discussion. The excerpts are part of an hour-long meeting. The participants were the manager (Y1), the deputy manager (Y2), and four employment secretaries (Y3–6). The speech by the manager and deputy manager is marked in grey in order to visualize the extent of their input. In the employment team, the manager was active most of the time, and he/she interacted most frequently with his/her deputy. This may well be problematic in cases where the actual practical knowledge is tacit and possessed by an employee who is passive. Such an event can be seen in Excerpt *Employment 1*.

Excerpt *Employment 1*

Questioning – disbelief on regulatory grounds
Y3: Why? How was it calculated? How was it done before?
Y2: Well, it was like (*a formula where*) you calculated how many hours of active work were in the [department 4] shift, and that determined the compensation. So now someone has obviously recalculated this and decided that it should always be a full 100 % as there is this sort of ruling.
Y3-6: (*Mutter*)
Y6: I think that MARK has just made it up …
Y4: It was here before. (*Points to paper*)
Y3: No, no.
Y5: I have had it …
Y4: It has definitely been over the past four years. At least while I have been doing it.
(*Silence for a few seconds.*)
Y1: So, do the [department 4 guide] orders state that a supervisor is entitled to change these compensations?
Y2: I don't know.
Y1: I'm just wondering under which mandate this was changed.

This presents a rare occasion on which the employees of the team actually contributed to the meeting, underlining the possibility of everyone having the agency to engage. The key point is that the nature of the work and the types of tasks associated with this team did not promote manifestations of agency and creativity. Nevertheless, if such manifestations are expected at all, they should be promoted in development situations, in order to ensure the flow of tacit information. Here, the secretaries displayed active professional agency in terms of disbelief in relation to the ruling presented, and the subsequent interpretations of the ruling to some extent presented resistance rather than agenda-engaging agency. Their incredulity served to evoke the expression of opinions, which was not characteristic of this team. One can see here a retraction of the withdrawal and passivity typically observed in the professional agency of this team: the engagement became more confrontational as personal interpretations were defended.

In Excerpt *Employment 2* below, the brevity of the inputs followed the style of professional agency normally practised in the team; nevertheless, it strongly affected the emerging product. Specific knowledge was gained from the individuals who did the actual work, and a decision depended on their input at that particular moment. Eventually the employment team achieved a conclusion that had similar characteristics to the collaborative creativity evident in the previous teams.

Excerpt *Employment 2*

A rare example of tacit knowledge becoming available
Y1: This was dated last month (*approved*) and these come from our employment contracts. So I'm suddenly (*wondering tone*) how this compensation has just been increased from 60 % to 100 %.
Y2: It has never been 100 %.
Y1: This is true. I have never seen anything like this. It is a huge increase. So where does this come from?
Y2: We have had 80 % in some units.
Y1: We have?
Y2: Yes. At [department 2].
Y1: No? And there is no mention that this will be temporary. This is not a temporary ruling.
Y5: Well, it's usually been and [department 1] where we have had temporary rulings …
Y4: So, in [department 2] and [department 3] it is always 100 %.

It is precisely the lack of such participatory moments and active engagements that leads to a lack of collaborative creativity in meeting procedures. In this connection, it is interesting that in the extract above, the employees did not seize the opportunity to contribute to idea development voluntarily, even though there was no apparent obstacle to this. A lack of employee initiatives or suggestions acts as a brake on emergent properties and lowers collaborative creativity.

4.6.2.3 Active Open Engagement Leading to Creative Collaboration

The teams differed in their professional agency in ways that related to the resulting creative products and processes. The managerial and education teams could be regarded as creative professionals according to the nature of their work. These teams spontaneously engaged with their members when problems occurred, and they achieved solutions through their interaction with each other. The atmosphere seemed to produce more collaborative creativity than similar circumstances in the employment team. In the managerial and education teams, the members showed creativity and insight, with a tendency to see things from different angles. The conversational atmosphere supported this, as the conversations were lively and varied. In informal conversation, the difference from the employment team was less dramatic.

There were other, more subtle differences. In formal meetings and negotiation situations, the conversations were more balanced and spaced in the managerial and education teams: discussions took place between several participants, and the activity level of those who did not talk seemed to be higher. In addition, in the managerial and education teams, it appeared that the input of others was valued, in so far as there was no direct confrontation or scepticism directed at information offered by individuals.

Overall, one could say that collaborative creativity was visible in the meeting discourse patterns. A simplification of such patterns suggests the following sequence: (1) presentation of the problem, (2) clarification of the problem, (3) recollection of previous practices, and (4) unification of the ideas and opinions presented (i.e. clarification, recollection) into novel, valuable, and appropriate solutions. It is important to understand that clarification and recollection can be conducted at an individual level through, for example, noncreative simple memories; however, at a collective level, these attain a level of novelty and add value when combined with other individuals' clarifications and recollections.

The findings here show differences within the organization, and between its teams, suggesting that opportunities and restrictions need to be addressed carefully. This can make it possible to gain control of the restructuring process, to obtain knowledge from all levels of the organization, and to promote the agency to take the creative action needed in reconstruction and renegotiation situations (Table 4.4).

Next, we shall summarize the findings, addressing some critical characteristics of the practice of professional agency and of emergent collaborative creativity.

4.6.3 Summary of Findings: Critical Characteristics of Professional Agency and Collaborative Creativity

The differences in the three teams can be summarized as follows. The *managerial team* had top- and mid-level meetings in which the power relations and hierarchical structures were relatively equal, even if the meeting agenda showed high differentiation between the different fields of expertise. The interaction was more

Table 4.4 Emerging collaborative creativity in the meetings investigated

	Managerial team	Education team	Employment team
Practice	Conversational	Conversational	Unidirectional
Evidence	High number of inputs	High number of inputs	Low inputs
	Assimilated end results	Assimilated end results	Minimal interaction
	Interactional decision-making	Interactional decision-making	Withdrawal
Result	Unification of presented ideas and opinions (i.e. clarification, recollection) into novel, valuable, and appropriate solutions	Unification of presented ideas and opinions (i.e. clarification, recollection) into novel, valuable, and appropriate solutions	Manager-driven decisions and syntheses
Manifestations of stress	Situations demanding collaborative creativity are dealt with in a relaxed manner.	Naturally emerging collaborative creativity during the meeting procedures	A situation demanding collaborative creativity causes confusion, incoherence, and anxiety

conversational, and different experts with varying perspectives were able to engage in the discussion with ease. This meeting type was one of collaborative creativity, ranging from the emergence of ideas to the construction of a more elaborated understanding (see Eteläpelto & Lahti, 2008). Collaborative creativity arose from high levels of individual freedom and from the conversational atmosphere. The *education team* presented a similar type of conversational interaction in a field where the work context demanded creative practice and where control and self-direction were the responsibility of individuals. This team's practices and tasks demanded autonomy and self-directed action – aspects which were facilitated by the conversational atmosphere of the team. Overall, one can say that the self-direction and autonomy of the first two teams was important for both professional agency and collaborative creativity. The *employment team*, for its part, represented a classic hierarchy, with lower status employees who displayed obedience and acceptance. These workers were not particularly active in their interaction and could therefore be seen as non-conversational or nonactive, despite their obedience to authority. This practice left the impression that the passive and nonparticipative role was what the individuals expected in the meetings. It is notable that the practices in this team were mostly regulated by various guidelines and rules (i.e. there was no discretion or divided responsibility at a decision-making level) permitting only minimal freedom. Furthermore, there was no evidence of creativity, or not on the same scale as in the other teams, at either a product or a process level.

It is apparent that organizational practices and procedures (i.e. the team culture) affect professional agency and hence collaborative creativity in meeting situations. Teams with more conversational practices present higher levels of professional agency, and they actively engage with the meeting agenda in given situations and at given moments. Thus, one critical aspect relating to professional agency would

Table 4.5 Key characteristics affecting agency and creativity in the meetings investigated

	Managerial team	Education team	Employment team
Practices and procedures	Conversation	Conversation	Unresponsiveness
	Self-direction	Openness to ideas	Obedience
	Interaction	Interaction	Unidirectional
Nature of the work	Interactional	Interactional	Independent
	Free	Free	Regulatory
	Enables idea and opinion creation	Enables idea and opinion creation	Routines, repetition, and habits reduce the need for novel solutions

seem to be the conversational atmosphere. In the team displaying individual autonomy and self-regulation (possessing a high level of freedom), agency (leading to engagement) was more clearly visible as compared to the more restricted and regulated team (which had a low level of freedom). This practice of agency encouraged individual initiatives and suggestions (i.e. idea development and creation), which can be regarded as a key ingredient in producing collaborative creativity in meetings. Thus, it should be noted that a certain amount of freedom seems to serve as critical component of agency, such as to encourage individual input during collaboration. Through this, teams with active professional agency produce more collaborative creativity. Furthermore, a key ingredient seems to be the appreciation of different views and opinions, which enhances the conversational atmosphere. Non-conversational traditions and practices imply lower participatory professional agency and thus low collaborative creativity, resulting in a lack of initiatives, suggestions, or ideas. The key characteristics are set out in Table 4.5.

4.7 Discussion

Our study indicated that professional agency is practised in different ways in team meetings with different habitual practices and power relations. The study also showed that in the meeting situations, the practice of professional agency affected the emergence of collaborative creativity. Agency has temporal shifts and situational changes, which relate to meeting agendas and have connections with the individual's practice of agency. Our comparison of the three teams with different circumstances in terms of power, equality, and traditions revealed the importance of professional agency in relation to collaborative creativity. Circumstances such as a high degree of freedom, as opposed to strict regulation, affect the practice of professional agency, and thus the emergence of collaborative creativity. In addition, the forms and locations of power, for example, in terms of specific knowledge and expertise, affect the practice of professional agency (see Hatch, 1997), thus leading to differences in the emergence of collaborative creativity. In teams in which ideas emerged, leading to the construction of elaborated understandings of the topic

(Eteläpelto & Lahti, 2008), the practice of professional agency was participatory and engaging in nature. By contrast, certain traditional practices, such as repetitive ways of working or a constricting conversational atmosphere, in conjunction with the minimal practice of professional agency, appear to restrict active engagement. It is therefore important to become aware of and to transform these practices if we wish to enhance agency and creativity. Casey (2006) suggests the possibility of reimagining or reorienting objectives to overcome these restrictions, while Edwards and Nicoll (2006) see escape from the effects of power as impossible. In the highly mediated contemporary work environment, it would seem important to seek possibilities to enhance both agentic and creative possibilities, for example, in development situations such as meetings. Moreover, even though the focus of the present investigation was bound to this particular setting, it is possible that similar conclusions will emerge from research in allied domains.

Collaborative creativity demands a combination of ideas and opinions in order to produce something novel, valuable, or appropriate. The present study indicated that ideas and opinions occur more regularly in meetings with an agenda that challenges those present to make use of individual participants' professional expertise. Professional agency is affected by the practices, procedures, and structures of the teams concerned, including variations and combinations of the regulation in place and the teams' independence, freedom, and tradition. The general critical characteristics for professional agency and collaborative creativity include freedom in relation to the organization of tasks and duties, with time available to interact and exchange views.

A comparison of the conditions between teams showed that the organic organizational structure (see Hatch, 1997) in the managerial and employment teams seemed to strengthen the practice of professional agency through allocations of responsibility and the granting of a certain amount of freedom in relation to tasks, duties, and decisions. Individual employees were empowered to use active professional agency, which in turn led to conversational practices and to the emergence of collaborative creativity through ideas and opinion sharing. In this way originality and novelty were achieved via collective processes, involving mundane individual realizations. This is in line with the systemic view of creativity (Csikszentmihalyi, 1996; Sawyer, 2006; Sternberg & Kaufman, 2010). In bureaucratic or mechanical structures, the passive participation and diminished engagement of individuals restricts professional agency and thus the emergence of collaborative creativity. Shifts in situational and temporal moments seemed to affect agency positions in the meetings. In meetings with active engagement (displaying professional agency), the conversational atmosphere enabled the sharing of ideas and opinions, resulting in collaborative creativity, with both the process and the product displaying the basic characteristics of creativity (originality, novelty, value, and appropriateness) at (in particular) the small everyday level. The team that was deficient in the practice of professional agency was also deficient in collaborative creativity.

The limitations of this study include the fact that it does not take into account the heterogeneous strategic or economic stances of organizations; hence one must be cautious about statements supporting or opposing particular structures or practices

on a practical level. However, it offers a view and raises questions, relevant to developmental practices that could benefit from active professional agency on the part of employee-level workers. The basic question to consider is: *What kind of contribution is expected from the individuals and groups within an organization?* If practices demand active agency and engagement, there is a need to review the surrounding conditions. If tasks demand creativity, employees will benefit from the use of different forms and locations of power, and a sufficient level of freedom. In collaborative settings, the critical characteristics for creativity appear to consist of freedom – particularly in the allocation of time – and conversational practices that enable ideas and suggestions to be exchanged without restraint. Individuals need to have sufficient time and to be able to engage in conversations, in order to (ex)change views, and to create collectively. Restrictions and regulations in the form of routine habits and repetitive mechanical tasks diminish this possibility. Routines and habits may also affect the ability of individuals to see things differently. If one's work is the same all the time, it is hard to imagine any changes. Nevertheless, one must recognize that some individuals may enjoy working in restricted surroundings with routine tasks, in so far as this kind of situation offers stability and security, without the stress associated with creative tasks. Thus, individual preferences are important: people differ in their work, their well-being, their inclination towards collaborative creativity, and the practice of active professional agency.

In order to increase the credibility of this study, we used different kinds of data and methods in a complementary manner; thus we utilized data and method triangulation (see Patton, 2002). Nevertheless, due the limited data set, further research will be needed to illustrate the relationships between professional agency and collaborative creativity in different work environments.

When considering a work organization as a place for learning (or development), we must include negotiations between its personal and social dimensions (see Billett, 2008), where learning can be seen as self-initiated or forced by others or incidental (see Biesta, Field, Hodkinson, Macleod & Goodson, 2011). These considerations are important in organizational development situations. Also, if idea generation or creative practices (based on active agency) are expected from employees, empowerment is required in order to facilitate participation and collaboration (see Collin, Paloniemi, et al., 2010; Collin, Sintonen, et al., 2011). This is important, as when routines and habits break down, active participation is necessary for professional agency to function properly (see Archer, 2012). Professional agency in the workplace is related to collaborative creativity through the kinds of engagement and participation illustrated here. In future, it will be important to elaborate these connections to reveal how they operate in the contemporary world of unpredictability and change.

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Chapter 5
Mediating Learning at Work: Personal Mediations of Social and Brute Facts

Stephen Billett

Abstract This chapter proposes an account of learning at and for work comprising the collective contributions of social and brute mediating factors and individuals' processes of mediating those contributions, that is, an account of individuals' learning and development accommodating both the inter- and intra-psychological contributions and the relations between them. It also seeks to redress the concern that in recent times, the mediation of individuals' knowledge has become overly associated with proximal social influences on human cognition as well as those of signs, symbols and artefacts within Vygotskian-inspired social constructivism. Seemingly overlooked in this privileging are, firstly, the contributions of brute facts (i.e. nature) both within and beyond individuals and, secondly, how individuals themselves mediate the suggestions of social and brute factors (i.e. inter-psychological processes). Together, these mediating factors comprise the suggestions of the social and natural worlds can sometimes, but not always (e.g. maturation), be negotiated with. Then, there are the ways that individuals exercise their engagement with these suggestions and come to construe and construct what they know and do (i.e. personal mediations). Together, these factors prompt a more inclusive account for how intra-psychological or intra-mental contributions and processes mediate learning at and through work. Certainly, understanding processes of mediation more fully requires a consideration of both inter-psychological and intra-psychological processes and how their contributions are brought together in advancing workers' learning and development.

S. Billett (✉)
Professor of Adult and Vocational Education, School of Education and Professional Studies, Griffith University, Brisbane, Australia
e-mail: s.billett@griffith.edu.au

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5.1 Mediation and Learning

As a means to understand the co-occurrence of work and learning, this chapter proposes an explanatory account comprising the collective contributions of social and brute mediating factors and individuals' personal processes of the mediation of these contributions as bases to understand both working and learning. It proposes that as inter- (i.e. those between the persons and world beyond them) and intra-psychological contributions (i.e. those within the person) shape individuals' learning and development through engagement in work-related activities, they both need including in explanatory accounts. The particular contribution here is to suggest that a more comprehensive account is required as some current accounts have offer incomplete explanations of these co-occurring processes. Certainly, in recent times, the mediation of individuals' knowledge in work and learning has become overly associated with proximal social influences on human cognition including those of signs, symbols and artefacts as proposed within Vygotskian-inspired social constructivism. Seemingly overlooked in such accounts are, firstly, the contributions of brute facts (i.e. nature) both within and beyond individuals and, secondly, how individuals themselves mediate the suggestions of social and brute factors (i.e. inter-psychological processes) and also their intra-psychological (i.e. sensory and cognitive) processes. These mediating factors comprise the suggestions of the social and natural worlds that exist and can sometimes be negotiated with, but not always, e.g. maturation. Then, there is how individuals exercise their engagement with these suggestions and come to construe and construct what they know and do (i.e. personal mediations). Here, a distinction is made between the institutional and brute factors that mediate learning and the personal mediation of those factors by individuals. This mediation is active, often intentional and directed by personal factors, yet also subject to competing demands, limits in capacities, understandings, intentions and energy, including their exercise of sensory, neural and cognitive processes. So, as a human process, personal mediation also can be just plain wrong, imprecise, hazy and ill-directed, because it is also shaped by brute personal facts such as fatigue, wariness and emotion. Yet, as noted, this mediation is also shaped by multimodal sensory processes as enacted through individuals' neural system. Hence, the brute facts of sensory, neural and brain function mediate what is experienced. Conversely, the potency of suggestions of the brute and social worlds is themselves mediated by their ability to project these suggestions, including the degree to which individuals consent and engage with these mediating factors. All of this prompts a more inclusive account for how intra-psychological or intra-mental contributions and processes mediate learning at and through work. Certainly, understanding more fully mediation requires a consideration of both inter-psychological and intra-psychological processes and how their contributions are brought together in advancing workers' learning and development.

It follows that a more complete and comprehensive account of mediation now seems necessary to inform contemporary accounts of learning and redress the particular over-privileging of the immediate social experience within contemporary accounts. It follows, therefore, that the case here now progresses by elaborating the

mediational means (Wertsch, 1991) of institutional facts, comprising both cultural-historical and situational contributions and how individuals themselves mediate those contributions in their work and learning. Next, the role of intra-psychological mediation comprising the processes that shape individuals' construal and construction of what is experienced is discussed. Then, and in conclusion, some considerations and implications for learning for the professions are advanced.

5.2 Mediation and Vocational Learning

The mediation of knowledge – that is, how it is experienced and negotiated with – is central to individuals' learning and development, and that required for and learnt through their paid work (i.e. vocational learning) is no exception. Certainly, much of the knowledge individuals need to learn for practicing the occupations that comprise their paid work arises through history and culture and as manifested in and shaped by situational factors that constitute their circumstance of work (Billett, 2003). So, this knowledge arises outside of or beyond individuals. Consequently, this knowledge needs to be accessed by individuals through engagement with the social world beyond them and constructed inter-psychologically (i.e. between individuals and the social and physical world). Moreover, how individuals come to know, use and extend their occupational knowledge is subject, in part, to the invitation extended to them for engaging in workplace activities and interactions. These invitations include the support of social partners (e.g. other workers, experts, supervisors) and access to norms, practices and artefacts that are central to the performance of occupational practice and how it is enacted in particular instances of practice (e.g. workplace). That is, invitations are about opportunities to experience, mediate and construct knowledge from what is afforded inter-psychologically. These social, cultural and situational contributions are currently popular, privileged and, potentially, overly emphasised within contemporary accounts of learning, such as communities of practice (Lave & Wenger, 1991), activity systems (Engestrom, 1999), practice of communities (Gherardi, 2009) and socio-material perspectives (Barad, 2003). Indeed, within Vygotskian-inspired social constructivism, the term mediation is commonly used to describe how societally generated affordances and forms of support (i.e. social norms, forms and practices) comprising mediums (i.e. meditational means) through which socially generated knowledge is made accessible to and taken up or appropriated by individuals (Wertsch, 1993). However, despite the essential qualities and salience of these social contributions, including as mediums through which occupational knowledge can be learnt, their overt privileging distorts these explanatory accounts in two ways. Firstly, there are brute factors that also influence the mediation of knowledge. These exist both within and beyond the person just like societal ones. The human sensory, neural and cognitive systems mediate our knowing and doing (Barsalou, 2005; Damasio, 2010; Iacoboni, 2005; Iacoboni et al., 1999), and these likely change over time for humans through the inevitable brute fact of ageing. Then, beyond us, the physical

world projects its suggestions about how we engage with it, including its impact and proximity. Secondly, the mediation of knowledge includes how mediating factors (i.e. both brute and social) are construed, engaged with and acted upon by individuals. This mediation is shaped by and enacted through both inter-mentally (i.e. within the person) and extra-mentally (i.e. between external suggestions and individuals), as Vygotsky is held to have favoured (Wertsch & Tulviste, 1992), or as is referred to here, respectively, as intra-psychological and inter-psychological contributions and processes.

In all, the phenomenon of mediation needs to be understood through a consideration of both (i) mediating factors (i.e. brute and social) and (ii) the personal process of mediation undertaken by those who think, act and learn. These mediating factors beyond the person comprise what Searle (1995) refers to as institutional and brute facts. Institutional facts refer to the range of collective human societal inspired factors that shape what and how we experience. These facts comprise the contributions of history, culture, society and institutions including how these institutions project and suggest them to individuals through social forms, norms, practices and artefacts. These suggestions are held by social constructivists as the key medium through which the social world shapes and directs human learning and development. Such precepts are largely attributed to Vygotskian proposals about the knowledge needing to be learnt appearing first on the social plane, before becoming an attribute within individuals and, more so, that their higher-order thinking being mediated by socially derived tools and artefacts (Wertsch & Tulviste, 1992). Consequently, and quite rightly, there has been much emphasis on the importance of such tools in providing capacities that enable higher orders of cognition and support for individuals' development. All of this is apt for considering learning the kinds of knowledge required to perform occupations as they arise from cultural and social need and are transformed when those needs, technologies and work practices change. Importantly, these accounts emphasise that individuals' cognition, learning and development are not restricted to what can be achieved by individuals' memory and processing capacity alone. However, more than acting as an external memory and providing clues and cues for how to proceed (Lave, Murtaugh, & de la Roche, 1984), these artefacts, symbols and forms (e.g. language) constitute mediums through which human cognition is both enabled and augmented (Scribner, 1985a). So these institutional factors are essential for understanding individuals' learning at and through work.

Indeed, these meditational means are held to develop individuals' capacities and in ways that set humans apart as a species. Such propositions are now broadly accepted as premises for explicating human cognition and development and deservedly so. Certainly, the mediations afforded by and in the circumstances of work and for occupational purposes emphasise these contributions. Workers consistently reporting the efficacy of being in environments where work is practiced and having access to clues, cues, procedures and practices provided in the physical and social setting comprising the circumstances of work and also the direct and indirect guidance provided by more expert partners (Billett, 2001b). Moreover, institutional facts (Searle, 1995), such as culturally derived norms, practices and

needs, shape what constitutes occupations and the activities and interactions comprising the enactment of those occupations as acknowledged in sociocultural theories (Daniels et al., 2007), cultural psychology (Valsiner, 2000) and anthropology (Marchand, 2008; Pelissier, 1991), including that their enactment is often shaped by particular or situated circumstances. Other disciplines, such as neuroscience and neuropsychology, similarly advance explanations of cognition as being grounded in the circumstances of practice (Barsalou, 2008) and/or embedded in such circumstances (Barsalou, 2009). Therefore, it is perhaps not surprising that evidence consistently suggests that much of the knowledge required for occupations is accessed and mediated in particular ways through activities and interactions in physical and social circumstances, such as vocational education institutions or, more commonly, workplaces (Billett, 2001a). It includes interactions with more informed social partners and the array of social suggestions (i.e. norms, practices, artefacts) afforded by the circumstances of practice. Moreover, the kinds of goal-directed activities and interactions afforded to individuals within vocational courses or workplaces often have particular mediating effects which, consequently, shape what is learnt through them (Billett, 2009a; Rogoff, 1990; Rogoff & Lave, 1984). There also cultural-historical and societal factors, such as occupations' status (i.e. their societal standing) and the norms and means by which this learning can be realised (e.g. in family, through apprenticeship, achievement in schooling, on the basis of gender, etc.), that also influence the learning of occupational knowledge, through means that are described as cultural and social capital. Consequently, for vocational learning, the suggestion (i.e. mediational reach and power) of institutional facts extends beyond what is experienced through the immediacy of interactions and activities (Valsiner & van der Veer, 2000) in vocational courses and workplaces. They are also projected by the suggestion of the social world individuals inhabit and with which they have daily engagements. These institutional facts also play roles in individuals' interest in their occupations (i.e. their vocations), in terms of the societal status or worthiness of particular occupations (i.e. social suggestion), who is permitted access to learn them and how that access is afforded. So, together, these institutional facts may also shape how individuals elect to engage with what is afforded to them and how they are supported and sustained in their learning efforts by others, regardless of where that learning occurs. Hence, this mediation is not just that which derives from what the social world suggests or proposes but also how individuals come to mediate (i.e. construe and construct) what they experience socially (Billett, 2009a) comprising the actions and interactions we engage in every day and all of the time at work, at home and in our social and family lives. These experiences have a range of legacies in terms of our conceptions (e.g. goals, expectations, ways of categorising and ordering things), procedures (i.e. how we plan and go about doing things) and our dispositions (e.g. how we come to value things, become interested and direct our intentionalities). They may avowedly resist a restrictive practice or participate in ways that give the impression of compliance, which (Wertsch, 1998) refers to as mastery, rather than appropriation (i.e. full and enthusiastic engagement).

As noted, this process of social mediation is usually described as arising through inter-mental or inter-psychological processes[1]: those between individuals and social and physical world beyond them. The orthodoxy within Vygotskian-inspired accounts is that there are legacies or changes within individuals (i.e. intra-psychological outcomes) arising from engagements with these inter-psychological processes: that these social suggestions shape that learning. Indeed, as noted, the claim that shapes the premise for much of the widely adopted Vygotskian position is that the knowledge appears first on the social plane before becoming an intra-psychological legacy of that experience: a change in individuals' knowledge (Wertsch & Tulviste, 1992). Indeed, Vygotsky is held to have suggested:

> Any function in the child's cultural development appears twice, or on two planes. First it appears on the social plane, and then on the psychological plane. First it appears between people as an inter-psychological category and then within the child as an intra-psychological category. (Vygotsky, 1981, 163, as cited in Wertsch & Tulviste 1992, 549)

The sets of institutional facts manifested as workplace activities and interactions can be seen here as representing what appears on the social plane, in terms of their potential to mediate learning for paid occupations through shaping what is afforded and experienced by individuals. Indeed, this orthodoxy has led to mediation being seen within Vygotskian-inspired constructivism as those largely comprising inter-psychological processes: between the individual and the social world beyond the skin.

Yet, rather than unidirectional and behaviouralist taking up of the social suggestion, the concept of inter-psychological processes emphasises something occurring 'between' two entities, reciprocally, negotiated or some other form of engagement by actors (Valsiner, 1994). Commonsensically, unless it is some learnt or behavioural response to a stimuli, this process cannot just be the unequivocal reception and acceptance of the social suggestion. Instead, individuals' construal, construction and response to what comprises this inter-psychological process of mediation, as in Luria (1976), account to appropriation. That is, the psychological plane is necessarily something individuals engage in personal-particular ways, because of their unique personal histories or ontogenies (Scribner, 1985b). Put plainly, inter-psychological processes require engagement of individuals, including their conceptions, interests, knowledge, mental functions and capacities, i.e. their personal mediations. To suggest otherwise is to position the social suggestion as being behaviourial or socially determined. So, it is not just what is projected by the social world (i.e. the social suggestion) that comprises what Vygotsky proposed as the first plane, but it is inter-mental or inter-psychological processes comprising how individuals mediate what is experienced and what they construct from that experience (i.e. the intra-psychological legacy).

This qualification and augmentation of how mediation is used contemporaneously is salient as individuals have been shown to construct knowledge in quite distinct (and person-dependent) ways from what might be taken as the same social experience (Billett, 2003). Individuals' construction of what is experienced appears

[1] The terms inter-mental and intra-mental where those apparently used by Vygotsky, rather than the inter-psychological or intra-psychology favoured in contemporary literature.

shaped by their personal histories, current circumstances, what they know and their capacities, as well as their particular interests and intentionalities. That is, the constructions that comprise these inter-psychological processes are mediated by personally mediated construals and constructions.

This consideration of the inter-psychological as comprising Vygotsky's first plane suggests that it comprises more than the social suggestion. Instead, it is an interaction between the person and the suggestions arising from beyond the skin. Hence, there is the need to go beyond just viewing mediation as being the product of institutional facts comprising sets of cultural, societal and situational norms, practices and invitations as some seem to do (Engestrom, 1999; Ratner, 2000). Instead, there is a need to consider the meditational processes of people who engage in inter-psychological processes, including how individuals' interests, subjectivities and intentionalities, not to mention their sensory and neural systems, mediate what they experience and what they elect to construe and construct (i.e. learn) from what they experience. Given the multimodal nature of how humans represent knowledge (Downey, 2010), how our sensory systems engage with the process of experiencing will also be shaped by individuals' earlier experiences. The way an experienced hairdresser surveys a new client will be different than a novice or a person without hairdressing experience (Billett, 2003). The same likely goes for other occupations. How the midwife hears the foetus's heart through the Doppler scope (Billett, 1999) or how the senior clinician hears the heart beat through stethoscope (Rice, 2010) are different from the novice doctor, and experienced physiotherapists' haptic capacities will be more attuned than novices. So, in these ways, individuals' sensory systems will be shaped by the particular ways they have been utilised earlier or pre-mediately. But, seemingly, the neural system operates with the sensory system in ways that generate similar legacies. Not the least of the considerations here is that the social suggestion can be projected in unambiguous ways (Berger & Luckman, 1967), which require making sense of by individuals. For instance, recent conceptions of the multimodal ways humans construct knowledge are ordered by simulations (Barsalou, 2009). Part of the higher-order process of exercise through simulations is to augment what is not observable or experienced, but can be completed because of previous experiences. Hence, individuals can and necessarily have to compensate for and augment what is suggested through social forms norms and means. Moreover, these individual bases for sense-making are likely shaped, albeit in personally unique ways, by the sets of socially shaped experiences individuals encounter and respond to across their lives and that comprise their ontogenetic development (Billett, 2003).

This inclusion of the personal within accounts of mediation also extends to how brute facts shape these processes. These facts include those associated with those of the natural world comprising much of the impetus for having occupational practices (i.e. food, shelter, transport, health, finite lives), but also the sensory processes through which humans perceive and act, including those extensive aspects of our behaviour over which we have discretions and also how these are shaped by maturity. Then, there are natural capacities with which individuals are endowed, physical strength, visual acuity, etc., which includes their sensory and neural systems. So, the mediation of what is experienced through engagement with brute and institutional facts is also

person dependent and particular in terms of pre-mediate experiences and brute factors. This personal mediation is seemingly shaped by their ontogenies (i.e. personal histories) that are a product of individuals' ongoing mediations of experiences with social and brute worlds across life courses. That is, they are socio-genetic. The impact of the brute is premised, in part, in how maturation plays out personally for individuals (e.g. changes to sensory perception, hearing, sight, strength, etc.), as it shapes how they construe, act and generate intentions. There are also the brute facts of desire, energy and fatigue that shape individuals' engagement with the world beyond them and, consequently, their construal and construction at any particular moment in time and how these contribute to their ontogenetic development. Consequently, individuals' hearing, sight and levels of fitness, not to mention psychological wellness, all influence how they construe experiences and construct meaning from them. So, for instance, the brute fact of maturity likely does much to shape inter-psychological processes in terms of processes of perception, construction and action.

Therefore, what constitutes the mediation of learning vocational knowledge goes beyond accounts of learning through and for occupations as being primarily explained by the social world (i.e. institutional facts) as privileged in Vygotskian-inspired social constructivism. In addition, there is a need to account for the mediating brute facts that exist beyond and within the skin, so to speak and more fully accommodate the processes through which individuals mediate what they experience, as premised by their intentionalities, subjectivities and cognitive processes in explanatory accounts of mediation. Rather than these explanations being primarily premised upon the mediating influences of what occurs 'beyond the skin' (i.e. social and brute facts), there is a need to account more fully for what occurs 'within the skin' (i.e. intra-psychologically), albeit being shaped by personally shaped brute and social facts. That accounting needs to accommodate how what is afforded or mediated by social and physical environments are construed and constructed (i.e. mediated) by individuals.

Consequently, when seeking to explain the processes of mediation for occupational, or any other form of learning, the explanatory concept of inter-psychological processes needs extending to accommodate these personal dimensions of mediation. This refinement does not connote a return to highly cognised individualistic accounts of thinking, acting and learning or mediation as some claim (Ratner, 2000), but positions mediation as being shaped by personally mediated social and brute facts, albeit through suggestions from both outside and within the skin.

5.3 Institutional and Brute Facts Mediating Vocational Learning

As proposed above, a range of institutional and brute facts (Searle, 1995), that is, those that are a product of human activities and institutions, and of the nature, respectively, shape the standing of, access to and contribute to learning about occupations (i.e. vocational learning), albeit through experiences in educational programmes or workplace activities. Institutional factors, although merged together and experienced

as the social suggestion by individuals, comprise norms, practices and privileging that can be delineated as sets of (i) cultural-historical, (ii) societal and (iii) situational factors (Billett, 1998; Scribner, 1985b). Culturally historical factors are generative of the need for most occupations, how they transform across time as requirements for them, the technologies that support them and practices used to enact them change and also situate individuals in particular relations to those occupations and at particular points in time. Yet, brute facts also play a role in occupations. Most occupations arise from needs for accommodation, shelter, food, other physiological needs and care across human stages of maturation. For instance, currently, with longer lives and ageing populations in countries with advanced industrial economies, there has been a growth in facilities that care for aged citizens and the number of those working as age carers in such facilities. The occupation of aged care worker is, however, usually quite lowly paid, only seen to require low levels of preparation and occupational certification, which is often primarily concerned with procedural, regulatory and occupational health and safety matters. Access to employment in age care work is sometimes through convenience and/or lack of other opportunities, and, concomitantly, within the healthcare sector and society more generally, age care work is usually seen as a low status work. Yet, it is physical work, often involving lifting patients or residents in which it has been claimed that many workers have back injuries that they wear like a badge of pride (Somerville & Bernoth, 2001). Yet, despite this societal status and physical components, individuals who engage in this work find worth in and come to identify with it as their vocation. So, the brute fact of ageing is addressed through sets of institutional facts that are also subject to mediation by individuals. Somerville (2006), for instance, reports women who engaged in this work out of convenience ultimately came to identify as being aged care workers and exercised a level of commitment to their clients beyond what might be expected of low status workers (i.e. they acted professionally). Yet, because of its societal status, it is unlikely that many young people would aspire to engage in this kind of work and choose it as their preferred vocation, nor would they be encouraged to do so, in the ways that they might be to become early childhood workers.

So, arising from a cultural-historical need (i.e. an ageing population), the demand for this occupation has increased. Yet, culturally, it has low standing, and as a consequence, levels of remuneration, modes of access and qualifications to engage in it are commensurate with that standing. These factors mediate how individuals view this form of work, see it as being worthwhile and get attracted to it as a viable occupation choice and, therefore, seek to learn more about it, and engage with provisions of support for that learning. In this way, societal factors also shape (i.e. mediate) the provision of vocational learning through how the provision of aged care is organised and the institutions that employ people to undertake this work. So, for instance, although in Australia much of the aged care facilities are operated by large healthcare companies or church systems, the actual unit size of these facilities is often quite small, and they can comprise relatively small workplaces. Typically, there is a unit manager and a range of aged care staff who have particular roles that might differ widely depending on the facility including cooking food or transporting residents, rather than or in addition to direct care of the aged. Likely, there will be no full-

time qualified nursing or medical staff in these facilities, and healthcare professionals will visit only as residents' requirements demand. Hence, the particular bases for patient care and the management of their health, the organisation and hierarchy of work tasks and the access to other related workers shape the activities of those who work in aged care facilities and, consequently, what and how they learn. For aged care workers, many of the provisions of initial occupational preparation and certification are offered within the workplace by visiting trainers and assessors. Consequently, much of workers' conceptions of the occupation, its learning and assessment are enacted within relatively isolated circumstances. That is, within small facilities and often without these workers having access to peers from other aged care facilities, or with contact with other healthcare workers (e.g. nurses and doctors), all of which is shaped by institutional arrangements. Even though some workers come to identify it as their vocation, it is likely that most individuals with the ability to select more high status and better remunerated occupations would not remain in work. Their mediation of institutional and brute facts might lead to other preferences. Therefore, these kinds of mediational means shape the enactment of aged care work, its standing, provisions for learning about it, the means of certifying and regulating it, all influence how it is mediated by individuals.

Then, there are particular situational arrangements that comprise the practices within each aged care facilities that mediate individuals' engagement in and their learning about and through their occupations. The degree by which the facility manager believes that training and certification is important and is willing to support workers' learning and development either materially or by providing training sessions and educational days, and has funds to do so, will do much to shape the range of opportunities available for aged care workers to learn their occupational skills. Whether workplace practices such as new recruits working alongside a more experienced co-worker are exercised, encouraged or organised is a product of situational practices or practice of the community (Gherardi, 2009). Indeed, the efficacy of these kinds of in-house occupational learning experiences is often premised upon the qualities and expertise of co-workers (Billett et al., 2012). Consequently, the kinds of guidance available locally, how work activities are organised and distributed, and co-workers' capacities and dispositions are quite central to how vocational learning is mediated in particular physical and social circumstances. So, there are particular situational (i.e. institutional) factors that shape what is experienced by and afforded individuals' which, in turn, mediates their learning and development.

Yet, such complexes of factors are not restricted to aged care. The demands for undertaking work in new ways not only indicate a requirement for ongoing learning across a range of occupations, but also much of the ongoing learning across working life is necessarily mediated by activities and interactions workers encounter as part of their normal working lives (Tynjala, 2008). It is through those lives that this work and its learning are undertaking, including the ongoing remaking of that work (Billett, 2009a). Such findings remind that much of both initial occupational preparation and ongoing learning is mediated by the activities and interactions individu-

als encounter and engage in as part of their working lives (Billett, 2001b; Eraut, 2004; Fuller & Unwin, 2003; Lave, 1990, 1993). Whilst Rogoff and Lave's (1984) maxim of 'activity structuring cognition' requires some qualification, it is a helpful starting premise. The kinds of intentional and goal-directed activities and interactions individuals are afforded (i.e. invited to participate in) shape the parameters, scope and potential extent of their experiences and, therefore, learning, not the least being the knowledge to which they are granted access within the particular social practices (Billett, 2001c; Marchand, 2008). Yet, the legacy of experiences (i.e. 'the structuring of cognition') arises from what is experienced and how it is perceived, constructed and acted upon by individuals (i.e. how they mediate it).

Through engaging in these activities, changes arise in individuals' concepts, procedural capacities or dispositions: i.e. their knowledge and knowing. That learning is not necessarily personally transformative (i.e. new learning), because it is often usefully reinforcing, honing of refining what individuals already known. When engaging in activities that are new, albeit in a course or workplace (i.e. nonroutine problem-solving), individuals likely extend what they know and even possibly transform it, depending on what they currently know. Conversely, participating in activities that are familiar (i.e. nonroutine problem-solving) assists, reinforces, refines and hones the capacities required for effective employability (Anderson, 1982, 1993). Yet, these different kinds of learning are not given in the nature of the activities. Individuals' existing knowledge and ways of knowing (i.e. their personal epistemologies) mediate their construal of them and how they engage in them and secure what kinds of outcomes. Given the constant changes occurring in workplaces, everyday opportunities for learning are ubiquitous. However, this learning, including the effort the individual exercises, is mediated by their personal epistemologies, including their interest, intentions and direction to which they exercise their cognition (Billett, 2003), and cannot be explained alone by institutional facts. What for one individual will be a novel experience may be quite routine for another. Individuals' personal epistemologies, therefore, play a key role in the mediation of their knowing (i.e. personal epistemologies) and knowledge.

In sum, vocational learning arises through experiences provided and suggested by the social and brute world that comprises important factors that shape individuals' mediation of that learning. That is how they elect to engage with what is afforded to them and the cognitive processes mediating this learning intra-psychologically or beneath the skin. That is, beyond mediating factors are how individuals come to mediate what is afforded and suggested to them in the social world.

5.4 Mediation of Individuals' Occupational Learning and Development

It is important to be reminded that learning is something that arises in people. It comprises nothing more or less than change in individuals as an outcome of experiencing. As proposed above, it is not wholly or directly a product of the suggestion

and affordances that social institutions and social partners or their intentions as behaviourialists and social determinists (Ratner, 2000) might hold. Instead, when individuals engage in socially derived practices, such as their occupations, they also shape those practices, remake and transform them (Billett, Smith, & Barker, 2005). Certainly, occupations are transformed through emerging cultural requirements; historical movements, such as technology or even fads and fashions; and the particular manifestation of these factors in specific workplace settings. Yet, both learning and the remaking of occupational practices are enacted, mediated and realised by individuals, who engage in work and utilise specific procedures, approaches and technologies, at particular times and to achieve specific kinds of outcomes. Whether referring to change within individuals (i.e. learning for their occupations) or the remaking and transformation of societies' norms and practices, such as new practices and technologies in workplaces, it is the individuals' construal, construction and subsequent enactment (i.e. their mediation) that realise and secure these changes.

These kinds of personal contributions have been proposed in terms of subjectivities and intentionalities and also more comprehensively as personal epistemologies (Billett, 2009b) because they are also mediated by human perception and action constituting intra-psychological processes. There is also another very important issue associated with personal engagement in occupations and their learning that is mediated personally. Hence, beyond the societal contribution and suggestion, individuals also mediate their learning as exercised through their intentionalities (Malle, Moses, & Baldwin, 2001) and as ordered by their subjectivities (Eteläpelto & Saarinen, 2006; Somerville, 2006) and interests (Boekaerts & Boscolo, 2002), as well as their cognitive capacities/processes, plus the level of energy they elect or are able to direct to exercise their intentionality (Billett, 2009a). In these ways, individuals' capacities and experiences likely collude in mediating what is experienced through processes as they construe and construct what they experience (Valsiner, 2000). Yet, these acts of construction are premised on fundamental processes of human cognition: perception, action and introspection (Barsalou, 2008; Glenberg, 1997). However, much consideration of individuals' engagement is with what is afforded to them. These considerations have focused on subjectivities and intentionalities (including this author's), that is, how personal agency plays out against and negotiates with what is suggested socially. This emphasis is important, as it extends from an active engagement with what is suggested to an active ignoring and exclusion of the social suggestion (Glenberg, Schroeder, & Robertson, 1998). Indeed, cultural psychologists refer to the importance of ignoring and rebuffing the social suggestion (Valsiner, 1998), which is required for maintaining individuals' viability in the face of much social suggestion.

Indeed, as is widely agreed in most contemporary accounts of learning, including both individual and social constructivism, learners themselves are key constructors of knowledge. Hence, the degree of effort, the direction of the intentionalities and the exercise of personal agency will likely be quite central to what individuals learn (Malle, et al., 2001). Such intentionality is perhaps exercised most strongly when individuals are engaging in what they take as their vocation. In these ways, the personal subjectivities and intentionalities arising through individuals' socially shaped

uniquely personal histories (i.e. ontogenies) mediate learning in the circumstances of work across working lives in person-particular ways (Billett, et al., 2005). However, no amount of personal agency and effort in engagement can secure the knowledge required to practise an occupation that is inaccessible or where the lack of capacities and/or means of accessing such knowledge exist. So, there is a necessary interdependence between the active meaning making of the individual and the world beyond them from which experiences arise and what they need to know needs to be sourced. It is through engagement with these sources that individuals' ontogenetic development includes the development of domains of knowledge which are organised, ordered and rendered accessible to perform work activities in ways which have been described as expertise. Indeed, three decades of the enquiry into human performance have emphasised the development of domain-specific knowledge as being central to expert performance (Ericsson, 2006).

Moreover, individuals' particular domains of knowledge, its representation, organisation and the richness of associations and the honing of its skilful manifestations are central to what constitutes their cognitive experience (Valsiner & van der Veer, 2000) through which they mediate (i.e. construe and respond to), what they encounter and subsequently learn. Of course, not all experiences in vocational courses and workplaces are beneficial or easily aligned to the requirements of occupational activities. Yet, the kinds of prior (i.e. pre-mediate) experiences individuals have had, the legacies of those experiences in terms of what individuals have learnt through them will also mediate their learning in the immediate circumstance of this learning (Valsiner, 2000). These attributes are referred to within earlier cognitive accounts as being the kinds of schemata individuals' possess and can use (Neisser 1976) and with claims that their particular qualities can distinguish between the actions of experts and novices (Ericsson & Lehmann, 1996). Seemingly, the combination of domain (e.g. occupational)-specific knowledge and a repertoire of experiences generates richly contextually mediated representations that constitute and permit the effective and targeted exercise of the capacities that permit effective performance at work, including, and importantly, workers' ability to engage in productive encounters with new tasks and novel situations (Billett, 2001a).

However, and as noted beyond subjectivities and dispositions, there are also the perceptual and processing attributes that mediate individuals' knowing and learning. Whereas much of the consideration of learning in the circumstances of work has focused on how individuals mediate what is experienced beyond the skin (i.e. inter-psychologically or extra-personally), there is also a need to account for how human cognition and, therefore, learning is mediated intra-psychologically or intra-personally. Advances in understanding about such intra-psychological activities are particularly helpful for explaining what workers have long reported about the efficacy of authentic workplace learning experiences, for instance. Humans' cognitive processing of experiences (i.e. perceptions and action) are now held both multimodal and multisensory and act as simulations (Barsalou, 2009). These simulations represent and can be recalled on the bases of individuals' multisensory experiences. Hence, in contrast to early accounts within cognitive psychology that human processing of experience was modal and computer like (e.g. as in analogue) in its

function (Pollock, Chandler, & Sweller, 2002), rich sensory-based experiences are now held to shape how we represent experience in memory as well as recalling and utilising what individuals know (Barsalou, 2008). Moreover, it is evident that these representations or simulations are informed and enacted upon by higher orders of cognition, yet which are founded on and informed by individuals' previous experience (Barsalou, 2008), and extend to explain this seemingly intuitive acts which are often reported as being performed by experts (Harteis & Billett, 2013). That is, previous experience fills in the gaps and works to close uncertainties, inconsistencies and lacks of viability in what is experienced. This is, of course, what constructivists have long proposed from (Baldwin, 1894), onwards (Piaget & Inhelder, 1973) and up to the moment. However, that such a process is informed by a multimodal and sensory representation aligns well and, as noted above, helps explain what workers have long reported about the efficacy of learning through practice (i.e. just doing it, observing and listening) (Billett, 2001b) and how the learning that arises through these experiences informs not only the performance in immediate circumstances, but also, subsequently, when they engage with a related kind of work activity in another circumstance. Indeed, the generation of multimodal simulations may well frustrate the adaption of knowledge from circumstances that project quite different sensory and multimodal inputs, to those in which what is learnt needs to be applied (e.g. the transfer of knowledge from educational to practice settings).

In sum, beyond the mediating qualities of institutional and brute facts that comprise the circumstances of work is that enacted by the intra-psychological processes that are mediated by subjectivities and intentionalities and as mediated by processes of human cognition, albeit in person-dependent ways. This personal mediation comprises more than providing a medium for the social and brute suggestions; it also augments what is suggested and proposed. So, considerations of vocational learning need to go beyond what is mediated through vocational courses and workplace settings and emphasise the fact that workers themselves individually mediate (i.e. construe and construct) knowledge at work through both inter- and intra-psychologically.

5.5 Implications for Developing Professional Capacities Through Work

The conceptions advanced above set out to explain how working and learning co-occur. Yet, it is also necessary to advance some implications for how the development of professional capacities might be informed by such an account. Four overall premises appear to arise through this account and also some procedural suggestions prompted by it. Firstly, what has been argued above suggest the importance of positioning individuals as learners and finding ways of directly engaging them in the process of active meaning making and constructing knowledge in and through that work. Secondly, the interdependence between individuals and the social and physical circumstances in which they engage suggest that this positioning emphasises the importance of learner interdependence.

That is, rather than independence, it is interdependence between learners and the social sources with which they engage that is most salient, albeit those sources being more informed others, artefacts, norms, texts or the observation of occupational practice. Thirdly, authentic experiences are important because of the rich array of sensory and cognitive engagements that activities and interactions in the circumstances of practice afford. These experiences provide more than opportunities to engage in authentic goal-directed activities, and access to more experienced partners. They also afford a range of other contributions in the form of clues and cues, as means of representing and recalling knowledge and building representations premised upon observation, auditory and olfactory peri-personal contributions for representations of knowledge as intra-psychological attributes. Hence, these experiences provide a range of contributions and mediational means that individuals can elect to engage with and which shape their representations and utilisation of what they know. Fourthly, curriculum concerns here are largely associated with the readiness of learners and sequencing of learning experiences. That is, the particular pathway of experiences that can assist individuals gain access to and learn the kinds of knowledge they want and need. However, that pathway should not just premised on a consideration of a progression of increasingly more demanding work activities and interactions. Instead, it needs to include identifying the readiness of the learner to progress along such a pathway which includes particular starting points and pace of progression. Here again, the duality of the provision of experiences and the basis upon which individuals can and will come to engage with those experiences is emphasised. So, it is on these kinds of premises that considerations for how curriculum and pedagogical practices can proceed to support this learning and development.

In addition, and more specifically, the kinds of pedagogical practices which might be utilised to promote learning in the circumstances of work are potentially distinct in some ways from those advanced by teachers and in classrooms settings. Anthropological literature, in particular, offers a set of pedagogical practices which have been identified as promoting the development of occupational type capacities in the circumstances of practice. It seems that these kinds of practices are those which might be utilised in work settings to promote workers' learning and development. Some examples of these practices include the use of storytelling (Jordan, 1989) that can be used to assist understanding the goals for performance and the way that these goals can be achieved. Similarly, the verbalisation of what more experienced partners are doing when they are being observed (Gowlland, 2012) can assist with the development of procedural capacities including those that comprise the considerations for acting that an experienced worker will enact, but are inaccessible by observation alone. By uttering allow the considerations for progressing with an activity, the basis for, rationales by which and intentions for particular activities can be made accessible. Then, there is also the importance of close guidance (Rogoff, 1995), which can provide models for observation and imitation and justifications for proceeding as well as making accessible heuristics (i.e. tricks of the trade) that are used by more experienced practitioners. This use of heuristics also

extends to means for capturing and representing knowledge (i.e. remembering and re-representing) such as are provided through mnemonics (Rice, 2008, 2010; Sinclair, 1997). Through such direct guidance bases for feeding, the representation and recalling of knowledge might be promoted. Then, and in terms of curriculum practices, opportunities might be found for individuals to engage in activities which are pedagogically rich. That is, certain activities have the potential to afford rich learning. For instance, the different kinds of handover briefings that are used in healthcare settings can provide a range of experiences which are inherently supportive of rich learning. For instance, the opportunity to begin to associate particular patient conditions with treatments and prognoses can assist in the development of the kind of propositional links and associations that characterise what is referred to as deep understanding (Billett, Sweet, & Glover, 2013), that is, the extent and consequences of associations among sets of concepts and their propositional associations. Hence, through such experiences and development, the prospect of promoting something of the range of conditional causal associations that are sent to diagnose and respond to complex work requirements arises.

Associated with all of the above is the importance of personal epistemologies of those who are learning. It is these which stand to be the basis by which the contributions of the physical and social world are engage with by learners and the focus, intentionality and direction of engagement. All of this suggests that finding ways of strengthening, extending and supporting an active and critical personal epistemology is likely to be quite central to how individuals come to mediate these contributions.

5.6 The Mediation of Vocational Learning

The case made here is that the mediation of professional learning can best be understood through a consideration of the existence and the relations between social and brute mediating factors, on the one hand, and the personal process of mediation undertaken by individuals, on the other. On their own, neither accounts of those factors nor personal mediating processes are sufficient. Instead, both need to be considered and the relationships between them when advancing an account of learning premised upon the mediation of knowledge. Certainly, the contributions of and implications for vocational learning from such understandings are complex and multifold. Vocational learning can initially progress through course and workplace experiences that provide activities and interactions from which knowledge will arise as construed and constructed by individuals' mediation of those experiences. This mediation will continue across their working lives, albeit shaped by changes in brute factors that arise through maturation (Billett, 2010b). As elsewhere, and across human history, this human process of meaning-making stands as the most central and enduring way in which occupational knowledge is learnt, sustained and remade (Billett, 2010a). Clearly, there is much that could be done to improve the quality of learning for occupational purposes and securing individuals' vocations. Yet, such improvements need to consider not only what is privileged in courses and

workplace experiences in terms of the activities and interaction that are afforded to these learners but also the bases by which they will be construed and constructed. Yet, whether referring to the organisation of learning experiences, intended outcomes of those experiences, how work is organised, opportunities to engage in work-related activities distributed or any other matters advanced, it is important to remember that it is not the institutional facts alone which are predictive of human behaviour, responses and change (i.e. learning and development). Instead, and importantly, it is how individuals mediate what is organised for them, proposed that they might do, how they interact and act and construe and construct that is so central to human learning and development. This simple fact seems to be often overlooked in workplace practices, educational provisions and the way in which communication and relations are sought to be ordered within the societies within which we live.

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Chapter 6
Error Climate and How Individuals Deal with Errors in the Workplace

Alexander Baumgartner and Jürgen Seifried

Abstract This cross-sectional field study investigates the effect of contextual influences (error climate) on reactions to errors (how individuals deal with errors). We surveyed $n=830$ apprentices in various trainee positions in the hotel and restaurant industry. The responses show that perceived error climate in the training company, as well as the self-concept of professional competence, predict the way in which apprentices deal individually with errors. Moreover, the findings indicate that both—socio-demographic group and the characteristics of the organization—also influence affective responses to errors.

6.1 Introduction

Apprentices in vocational education and training often experience errors as something negative and emotionally stressful (Kutscha, Besener, & Debie, 2012). This attitude prevents errors from becoming learning opportunities (Oser & Spychiger, 2005). This is hardly surprising since the idea that errors include learning potential has rarely been put forward in the past (Weimer, 1925). In recent years, however, doubts have arisen about the effectiveness of a negative assessment and sanction of errors in pedagogical contexts (Yerushalmi & Polingher, 2006), and the idea that an analysis of errors can provide useful information to optimize working processes is now gaining acceptance. Of course, errors in working life are primarily adverse events and should be avoided, particularly in the context of "High Reliability Organizations" (HROs, see La Porte, 1996; Roberts, 1990; Seifried & Höpfer, 2013; Weick, Sutcliffe, & Obstfeld, 1999) such as air carriers and chemical or nuclear plants, where errors can have extensive and significant consequences. But it is also the case with service organizations (e.g., the hotel and restaurant industry, and retail). Whereas HROs have been and still are

A. Baumgartner (✉) • J. Seifried
Economics and Business Education II, University of Mannheim, Mannheim, Germany
e-mail: baumgartner@bwl.uni-mannheim.de; seifried@bwl.uni-mannheim.de

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subject to intensive research, service organizations are not the focus of research in terms of error learning. Nevertheless, the service industries offer a wide range of opportunities to learn from errors. Errors here have moderate consequences, are high in frequency, and are significant for customer satisfaction and organizational reputation. As the working environment is usually too complex to eliminate completely the potential for errors (at least in company training), dealing effectively with errors is an important part of any strategy for workplace learning (Baumgartner & Seifried, 2012; Harteis, Bauer, & Gruber, 2008). Moreover, there is now empirical evidence of a positive relationship between the quality of support provided by an environment in which people can learn from errors (e.g., norms and common practices such as communication regarding errors, their detection, analysis and rapid correction) and company performance (Van Dyck, Frese, Baer, & Sonnentag, 2005).

Against this background, researchers working in educational and organizational environments have introduced the term "error culture" or "error climate" (e.g., Putz, Schilling, & Kluge, 2012; Spychiger, Mahler, Hascher, & Oser, 1998; Steuer, Rosentritt-Brunn, & Dresel, 2013; Van Dyck et al., 2005).[1] In recent years, several studies in schools (e.g., Heinze, Ufer, Rach, & Reiss, 2012; Seifried & Wuttke, 2010; Spychiger et al., 1998; Steuer et al., 2013) and companies (e.g., Rybowiak, Garst, Frese, & Batinic, 1999; Tjosvold, Yu, & Hui, 2004; Van Dyck et al., 2005) have been carried out to analyze the consequences of the error-related learning climate on the way that individuals deal with errors. All in all, the findings indicate that a positive error climate fosters adaptive affective-motivational and cognitive-behavioral reactions to errors. This in turn *may*, but does not necessarily, result in learning from errors.

In this chapter, we deal with the area of initial vocational and educational training (such as the German "dual system"), where very little research on the possibilities and constraints of error learning has been carried out. Training in the dual system combines company training, predominantly workplace learning, with learning in vocational schools. We redress the lack of empirical evidence in this area by investigating how apprentices perceive error climate in training companies, and how this perception affects the way that they react to errors. We do so by conducting a questionnaire study within the hotel and restaurant industry.

6.2 Learning from Errors in the Workplace

We present briefly some theoretical considerations on learning from errors in the workplace, which involves a characterization of the term "error" as well as a conceptualization of learning from errors.

[1] The terms "climate" and "culture" often are used synonymously in research on human error. They are closely intertwined and difficult to distinguish (Reichers & Schneider, 1990). We follow the understanding of error climate as "the evaluation and use of errors as integral elements of the learning process in the social learning environment" (Steuer et al., 2013, 198) of the company in which training is taking place.

6.2.1 Characteristics of Errors

Learning from errors in the workplace is important for the development of apprentices' professional competence. In order to describe and analyze the process of learning from errors, a definition of the term "error," which is used with different meanings in many contexts, is necessary. Reasons for this can be found in domain-specific approaches as well as in linguistic barriers, particularly as a great deal of relevant research has been conducted in English-speaking countries, where terms such as "error," "failure," "fault," "slip," and "mistake" (Senders & Moray, 1991) are not synonymous but rather imply differences in intent. Nevertheless, all these terms could be translated into German as "Fehler." In addition to the well-known classification given by Reason (1990), according to which slips and lapses are execution failures, while mistakes are the result of inadequate planning; Keith and Frese (2011) use terms to differentiate between errors such as inefficiency (reaching the intended goal, but missing the standard of efficiency), failure (which refers to a negative outcome, but not every error leads to failure), or deviation from norms or standards (intended deviation, whereas an error is a deviation that is not intended). Different research methods in psychology conceptualize errors as either (1) planned actions that miss intended objectives (a definition from research in industrial psychology, e.g., Reason, 1990) or (2) deviations from routines, usual procedures or actions (a view from research in organizational psychology, e.g., Van Dyck et al., 2005).

6.2.2 Conceptualization of Learning from Errors

From the perspective of an individual, learning from errors can be seen as the engagement in reflecting on errors and acquiring knowledge which is linked to that person's own errors or to the errors of others (Bauer, 2008; Harteis et al., 2008). Experience-based learning processes triggered by errors can lead to knowledge acquisition (Kolb, 1984; Kolodner, 1983). When it comes to learning from errors, the idea of "negative knowledge"—knowledge that helps the person avoid repeating errors made in the past—has been established (Gartmeier, Bauer, Gruber, & Heid, 2008; Gartmeier & Schüttelkopf, 2012; Minsky, 1994; Oser, Näpflin, Hofer, & Aerni, 2012; Oser & Spychiger, 2005). Negative knowledge can be described as knowledge which is not directly useful, but which is nonetheless heuristically valuable. It incorporates knowledge that is both procedural (how something does not work; Minsky, 1994) and declarative (what something is not; Parviainen & Eriksson, 2006). The idea is that people recognize their own deficits when they make errors and therefore start a process of reflection. Whether the potential connection with the acquisition of negative knowledge can actually develop and result in knowledge acquisition depends on whether the person analyzes and reflects upon deeper reasons for errors, something that is more likely in an organizational climate that

supports error learning processes. Thus, it can be assumed that the way how individuals deal with and learn from errors depends not only on personal factors but also on contextual factors inherent to the (learning or working) environment (Bauer, 2008; Steuer et al., 2013). It therefore makes sense to draw a clear distinction between how individuals deal with errors that they have made at the personal level and the error climate at the level of the training company.

6.3 Error Climate and How Individuals Deal with Errors

In the following, we propose a conceptualization of how individuals perceive error climate and how they react to errors (with a link to the self-concept of professional competence).

6.3.1 Error Climate

The concept of error climate includes contextual aspects fostering (or hindering) learning from errors. A favorable error climate means that errors are perceived and evaluated as integral components of learning processes. It is assumed that a good error climate can result in better (company) performance, an increase in stable knowledge, and a greater personal initiative amongst employees (Putz et al., 2012; Spychiger, Oser, Hascher, & Mahler, 1999; Van Dyck et al., 2005). Steuer et al. (2013) presume that these effects are mediated through the ways that individual learners deal with errors (i.e., cognitive-behavioral reaction and affective-motivational reaction; Dresel & Ziegler, 2002) (see below).

Following Steuer et al. (2013), we suggest that the individual's perception of error climate in the training company is made up of six components, focusing on the trainer (absence of negative trainer reaction, trainer support following errors, and error tolerance by the trainer), on colleagues and supervisors (risk-taking), and on social processes of learning from errors (analysis of errors and communication about errors, functionality of errors for learning). These components have been developed in relation to research in schools (e.g., Meyer, Seidel, & Prenzel, 2006; Spychiger et al., 1998; Spychiger, Kuster, & Oser, 2006) as well as in companies (e.g., Rybowiak et al., 1999; Tjosvold et al., 2004; Van Dyck et al., 2005). We shall now describe the six components in detail.

1. *Absence of negative trainer reaction* is the degree of adverse trainer reaction on a trainees' error (Oser & Spychiger, 2005; Steuer et al., 2013). Edmondson's concept of psychological safety (1999) has highlighted the importance of this component. The approach is based on people's confidence that nobody will be embarrassed, rejected, or punished as a result of error reporting (Seifried & Höpfer, 2013). Tjosvold et al. (2004, 1225) have stated that "blame-orientated interaction" only rarely leads to learning from errors.

2. *Trainer support* is the degree of trainer support after an apprentice has made an error, and includes help and explanations (Oser & Spychiger, 2005; Steuer et al., 2013).
3. *Error tolerance by the trainer* is the degree to which the trainer tolerates errors (Spychiger et al., 1998). It is relevant because a strong attitude of error avoidance decreases the chances of learning from errors (i.e., errors are to be avoided to ensure that incorrect thoughts and ideas do not become habitual) (Steuer et al., 2013; Van Dyck et al., 2005).
4. *Analysis of errors and communication about errors*. Research in organizational psychology has shown that the analysis of and communication about errors are important factors in understanding how people learn from errors (e.g., Van Dyck et al., 2005). Open communication about errors facilitates the development of shared knowledge and enables others to provide support in error situations. Accordingly, "problem-solving interaction" appears to help people learn from errors (Tjosvold et al., 2004, 1238).
5. *Error risk-taking* describes the degree to which apprentices are allowed to report errors and to take the risk of making errors (Rybowiak et al., 1999). Besides the trainer's reaction, the error reaction of colleagues and supervisors play a role here, too. Hence, "a positive error climate is characterized by the absence of fear and shame" (Steuer et al., 2013, 198). This component has also been discussed in educational contexts within the concepts of error strain (Spychiger et al., 2006), atmosphere, error response, and anxiety (Meyer et al., 2006).
6. *Functionality of errors for learning* is the degree to which errors in general are starting points for learning processes in the training company. Steuer et al. (2013) propose that several prerequisites must be fulfilled before errors can be used to initiate learning; most of the other components described above have to be met to some degree. This component of error climate has also been described in organizational contexts (Rybowiak et al., 1999; Van Dyck et al., 2005).

6.3.2 How Individuals Deal with Errors

Dealing constructively with errors requires learning motivation and joy in learning. It can be assumed that errors are often considered a burden. Adaptive affective-motivational reactions to errors serve to regulate negative emotions (Tulis, Grassinger, & Dresel, 2011), whereas maladaptive reactions decrease learning motivation and increase negative emotions (e.g., shame, fear, and anger). According to Skaalvik (1994), a positive self-concept of professional competence protects against maladaptive reactions to errors (see also Tulis et al., 2011). Cognitive-behavioral reactions to errors can be distinguished from affective-motivational reactions (Dresel & Ziegler, 2002). These can be described as reflections upon the causes of errors with the intent of identifying incorrect trains of thought and knowledge gaps or "deliberately practicing the type of task in which the error occurred in order to bridge the knowledge gap that was responsible for

the error" (Steuer et al., 2013, 197). The individual use of errors in learning processes has also been investigated by Spychiger et al. (1998). Dresel and Ziegler (2002) describe two ways in which an individual might deal with errors. (1) *Action adaptivity* is defined as "the degree to which the learners initiate cognitive processes and behaviors aimed to specifically overcome a possible misconception underlying the present error" (Steuer et al., 2013, 197). (2) *Affective-motivational adaptivity* is defined as "the degree to which the learner maintains positive affect (e.g., joy) and motivation to learn in the face of errors" (Steuer et al., 2013, 197). Both aspects seem to be of importance (see below).

6.4 Research Questions and Method

We shall now provide a description of the research questions, the domain of the study, the sample, and the methods used.

6.4.1 Research Questions and Domain of the Study

Based on research in educational and organizational contexts (Rybowiak et al., 1999; Spychiger et al., 1998; Steuer et al., 2013; Van Dyck et al., 2005), this study aims to analyze how apprentices in vocational training perceive error climate and the ways that they deal with errors. We assume that components of the error climate are important predictors for how apprentices deal with errors, and that factors at the individual level are of interest, too (we focus here on the self-concept of professional competence). Finally, we assume that there are differences in relation to socio-demographic (e.g., gender, training occupation) and organizational (e.g., type of business, hotel category) factors. This leads us to the following research questions:

- How do apprentices perceive the error climate in the training company?
- How adaptive are apprentices in dealing with errors in the workplace?
- Do facets of error climate predict the ways in which individuals deal with errors?
- Are there differences in relation to socio-demographic and organizational factors?

As different work environments make different demands upon workers, errors must be analyzed within their contexts. Thus, the research questions presented here require a domain-specific approach. We conduct an empirical study to investigate the effects of error climate on the ways that individuals deal with errors. To do so, we focus (1) on the domain of the hotel and restaurant industry, and (2) on the German dual system of vocational education and training. In-house training in the workplace is of particular interest. The selection is based on at least two considerations. First of all, dealing with errors is an important issue in the hotel and restaurant industry as sufficient numbers of qualified staff must be maintained. The hotel

and restaurant industry suffers from a high dropout rate among apprentices who are training for the occupations of "specialist in restaurant business" (48 %), "cook" (46 %), and "specialist in hotel business" (30 %) (BMBF, 2012; DGB, 2012). As reasons for this, conflicts with trainers and a negative work climate are frequently mentioned (Piening, Hauschildt, & Rauner, 2010). Furthermore, there are many vacant training positions, and the level of training maturity is rather low (Fehring, 2007; Kinkopf, 2012; Wolf, 2012). Conversations with representatives from the hotel and restaurant industry confirm the relevance of this issue. Secondly, the highly standardized nature of the work processes (transparency in work processes, moderate consequences, and fast feedback) facilitates the identification of errors and is therefore well suited to the discussion of errors. Thus, we can expect to be able to collect fruitful data from this sector.

6.4.2 Method

The sample comprised $n = 830$ apprentices from the most popular training occupations in the hotel and restaurant industry. More than half worked in hotels while the others held positions in other establishments such as restaurants or canteen kitchens. The average age of the participants was 21, and 52 % were female. The data were collected using a self-report questionnaire in vocational schools in Baden-Württemberg (Germany) (Mehle, 2013; Mueller, 2012; Schwarz, 2012).[2] All the items in the survey were concerned with the part of training that takes place within companies in the German dual vocational training system.

In order to measure how error climate is perceived, we used an adaptation of the questionnaire "Perceived error climate in the classroom" provided by Steuer et al. (2013).[3] The questionnaire is based on work by Spychiger et al. (1998) and Meyer et al. (2006), which focus on error climate in schools, and Rybowiak et al. (1999), Tjosvold et al. (2004), and Van Dyck et al. (2005), which focus on error climate in organizations. In the original version, the questionnaire consisted of eight components, two of which had a clear focus on learning in schools, and it is these two that we therefore omit. To adapt the remaining six components of error climate (23 items) to the context of company training was unproblematical. The following scales were used:

- Negative trainer reaction (4 items; Cronbach's $\alpha = .86$; Example: "If in our company someone makes a mistake, then the trainer may taunt him or her").
- Trainer support (4 items; Cronbach's $\alpha = .85$; Example: "If in our company someone can't perform a task correctly, then the trainer will help him or her").

[2] Within the scope of this study, Sabrina Schwarz (M.Sc.) and Judith Mueller (M.Sc.) wrote their master's theses, and Ina Mehle (Dipl.-Hdl.) wrote her diploma thesis. We would like to thank them for the data collection.

[3] We would like to thank Gabriele Steuer, Gisela Rosentritt-Brunn, and Markus Dresel for providing a draft version of the questionnaire before publication.

- Error avoidance attitude (4 items; Cronbach's $\alpha = .79$; Example: "In our company, our trainer doesn't like it if something is done wrong").
- Analysis of errors and communication about errors (4 items; Cronbach's $\alpha = .76$; Example: "In our company, we talk in detail about something if it is done wrong").
- Error risk-taking (3 items; Cronbach's $\alpha = .78$; Example: "In our company, most of the trainees don't dare to say anything, because they are afraid it might be wrong").
- Functionality of learning (4 items; Cronbach's $\alpha = .64$; Example: "In our company, we learn a lot from tasks that we haven't performed correctly").

All items were rated on six-point Likert-type scales from 1 (strongly disagree) to 6 (strongly agree). Internal consistencies were acceptable/good with $\alpha = .64$ to .86. Exploratory factor analysis yielded the factor structure, which explained 65 % of the total variance.

How individuals deal with errors was measured with an instrument adapted from Dresel and Ziegler (2002). The instrument consists of two components (13 items)—action adaptivity of error reactions (How do apprentices act after an error?), and affective-motivational adaptivity of error reactions (How do they feel after an error?):

- Action adaptivity of error reactions (7 items; Cronbach's $\alpha = .81$; Example: "When I can't solve a problem in our company, then I practice these types of tasks on my own").
- Affective-motivational adaptivity of error reactions (6 items; Cronbach's $\alpha = .82$; Example: "When I can't solve a problem in our company, my work will be just as fun in the future as it always has been").

All items were rated on six-point Likert-type scales from 1 (strongly disagree) to 6 (strongly agree). Internal consistencies were good with $\alpha = .81$ to .82. An explorative factor analysis confirmed the predefined factor structure of the individual dealing with errors (explained variance = 52 %).

Finally, we measured the self-concept of professional competence as an individual characteristic of the apprentices by using an instrument designed by Kauffeld (2003):

- Self-concept of professional competence (12 items; Cronbach's $\alpha = .85$; Example: "In our company, I've learned to develop new ideas to improve my work").

Responses to the items were assessed using Likert-type scales from 1 (strongly disagree) to 6 (strongly agree). Internal consistency was good.

6.5 Findings

In the following section, the empirical findings will be reported. We present descriptive statistics and bivariate correlations for all constructs, as well as predictors of how individuals deal with errors and differences in relation to socio-demographic and organizational characteristics.

Table 6.1 Mean value, standard deviation, and bivariate correlation

		M	SD	1	2	3	4	5	6	7	8
Error climate											
(1)	Negative trainer reaction (–)	3.84	1.29	–							
(2)	Trainer support	4.08	1.10	.64	–						
(3)	Error avoidance attitude (–)	3.30	1.11	.57	.50	–					
(4)	Analysis of and communication about errors	3.76	.98	.32	.54	.28	–				
(5)	Error risk-taking	3.65	1.20	.46	.40	.39	.16	–			
(6)	Functionality for learning	3.82	.89	.30	.47	.41	.52	.18	–		
Individual dealing with errors											
(7)	Action adaptivity	4.71	.65	.16	.32	.13	.30	.13	.33	–	
(8)	Affective-motivational adaptivity	3.93	.92	.35	.34	.27	.19	.31	.20	.30	–
Self-concept of professional competence											
(9)	Self-concept of professional competence	4.49	.66	.24	.31	.17	.22	.21	.26	.49	.32

Notes: $n = 830$ apprentices; (–) subscales with reversed polarity; all the subscales were measured by using six-point Likert-type scales. These scale ranged from 1 (strongly disagree) to 6 (strongly agree); all $r = p < .01$ (two sided)

6.5.1 Descriptive Statistics and Bivariate Correlations

Table 6.1 provides an overview of the mean value, standard deviation, and bivariate correlations for all the variables. The mean values of the different components indicate an average level of agreement regarding the error climate. The component "Trainer support" achieved the highest score and "Error avoidance attitude" the lowest. In comparison to the results of similar studies in schools (Heinze et al., 2012; Seifried & Wuttke, 2010; Spychiger et al., 1998) and companies (Putz et al., 2012; Tjosvold et al., 2004; Van Dyck et al., 2005), the error climate scores found in this study are rather low. However, this is not unexpected if we consider the challenges of the hotel and restaurant industry discussed above. The components of the measurement regarding how individuals deal with errors show comparatively high values. In particular, the cognitive-behavioral error reactions ("initiation of cognitive processes and behaviors aimed at specifically overcoming the error," Steuer et al., 2013, 15) were rated positively by apprentices. The values of the affective-motivational error reaction ("maintenance of positive affect and motivation to learn," Steuer et al., 2013, 14) are slightly lower. Furthermore, apprentices have an above-average level with regard to their self-concept of professional competence.

Bivariate correlation between the components of error climate and how individuals deal with errors, as well as the self-concept of professional competence, reveal a consistently significant relationship ($p < .01$). There is a weak positive correlation between how individuals deal with errors and the perceived error climate ($r = .16$ to $.35$).

Table 6.2 Predictors of action adaptivity of error reactions

	Model 1				Model 2			
	B	SE	B	VIF	B	SE	β	VIF
Error climate								
Negative trainer reaction (–)	–.028	.023	–.057	2.07	–.032	.021	–.063	2.08
Trainer support	.136	.029	.231**	2.32	.090	.026	.153**	2.36
Error avoidance attitude (–)	–.049	.024	–.084*	1.71	–.037	.022	–.063	1.71
Analysis of and communication about errors	.067	.027	.102**	1.63	.058	.025	.088*	1.63
Error risk-taking	.024	.020	.044	1.33	–.003	.018	–.006	1.35
Functionality for learning	.152	.029	.210**	1.58	.109	.027	.152**	1.61
Self-concept of professional competence								
Self-concept of professional competence	–	–	–	–	.399	.031	.406**	1.15
$R^2_{\text{adjusted}}/\Delta R^2_{\text{adjusted}}$	.15/.15				.30/.15**			

Notes: *B* unstandardized regression coefficient, *SE* standard error, β standardized regression coefficient, *VIF* variance inflation factor, R^2_{adjusted} Adjusted coefficient of determination, (–) subscale with reversed polarity
*=$p<.05$; **=$p<.01$

Moreover, the results show a weak to medium positive correlation between the self-concept of professional competence and both aspects of how individuals deal with errors ($r=.32$ to .49) and the components of error climate ($r=.17$ to .31). The correlations between the different scales of the error climate are within the range of the values found by Steuer et al. (2013) and show no major deviations.

6.5.2 Predictors of How Individuals Deal with Errors

In order to analyze the predictors of action adaptivity of error reactions (Table 6.2) and affective-motivational adaptivity of error reactions (Table 6.3), we use multivariate regression analysis. In Model 1, the error climate subscales were included, whereas Model 2 was expanded to include the self-concept of professional competence. To detect problems with multicollinearity, we calculated variance inflation factors (VIF) for all predictors in the regression models (Hocking, 2003; Urban & Mayerl, 2006).

In particular, "Trainer support," "Functionality for learning," and "Analysis of errors and communication about errors" predict the cognitive-behavioral reaction to errors in Model 1. A positive cognitive-behavioral reaction to errors takes place if trainers provide assistance, guidance, and explanations in error situations and apprentices have a positive view of the potential benefits of errors. Surprisingly, negative cognitive-behavioral reactions to errors could be explained through how tolerant the trainer is of errors (inverted component "Error avoidance attitude"). The more tolerant the trainer is of errors, the less apprentices use errors for learning. This may result from the fact that initiation of cognitive processes and behaviors

Table 6.3 Predictors of affective-motivational adaptivity of error reactions

	Model 1				Model 2			
	B	SE	B	VIF	B	SE	β	VIF
Error climate								
Negative trainer reaction (–)	.110	.033	.153**	2.07	.101	.032	.141*	2.08
Trainer support	.106	.041	.126*	2.32	.071	.040	.085	2.36
Error avoidance attitude (–)	.030	.034	.036	1.71	.040	.034	.048	1.71
Analysis of and communication about errors	.017	.038	.018	1.63	.010	.037	.011	1.63
Error risk-taking	.122	.028	.160**	1.33	.102	.028	.134**	1.35
Functionality for learning	.043	.041	.042	1.58	.013	.041	.012	1.61
Self-concept of professional competence								
Self-concept of professional competence	–	–	–	–	.302	.047	.216*	1.15
$R^2_{\text{adjusted}}/\Delta R^2_{\text{adjusted}}$	.16/.16**			.20/.04**				

Notes: *B* unstandardized regression coefficient, *SE* standard error, β standardized regression coefficient, *VIF* variance inflation factor, R^2_{adjusted} Adjusted coefficient of determination, (–) subscale with reversed polarity
*=$p<.05$; **=$p<.01$

aimed specifically at overcoming the error receives particular attention if errors entail noticeable consequences (Sitkin, 1992). In this context, Heinze et al. (2012) have stated that affective teacher support does not lead to a more intense use of errors in the learning process because this effect is neutralized by reduced activity brought about by the absence of fear (see also Rach, Ufer, & Heinze, 2012). If we include the "Self-concept of professional competence" feature (Model 2), then this effect becomes statistically insignificant. Important predictors for the affective-motivational reaction to errors in Model 1 are the subscales "Error risk-taking," positive trainer reaction (inverted component "Negative trainer reaction"), and "Trainer support". The results point out that derogatory comments by trainers (e.g., exposing the failings of apprentices to others) and a tense atmosphere in the company (e.g., fear of making errors) cause negative affective-motivational reactions to errors. In Model 2, the "Self-concept of professional competence" subscale has a strong influence on cognitive-behavioral error reaction and a comparatively moderate influence on affective-motivational error reaction. This result is not in line with prior research. In the studies of Tulis et al. (2011) and Steuer et al. (2013), the self-concept of professional competence positively predicted adaptive affective-motivational error reaction and predicted action adaptive error reaction to only a small extent.

As expected, the results show that how the individual deals with errors depends not only on error climate but also on the self-concept of professional competence. In Model 1, the components of the error climate analyzed explain 15 % (16 %) of the variance of the cognitive-behavioral reaction (affective-motivational reaction). If we include the self-concept of professional competence in Model 2, 30 % (20 %) of the variance of the cognitive-behavioral reaction (affective-motivational reaction)

Table 6.4 *T*-test: gender

	Female ($n=432$)		Male ($n=395$)			
	M	SD	M	SD	*p*	*d*
Error climate						
Negative trainer reaction (–)	3.85	1.33	3.83	1.24	.832	.02
Trainer support	3.93	1.12	4.25	1.05	.000	.29
Error avoidance attitude (–)	3.29	1.13	3.30	1.08	.826	.01
Analysis of and communication about errors	3.54	0.97	3.99	0.93	.000	.47
Error risk-taking	3.56	1.20	3.75	1.20	.022	.16
Functionality for learning	3.72	0.92	3.92	0.85	.001	.23
Individual dealing with errors						
Action adaptivity	4.71	0.61	4.72	0.69	.824	.02
Affective-motivational adaptivity	3.85	0.95	4.01	0.87	.015	.18
Self-concept of professional competence						
Self-concept of professional competence	4.55	0.63	4.43	0.68	.011	.18

Notes: (–) subscales with reserved polarity; all the subscales were measured by using six-point Likert-type scales. These scale ranged from 1 (strongly disagree) to 6 (strongly agree)

can be explained. The levels of explained variance can be seen as good, due to the fact that field research often accepts lower measures. With a maximum of 2.36, the VIF values do not suggest multicollinearity.

6.5.3 *Differences in Relation to Socio-demographic and Organizational Characteristics*

In order to examine differences with respect to gender, we carried out *t*-tests for independent samples. There are significant differences (with medium-effect sizes) between females and males (Table 6.4). Males give a significantly higher score than females when assessing "Trainer support" and the "Analysis of errors and communication about errors" in error situations. Furthermore, the two groups of participants significantly differ in their perceptions of "Error risk-taking" and "Functionality for learning," as well as in the affective-motivational error reaction. Notably, females show a lower level of agreement than males with almost every component of our measure of the error climate and how individuals deal with errors. In spite of the fact that females have a higher level of "Self-concept of professional competence," this result is surprising. A possible explanation could be that, if an error occurs, negative emotions outweigh the potential for knowledge acquisition for female apprentices. Hence, they evaluate errors as a misfortune rather than an opportunity to learn (Oser et al., 2012).

Moreover, there are differences in relation to the type of business (hotel vs. restaurant). In a *t*-test for independent samples, we identified significant differences

Table 6.5 *T*-test: type of business

	Hotel ($n=531$)		Restaurant ($n=201$)			
	M	SD	M	SD	*p*	*d*
Error climate						
Negative trainer reaction (–)	3.75	1.30	4.03	1.26	.009	.22
Trainer support	3.97	1.09	4.30	1.15	.000	.29
Error avoidance attitude (–)	3.18	1.10	3.50	1.13	.001	.29
Analysis of and communication about errors	3.71	0.97	3.80	1.03	.263	.09
Error risk-taking	3.50	1.15	4.00	1.26	.000	.41
Functionality for learning	3.78	0.88	3.86	0.94	.285	.09
Individual dealing with errors						
Action adaptivity	4.70	0.64	4.76	0.67	.311	.09
Affective-motivational adaptivity	3.85	0.87	4.11	0.87	.001	.30
Self-concept of professional competence						
Self-concept of professional competence	4.50	0.64	4.48	0.71	.712	.03

Notes: (–) subscales with reserved polarity; all the subscales were measured by using six-point Likert-type scales. These scale ranged from 1 (strongly disagree) to 6 (strongly agree)

with small effect sizes for components of the perceived error climate which relates to trainers: "Negative trainer reaction," "Trainer support," and "Error avoidance attitude of trainers." It seems that trainers in restaurants deal with errors made by apprentices in everyday work more constructively than trainers in hotels. In addition, there are significant differences between hotels and restaurants with regard to the error climate factor "Error risk-taking" and to the factor of "Affective-motivational adaptivity." The data indicate that apprentices working in restaurants assess the error climate and the individual dealing with errors consistently more positively than do apprentices in hotels. One possible reason for this is the structure of the data. Unfortunately, we have no information about the quality of the restaurants, while most of the hotels are of a "higher level." The negative consequences of an error may be higher in a hotel compared with a restaurant in this study because the guests have higher expectations of quality of service. These organizations therefore wish to avoid damage to their reputations and financial losses, leading to their adopting an approach of pure error prevention (Zhao & Olivera, 2006). In such cases, trainers try to avoid the negative consequences of errors by avoiding errors altogether (Table 6.5).

There are also differences in relation to the training occupation (cook, specialist in the restaurant business, and specialist in the hotel business) and to the category of hotel (three-star, four-star, and five-star hotel). The findings show that cooks perceive the error climate more positively than specialists in the restaurant business and specialists in the hotel business. Moreover, the mean values for almost every component of the error climate decrease with an increasing number of hotel stars. Here, the effect sizes are small to medium.

6.6 Conclusions

The main purpose of this chapter has been to examine several components of the error climate and the self-concept of professional competence as predictors of how individuals deal with errors. Considering the problems and challenges of the hotel and restaurant industry, in particular the high dropout rates among apprentices, we can see that the agreement of apprentices regarding the error climate and the handling of errors is also of interest. Furthermore, we analyzed differences generated by socio-demographic and organizational characteristics. All in all, the questionnaire used in this study is suitable for answering the research questions. With the exception of the scale "Functionality for learning," the internal consistencies (Cronbach's α) ranged from acceptable to good. One reason for the questionable reliability of the above-mentioned scale could be related to the problem of participants having different perceptions of the meaning of the term *learning*.

When it comes to predicting how apprentices deal individually with errors, we found that the components both of the error climate and, to a considerable degree, of the self-concept of professional competence are relevant. In view of the variance explained in the regression analysis, it can be assumed that the way that the apprentices deal with errors also depends on other factors. Empirical results indicate that goal-orientation in particular is a strong predictor of learners' individual reaction to errors. Studies in schools have demonstrated that mastery goal-orientation (goals to increase one's own competency) in contrast to performance goal-orientation (goals to show high competency or to avoid showing low competency) positively predicted action adaptivity and affective-motivational adaptivity (Steuer et al., 2013, 205; Tulis et al., 2011, 40). Moreover, the findings show that apprentices evaluate the error climate in training companies as moderate. In contrast, the components of how individuals deal with errors show rather high values. Additionally, it could be said that perceived error climate and how individuals deal with errors varies in relation to gender, training occupation, and the type and service level of the company concerned. However, the effect sizes show that the differences are rather small.

Our study does, however, suffer from some limitations, which include the cross-sectional design of the analysis and the exclusive use of self-evaluation reports for measuring how people deal with errors. An analysis of how individuals deal with errors over time after an error situation would be worthwhile. Furthermore, it is not possible to draw any firm conclusions as to whether a positive error climate and/or an adaptive reaction to errors results in learning from errors. Finally, a multilevel perspective could offer further information on training company effects. Despite these limitations, though, our study provides a differentiated insight into the contextual and personal aspects relating to errors in the hotel and restaurant industry.

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Chapter 7
Reflection and Reflective Behaviour in Work Teams

Thomas Schley and Marianne van Woerkom

Abstract Despite many routinised and rule-based workflows, there are often unique features and new experiences in the workplace. These deviations originate from exceptional cases or lasting changes. It is not until these experiences are reflected on that they lead to learning in terms of modified beliefs, mental models and knowledge. This need for reflection and reflective behaviour is of particular importance within work teams, and both require and benefit from the reflection skills of its participants. Starting with learning as problem-solving and the need for reflection, we will focus on the purpose of reflection to solve challenges (problems) and break-up routines. Afterwards, we discuss individual reflection and its connection to team reflection and team reflective behaviour because individual reflection is the basis of team reflection and benefits from it. Based on the discussion of the individual and team level, we look at the organisational level and focus on exemplary contextual settings and methods of reflection in team settings and their implementation in work settings. With this, we look at the connection between team reflection and organisational learning and offer a brief insight into the challenges and boundaries of reflection in teams. After showing the relations and difficulties of team learning and organisational learning, we conclude our chapter with the recognition that a comprehensive analysis of reflection has to consider the individual, social as well as the organisational perspective when it comes to team reflection.

T. Schley (✉)
Chair of Business Education and Educational Management, University of Bamberg, Bamberg, Germany
e-mail: thomas.schley@uni-bamberg.de

M. van Woerkom, Ph.D.
Department of Human Resource Studies, Tilburg University, Tilburg, The Netherlands
e-mail: m.vanwoerkom@uvt.nl

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7.1 Introduction

In recent discussions, there has been a growing interest in reintegrating work and learning particularly because of the necessity of lifelong learning. Learning in the workplace occurs if one's own expertise does not extend further enough to fulfil a given task. Thus, this task becomes a problem that triggers reflection. A problem exists—according to research on problem-solving—if there are barriers that prevent getting from a present state to a desired goal state, so that one does not know exactly how to get there. Therefore, new behaviours have to be developed through thinking and reflection. A problem in this sense is not given a negative value as it is in colloquial usage. Problem-solving is just what we do, when we are not exactly sure what to do (Frensch & Funke, 1995). Problems are subjective, depending on individual expertise, prior knowledge, self-confidence and so on, so that most problems at work have to be recognised and solved reflectively (Dörner, 2002). We only tend to consult our "solution database" to find an answer to the problems we consider. "Our solution database contains all the standard answers and assumptions we have used in our past to solve our problems" (Raelin, 2002, 67). This means that we try to solve challenging situations using routines, heurism and algorithm and forms of rule-based knowledge (Dörner, 1996; Ellström, 2006; Gersick & Hackman, 1990). Additionally, we tend to ignore or misinterpret situations or try to avoid problems, for instance, by delegating them, and as a result miss out on learning opportunities (Dörner, 2002; Ellström, 2006; Van Woerkom, 2010). Furthermore, we do not recognise how current ways of operating may have become obsolete due to environmental changes, sometimes which might have been possible through us of reflections (Tjosvold, 1991). But the adherence to the established is a normal human tendency to draw, for example, on path dependencies, the force of habits, rituals, rules, mental models and routines. There is little willingness to question individual actions and assumptions at regular intervals (Busch, 2010; Dörner, 1994). On the one hand, this is the case because "society gives reflection and its counterpart—listening—short shrift" (Raelin, 2002, 66) and focuses more on actions at work because there is no time to think and also a tendency to avoid conflicts (ibid.). On the other hand, there is the adherence to the established, and it is quite natural to save resources by not asking oneself the same questions again and again (Dörner, 1994, 1996; Gersick & Hackman, 1990). Building up (mental) models and routines gives us safety in our orientation and behaviour, and it is much easier to act at ones current level of competencies (flow experience) or to hide in groups than think for oneself (ibid., Dörner, 1994; Reither, 1985; Sembill, 1999). Routine action is an important aspect not only for individuals but also for organised social systems like groups and organisations because routinisation helps to get a large amount of work done in less time (Gersick & Hackman, 1990).

Nevertheless, reflection and critical reflection are widely recognised as crucial elements in the (self-organised) learning and problem-solving processes of individuals, teams and organisations and thereby necessary for workplace learning and professional development. However, this is not so far backed by a consistent theory,

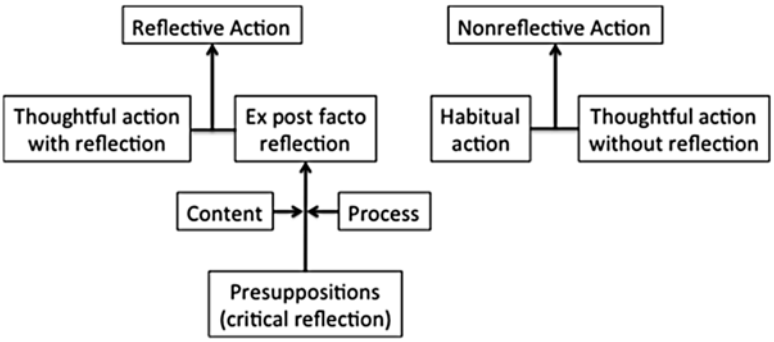

Fig. 7.1 Nonreflective and reflective action according to Mezirow (1990, 7)

and there remains a lack of empirical evidence to support these claims (Boud, Cressey, & Docherty, 2006, Dörner, 1979; Ellström, 2006; Gillen, 2007; Marsick, 1988; Schön, 1983; Sembill, 1992; Tisdale, 1998; Van Woerkom, 2003, 2010).

7.1.1 The Need for Reflection at Work

Despite the importance of reflection and problem-solving at work, most work processes still seem to consist of predominant routine and rule-based tasks that are not interpreted as problems and could be solved without great cognitive effort and reflection (cf. nonreflective action, Mezirow, 1990, see also Fig. 7.1). Reflection is only triggered if there is an instruction or the appearance of any failure within routines, for example, through errors, obviously and surprisingly changed conditions, questions and dissatisfaction, and these circumstances offer the possibility of solving the problem or breaking up routines and inducing workplace learning. Moreover, even in the most routinised tasks, there are unique variables worth reflecting on because some variables or the context could have been changed (Billett, 2006; Raelin, 2002; Schön, 1983/1999). So it seems valuable to take a break from a routine to make problematic unconscious aspects conscious and to look more at the differences between situations than the similarities (Boud, 2006; Raelin, 2002).

More important, in "professional contexts, people are paid to solve problems" (Jonassen, 2004, xxi) and are—up to a certain degree—responsible for their own professional development. We are frequently confronted with diversified problems in every condition of life, and these problems offer us a possibility to learn (i.e. deliberate practice) (ibid.).

Therefore, in the workplace, there are two ends of a continuum for professional actions: (nonreflective) routine actions with implicit learning taking place and problem-solving (thoughtful action with reflection) where conscious learning occurs (Rausch, 2011, 2012; Mezirow, 1990, see also Fig. 7.1). If a worker is faced

with something new, he is confronted with a problem (see above) and has to deal with it consciously and reflectively. Dealing often with that kind of problems leads to routinisation (Rausch, 2011, 2012) which is "adaptive learning" for Ellström (2006) and means that formerly conscious elements become unconscious (Dörner, 1994; Rausch, 2011, 2012). On the contrary, to break routines that might no longer be adequate, one has to reflect on them making former unconscious elements conscious (Rausch, 2011, 2012)—at least as far as possible because not everything is consciously accessible. That is what Ellström (2006) calls "development learning". Whilst there are implicit and incidental learning processes going on, "experience itself does not teach" (Tjosvold, 1991, 189). Implicit knowledge has to become conscious (as far as it is possible; cf. Eraut, 1998, 2000) to have the ability to use this knowledge consciously.

Despite the premise of the need and positive effects of reflection for workplace learning and problem-solving, it also has negative effects and can create (new) difficulties. If one sees, for example, one's own incompetence, reflection might lead to demotivation, inactivity and pessimism (cf. discussion about rumination and brooding, e.g. Trapnell & Campbell, 1999). There seems to be a need for an adequate balance between a required amount of reflection and other ways of learning and solving problems as well as reflection and action in the workplace, and therefore the questions regarding the necessary extent of reflection are not answered yet (Van Woerkom, 2010). "For an effective and productive performance, there needs to be a balance between routine and flexibility" (Van Woerkom, Nijhof, & Nieuwenhuis, 2003, 185).

7.1.2 Reflection and Reflective Behaviour in Work Teams

What presents a large challenge for individuals is all the more so for teams and especially teams that are working together in projects as they are faced with problems that can seldom rely on routines as project work is highly problem based. In teams, the systematic care of reflection and pause (to think) is not a luxury but a necessity (Busch, 2010). Particularly in changing environments, teams must reflect on their internal and external environments and change how they operate in order to be effective (West, 1996, cf. Tjosvold, 1991). "Teams need to be able to assess their present state of functioning, celebrate and build upon their accomplishments, learn from mistakes and deal with frustrations. Effective groups monitor and regulate themselves so that they can continue to work together without great deal of intervention by managers. They built themselves up into an independent team that will be productive in the future as well as the present" (Tjosvold, 1991, 38). Effective and efficient work in groups is a cornerstone of successful organisations, and team reflexivity is one central determinant (Neininger & Kauffeld, 2009; Schippers, Den Hartog, Koopman, & Van Knippenberg, 2008). But team reflection is not a "fast-selling item" making interventions and implementations necessary (Neininger & Kauffeld, 2009).

The implementation of a reflective practice is a challenge for individuals, teams and organisations alike, especially when looking at the interactions between these different ontological levels.

7.2 Individual Reflection and Learning at Work

Team reflection requires and benefits from the reflection skills of each participant. Thus, what individual reflection is and what it has to do with team reflection has to be clarified. When it comes to individual reflection and the central question "What is reflection?", we have to focus on different essential sub-questions to analytically dismantle reflection. We have to ask about the triggers of reflection that provoke the reflection process. Additionally, we have to know what elements of the reflection process can be distinguished, which focuses on the extent of reflection—the perspectives and levels that were taken into account. Furthermore, it is important to consider the functions of reflection and with this the question why we reflect. Reflection is an action we do with a specific aim—eventually to correct beliefs, mental models and for knowledge acquisition and through this building identity. These questions are not easy to answer because of the problem that reflection is often used as a synonym for higher-order mental processes (Mezirow, 1990) and because of a lack of specific empirical studies that show how reflection develops in working processes. We will take a closer look at the aforementioned systemisation in this section.

After the systemisation of literature, Boud (2006) summarises the notion that reflection is seen as a means of examining and re-examining experience, as a conscious, volitional process and as an act of the individual. That is true for Daudelin (1996), too. She sees in reflection "a highly personal cognitive process. When a person engages in reflection, he or she takes an experience from the outside world, brings it inside the mind, turns it over, makes connections to other experiences, and filters it through personal biases" (Daudelin, 1996, 39). She continues: "reflection is the process of stepping back from an experience to ponder, carefully and persistently, its meaning to the self through the development of inferences; learning is the creation of meaning from past or current events that serves as a guide for future behaviour [sic]" (Daudelin, 1996, 39). With this, she defines the two etymological meanings of reflection: to see oneself in a mirror and to bend back, looking on oneself. Van Woerkom (2003) defines reflection according to Boud, Keogh, and Walker (1985) as a complex activity aimed at investigating one's own action in a certain situation and involving a review of the experience, an analysis of causes and effects and the drawing of conclusions concerning future action which results in a changed conceptual perspective. "Reflective practice … is the practice of periodically stepping back to ponder the meaning of what has recently transpired to ourselves and to others in our immediate environment. (…) It typically is concerned with forms of learning that seek to inquire about the most fundamental assumptions and premises behind our practice" (Raelin, 2002, 66). Though all

Table 7.1 Analytical elements of an ideal-typical reflection

Element of reflection	Description	Examples (see also Table 7.2)
Triggers of reflection	Triggers are external circumstances and intrinsic states that can cause a reflection process	Errors, (negative) feedback, (critical) questions, conflicts, difficult situations, (disturbing) behaviours of others, discontent
Object(s) of reflection	The object of reflection is the main focus of the reflection and is always a thought (e. g. about an experience). It is often the thought of the trigger itself, especially in incidental reflections	Triggers, learning processes, learning outcomes, own and others' behaviour
Perspectives of reflection	Based on the object of reflection, the perspectives of reflection are alternative views, perceptions of others, alternative approaches and so on	Focusing, for instance, on the content, process or premises of a problem. Looking at the output, outcome, different stakeholders, social environment or general frameworks
Levels of reflection	The levels of reflection define the depth and quality of the reflection. There exist different classifications from descriptive up to questioning assumptions and embedding the insights into a (social) context	Descriptive, dialogic and critical level (Hatton & Smith, 1995) Descriptive, comparative and critical level (Jay & Johnson, 2002) Prereflective, quasireflective, reflective thinking (King & Kitchner, 2004)

these definitions emphasise different aspects of reflection and combine these aspects with reflective behaviour, they focus only partly on the different questions raised at the beginning of this section. Sometimes the definitions of reflection even blend these perspectives and focus on more than the question of what reflection actually is. Because of the complexity of the reflection process and its similarity to other concepts, like action regulation and control (cf. metacognition) or problem-solving itself, it is expedient for the discussion and survey of reflection processes to analytically dismantle it (cf. Mezirow, 1990). Hence, a consensual working definition of reflection is that reflection is the deliberate realisation and critical analysis of a memory content (object of reflection as a thought) using the mechanism of recapitulation and reconstruction. With this, the reflectitioner looks at various perspectives and varying viewpoints (extent of reflection), in regard to different qualitative outcomes of the learning potentials (levels of reflection) and its possibilities to learn and solve problems as a kind of Munchhausen trick, to lift oneself up by one's own bootstraps, as is explained in greater detail below (Dörner, 1979; Tisdale, 1998; Van Woerkom, 2010).

The description of the following reflection process is an ideal-typical one, which is seen taking place inside the individuals mind. It offers a closer look at the questions of what triggers reflection, what is reflection and what does it look like (see also Table 7.1):

Table 7.2 Comparing the main aspects of individual and team perspectives on reflection (following Høyrup & Elkjaer, 2006, 38)

Aspects	Individual perspective	Team perspective
Support of reflection	Time, space, positive emotions or degree of suffering, openness about mistakes, career awareness	Time, space, climate of trust, culture of reflection and feedback, openness about mistakes
Trigger of reflection	Habits do not work (errors, mistakes). Complex, ambiguous, uncertain and unique problem situations. (Negative) feedback, criticism, questions, conflicts, changes in the organisation, etc., that lead to perplexity, hesitation doubt, inner discomfort, dilemmas, dissatisfactions, unfulfilled expectations, unexpected outcomes (…)	
Degree of organization	Spontaneous/informal to planned/formal	
Cognitive processes	Can be tacit language/not codified language Anticipatory thinking. Analysing, observing, recapitulation, reconstructing and concluding. Introspection, synthesis of different kinds of experience. Elaboration	
Elements of action/ behaviour	Inquiry, asking for feedback, experiments	Thoughts are converted through interaction into explicit language (codified). Discussing, enter into a dialogue, asking for and receiving feedback, sharing knowledge and visions. Collective planning, analysis, decision-making
Critical elements	Hunting assumptions. Questioning of the taken for granted. Focusing on political, social, organisational and cultural processes	Challenging groupthink. Breaking assumptions. Focusing on political, social, organisational and cultural processes

1. The question about the when and why there is reflection is aimed at the *triggers of reflection*. In the reflection literature, the triggers or initiators are the starting points of the reflection process. The examples of triggers vary, but they have in common that they often have a negative connotation. So triggers are deficiencies, resistors and difficulties, for example, errors, (negative) feedback, critical questions, conflicts, difficult situations, (disturbing) behaviours of others and so on (e.g. Høyrup & Elkjaer, 2006; Reither, 1979; Swift & West, 1998, see also Table 7.2) which force the worker to pause and think—as far as the trigger reaches the awareness. But if the outcome of a situation is better than expected, reflection could also be triggered. From the point of view of the action-regulation theory (e.g. Frese & Zapf, 1994), the mere existence of a trigger is not enough to start the reflection process. In the sense of Scherer (1986), the triggers are only stimuli that are initially and unconsciously assessed by the individual. Scherer called these appraisals Stimulus Evaluation Checks (SEC). If there is a trigger which lasts as a stimulus, it is checked to see if it is new (routine or problem), if

it is pleasant (Do I like it? escaping, coping or exposing), refers to aims and needs (relevance, expectations, convenience, pressure), coping capacity (control, power, adaptability) and conformity with (internal and external) standards (norms). Every stage of the evaluation process also refers to positive and negative emotions: (1) surprise, interest and fright; (2) palatableness, approximation/prevention and passion/disinclination; (3) fright and anger vs. pleasure and satisfaction; (4) confidence vs. fear, awkwardness and depression and (5) experience of identity and pride vs. shame, guilt and contempt (for a detailed explanation, see Sembill, 1992). We claim that reflection processes only start when the appraisal comes to the fourth level (level of intellectual regulation). Otherwise, we act within routines and automated autonomous reactions (sometimes rule based). The trigger has to irritate or surprise oneself in a certain way so that in this sense, it is worth reflecting on or necessary to. Affiliated to the triggers, we have to distinguish between reflection as a natural spontaneous aspect or self-initiated and self-perpetuated process inherent in learning, problem-solving and team processes and reflection as a (ideally self-motivated) deliberate (highly organised managerial) intervention to promote learning (e.g. Tarrant, 2013). Individuals who have a great tendency to reflect will not need an intervention for reflection processes, whereas others do. Hence, reflection processes interrupt actions and require time and of course space (Boud, 2006; Ellström, 2006; Kayes, Kayes & Kolb, 2005). "Perceiving oneself as 'off-the-job' can be important for reflection" (Boud, 2006, 165) because otherwise the pressure and stress of daily work prevents us from taking some time for reflection. Hence, the more stressful, incriminating and urgent a situation is, the less likely that reflection will occur. This should also show that emotions and motivation in reflection processes should not be neglected as has been the case in previous research (Van Woerkom & Tjepkema, 2013).

2. To avoid an endless regression of a metatheoretical systemisation of reflection, as Tisdale (1998) and Dörner (1994) advise against, we first have to take a closer look at the *object of reflection*, which is for initial reflections often the thought of the trigger itself. For this, we have to model an assumption of the existence of a special kind of memory—a log memory or behavioural record—because reflection assumes a trace of one's own activities (Candy, Harri-Augstein, & Thomas, 1985; Dörner, 1994; Reither, 1979; Tisdale, 1998). The log memory contains a journal of mental processes of our behaviour and inner processes, and it is necessary to keep orientated within time (Dörner, 1994). This record contains all memories of events, our thoughts, our experiences, our volition, our actions and our feelings (Tisdale, 1998). But there might be gaps and blurred lines within the log memory where a reconstruction (repair) based on "similarity matching" and "frequency-gambling" (Reason 1988 cited after Tisdale, 1998, 7) becomes necessary. In this kind of view, reflection is the critical observation and analysis of memory content (of the log memory) with the help of processes of recapitulation and reconstruction (Tisdale, 1998). The mere remembrance and description of this content is a necessary but not sufficient condition of reflection (ibid.). This is what is meant by shallow or simple reflection (cf. Marsick, 1988) and is inherent

in common sense. With regard to the levels of perspective of reflection, this depicts only the first and second level of reflection: remembering and description (e.g. Hatton & Smith, 1995). In this understanding of reflection the distinction between the times of reflection (i.e. reflection-in-action and reflection-on-action, Schön, 1983) is obsolete. Reflection always happens in the present moment; the object of reflection is in every case a memory content—a thought about something, a mental model. Only the recent nature of the thoughts changes and with it the amount of gaps.

3. If it finally comes to a reflection, there is the question of how deeply are aspects reflected (*perspectives and levels of reflection*), and that is related to insight quality and learning potential (cf. Bolton, 2010). The perspectives of reflection means the different aspects that are taken into account in relation to the object of reflection, for example, the product/content or the process, the individual or the group or the environment, internal vs. external, variable or stable aspects, premises and so forth (Mezirow, 1990; for a German example, see Egloffstein, Frötschl, & Baierlein, 2010). For each level of reflection, there exist different classifications (e.g. Boud, Keogh, & Walker, 1985; Daudelin, 1996; Hatton & Smith, 1995; Jay & Johnson, 2002; King & Kitchner, 2004; Swift & West, 1998). To sum them up, there are at least four levels: description of the object and with this an explication and realisation of mental models, appraisal, interpretation and explanation (first level, sometimes classified as nonreflective) and the relation to one's own knowledge and skills (second level). These two levels cover simple or shallow reflection. Eventually, the new insights should be projected into further actions and respective changes in behaviour (third level, moderate reflection). Within the fourth level of reflection, the new knowledge is validated by questioning one's own assumptions and becoming aware of the (social) contextual embeddedness (critical reflection). However, in studies, the last two levels in particular have rarely been discerned empirically (e.g. Schippers, Den Hartog, & Koopman, 2007). Again, the reflection process depends on motivational and emotional aspects because the remembrance of perspectives and levels and the endurance (volition) to go in-depth are related to positive and negative emotions that prevent or promote the reflection. The amount of perspectives that an individual is taking into account and the depth of the level of reflection depend on the object of reflection, the knowledge, the emotion, the motivation and the volition, as well as the time available. The need to ask somebody else is presumably higher if there is less time to reflect, if a worker has a lack of knowledge in a specific case or if he is not keen on it and maybe gets exactly this as a result of his insight (cf. Ellström, 2006).

Reflection is like problem-solving, in this meaning a specific kind of action. Reflection and respectively self-reflection are the (triggered) conscious observation and critical analysis of a memory content (log memory, object of reflection) with the help of processes like recapitulation and reconstruction with the aim of knowledge acquisition (extent of reflection). Therewith, it is possible to act adequately within problem-solving processes (cf. "effective performance", Van Woerkom, 2003), which means operating flexibly (change of processing strategies) and plastically

(assimilation to changing requirements) (Boud, Keogh, & Walker, 1985; Dörner, 1994; Tisdale, 1998). Critical means in this sense to scrutinise and correct one's own mental models together with an integration of one's knowledge and action into "the big picture" (Mezirow, 1990; Hatton & Smith, 1995, cf. Marsick, 1988).

For the critical aspect, we ordinarily need others for approval and refusal and with this, the validation of new insights—a point we are normally not aware of. Habermas (1971, 1974, 1984 cited after Pearson & Smith 1985, 74, and Mezirow, 1990, 10) found some possibilities for proving knowledge:

1. Turning to an authority, tradition or force (i.e. conventional knowledge).
2. Make an empirical observation.
3. Share meanings and understandings through language (cf. 1., rational discourse)
4. Knowing about ourselves, our theories and our actions within a context of the wider world (critical knowing)

To these possibilities, one can add logical concluding and experimenting (or as ultima ratio of problem-solving "trial and error") (cf. Schön, 1983). Nevertheless, there seems a point in reflection processes where we need colleagues, mentors, coaches and friends or at the very least simply other people to declare our insights to be true and realistic.

As we know from empirical studies, humans tend not to sit quietly and silently and reflect for themselves—undertaking a "professional monologue" (Bolton, 2010)—particularly when other people are around them, for instance, at work. Thus, at some point of the reflection process, we need to submit our assumptions to the review of others by talking about them (cf. Andersen, 1990; Daudelin, 1996). In these situations, reflective behaviour could be observed, and reflection is no longer only an individual process (Van Woerkom & Tjepkema, 2013). Reflective behaviour can be part of an individual reflection process as well as the end of it. Critically reflective work behaviour is operationally defined as "a set of connected activities carried out individually or in interaction with others, aimed at optimizing individual or collective practices, or at critically analyzing [sic] and trying to change organizational or individual values" (Van Woerkom & Croon, 2008, 318). Van Woerkom (2003), Van Woerkom et al. (2003), and Van Woerkom and Croon (2008) identified different aspects of critically reflective working behaviour, such as critical opinion sharing, asking for feedback, challenging groupthink, experimenting and also attitudes that facilitate reflective behaviour like openness about mistakes and career awareness (see also Edmondson, 1999). This kind of behaviour helps the individual if it comes to a point where his reflection process gets stuck or where it is necessary to validate the new insights. In the sense of subjective theories (Groeben & Scheele, 1982), we try to approve our hypotheses and opinions through experimenting with interaction with others who can have new ideas, similar problems and challenging questions to help us rethink the problem (cf. Andersen, 1990; Daudelin, 1996). Besides, "reflection includes behaviors [sic] such as questioning, planning, exploratory learning, analysis, diverse exploration, making use of knowledge explicitly, planfulness, learning at a meta-level, reviewing past events with self-awareness, and

coming to terms over time with a new awareness" (West, 2000, 4). From the perspective of the German approach to work psychology, we have to distinguish between actions and behaviour because actions are defined as intentional, conscious behaviour (Dörner, 1996; Frese & Zapf, 1994; Kaiser & Werbik, 2012). As an observer, it is difficult to say if a behaviour such as feedback seeking is an unconscious act, for example, to avoid reflection, if it is a step within the reflection process, to fill a log memory gap, or if it is a logical action that concludes the reflection process (e.g. recognition of missing skills). What is more, feedback seeking can become a routine, so that the SEC "Can I do this?" with the answer "No, I cannot do this" leads to help seeking instead of dealing with this problem (preliminary) on one's own.

Furthermore, Van Woerkom and Tjepkema (2013) argue that reflection is only a conscious process and dismiss the emotional and motivational aspects. Although an unconscious reflection as defined above is not seen as a reflection at all, there is implicit knowledge engaged in reflection processes that cannot be completely verbalised (Berry, 1987; Eraut, 2000). This is precisely the case for routinised intuitive actions of experts that can only partly be verbalised (if at all). Additionally, some authors claim the existence of unconscious reflection processes that can be scrutinised (e.g. Daudelin, 1996 who refers to J. Allan Hobson's book "Sleep"). Stepping back from a problem and making a pause from thinking can prevent rumination. The lag between looking back on the reflection object could seemingly reveal new insights or the solution to the problem, but such insights cannot be the result of an unconscious reflection process. It is more the case that the standoff gives us the opportunity to look with a clear mind on the object again and subsequently a formerly unassociated perspective could potentially reveal a solution.

7.3 Reflection and Reflective Behaviour in Working Teams

The following sections discuss the central aspects of the topic focusing on team reflection and behaviour compared to individual reflection and exemplary contextual settings and methods. Additionally, the challenges and boundaries of team reflection will be outlined, and also the connection to organisational learning will be demonstrated. In the following discussion, we see a team as a group of two (dyad) or more people permanently (e.g. in a department) or temporarily (e.g. in a work project) who are working together semi-autonomously and are pursuing common (organisational) goals.

7.3.1 Team Reflection as Individual Reflection in Team Settings and Reflective Behaviour in Teams

Individual reflection takes place in different kinds of settings. Often, it is seen as a process we do on our own without interacting with others. As, for instance, Van Woerkom (2003) and Van Woerkom and Croon (2008) have shown, there are

moments in reflection processes were we cannot go further and need a counterpart to review and validate what we are thinking about (see above, cf. Andersen, 1990). This moment can be seen as reflective behaviour when, for example, we ask somebody for feedback. This behaviour is especially important to prevent rumination and brooding that do not lead to an end or an aim. Talking to colleagues can be considered as two combined individual reflection processes that influence and (hopefully) enrich each other (cf. Andersen, 1990; Pearson & Smith, 1985). As a result, improved individual reflection competencies can enhance team reflection so that this process is of a higher quality (ibid.). In addition, teams with improved individual and team reflection skills do not need interventions to enforce reflection and with this learning processes (cf. Buljac-Samardžić & Van Woerkom, in press). This leads to the conclusion that "the application of the concepts should not be restricted to an individual perspective" (Høyrup & Elkjaer, 2006, 29). "Reflection does not have to be a solitary activity. It can occur in group settings as well as through individual writing and thinking" (Boud, Keogh, & Walker, 1985, 16).

Team reflexivity can be defined as "the extent to which group members overtly reflect upon, and communicate about the group's objectives, strategies (e.g. decision-making) and processes (e.g. communication), and adapt them to current or anticipated [endogenous or environmental] circumstances" (West, 1996, 559; West, Garrod, & Carletta, 1997, 296, cf. Schippers et al., 2007, 190). As Carter and West (1998, 599) found, "team reflexivity is useful in predicting team effectiveness: Higher team reflexivity does predict better team performance". Thus, reflexivity can be seen as a key variable in team functioning (Schippers, Den Hartog, & Koopman, 2003; Swift & West, 1998; West, 2000), yet research on this topic is scarce (Schippers et al., 2007).

The articulation of individual thoughts is a central behaviour in team reflection processes. Besides, the articulations of individual reflections have the effect that the reflecting person becomes more aware of his own thoughts and mental models. That is also true for problem-solving processes that can be improved by speaking aloud what one is thinking (e.g. Hacker & Wetzstein, 2004). The externalisation of thoughts (as internal models of a subject area) is a semantic model of the second level (cf. Gigerenzer, 1981) that influences, on the one hand, my own internal model because language itself has a modelling function and relieves the brain as notes do, and, on the other hand, this external model can be perceived by and debated with others (ibid., cf. Andersen, 1990). "When reflection takes place in a small group, ideas are generated by the sharing of different perspectives. … While one person is sharing his or her experience, the others are relating the information to their own challenges" (Daudelin, 1996, 42, cf. Andersen, 1990). That also means that we "subject our assumptions … to the review of others" (Raelin, 2002, 67, cf. Høyrup & Elkjaer, 2006). This interactions process, whether it be discursive or dialogic, leads to new insights and learning (cf. Edmondson, 2002).

The following table shows the differences and similarities between reflection from the individual and the team perspective (Table 7.2).

From the viewpoint of problem-solving, "… teams have considerable potential to combine the ideas and actions of many to solve complex problems. Team members

can combine their strengths and efforts to complete tasks that individuals working alone could not efficiently do" (Tjosvold, 1991, 45). In this case, the object of reflection is a specific challenge the group is faced up with, and every individual can contribute from its specific point of view using its knowledge and skills (perspectives of reflection). Other objectives teams can reflect on are the commitment to team objectives, team processes, strategies for achieving team goals, progresses made and others (Swift & West, 1998). During team processes, the object of reflection can change if new problems occur, for example, if a conflict arises. West (2004) distinguishes between "task reflexivity" and "social reflexivity", which can be seen as new objects in the sense discussed in Sect. 7.2 (cf. Busch, 2010). Such a focus also influences the development of questionnaires for measuring team reflexivity (see, e.g. the confirmatory factor analysis by Carter and West, 1998).

From the perspective of breaking up routines within team reflections, the individual reflecting person benefits from the diverse perspectives of others (e.g. in debriefing group activities) that can offer new insights (perspectives) or can lead through questions to a deeper level of reflection (see Sect. 7.2). Furthermore, the approval and refusal of externalised individual reflection prompt further reflection within all the team members (Boud, 2006). Additionally, emotionally intense reflections can be clarified through the perceptions of others. In teams, a deeper type of reflections could be possible if the group atmosphere is open and frank.

Albeit, mainly in case of breaking up routines, "individuals and teams rarely reflect spontaneously; rather, teams tend to behave in habitual ways, even when presented with evidence that this behaviour might be dysfunctional" (Schippers et al., 2008, 1594 cited after Busch, 2010, 299). From Busch's (2010) point of view, the team leader is responsible for initiating team reflection. However, Buljac-Samardžić & Van Woerkom (in press) found within their empirical study that only weak teams benefit from these interventions. Furthermore, research shows the ineffectiveness of group discussions (Edmondson, 2002). Reasons for this might be problematic individual beliefs in the team's efficacy, the team's resources (such as the resources of individual members) and a dysfunctional team climate. As Edmondson (1999) shows, the psychological safety of team members and positive views of the team's effectiveness are important premises for a productive team reflection and serve as a basis for reflective behaviour. In her sense, psychological safety means "a shared belief that the team is safe for interpersonal risk" (ibid., 354). Only if a team member feels free to truly express what he or she thinks—without the fear of being sanctioned or isolated—reflective development in teams is possible (cf. Brooks, 1999, see also Sect. 7.3.4). Every team member and the team leader are responsible for the creation of beneficial preconditions.

Additionally, crucial for team processes are the creation of valid, useful information and the recognition of accomplishments and obstacles (Tjosvold, 1991). As described in relation to individual reflective behaviour, there is also a tendency for teams to behave in a similar way (see Table 7.2 and above). So teams may also ask for feedback, share knowledge, learn from mistakes and experimentation (Edmondson, 1999; Van Woerkom, 2003, cf. Busch, 2010). It is also important for teams to share a vision and challenge groupthink (Van Woerkom, 2003).

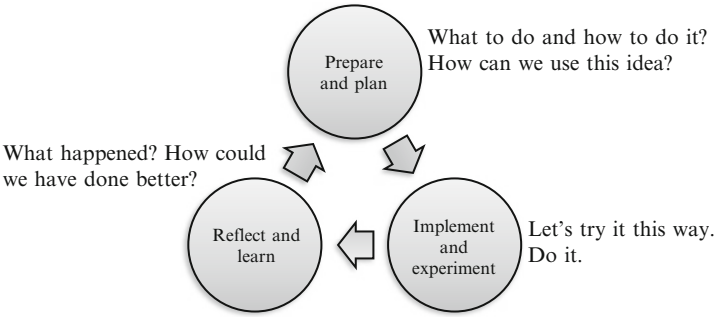

Fig. 7.2 Evaluation and development process of teams (Tjosvold, 1991, 190)

Feedback-seeking behaviour and asking for help are especially common at work because they are the easiest and most economic ways to get information or the task done without great cognitive effort (Frese & Zapf, 1994, cf. Van Woerkom & Croon, 2008). Because of that, we have to state that feedback-seeking behaviour is not a reflective behaviour in every case. "However, although feedback-seeking behavior [sic] is important for reflexivity, it is not identical to reflexivity. Reflexivity has to do with how things can be improved, while feedback seeking is getting information on how far one is from the (performance) goal and does not necessarily imply that the obtained information is reflected upon" (Schippers et al., 2007, 192).

Additionally, for Tjosvold (1991) team reflection is a combination of behaviour for collecting data with open discussions and planning and the implementation of these new insights. So team learning is an ongoing evaluation and development process (Tjosvold, 1991, Fig. 7.2).

Without reflection, the individual as well as the team will not use its experience to improve its abilities because "[r]eflection contributes critically to team productivity" (Tjosvold, 1991, 190, cf. Neininger & Kauffeld, 2009). Team learning does not occur if the team fails to reflect on its own actions or when they fail to make changes following their reflections (Edmondson, 2002, 130). Reasons for this might include the inability to break out of routines, the lack of necessary resources or motivation, ineffective discussions (Edmondson, 2002), surface perspectives on learning (Rausch & Schley, 2011) but also obstructive work characteristics (Rausch, 2012).

Finally, in addition to the reflection part within teams, it is most important not to forget the action part. As already mentioned, there has to be a balance between stability and flexibility at work together with a balance between action and reflection (Edmondson, 2002; Van Woerkom, Nijhof, & Nieuwenhuis, 2003). "There is unfortunate a gap between what many of us say we will do and what we actually do" (Raelin, 2002, 67). All kinds of combinations of action and reflection are conceivable (team learning behaviour classification of Edmondson, 2002):

- Reflection and action
- Reflection without action
- Neither reflection nor action

Furthermore, action without reflection is also possible when it comes to routinised actions at work and in working teams.

The same relation between individual reflection and team reflection that we have already discussed above can be transferred to reflection processes between different teams. The fundamental modelling of the ideal reflection process as well as the reflective behaviour, and with this learning from one's own experiences and that of others, stays the same (cf. Busch, 2010). But that does not mean that there are no additional aspects to take into account because, based loosely on the saying by Aristotle, the whole is greater than the sum of its parts and is different in kind. As such at every ontological level, there have to be separate empirical studies to explain the whole process (Sembill, 2012). Concluding from one level to another could introduce a problem of deduction (or induction, depending on the direction) and with this the danger of introducing fallacies.

7.3.2 Contextual Settings and Implementations of Team Reflection in Companies

Instead of a balance between stability and flexibility (see above) from an organisational point of view, the question is about the balance between control and flexibility (Brooks, 1999). Individual reflection and team reflection as well as team learning are—besides personal and team properties (traits)—determined by the contextual settings of the workplace and the organisation and with this by the implementation of methods for reflective practice and concession of time and space. In this chapter, we will only discuss aspects related to team reflection. However, reflection must be involved between the system world of the organisation and the lifeworld of the workers, between the formal and the informal, the structured and the emergent (Boud, 2006). The organisation is a complex system where changes lead to effects as well as to side and follow-up effects that are often neglected in problem-solving and reflection processes. Implementing instruments for reflection and setting the right contextual variables is a challenge as in every problem-solving process and, according to the literature, is necessary because reflection processes are rare and have to be triggered (e.g. Gersick & Hackman, 1990; Newell & Simon, 1972; Reither, 1979; Tisdale, 1998).

As Ellström (2006) indicated, learning at work is a matter of design. We cannot just rely on the knowledge and skills of the employees and the evolution of healthy structures that foster reflection and learning. "In the organizational perspective focus is very much on implementation of frames, structures, collective actions and organizational matters. The structures have to support processes of reflection" (Høyrup & Elkjaer, 2006, 40). With these frames and structures, organisations indirectly influence rule-based and knowledge-based actions (Ellström, 2006; Frese & Zapf, 1994; Rausch, 2012) and should be themselves the result of reflective actions. The frames and structures also guide reflective actions and determine how the results are recorded and transferred into rules, guidelines, recommendations and so

on (knowledge management). Organisations have to have a strong focus on these developments because once established, actions at skill-based and rule-based levels are difficult to change (Ellström, 2006; Frese & Zapf, 1994). Then again, reflection is needed to break up these routines and tacit theories ("theories-in-use") so as to change them (cf. Edmondson, 2002; Rausch, 2012).

7.3.2.1 "Reflexive Learning Spots"

By the promotion of reflective practice and herewith the professional development of employees and teams, an organisation can implement different structures and approaches that should fit the needs of the employees because during the experience itself, people are often so deeply involved that reflection is simply not possible (Brüggemann & Rohs, 2007; Pearson & Smith, 1985). An organisation has to implement opportunities for reflection through cultural and spatial structures. Brüggemann and Rohs (2007) propose the institutionalisation of little (formalised) "spots" that can foster reflection and therefore learning at work which have the following characteristics: short duration (5–10 min), immediately usable without or with only little effort (verbal, note-taking as appropriate), non-formal to informal organised, non-complex and with a connection to the workplace (ibid.). This can include small talk at the coffee machine or in the parking lot as well as checklists, for instance, general questions or activities. A central point for productive reflections might be a feeling of being off-the-job (Boud, 2006, see also Sect. 7.3.4). For that, the company climate and culture play an important role. Workers should feel free to take these off-the-job breaks and to know that they are allowed and will not be sanctioned (e.g. Pearson & Smith, 1985).

7.3.2.2 Learning Rounds

With a greater focus on teams, Busch (2010) distinguishes between work-related instruments that foster learning within teams and work-spanning instruments that serve the experience exchange between teams. In this paragraph, we concentrate on exemplary work-related instruments. Vince (2002), for example, sees in the reflection organising process the requirement to create and sustain opportunities for organisational learning and change. He suggests three characteristics that have to be fulfilled for a successfully reflective practice. Such practices should:

1. Contribute to the collective questioning of assumptions
2. Provide a "container" for the management of the anxieties raised
3. Contribute towards democracy in the organisation

He recommends focusing on four reflective practices: peer consultancy groups, role analysis and role analysis groups, communities of practice and group relations conferences. All these suggestions are some kind of learning rounds with different objectives that support a continuous professional development—they approach

reflection as a collaborative process. Within these rounds, "the group of voices produce more analysis then could be discovered by any single person" (Tarrant, 2013, 32). But it has to be questioned whether the observations are really objective, as Tarrant proclaims. A consensus of many does not automatically produce an objective truth (e.g. Kaiser & Werbik, 2012). The distant goal of these implementations should be collective action that acts as a prompt to make people act attentively, conscientiously and critically (Raelin, 2002). Intentional triggered reflection is especially needed at those times when we are unaware of our behaviour and its consequences (ibid.). Raelin (2002, 69) suggests the implementing reflective actions such as journal writing, conducting postmeeting e-mail minutes, reflective note-taking, learning histories and "stop and reflect" (comparable to the reflection and learning spots above) or managing debriefing episodes, building communities, improving processes and forming learning teams, which helps people make sense of their own (subjective) theories and experiences and lead to a learning culture amongst employees.

7.3.2.3 Debriefings and Briefings

Debriefings and briefings are two widespread methods for an organisational implementation of reflective practice for teams and have their roots in the military (Pearson & Smith, 1985). The less well-used method of briefings is a meeting and discussion in advance of a task or a project which should give an orientation to the practice, the project or the task, give clear instructions and discuss the goals, rules, purposes and intentions from different viewpoints (organisation, management, team leader). Additionally, individual expectations should be discussed (ibid.). It could help to correct possible mistakes within the tacit theories of a team and by association help identify differences in the understanding of central variables to plan the proceedings.

By contrast, debriefings take place several times during a longer project or at the end of it. The aim is to evaluate the effectiveness and the efficiency of the project and to learn for future actions. The process Pearson and Smith (1985) suggest for the conducting of debriefings is similar to the reflection process of Boud, Keogh, and Walker (1985). They suggest a description phase in which the question "What happened?" should be answered (returning to experience). Afterwards, the feelings of each participant are focused on attending to feelings, following the question "What does it mean?" (re-evaluation); the situation is interpreted and appraised from a new perspective. In Pearson's and Smith's (1985) method, the integration, validation and appropriation of the new insights in addition to the focus on future actions are missing (Boud, Keogh, & Walker, 1985; Boud & Walker, 1993). A special form of debriefing is the "After Action Review" or "After Action Report" (AAR) (cf. Darling & Parry, 2001; Ron, Lipshitz, & Popper, 2006) and the "After-Event Review" (AER) (Ellis & Davidi, 2005), which are compulsory in high-performance teams (e.g. fire brigade, police). In AARs and AERs, there is interplay between analysis, reflection and reintegration in actions of the team (Geithner & Krüger, 2008).

In these teams, the focus is often placed on "critical incidents" (cf. critical incidents technique CFT, Flanagan, 1954).

Finally, effective debriefings depend in part on several aspects (Pearson & Smith, 1985). There should be a positive commitment in the company and amongst the team members. Deliberate planning is just as necessary as the establishment of clear intentions, objectives and purposes using the debriefings and the identification of ways of knowing and types of knowledge. The establishment of a debriefing environment has to be based "upon trust, acceptance, willingness to take risks and the mutual respect of individuals' feelings, perceptions and theories" (Pearson & Smith, 1985). Employees have to see that reflecting critically is rewarded and maintained in a "danger-free environment" which means no punishments for expressing personal perspectives (Brooks, 1999, 75). "Teams have a great number of ways to reflect" (Tjosvold, 1991, 194); they just have to use at least a few of them.

Prerequisites of a reflective practice are nevertheless the adequate reflective skills of each individual. Not all practitioners may reflect appropriately or understand the reflective process (Davies, 2012). As shown above, individual reflection processes cannot be distinguished from team reflection processes, whereby the improvement of individual reflection skills is indispensable. Neininger and Kauffeld (2009) showed workshops on reflection and transfer discussions to be an adequate instrument to enhance the reflection skills of individuals and teams. A reflective practice for the professional development of teams needs an initial focus on individual reflections.

7.3.3 Team Reflection and Organisational Learning

This section is closely linked to the previous section because within the organisational perspective, the focus is very much on implementation structures that support processes of reflection (Høyrup & Elkjaer, 2006). Central aspects are the structures of reflection and learning in teams with an emphasis on staff development, which is what Somerville and Keeling (2004) call reflective management, using methods like coaching, journal writing, feedback seeking, view experiences objectively, time for reflection-on-action, anecdotal notes and group discussions. Additionally, there is a knowledge management perspective where the central focus is on the formalisation and respective transformation of (new) insights into recommendations, guidelines and rules (company philosophy, organisational solution database).

The first aspect, the improvement of reflection skills, has been discussed in the previous sections; so now, the spotlight is on how the insights of individuals and teams lead to organisational learning. Organisational learning means the process of improving organisational actions through better knowledge and understanding (Edmondson, 2002), in order to provide a solid foundation for routinised and rule-based actions. To achieve this, "… an organization 'learns' through the actions and interactions that take place between people who are typically situated within smaller groups or teams" (Edmondson, 2002, 128) and the formalisation and respective

Table 7.3 Comparing the individual and team perspective with the organisational perspective of reflection (following Høyrup & Elkjaer, 2006, 41)

Dimension	Individual and team perspective	Organisational perspective
Purpose	Dealing with problems, ideational realisation of routines, learning for professional individual and team development (individual learning and learning in teams)	To make explicit and share organisational matters and workplace problems and plans in order to make common decisions and influence common actions and change of workplace structures and policy (organisational learning)
Language form	Tacit, implicit, intuitive or explicit verbal	At least explicit socially shared and accepted verbal language often formalised and determined in writing (e.g. rules, values, recommendations)
Degree of organisation	Spontaneous/informal to planned/formal	Formalised, planned activities, controlled by management. Implementation and institutionalised processes (e.g. AAR, meetings)
Content	Memory content of the log memory (behavioural record) and in the narrow sense experiences, perceptions, cognitive and social processes	A narrow focus on power structures, forms of democracy, political and cultural processes influencing organisational life
Access	Content may be private with access through introspection and reflection or public and shared. Disclosure may be a threat or uncomfortable	Content is common organisational matters and work-related items. Can be made transparent at planned meetings (etc.). Disclosure in relation to organisational values may operate here
Critical element	Analysing and trying to change individual, social or organisational values, assumptions and structures	Questioning assumptions, power structures and political and cultural processes within the organisation

transformation of these aspects within rules and guidelines. Hence, individual and team reflections and actions are a necessary but not sufficient condition for organisational learning. The challenge for organisations is to record the insights adequately and transform them into recommendations, guidelines and rules for future actions or to use them to change organisational structures. Therefore, the strategies for organisations to foster reflective practice have to be combined with possibilities of recording. That is because the dimensions of the individual and team perspectives are largely different, compared to the organisational perspective (see Table 7.3).

For an organisation, it is important to know where the possibilities and boundaries of structures and actions might be. An institution has to know when it is time for a change in working environments, working structures and corporate objectives (cf. structural reflection, Lash, 1996; see also exemplary for school development

Schley, 2013). So there has to be an infrastructure which enables people to write down central insights of team reflection processes, for instances, via an intranet, to deduce the rules that lead to future actions. An instrument that makes this possible is, for example, a collaborative learning environment within an e-portfolio or wiki. There, the employees can individually reflect on their experiences recorded when in writing together with teams who can record central aspects of their team reflections.

7.3.4 Challenges and Boundaries of Learning Through Reflections in Teams

After discussing reflection on the respective levels of the individual, the team setting and the organisation, we would like to focus on the challenges and boundaries of learning through reflections in the following chapters. As is often the case, there is also a range of benefits and limitations to reflective practice from which we would like to highlight a few central criteria (e.g. Boud & Walker, 1993; Davies, 2012).

As mentioned in the introduction, reflection has been proven to be crucial for learning from experience, especially when it comes to deep learning. With reflection, it is possible to become aware of one's own knowledge, skills, strengths and weaknesses, and in this way, it is then possible to identify educational needs (Davies, 2012). Beside the possibility of breaking up routines, it is feasible as a means of gaining a further understanding of one's own beliefs, attitudes and values and encouraging self-motivation and self-directed learning. Reflection can also act as a source of feedback (ibid.). Reflection is an important aspect for developing a team and for gaining information about organisational improvements. Indeed, limitations already appear through the individual problems of employees not having the skills to reflect adequately or not feeling comfortable when challenging and evaluating their own practice (see above, Davies, 2012). Furthermore, to aid reflection, employees need a break from action, whilst reflection is also time-consuming (ibid., Boud & Walker, 1993; Raelin, 2002). "To choose to reflect can seem self-indulgent or an excessive formalization of what is perceived to be an essential act. Excuses need to be made for it and opportunities taken as part of other everyday activities—the drive home, over tea or coffee. It works as part of something else, not as an activity in its own right" (Boud, 2006, 165). Boud and Walker (1993, 79) brainstormed a whole list of barriers to reflection (partly restated, rearranged and modified here):

- Presupposition about what is and what is not possible for us to do (experience of competency)
- Past (negative) experiences
- (Anticipated) expectations of others
- Hostile or impoverished environments
- Lack of
  - Self-awareness, confidence, self-esteem and suchlike
  - Skills

  - Opportunities to step aside from tasks (time and space)
  - Support from others
- External pressure and demands
- Established patterns of thought and behaviour

Again, this list reveals that reflection cannot be distinguished from motivational and emotional aspects in addition to individual skills and environmental aspects. Discussion of reflection processes on the individual, social and organisational levels is a complex task to fulfil because of the integrated nature of all the levels.

Aggravating this situation is the fact that people usually do not like to contemplate, especially when facing barriers. It is easier not to take responsibility for one's own actions. It is much easier to act in a routinised and rule-based manner or dive back into the comfort of a group than thinking on one's own. So conflicts can be avoided, for instance, through the refusal to perform an active assimilation of information (Dörner, 1994; Reither, 1985). This behaviour is common in stressful and critical situations. Against this background, we may ask the question whether teams are actually more productive than individuals. Although it is possible to see it this way because a group of people may have different knowledge and skills, it depends on various influences on team performance, for example, permissions, members, promotion, biases, information and task characteristics. In addition, ritualisation and dogmatisation are common group phenomenons because the group gives feedback on the adequacy of a behaviour, which the real world with its "death times" cannot offer (Dörner, 1994, 216). This is also one reason why people within groups might act in a different way than they would if they were on their own. "Groupthink" provides support to individuals and which is why teams show a greater willingness to take risks (ibid.).

Also it is important to remember that reflection itself does not cause changes (Edmondson, 2002; Schippers et al., 2007). Action and adaption as "goal-directed behaviors [are] relevant to achieving the desired changes in team objectives, strategies, processes, organisations or environments identified by the team during the stage of reflection" (West, 2000, 6). Reflection gives the "opportunity for anecdotal offloading" (Tarrant, 2013, 27). Venting experiences and feelings is time-consuming, partly incriminating and will also not lead to changes alone. As already mentioned, a healthy balance of reflection and action adjusted to the respective context is essential to prevent incapacity and individual burden. There has to be prevention of "paralysis through analysis" (Busch, 2010, 297) or in other words rumination and brooding (e.g. Trapnell & Campbell, 1999).

Additionally, organisations have to be cautious in implementing structures and forcing methods for reflection because "[t]here is a risk in formalizing the informal … [as] both formality and informality are needed for reflection" (Boud, 2006, 165). Every formal activity has informal elements that may support or undermine it (ibid., see also Introduction). "Perceiving oneself as 'off-the-job' can be important for reflection" (ibid.)—sometimes explicit reflection does not lead to better results (Van Woerkom & Tjepkema, 2013). Moreover, an exaggerated reflective practice can evoke defensive responses from individuals and members of a team if

it turns out to be a burden and means a lot more work with no appreciable outcome (Busch, 2010; Tarrant, 2013). But there are also key barriers to informal critical reflection (Brooks, 1999). Internal competition and the employees' tendency to protect their turf, conflict avoidance ("sitting" on information that might be crucial to others; dancing around issues, somebody else will find it) and the tendency to act without adequate considerations of the benefits and consequences (cf. side- and follow-up-effects, Sembill, 1992; e.g. Dörner, 1994) are widespread in practice. Brooks (1999, 77) states that a loss of learning is possible in several places:

- Team members do not contribute to their own information or ideas.
- Information and ideas brought to the table are not allowed to recombine in new and unexpected ways.
- Team leaders fail to recognise that he or she is alienating other team members.
- Participants miss the opportunity to better understand how groups can work together.
- Participants leave the room frustrated and hostile and will never work in this team again.

Leaders in organisations should not be afraid of employees who, metaphorically speaking, "can see the emperor is wearing no clothes" or of those who typically are called "troublemakers" (Brooks, 1999, 68). It is important from the perspective of organisations to foster a culture of reflection, beginning with individual reflection to team reflection and finally the implementation of matching structures and methods with challenges and boundaries of reflection borne in mind.

7.4 Implications and Conclusions

It is not an easy task to suggest implications and conclusions out of the content of this paper because only a small proportion of it is underpinned by empirical studies. However, "[t]eam reflexivity is seen as a key factor in team effectiveness and enhancing reflexivity is therefore important to organizations" (Schippers et al., 2008, 1608). Thereby, it seems constructive to include the individual, the social and the organisational perspectives of reflection into one's deliberations "to conceptualize the complex processes of learning at work. When it comes to learning at work it seems evident that reflection is incomplete if conceived of as a private individual activity" (Høyrup & Elkjaer, 2006, 40), and likewise it is only partial when discussing team reflection processes without focusing on individual reflection and organisational structures. Team reflection benefits from the individual reflection skills of each participant as well as from supportive organisational structures that offer the employees the time and space for reflection and do not blame those who make grievances visible. "What is needed is the taking up of reflection as a part of workplace discourse to legitimize it and to enable work to be organized to permit it to flourish" (Boud, 2006, 168). Structural implementations for supporting reflections are needed, whilst taking

account of the challenges and boundaries. Provoking defensive reactions would be counterproductive (cf. Busch, 2010).

To sum up, "[f]eeling directed, unified, empowered, and able to explore issues helps teams reflect openly and productively. Then team members understand that reflection will be used to keep them on course, promote mutual benefit, strengthen their abilities, and use problem solving to examine their teamwork. Teams also need norms, procedures, and skills to identify and overcome interpersonal conflicts, deal with failures, and celebrate success as they work together" (Tjosvold, 1991, 194). Most of the statements and theoretical recommendations for actions in this chapter and the cited literature are predominantly normative and therefore convenient for producing theories. These theories then have to be tested within empirical studies because theoretical approaches are not always accurate when proclaiming the need for improvements through reflection for everybody. A few empirical studies show that only specific groups of employees (partly) benefit from implementations (e.g. Boud, 2006; Buljac-Samardžić & Van Woerkom, in press). But there is a lot of empirical research to conduct in this complex field to bridge the gaps that are still apparent.

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Part II
Analytic Perspective 2 – Work as Learning Environment

Chapter 8
Apprenticeship and Vocational Education: An Institutional Analysis of Workplace Learning in the German Vocational System

Karl-Heinz Gerholz and Taiga Brahm

Abstract Apprenticeship in the German vocational system is organised as a dual system with both workplace and school-based trainings. This dual system has a long successful history in Germany, which is visible, for instance, in a stable transition from the dual system to employment and a low youth unemployment rate. A main factor for this success is the regulative structure of the German dual system in the society. Accordingly, this chapter analyses this structure from an institutional point of view. The relevant institutions regulate the actions of people in the dual system. These institutions act on different levels, enabling workplace learning in the dual system. Examples for the institutions are the concepts of vocations and occupational competence, the principles of consensus and corporatism as well as action orientation. The institutions have different roles to play, and not all institutions have the same power. Nevertheless, as one result can be mentioned, the quality of workplace learning is assured since people involved appreciate apprenticeship as an institution.

8.1 Workplace Learning in Vocational Education as an Institutional Challenge

In recent years, the discourse on workplace learning has intensified (Malloch, Cairns, Evans, & O'Connor, 2011). In this context, various different developments can be observed, for instance, an intense discussion about the importance

K.-H. Gerholz (✉)
Higher and Vocational Education, University of Paderborn, Paderborn, Germany
e-mail: gerholz@wiwi.upb.de

T. Brahm
Educational Development, University of St. Gallen, St. Gallen, Switzerland
e-mail: taiga.brahm@unisg.ch

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of 'lifelong learning' in a knowledge-based economy (Billet, 2008; Nijhof, 2005; Stuart, 2007). This is in line with the call for highly skilled workers (Ananiadou, Jenkins, & Wolf, 2004; Ashton & Sung, 2002). There is convincing evidence that workplaces are settings for acquiring the necessary vocational competencies for the knowledge economy (Billet, 2001, 19; Nijhof & Nieuwenhuis, 2008, 5). At the same time, the workplace is, above all, a place to work and to follow economic goals such as achieving profit and sales. In contrast, learning refers to the development of an individual's personal competences. To deploy the learning potential of the workplace, an appropriate educational design that supports and stimulates learning is required (Billet, 2001; Kell, 2006). Learners have to reflect on their experience in the working situation in order to foster vocational competencies (Bailey, Hughes, & Thornton, 2004, 216). For this reflection of the learners' work experiences, the working situation needs to be designed in such a way that the advantages of experience-based learning can be achieved. In fact, the mix of workplace and school learning proved to be an appropriate educational design for vocational education and training (Nijhof & Nieuwenhuis, 2008). Both the workplace and the school contribute substantially to the skill development of the individual. This design is successfully achieved in the example of the 'dual system', which is implemented, for example, in Germany, Austria and Switzerland (Nijhof & Nieuwenhuis, 2008, 5).

The dual system has a long history in these countries. The main reasons for this are: the high participation rates of young people, the stable transition from the dual system to continuous employment and the comparatively low unemployment rate of adolescents (Ertl & Sloane, 2004). The dual system prepares learners for various vocations with high-level skills of practical relevance. A recent OECD study, 'Skills beyond School', confirmed that over 90 % of the 15–24-year-olds in Germany either found employment after compulsory schooling or were able to find another form of education. Compared with other European countries, Germany has the lowest youth unemployment rate, at 8.0 %. In 2012, about 550,000 new apprenticeships were started (Federal Ministry of Education and Research, 2013), with a total of about 1.4 million apprentices in the dual system. The participants in the dual system are also highly competitive on the labour market (Fazekas & Field, 2013).

Thus, the purpose of this chapter is to analyse the elements of the dual system of vocational education and training (VET) in Germany with a particular focus on workplace learning. This analysis draws upon the institutional perspective. Following North, institutions are the rules of the game in a society (North, 1990, 5). Institutions represent the regulative structure and help to organise a social phenomenon such as the dual system. The interdependencies between organisations and their respective environments, as well as the question of legitimacy of organisational behaviour, are the foci of the analysis (DiMaggio & Powell, 1994). The institutions have an influence on the behaviour patterns of the people in the dual system. From this perspective, institution is understood in the sense of rules such as laws, corporative bodies, or cultural conditions (Picot, Dietl, &

Franck, 2005). The aim of this chapter is to describe the institutions enabling workplace learning in the dual system. Our assumption is that one of the major success factors, but also one of the major challenges of workplace learning in the dual system, is the presence of specific regulative structures and institutions, respectively. In the following, we will outline the main structure of the dual system of vocational and education training in Germany (Sect. 8.2). Following this, we examine the institutions from different organisational levels: educational policy (Sect. 8.3.1), the administrative level (Sect. 8.3.2) and the instructional level at the workplace (Sect. 8.3.3). Our goal is to illustrate the effects of the institutions on the several levels regarding the design of workplace learning in the dual system (Sect. 8.4).

8.2 The Structure of the German VET System

The main principle of the dual system is that vocational education and training are organised at companies and vocational schools (*Berufsschulen*) at the same time. The trainees spend 3–4 days a week at the company where they focus on the practical elements and on learning about the requirements of the world of work. They have the opportunity to experience the workplace, on the one hand. The training in the vocational schools, on the other hand, takes place 1–2 days a week and provides general and vocational education. In the vocational schools, classes complement and reflect the trainees' workplace learning experience (Aff, Klusmeyer, & Wittwer, 2010). The duration of an apprenticeship in the dual system varies between 2 and 3 years.

The duality principle is not limited to the learning environments in companies and vocational schools. In addition, there are significant structural elements of the dual system, such as questions of the political regulation of the system (Greinert, 1995). In fact, the duality represents an overriding principle in the German vocational education system. When comparing the dual system to pure market systems of vocational education (e.g. Japan, England) and pure state systems of vocational education (e.g. France) (Deissinger, 1998), the German vocational education system reflects both market system and state system elements. These elements structure the different levels of regulation in the dual system (Kell, 2006; Kutscha, 2010). Greinert therefore describes the dual system as a state-steering market model, which the state forms using specific regulations (Greinert, 1988, 1995).

Three different levels of regulations and institutions can be differentiated for the dual system of VET:

At the macro-level – the policy and society view – two legislative structures regulate the vocational training process. The legal standardisation of the training in the companies is regulated according to federal law. The main law is the Vocational Training Act (*Berufsbildungsgesetz, BBiG*) which regulates apprenticeship in the

dual system. The training in vocational schools is governed by the legislation of the federal states in Germany in the form of school laws. In school law, there is a federalist structure of the 16 federal states in Germany.

At the meso-level – the administrative and organisational view – decrees for the regulation of the learning processes in the companies and vocational schools are in place. For the vocational training part in the companies, there are standardised apprenticeship decrees (*Ausbildungsordnungen*) that regulate the content to be covered and the skills to be developed during the apprenticeship in the company. They are obligatory for all companies in the dual system. For vocational schools, there are so-called framework curricula (*Rahmenlehrpläne*). These are recommendations and must be further defined for the vocational schools in the different federal states. The training process in the companies is monitored by 'competent authorities' (*zuständige Stellen*), such as the chambers (*Kammern*). The state delegates the regulatory mandate concerning vocational education to these 'competent authorities'. Thus, they are an influential element for the organisation, administration and monitoring of the vocational education process in the companies. The counterparts for the training processes in the vocational schools are the school supervisory boards (*Schulaufsicht*) in the federal states.

At the micro-level – the instruction of the trainees – it is important to differentiate between the trainers at the companies and the teachers at the vocational schools. They guide the learners' vocational development process. The basis for the guidance in the company part is the so-called training plan (*Ausbildungsplan*). The training plan specifies which competencies are to be fostered and which content needs to be covered during the apprenticeship in the company. The basis for the training plan is the standardised apprenticeship decree (see above). The equivalent for the vocational schools is the curriculum (*Lehrplan*), which is derived from the frame curricula (see above). To accomplish its transformation into a training plan, the trainer needs pedagogical and instructional competences. There is a certification of such competences which is regulated by a federal decree, the so-called ordinance of trainer aptitude (*Ausbildereignungsverordnung, AEVO*). The equivalent for the vocational school is the qualification process of the teacher, which consists of academic study and a 2-year traineeship in a vocational school (*Referendariat*). In this context, it is important to clarify that the 'ordinance of trainer aptitude' requires more rudimentary qualification process with a duration of 1–2 months – in contrast with the longer duration of the qualification of teachers in vocational schools. In consequence, the qualification processes of trainers and teachers are only partially comparable.

In Fig. 8.1, the main elements of the duality principle in the dual system in Germany are presented, showing the institutions from a legal perspective. In the following section, the institutions in the workplace training part are analysed in greater depth. The analysis is conducted from a legal perspective but also from the perspective of the underlying standards, the day-to-day practices of the actors, and norms in the dual system.

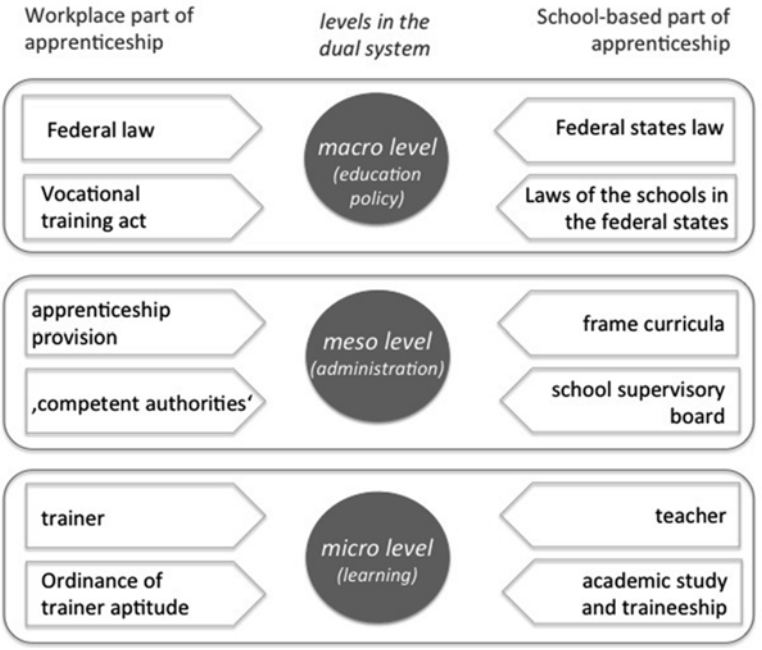

Fig. 8.1 The duality principle at the different levels of the dual system

8.3 Analysis of the Regulation Levels in the Dual System

8.3.1 Macro-level: The 'Concept of Vocations' and 'Occupational Competence'

The vocational training act regulates apprenticeship in Germany. The apprenticeship is agreed through a training contract between the trainee and the company or the employee and the employer as the training contract also represents an employment contract. Therefore, the legal basis is a market-oriented principle, which is based on the freedom to choose an occupation (Kell, 2006). In the training contract, the aim, duration, content and temporal structure of the apprenticeship must be regulated, alongside other aspects. In addition, it indicates the vocational profile in which the trainee is undertaking the apprenticeship.

This 'concept of vocation' (*Berufskonzept*) is a central element in the dual system. It encompasses a bundle of skills or competencies which is applicable in certain functional areas across the boundaries of the several companies. These skills and competencies are fostered during the apprenticeship. The 'concept of vocation' has two main meanings in the dual system. It can be viewed from two perspectives: (1) from the point of view of the labour market system (allocation function) and (2) from the point of view of personality development (socialisation function).

8.3.1.1 Point of View of the Labour Market: Allocation Function

Concerning the labour market system, an interconnection between apprenticeship, vocation profile and working life can be identified (Daheim, 2001). The vocational education system and working life are structured across vocations. For an individual who acquires a certain vocational profile in the apprenticeship, the concept of vocation has the advantage that it is accepted in society, useful on the labour market and applicable in the companies (Kutscha, 2010). This enables the transition from the apprenticeship into employment in the labour market. The 'concept of vocation' reflects the intention of the dual system that the individual not only develop skills for company-specific requirements, or a small number of specific tasks in a functional area, but rather competences for requirements in an occupational field (Billet, 2008, 2). With the 'concept of vocation', the dual system of vocational education applies an allocation function as a bundle of skills that aligns with the specific requirements in the workplace. In addition, a selection function is included, as the vocational profile leads to a selection of specific occupational fields.

8.3.1.2 Point of View of the Personality Development: Socialisation Function

Concerning personality development, the 'concept of vocation' is also very important for the individual's development process. The overarching aim of vocational education and training is to develop the trainees so that they are able to work and act competently in a given vocational environment (Ertl & Sloane, 2004). For example, in paragraph 1 (3) of the Vocational Training Act, vocational educational is defined as preparing the individuals for a vocational profile in a permanently changing world of work by fostering the necessary skills and knowledge and providing sufficient vocational experience. Vocational occupational competence (*berufliche Handlungskompetenz*) points to professional and interpersonal skills, as well as methodical and personal skills (KMK, 2000). This occupational competence is also reflected in the legal foundations such as the 'framework curricula' (for vocational schooling) and the vocational training act for workplace learning. Occupational competence enables an individual to act according to the performance requirements in a given working situation (Reetz, 1999). Above all, the purpose of vocational education is not to reduce the individual development to a specific functional field. Competence development in the concept of the vocation should always contribute to the development of a trainee's identity and personality. At the end of the apprenticeship, the individual should be able to act upon his or her own initiative in a given vocational context. From this perspective, the 'concept of the vocation' in the dual system also fulfils a socialisation function. The vocation of a person represents skills concerning a vocational field as well as the personality of the individual.

The 'concept of vocation' can be described as a stable institutional pattern in the dual system. It is an 'organising principle' in the vocational education system and

the working world (Deissinger, 1998). Currently, there are about 340 vocational profiles in Germany.[1]

The strong institution of the vocations implies that vocational education is institutionalised beyond the legislative foundations (see 8.2 and 8.3.2). The 'concept of vocation' enables the dual system's stability but also its rigidity. In a changing working world, the requirements of working situations are constantly shifting. This leads to a discussion in the German vocational education system regarding whether the traditional vocational profiles are appropriate. It can be observed that the vocational profiles are adapted to the requirements of the working world. Most importantly, however, the vocational profiles are the result of a negotiation process between different parties. Vocational profiles are social constructs, and parties such as employers, employees or state partners have an influence on the vocational profiles (Büchter & Meyer, 2010; see Part 8.3.2).

The 'concept of vocation' not only has a long historical tradition in the German dual system but can also be identified as a strong institution in the vocational education system. Workplace learning in the dual system encompasses a learner's development towards a certain vocational profile. In addition to the training of skills required for occupational fields, it also involves the development of the personality and preparation for participation in society. Thus, the institutional pattern of the 'concept of vocation' goes beyond the vocational education system.

8.3.2 Meso-level: Co-operation Between Companies and Vocational Schools

The meso-level focuses on the institutional regulation of the learning environments in companies and vocational schools. For the organisation of workplace learning in the companies, there is apprenticeship provision for every vocational profile. This is a nationwide provision and provides the basis for a standardised vocational training process in the companies. The apprenticeship provision defines the aim of the apprenticeship, the contents in the apprenticeship, the fostering of vocational skills and the examination requirements. The requirements in the apprenticeship provision are the minimum standards for the vocational training in the companies (see § 5 BBiG).

While the federal minister in office decrees apprenticeship provision, the relevant societal groups of the vocational education system co-operate in order to develop the apprenticeship provision. This represents the so-called consensus principle which ensures the participation of all relevant societal groups in vocational training. The societal groups include the agents of the employers (employer associations) and employees (trade unions) as well the federal ministries and the federal states. In

[1] For instance, in the commercial field 'industrial clerk' and 'bank clerk' or in the technical area 'electrical fitter' or 'recycling and waste management technician'. An overview can be founded at: http://www2.bibb.de/tools/aab/aabberufeuebersetzungen.php?bt=1

order to develop apprenticeship provision, an agreement between these societal groups is needed. This complex process, comprising several stages of decision-making, is moderated by the Federal Institute for Vocational Education and Training (*Bundesinstitut für berufliche Bildung, BIBB*). The development of the framework curricula for the vocational schools is embedded in this moderation process (see Sect. 8.2). This ensures that the apprenticeship provision for the workplace training and the framework curricula for the vocational school are consistent. In sum, the 'principle of consensus' can be described as a specific form of negotiation of educational policy decisions (Kutscha, 2010). From the point of view of an employer, the companies have an influence on the design of the apprenticeship, but there also needs to be consensus with the other societal groups. A benefit of this 'consensus principle' is that the constitution of the training process is commonly accepted. Through this process, the risks of market as well as government failures are limited, and barriers to implementing decisions in vocational training laws can be overcome (Kutscha, 2002). Despite all these advantages, the need for consensus often leads to time lags and halts during the redevelopment of apprenticeships. Sometimes it seems that it is easier to continue with an existing consensus than to negotiate a new one (Ertl & Sloane, 2004). In the light of fast-changing working environments and the corresponding new competence requirements, the principle of consensus can be described as inflexible. In particular, the employers see the danger that a modernisation of vocational training would take a great deal of time. Nevertheless, the 'principle of consensus' ensures the participation of the relevant stakeholders and establishes the broad social acceptance of vocational training.

While the 'principle of consensus' is an influential social rule in the (further) development of vocational training, the 'principle of corporatism' can be outlined as the social rule for the administration and monitoring of the apprenticeship. As mentioned at the beginning of this chapter, the dual system is a state-steering market model, in which the state applies corporatist institutions to regulate the vocational training process. The institutions are bodies of self-government, such as the chambers (e.g. the Chambers of Industry and Commerce and the Craft Chambers). The legal function of these institutions is the 'competent authority' (*zuständige Stelle*) which means that they are responsible for the realisation of the vocational training and the practical implementation of the legal vocational norms and regulations (Ertl & Sloane, 2004; Kutscha, 2010). It includes the administration and the organisation of vocational training. Furthermore, the chambers supervise the organisation of the examinations and act as awarding authorities for vocational qualifications. Thus, the chambers and 'competent authorities', respectively, can be described as intermediate organisations between the state and the companies (Ertl & Sloane, 2004). While the 'principle of consensus' is the basis for the collaboration between the societal groups in the vocational training system, the 'principle of corporatism' ensures the implementation and monitoring of the negotiated rules between the social groups.

The 'principle of consensus' and the 'principle of corporatism' are regulative institutions for the administration of the workplace learning in the dual system. In order to match the learning process in the companies and in the vocational schools, the 'principle of co-operation between the learning venues' (*Lernortkooperation*)

has evolved since the 1960s. This principle of co-operation does not only include the companies and the schools, but it also includes the competent authorities and other learning venues (for instance, those organised by industrial enterprises and banks) (Schmidt, 2004, 41).

This co-operation can have different objectives and content and, as a consequence, can be characterised by different levels of intensity (Euler, 2004, 14). Buschfeld and Euler (1994) distinguish between three levels of co-operation:

(a) At the level of information, the teachers (schools) and the trainers (companies) exchange information and communicate about the expectations, experiences and challenges of apprenticeships. This is conducted via letters from both partners.
(b) At the level of co-ordination, teachers and trainers agree (and develop) different measures which will then be implemented based on division of labour and respecting the conditions of schools and companies.
(c) Finally, the level of co-operation includes direct teamwork between teachers and trainers. Their actions are targeted at supporting the learning process of the apprentices, for instance, by preparing content collaboratively and working on it in the companies and/or in the schools at the same time (Euler, 2004, 15).

At the meso-level, the dual system of vocational training can be described as a mix of state, corporate and market regulation. The process of negotiation of the rules between the social groups is meaningful and essential in order to maintain the balance between these regulations and the partners involved (Kutscha, 2002). The employers aim to ensure their influence on the vocational training process; in consensus with the other social groups, they try to achieve their aims. In summary, through these principles, the corresponding parties accept the negotiating rules. This allows workplace learning to match the objectives of the requirements of the companies but also serves the overall goal of apprenticeship of educating the apprentices.

8.3.3 Micro-level: 'Action Orientation' as an Institutional Principle in the Instructional Process

The micro-level deals with the realisation of the actual vocational training. Workplace learning is anchored here. As mentioned above, operations in companies generally follow economic aims and criteria. Thus, educational aims need to be designed in connection with these economic functions (Kell, 2006). At the same time, workplace learning enables a learning process in an authentic environment, gradually leading the trainee to more ambitious workplace requirements. Therefore, the learning venue of the 'workplace' offers the conditions to foster occupational competence, including both the skills required for different occupational fields and the development of the personality (see Sect. 8.3.1). To achieve these twofold goals, workplace training needs a corresponding instructional design.

One institutional instructional principle for the vocational training process can be described as 'action orientation'. A translation of the German discourse concerning this topic is not easily achieved. The main idea of 'action orientation' is that instructional methods should be informed by the vocational action process. The learning environment should allow the trainee to try out different vocational actions. Thus, a second instructional principle is 'learner centeredness' (Bransford, Brown, & Cocking, 2000): The individual's or the trainee's actions should always be the starting point of the learning process. In summary, the apprenticeship provision recommends an instructional design in which the trainee autonomously and self-dependently plans, carries out and evaluates his or her work tasks. This capability is also a component of the examinations of the apprenticeship.[2] This conception of 'action orientation' is an influential institutional pattern in the German vocational education system. The model includes that learning and acting have a structural identity. During the acting process, the individual is exploring a learning object (e.g. a specific working process), and during this process, there is a change in the individual's cognitive and occupational competence (Dilger & Sloane, 2007; Sloane, 1999). Thus, it is a dual process including an execution of the working process and an acquirement of skills (Czycholl, 1996). 'Action orientation' is not limited to the preparation to act in the working practice. Furthermore, there is also a traditional dimension in the vocational education system to prepare the trainees for autonomous and responsible action in future social situations (Kutscha, 1995). The concept of 'action orientation' is also reflected in the discourse of workplace learning. Accordingly, Billet states that learning and working are interdependent. People learn through acting in conscious goal-directed activities (Billet, 2001). Goal orientation and awareness are also key characteristics of action processes (Gerholz, 2010).

The design of such 'action-oriented' learning environments is one of the challenges faced by the trainers in the companies. Based on the vocational training act (*BBiG*), only those who are qualified personally and professionally can take on the role of the trainer. Professional ability refers to vocational skills and knowledge. Beyond that, it also includes educational and pedagogical skills (§ 28, 30 BBiG). As described above, the confirmation of these skills is regulated in a federal decree, the 'ordinance of trainer aptitude' (*Ausbildereignungsverordnung, AEVO*). The examination of the 'ordinance of trainer aptitude' is organised by the chambers as 'competent authorities' (see above, Sect. 8.3.2). The requirements for the trainer include the planning, implementing and controlling of the trainees' apprenticeship. Thus, the trainer has to be able to create a training plan for the apprenticeship, and this plan needs to be derived from the apprenticeship provision (see Sect. 8.3.2). The training plan specifies which competencies are to be fostered and which content needs to be covered during the apprenticeship in the company. The training plan should consider the process orientation in the world of work, i.e. the learning environments should be developed with the working and business processes in mind. This again leads to 'action orientation'. Furthermore, the trainer has to be able to counsel the trainees concerning their individual conditions and learning needs. This

[2] As an example, please see the apprenticeship decree for an industrial clerk (Sects. 8.2 and 8.3).

refers to 'learner centeredness' and includes the necessary role change from instructor to learning counsellor.

The legal regulation of the 'ordinance of trainer aptitude' ensures that the workplace training aspects of apprenticeship are organised by well-suited und educationally qualified people. The ordinance is supposed to ensure quality assurance for the instruction in the workplace. However, in the training practice at the companies, the situation is different. The qualified trainers are indeed responsible for apprenticeship in the company, but often these trainers assign the actual training tasks to employees in the working process. Thus, in most companies, the instruction of the trainees is carried out by other employees who are not qualified with the 'ordinance of trainer aptitude'. In consequence, the trainers who are qualified are often not involved in the apprentices' competence development since they are responsible for the organisation of the apprenticeship (Seifried & Baumgartner, 2009). In summary, the purpose of the 'ordinance of trainer aptitude' and the training practice in the companies are not in alignment. A gap in the effectiveness of the ordinance can be identified.

At the same time, there has been critical discussion regarding whether the 'ordinance of trainer aptitude' is sufficient for the requirements of a modern vocational education process (Buschfeld, 2010; Gössling & Sloane, 2013; Pätzold, 2008). The changes in the world of work from an industrial society to a knowledge society require that trainees learn to act within holistic connections and orient themselves towards the processes in the working life. Therefore, the trainer in the apprenticeship requires specific pedagogical skills. The 'principle of action orientation' has to be reconstructed within these modern requirements of apprenticeship. In this context, there are several different trainer profiles. At the instructional level, trainers are required who can prepare the trainees for standardised provisions of service and working tasks and also trainers who focus on the preparation for working fields that feature intense use of knowledge and skills. At the curricular level, trainers are required who are able to reflect on the conditions of the learning environments in the workplace, and based on that, they are able to develop curricular solutions for a modern apprenticeship (Gössling & Sloane, 2013; Pätzold, 2008). The current 'ordinance of trainer aptitude' fulfils these requirements only partially. The idea of a rather generalist qualification for the trainer is widespread. Therefore, 'action orientation' has to be reconstructed relative to the modern requirements of the companies, including the design of 'learner-centred' environments.

8.4 Regulating Institutions of Workplace Learning Within the Dual System

The structure of the dual system in the German vocational education system reflects the historical development (Kell, 2006; Kutscha, 2010). The different levels of the vocational system were described earlier in this chapter (see Sects. 8.3.1, 8.3.2, and 8.3.3). In the following figure, these levels and their interconnections are presented.

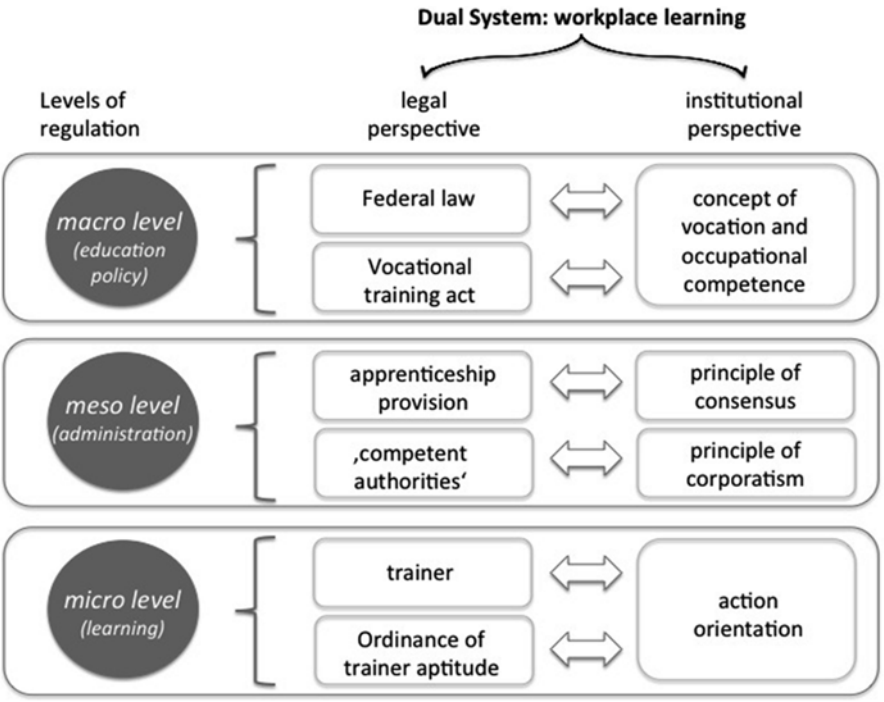

Fig. 8.2 Regulations of workplace learning in the German dual system

This represents the regulation of vocational education and training in the workplace. The regulation instances can be described from a legal perspective (the legal conditions) and from an institutional perspective (the rules of the vocational education system) (Fig. 8.2).

The institutions regulate the actions of the people in the vocational education system and especially with regard to workplace learning. In this context, the question of the extent to which these rules are highly institutionalised is often posed. According to Zucker, it can be assumed that highly institutionalised settings have a strong influence on the thinking and acting of the people, mostly leading a resistance to change (cultural persistence) (Zucker, 1994).

With regard to the macro-level, the ‘concept of vocation’ provides a highly stable structure in the vocational education system. In the last two decades, different reform discussions have been led with regard to the dual system (e.g. Euler & Severing, 2006; Kutscha, 2002). Nevertheless, the ‘concept of vocation’ was never fundamentally put into question. In addition to the fostering of skills required in occupational fields, workplace learning also implies the development of the trainees’ personality. However, differences in the foci of the people involved in the dual system can be identified. Empirical analysis has shown that the trainer in the companies and the employer association focus on the training of the skills for the

specific working fields, while for the trade unions, personality development and participation in the employment system are key aspects of apprenticeship (Ebbinghaus, 2009).

At the meso-level, the 'principle of consensus' and the 'principle of corporatism' represent influential patterns for those involved in the vocational education system. It ensures participation in the design and decision-making processes of the stakeholders. How these principles influence development processes can be demonstrated, for instance, by the development of the National Qualification Framework (NQF), which originates from European educational policy. The NQF and the German education system were supposed to be joined in a common framework. Since the NQF is geared towards outcome orientation, visible in learning outcomes defined for each qualification, a new governance tool was introduced into the German education system. During the implementation process in Germany, the principles of corporatism and consensus were present. It becomes apparent that the social groups do not place the key aim, that is to say the learning outcomes, in the foreground. Instead, the social acceptance of the framework by the stakeholders, i.e. the idea of a consensus, is more important (Sloane & Gössling, 2012). In consequence, outcome orientation is not implemented consistently. In fact, it can be described as a combination of input and outcome elements.

'Action orientation' can be described as a less institutional pattern at the micro-level. From a legal perspective, the 'ordinance of trainer aptitude' provides a qualification requirement for the trainers. From an institutional perspective, the institutions at the micro-level could be interpreted as a formal structure in the sense of legitimation. For instance, the trainer's certificate shows that the company can offer the instructional skills for workplace learning. Thus, as Meyer and Rowan (1994) have conceptualised, the organisation develops its formal structures in order to meet the legitimacy standards of society, but it could be that the real activities of an organisation – the activity structures – do not fit the formal structure (Meyer & Rowan, 1994). As discussed in Sect. 8.3.3, the current qualification process of the trainers is not adequate to be consistent with the modern requirements of apprenticeship in the activity structure. Further developments of the trainer's qualification are required, in alignment with the requirements of the world of work. Through such advancements, the intention of 'action orientation' could indeed have an effect on workplace training in apprenticeships. Additionally, it has been shown that in training practice, that is to say, in the activity structure, the instruction of the trainees is de facto carried out by other employees rather than by the qualified trainers. However, formally at least, only the qualified trainers are responsible for the training process. In the future, it is essential to close the gap between the formal requirements and the activity structure to assure the quality of the apprenticeship.

However, the different principles result in a high level of acceptance of apprenticeship and especially of workplace learning in companies. As a consequence, the quality of workplace learning is assured since the people involved appreciate apprenticeship as an institution.

The institutions have different roles to play, and not all institutions have the same power in the system of workplace learning. As already mentioned, there is a great deal of potential for further development. The system's weaknesses are indeed being discussed in Germany, and they are often ascribed to the structure of the system. However, from the outside, the dual system is seen as 'good practice' because of its structural embeddedness at the different levels. On a final note, it can be stated that the structural elements have grown historically. There is a threat that the system is more resistant to change, but there is also the potential of a wide range experience to exploit in the future and in other countries.

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Chapter 9
Learning in Response to Workplace Change

Mark A. Tyler, Sarojni Choy, Raymond Smith, and Darryl Dymock

Abstract Across the world, and particularly in developed countries, workplaces are changing, arguably more rapidly than ever before in response to external and internal forces. Altering the ways workplaces operate inevitably requires changes in the knowledge and skills workers need. This relationship is evident in the conclusion by the Australian Workforce and Productivity Agency (Future focus: 2013 National workforce development strategy, AWPA, Canberra, 2013) that the major influences on the nation's skills and workforce development needs are driven by globalisation, technological change, the changing nature of work, the need to respond to climate change impacts and issues of sustainability. These are very broad influences that raise questions about the extent to which they impact workers, as distinct from affecting industries and enterprises. In order to examine how employees perceive the impact of change, 86 workers in various occupations in four different Australian industries were asked about current and anticipated changes in their jobs. Analysis of the semi-structured interview transcripts revealed that workers tend to perceive workplace changes in terms of their immediate work tasks rather than with, say, an organisation's strategic directions or industry workforce development perspective. That is, their need to learn as a result of workplace change is essentially based on maintaining their individual competence and hence their employability. This focus on their own workplace practice suggests that the most appropriate setting for individual learning in response to change appears to be the workplace itself, which in turn has implications for the way such learning is organised.

M.A. Tyler (✉) • S. Choy • R. Smith • D. Dymock
School of Education and Professional Studies, Mt Gravatt Campus, Griffith University, 176 Messines Ridge Rd, Mt Gravatt, QLD, Australia
e-mail: m.tyler@griffith.edu.au; s.choy@griffith.edu.au; raymond.smith@griffith.edu.au; d.dymock@griffith.edu.au

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9.1 Introduction

If contemporary organisations are to stay relevant, and enterprises to remain productive, they need to be able to respond to the numerous social, economic and political developments and changes that influence how they operate. Major influences on Australian workplaces have been identified as globalisation, technological change, the changing nature of work, the need to respond to climate change impacts and issues of sustainability (Australian Workforce and Productivity Agency, 2013). Responding to such influences has implications for the nation's skills and workforce development needs.

The impact of those changes on workplaces is noted at two levels. At the enterprise level, managers interpret the significance of such broader influences for the organisation's operations and productivity. It is at the worker level, however, that such influences are arguably most directly felt because of their impact on work practices. In discussing learning as a response to change, Skills Australia (2010) suggested that:

> New skill demands may flow from the changing skill composition of existing occupations, resulting from new technology, services or products, rather than from industry or occupational growth and decline. Such demands will vary from firm to firm, depending on their innovation intensity and business strategy. (p. 18)

The challenge lies in how best to enable and enhance new and ongoing learning in order to achieve the most effective outcomes for the individual and the workplace. Ultimately, the integration and implementation of new learning come down to how individual workers perceive and experience the impact of the changes on their work practices. It is they who will enact these changes as new work practices. It is they who will upgrade their skills and knowledge in order to maintain their competence, and hence their employability, in the face of change.

In the study reported here, 86 Australian workers in four different industries were asked about their experience of work and learning through recent changes in their jobs, what changes they anticipated in the future and the kinds of learning practices they would prefer in responding to these changes. Some of them identified broad social and economy-wide influences at the industry and enterprise level (of the kind noted above as reported by the Australian Workforce and Productive Agency, 2013). Others saw change in terms of their own careers and the personal futures they would occupationally pursue and enact. A small number claimed their job had remained the same and that they foresaw this would continue. However, the majority nominated specific changes to their own workplace practice as having the greatest impact on their learning needs to date and in the future. This finding has implications for how their learning might be organised or facilitated and how workers might best engage in that learning.

Work learning, its purpose and provision, cannot be viewed outside the experience and expectations of the workers who enact it, despite the extent of external and seemingly uncontrollable changes by which it may be directed. Work learning is highly situated (Lave & Wenger, 1991) and most effective when grounded in the

authenticity of its tasks and activities (Barsalou, 2008). Equally, more than context dependent, work learning is person dependent and progresses from the values and priorities workers bring to their circumstances (Smith, 2012). Hence, work learning is a relational and socio-personal practice enacted at the nexus of the social, situational and personal factors shaping its enactment (Billett, 2008). Such work-learning perspectives comprise the conceptual premises from which the 86 workers' interview responses are examined and discussed in this chapter. These perspectives seek not to simply emphasise work changes as the basis for better understanding work and the learning it necessitates. Rather, they indicate the interdependent nature of learning in and for work and how the complexity of its provision and enhancement (under the pressures of social, industrial, global, etc. (macro) and organisational, enterprise, etc. (meso) forces for change) is bound in the agency of workers. Such perspectives highlight the increasing importance of the workplace as a context for learning through change and begin to elaborate the nature of contemporary work as a learning practice.

This chapter contributes further to these work-learning perspectives. It advances (a) that workers are very aware of their learning needs and capacities and effectively enact them through a focus on their own workplace practice and (b) that this focus supports acknowledging and accepting work and workplaces as highly appropriate contexts for learning in response to change because (c) work and learning are increasingly indistinguishable activities enacted through change. The chapter progresses its case through the following three sections that, respectively, (1) outline some research and literature perspectives on work, change and learning, (2) outline the research and findings reported here as the substantiation of the argument advanced and (3) conclude with a brief discussion of some of the implications emerging from the findings presented.

9.2 Change and Work Learning

Changes to industries and enterprises, particularly in developed economies, are arguably occurring more rapidly than ever before. The Australian Workforce and Productivity Agency (2013, p. 26) predicted that the broad drivers of workplace change in the next decade or so will be social, demographic and cultural trends; economic and financial trends and globalisation; labour force, industrial and workplace trends; science, technology and innovation; governance and public policy; and environment and population sustainability. In Canada, Burke and Ng (2006) identified similar drivers of change as did Watson, Galway, O'Connell and Russell in Ireland (2009). At the enterprise level, those broad influences impact on services and productivity, sometimes on the level of competitiveness, and for some organisations, on their profitability.

It is arguably at the worker level that change has the most visible impact, however, because it affects work practices. For example, on examining changing skill demands for Australian enterprises, Misko (2010) concluded that 'work practices

have been affected by the social, regulatory and technical and technological environments in which skills are performed' (p. 21). This worker focus on what affects their own work emphasises the significance of the work context in any learning workers undertake in order to respond to perceived changes, as Illeris (2011) noted: 'Everyone must be prepared for their working functions to change constantly and radically throughout the whole of their working lives' (p. 4).

The role of the workplace as a context for learning has been increasingly examined in the past two decades. Stern and Sommerlad (1999, cited in Lee et al., 2004, p. 5) suggested that three broad approaches to workplace learning had developed: the workplace as a site for learning, the workplace as a learning environment and learning and working as inextricably linked. Lee et al. (2004, p. 6) observed a changing view of workers' learning processes from one of acquisition to one of participation and also a growing recognition of the need to consider both the organisational structure of the workplace and individual engagement by workers. Hodkinson and Hodkinson (2005, pp. 113–4) also noted two key ideas in the literature on workers' learning processes: (1) that learning is an inevitable part of everyday work practices and that workplace learning is heavily influenced by social and cultural factors. The two authors concluded from their review that 'learning is primarily concerned with participation—in workplace activities (Billett, 2001a) and activity systems (Engeström, 1999, 2001), or in workplaces as living social communities—in communities of practice (Lave & Wenger, 1991)' (p. 114).

The other significant development Hodkinson and Hodkinson (2005) reported is an increasing research interest in the worker as an individual learner. Among such researchers, Billett (2008) claimed that 'the contribution of personal agency in enacting, remaking and transforming culturally derived practices is central to the regeneration and transformation of work and its learning' (p. 235). Similarly, Fuller and Unwin (2011, p. 13) proposed that 'each individual will … exert their individual agency in terms of how far they decide to participate in (and help to shape) the opportunities that the workplace offers to them'. Those opportunities have been termed 'affordances' by Billett (2001b), who argued for the 'co-participation' of individual engagement and workplace affordances to facilitate workers' learning. In similar vein, Fuller and Unwin (2004) proposed the concept of an 'expansive learning environment', which was described by Hodkinson & Hodkinson (2005) as 'one that presents wide-ranging and diverse opportunities to learn, in a culture that values and supports learning development' (p. 123).

Lave and Wenger (1991) were also interested in the influence of the immediate working environment on individual worker's learning and proposed the concept of 'situated learning', whereby learning, thinking and knowing occur through interrelationships among people among people engaged in a socially and culturally structured world. In related research, Billett (2004) argued that 'the workplace as a learning environment must be understood as a complex negotiation about knowledge-use, roles and processes – essentially a question of the learner's participation in situated work activities' (p. 312). Hetzner, Gartmeier, Heid, and Gruber (2009) illustrated this point in a study of the impact of changes on bank employees' work practices, concluding that the workers' conceptual and practical learning was influenced by both the nature of their work and the working environment.

This brief review of literature shows that workplace change brought about by external and internal influences ultimately impacts on work practices and therefore on individuals' work tasks, requiring them to undertake new learning. Much recent research indicates that new learning takes place through everyday work practices and is influenced by the workplace learning environment and that the agency of the individual worker is a key element.

9.3 Examining Learning and Change

This inquiry takes a qualitative orientation (Neuman, 2005) and addresses the question: What changes are experienced by contemporary workers and how do they learn in response to these changes?

Participants represented five industry sectors: services, mining, health and community services, financial services and a small number representing the training sector. The sampling was based on a combination of selective and convenience sampling. The aim was to seek cases for rich information (Patton, 1990) in regard to the experiences of workers situated in their circumstances of practice. Participants were recruited through various enterprises within the above industries, and the researchers nominated enterprises on the basis of their personal networks and also accessibility during the data collection time frame. The particular workers available for interview were all volunteers and were unknown to the researchers. Semi-structured, face-to-face interviews (Wengraf, 2001) were conducted with 86 workers using a survey instrument that included both open and closed questions. The interview duration was approximately 40 min. Data for this project consisted of participant responses to two of the survey questions and subsequent questions that led from the respondent's answers in order to obtain rich and thick descriptions of their experiences (Geertz, 1973). The guiding questions were:

1. In what ways has your current job changed in recent years?
2. What kinds of changes do you expect to occur in your job in the future?
3. How do you go about learning to respond to current and emerging changes in your job?
4. How would you prefer to learn to respond to current and emerging changes in your job?

The transcribed responses were analysed iteratively (Srivastava & Hopwood, 2009). The researchers engaged by reading and rereading the responses and then conducted a collaborative critique of each other's interpretations. A thematic analysis (Liamputtong, 2009) was deployed to note patterns of meaning across worker responses about current and anticipated changes in their workplace and their learning to respond to those changes. This process allowed the researchers to categorise the nature of those changes and identify changing skill needs, leading to implications for how any new learning might be organised and provided. The

findings, outlined below, are used to elaborate ways workers' learning could be organised and enhanced to support their learning preferences in a context of continuing work change.

9.4 Perceptions of Workplace Change

In this and the following section, we report data that emerged from the surveys and interviews. The data are reported as observations and interpretations supported by pertinent selected quotes from individual participants which support the trustworthiness of the interpreted perspectives. In this section we report on participants experiencing a high degree of change in the work they experience, how recent changes in policy or procedure impacted on jobs, perceived instances of no change in jobs and the participants' anticipation of future changes to their work.

The 86 participants identified 93 instances of change in their current workplaces. The most commonly perceived changes were those directly related to work tasks, new work roles and changing organisational policy. These signify changes in the nature of the work, as illustrated by a worker in the aged sector who reported the need to change work practices to accommodate people who were now coming into aged care facilities at much older ages than before, and hence needing more care and attention because they were 'particularly vulnerable' [WRA13]. Because the level of care and attention was more intense for these less able clients, workers experienced a demand for specialist skills as well as an increase in workload. For example, new techniques in physically handling more vulnerable residents had to be learnt. In this instance workers had to respond to changes in the types of services required for different clusters of clients. Such 'intensification of work' was a common theme among this group of workers. Another example is of a worker from the service industry [MM2] who was originally engaged to undertake general maintenance at a tourist venue, and then gradually took on a number of different roles as the business expanded, and other employees left, requiring him to develop new skills. Here, the changes were prompted by restructuring of the organisation for improved business and economic performance. An animal trainer at the same facility said, 'I also do a lot of cleaning, preparation [and] commentary…. We do a big variety' [MM3]. In this instance, this worker highlighted the need to be multi-skilled, a requirement common in many contemporary workplaces.

New work roles featured in the responses from 17 (20 %) of the workers, indicating a high degree of changes in the nature of work. These new roles were not the result of promotion or demotion, but a requirement to accommodate to emerging transformations in occupations. One example came from an administrative assistant whose responsibilities had changed from supporting one manager to supporting several, due to change in organisational structures driven by economic demands [SBSW4]. Under the new structure in her organisation, temporary staff were also employed, but they tended to be limited in their skills, so for her it was a case of 'just

rolling your sleeves up and doing what you need to do and not be precious about that's your job or my job' [SBSW4].

Similarly, workers in a major accounting organisation who were now moving through departments and work tasks identified their need to respond and adapt to changes from one section of the organisation to another. As their interests and aptitudes to their work became clearer through the changes, they came to identify how their new roles provided a 'tighter fit' with their work preferences and skills and knowledge. In another example, an office worker in mining explained that he started as a cleaner but now occupies the role of administration officer dealing with payrolls [WRM08]. A colleague in the same office reflected some positive sentiment in the experience of these kinds of changes: 'It's been different procedures … so my job runs smoother and everyone else's job runs smoother as well' [WRMW11]. Such organisational and procedural changes can enable positive work and self-learning experiences.

Twenty nine (35 %) of the respondents related instances of recent changes in policy or procedures that had an impact on their jobs. For those in mining and aged care, in particular, changes in occupational health and safety regulations are pre-eminently significant. For example, a mining worker drew on an example associated with safety: 'a brand new permit-to-work system…of checks and balances… on machinery or well heads' [WRMW12]. In another example, a service worker told of how her employer was seeking to 'create a better bond between [themselves] and community' [RSL3], so staff were expected to take on community engagement and community relations roles. A finance worker told how they undertook courses conducted by a software supplier so they could learn a new financial management system, augmented with a new buddy system for teaching new practices [SBFW1].

For five of the respondents, the changes were major, such as in the case of the manager in financial services who had moved into that position from the health sector after completing a degree the previous year [SBFW3]. In another instance, a worker in mining indicated that moving to a similar position in a different company meant that he had to learn new things. 'It keeps your mind busy, .. but it's good' [WRMW25]. Such career changes demand high levels of learning response.

On the other hand, 10 (15 %) of those interviewed claimed their jobs had not changed in recent years. Among these were two cleaners, one of whom said, 'I was employed to do a specific job, and I'm still doing that specific job [VSW1]. However, this does not mean they did not engage in learning. Certainly, new cleaning products, technology for cleaning and health and safety requirements would have entailed some form of learning, although the individuals may not have considered these as learning per se. In another example, a mine worker said his job had not changed in over 6 years, although he claimed to have missed out on particular work tasks due to his low level of literacy [QW04].

All 86 workers were also asked about future changes they anticipated in work. A few responded in terms of their own career goals, but 62 % thought there would be changes in the ways they worked. The introduction of new technology was most frequently mentioned (15 instances), while those in industries serving clients or customers predicted changes to the types of services provided (11 responses),

although they did not elaborate on this. There were also numerous examples of changes originating from within the organisation, such as changing personal work roles (14), the introduction of new systems (7) and changed or uncertain personnel arrangements (7). Despite the range of possible changes identified by these workers, however, 19 (24 %) of those interviewed did not perceive their jobs might be different in the future.

In summary, a strong majority of workers interviewed could identify recent changes in their work, and around three-quarters of them expected such changes to continue. The kinds of changes reported here highlight the transforming state of Australian workplaces, with increasing intensification of work, and the introduction of new technology, and also the effect of broader influences such as greater emphasis on occupational health and safety, and organisation-wide restructuring. In the main, the workers were able to identify how such changes impacted on their daily work practices, so it is important to understand how they learn in and through these changes and hence remain up to date and sustain their employability and their preparedness for future changes.

9.5 Ways of Learning

The 86 interviewees were asked to identify how they personally learned in order to keep up to date with change. To assist their thinking, they were provided with a list of possible ways learning might be assisted or supported and asked to indicate which of those were most relevant to their learning for work. That list evolved from the data collection undertaken in a larger study (Billett et al., 2012). The results are presented in Table 9.1.

Evident from Table 9.1 is the overwhelming number of respondents (93 %) who indicated individual learning as the most frequent way they learned while at work. Almost as many (89 %) learned individually with support from fellow workers. The next two ways were less frequent, but both were also undertaken in the workplace.

Table 9.1 Ways of learning ($n=86$)

	Total
Ways of learning	*N* (%)
Individually	79 (93)
Individually from other workers	77 (89)
Experienced person (part of group)	52 (61)
Experienced person (individual guidance)	45 (53)
Updated through a professional network or through friends and family	38 (45)
External trainer – individual on site	37 (44)
External trainer trains – group off-site	29 (34)
External trainer trains – group – on site	23 (27)

Their learning from an experienced person, suggested that accessing 'expertise' is an important factor. It is noteworthy that learning through a professional network or from friends and family ranked higher than learning from an external trainer, whether the latter was on or off site.

In order to explore these responses, the interviewers asked the workers to elaborate their responses about learning in response to change. Analysis of their responses is discussed below under three main themes: (1) learning individually, (2) learning from the more experienced and (3) learning in a group facilitated or trained by an experienced person.

9.5.1 Learning Individually at Work

The workers explained that their main and preferred ways of learning were through working it out for themselves and 'picking it up as they went along'. Much individual effort in learning was undertaken without direct support or guidance. Brenda, who worked in an administrative role in a mining company office, said: 'I like to do it individually because to me it seems to sink in better'. This is not to say that she and other workers learned in social isolation or did not seek or use assistance, but rather preferred to learn in individualistic ways that required self-directedness, proactivity and self-accountability. However, the interviews revealed that this approach is often based on a foundation of previous instruction and/or working with others who had been observed and questioned, as one mining worker elaborated:

> … probably my most effective way of learning is actually just doing it with other people, watching, asking them questions and even just seeing them, observing them when they work and how they even talk to other people, how they look at things that I look at … It's easier to talk to someone … It's good to be able to ask stupid questions and not feel stupid.

Such statements are indicative of a personal learning process based in using the immediate resources of work. In elaborating these processes, workers talked of the benefits of learning strategies such as trial and error, self-paced learning and having time to reflect on and practise what they were learning. They variously found such effortful processes as challenging, rewarding and motivating, and confidence-building, thereby helping develop and sustain their interest and commitment. A financial services worker summed up how the individualistic approach is personally meaningful: 'I just like to go in myself, just look at it and learn that way which is probably best for me'. This sentiment was corroborated by a co-worker: 'Well the one good thing about it, when you do a trial and error thing like that, you don't just learn it goes here, that goes there, you know why it goes there because you had to work through the process to understand it'.

In other words, the concept of 'learning individually at work' is shaped by factors that support that learning – working alone is welcomed and appreciated as strongly assisting workers' learning when initial instruction is followed by time to practise that enables them to consolidate, test and reflect on the purpose and

performance of their work. This seems most effective in circumstances that support slow, incremental increases in task complexity and associated responsibility. However, this approach to learning requires downtimes where there is less pressure on the workers. For example, in elaborating her learning approaches, Ann, a finance worker, stated, 'It would be good to take a step back and just reflect on what you actually have learnt – it just helps to reinforce'. Creating such moments supported her developing competence and confidence as she responded to the changes her work entailed.

In sum, the majority of workers interviewed, from miners in remote locations to aged care and office workers in cities, generally managed their own learning but recognised the support provided by their peers, and sometimes by supervisors, and by trainers from within and outside the organisation. Most of this learning was to help with the requirements for immediate work tasks and was self-directed as they deployed their personal approaches in seeking support, establishing better perspectives on their work tasks and strengthening their confidence to address what was required.

9.5.2 Learning Individually from 'Experts'

As seen in Table 9.1, working and learning with another person is consistently reported as being an effective form of support. Some 89 % of the workers said they learned from other workers as part of their normal workplace practice, and 53 % said they received guided input. In the subsequent exploration of those responses, workers indicated they were motivated and willing to learn from people they regarded as what might be called 'experts'.

Experts are those people in and out of the workplace who were considered credible because of their perceived knowledge of the industry and expertise in the particular work practice or context. An example of such an expert was provided by a services worker:

> Kevin is my supervisor and we discuss things regularly and Kevin has a wealth of information regarding the industry … he's also a life balance mentor as well. He makes sure that you're not doing excessive hours and killing yourself over it all.

In this instance, learning was assisted by a senior staff member who brought expertise and pastoral care, albeit in an unequal working relationship. On the other hand, another service worker described a more equal relationship with his supervisor: 'Myself and the marketing manager, we work in a team … because it's only the two of us, we pick up a lot'. In this particular instance, working and learning together is enabled by work projects and shared preparatory training (e.g. setting up workplace email systems and in-house printing and publishing) that bring these two workers together. Their learning is assisted by the collaborative effort that comprises their work. Similarly, a mining engineer enjoyed support from a company-sponsored external expert who was flown in 1 day per month to work exclusively alongside him in his trainee management role.

From the workers' responses, five different sorts of experts can be discerned: (1) co-workers, (2) supervisors/managers, (3) mentors, (4) buddies and (5) occupational experts. Their expected qualities comprise occupational knowledge, situational competence and ability to understand and respond to learners' needs. Engagement with experts relied on individual agency to initiate learning that meets immediate needs, such as gaining knowledge to perform a task correctly and efficiently. This kind of assistance involves immediate and relevant interactions through (1) sharing information, (2) accessing perspectives about effective performance, (3) receiving constructive feedback (e.g. praise and correction) and (4) performing authentic work tasks, characterised by meeting particular situational requirements and timelines. That is, the work and learning co-occurs in workplace-specific ways. For example, an aged care worker said, 'When somebody actually sits with us and says, 'We're now doing this,' and actually gives us a reason, I'm all for that rather than being told it must be done'. Importantly, this form of learning support tends to arise through everyday work activities and is dependent upon experts or other co-workers being willing to provide that support.

In the frequent reports of one-to-one working and learning relations found throughout the data, respondents were positive about these experiences. Consistent across these informants and their circumstances is that working and learning with more experienced others can sustain employability and advance workers' learning. More than just engagement with other workers, access to more experienced co-workers' knowledge was reported as strongly supporting work-related learning. However, access to such expertise can be restricted by the availability of such more informed others. For example, a worker in financial services valued the one-on-one personal training she was receiving from a more experienced colleague, although she could see the limitations of such a process: '… the person that's training me is very knowledgeable, but I guess it's in their head so that makes it difficult'. So, seemingly, her learning was restricted by limits in what could be shared through one-on-one interactions, without opportunities to further elaborate her knowledge. It is for such reasons that learning from expert others, such as a trainer from a training provider or from a product supplier, is necessary. However, it also requires learners to question and seek clarification. Often this latter form of learning takes place in groups, which is the third significant way that workers mentioned when they talked about their learning.

9.5.3 Learning in Groups

Working and learning as part of a group or team was frequently reported as an effective form of supported learning in and through change. Table 9.1 shows that this happened in two main forms: in a group led or convened by a person in the workplace who was usually at a more senior level (61 %), and by a trainer at either an external venue – most often a classroom (34 %) or at the workplace (27 %) in a training room.

In the case of the facilitated group at the workplace, this was most likely to be with fellow workers, either ad hoc or at regular gatherings such as staff meetings where new information or changes to industry requirements were shared and discussed. The interviewees elaborated how collaborative and supportive staff could provide effective learning assistance for developing the competence and confidence required for work, and, particularly, for working with others. Further, some discussed how participation and motivation could be encouraged and authenticity, relevance and purpose heightened when working together. When workers help each other, different perspectives and ways of acting are made accessible and experience becomes visible and valued. For example, an administrative worker in mining stated:

> … it's my colleagues who are most knowledgeable about what I do, not outside people … and I most relish being with my experienced buddies who were doing my job, who were deeply familiar with what I was doing, who could give me insights into my job. People from the outside, their advice was often … less relevant because they didn't have intimate details of my job … And, likewise, an experienced person within the group. In-house, they know. They know the system. Outside people don't.

However, not all the required learning support for meeting the demands of change can be obtained within workplaces. Accessing outsiders as experts is sometimes necessary. These experts may be external trainers from registered training organisations, supplier representatives or client representatives who conduct their sessions on or off site, typically in groups rather than one-to-one. Workers described these to be beneficial for obtaining practical knowledge on the job and theory through classes off-site, opportunities to network with people from other organisations in similar roles, keeping up to date with compliance and legislation and becoming aware of issues and practices outside their particular workplaces. One mining engineer undertaking a leadership course commented on his experience with a class led by an external trainer: 'We learned a hell of a lot and we were able to discuss a lot of things and get things clear that we've always wondered about'.

Outsiders can offer specialised, best practice and well-informed experiences that develop specific capacities and consolidate learning for improved workplace performance. Nevertheless, their credibility depends on their perceived industry experience and the relevance of the training they provide. The precariousness of the external trainer's position is encapsulated by a comment from an administrative worker in the mining industry: 'Outside people are essential for teaching us new stuff that we just don't know. Having said that, it's the people that I'm working with who I'm learning from more, much more'. This distinction between experts as sources of what we 'don't know' and immediate colleagues as sources of ongoing learning support was a common factor when access to expertise was discussed.

The workers also reported that training in a group assisted with building relationships and networking with co-workers. This development extends to participants: (1) becoming learning supporters, or trainers, as they return to their work (2) assisting others to establish benchmarks or agreed requirements and (3) sharing expectations about goals for work performance. Hence, these collective learning experiences can generate opportunities for advancing learning and better collective action through shared understanding and practice requirements. The reported factors that

best enhance such learning were: small groups, conducted at and in work (i.e. on-site and hands-on), company funded and organised to enable any necessary preparations, short in duration (e.g. no more than a few days) and conducted by acknowledged experts who are accessible after the training.

In sum, the ongoing development of workplace competence for continued employability and possible advancement was reported as being most potent when work and learning co-occur. Even where new and highly complex task completion is necessary, workers reported that initial instructions and subsequent practice required for adequate performance are best assisted if undertaken almost immediately in work. In short, being in work means being engaged in learning and generating and accommodating the changes that characterise contemporary work performance. Being in work links working and learning: (1) autonomously, (2) with one other experienced worker and (3) with others who comprise groups and teams through which work is enacted.

Formalised structured training may play important roles for those wishing to learn for promotion or for a new job or occupation; but in the data reported here, most of the discussion among workers and managers was about meeting immediate workplace needs rather than career progression. In the first instance, the research showed that workers rely heavily on their own capacities for learning in order to cope with workplace change. Nevertheless, individual motivation and proactivity can be encouraged and supported by recognising that such learning is worker specific. This kind of worker-specific support appeared most effective when on-site and hands-on training is conducted by experts and when supervisors work individually with workers. On the other hand, learning in teams brings about other sorts of outcomes, such as understanding goals and influences outside immediate practice, working autonomously with others and learning ways to obtain informed assistance and guidance. Where local expertise is not sufficient, or accreditation is involved, it may be necessary to recruit external experts.

9.6 Discussion

The workers in the research reported here regularly and frequently experienced planned and unplanned changes in their immediate work practices. These changes included altered job roles, tasks and responsibilities and emerged from requirements to be multi-skilled and from new technologies, demand for different types of services and products, new policies and systems, and reforms in regulations and licensing details. Many of these changes are reported in literature (e.g. Australian Workforce and Productivity Agency, 2013; Burke & Ng, 2006; Skills Australia, 2010) where they are discussed in terms of the wider implications for work and productivity. Saliently and predominantly, the 86 workers interviewed here perceived the need for changes to have emerged from internal organisational changes rather than broad external sources. They looked at and experienced the impact of the changes more from the perspective of how these changes shaped their daily work practices.

Their interest and focus were on responding to changes and addressing the demands of new and altered work, and it is likely many did not necessarily see this

as learning per se or engaging in new learning. Yet, they engaged effortfully in learning to develop the knowledge, skills and attributes that would adequately meet the requirements of their daily work practices rather than other organisational functions. This type of attention to immediate work tasks is not surprising. Watson et al. (2009) also noted that workers in their study were more concerned with organisational practices that directly affected their own work. Such interest and focus on immediate work tasks have implications for what and how workers would prefer to learn in order to respond to and in the changes impacting their work. Not surprising workers in the research reported here prefer to learn at and through work tasks so that it is context specific and supportive of their own ways of developing their work practice. These preferences can be explained in terms of situated cognition (Lave & Wenger, 1991) or grounded cognition (Barsalou, 2008). Barsalou contended that to develop procedural capacities, strengthen conceptual links and dispositions (i.e. values, attitudes), individuals' cognition needs to be enacted and learning shaped through experiences in authentic work tasks. Hetzner et al. (2009) also advocate an alignment between learning at work through work practices.

Workers prefer to learn at work and in work. The workplace provides an authentic environment to learn through the practices of a living working community (Gherardi, 2009), where the enactment of occupational activities and the learning co-occur (Jordan, 2011). Nonetheless, a focus on learning by workers to respond more to changes that relate primarily to their immediate job tasks may constrain learning that serves the wider goals of productivity and ongoing employability. This is because the canons of the occupation are constantly changing (Dymock, Billett, Martin, & Johnson, 2009), and these changes demand new symbolic and abstracted knowledge (those not visible or experienced directly) and use of new technologies that necessitate understandings by their mechanisms and added sets of skills to operate.

The responses of workers reported here suggest that workers know what they need to learn, are skilled in a robust repertoire of personal learning approaches (e.g. individually, from other workers, guidance from experienced workers, personal and professional networks, external trainers) and will seek the resources necessary to their enactment of those approaches. Each of these approaches has strengths in serving different purposes and requirements and necessitates different levels of agency from individual workers. For instance, learning individually relies heavily on observation, mimesis (i.e. imitation), practice (Marchand, 2008) and evaluative reflection and is premised upon the efforts and capacities of individuals as observers, imitators and initiators, yet allows individuals to practice and refine what they may have learnt recently and need to implement. However, this approach to learning counts on the skills and motivation of workers as well as their place within the workplace's sociocultural and structural arrangement, given that opportunities and provisions in workplaces can be contestable (Billett, 2001a), unpredictable (Beckett, 2013) and negotiable (Smith, 2012). However, it is not clear how workers make decisions about which approaches to use for what types of learning, within what kinds of circumstances or at what point in their learning journey.

The findings reported here refer to individual engagement, worker agency and co-participation with others (Billett, 2004) and the kinds of changes workers address as

immediately shaping and influencing their learning. Furthermore, a workplace curriculum that includes strategies such as coaching, mentoring and guiding (Billett, 2001a) can structure and integrate new learning, translating this into more effective response to change. The findings suggest a need for expansive workplace learning (Fuller & Unwin, 2004) to allow a diversity of experiences. Indications of how workers prefer to learn and respond to changes also stress the importance of appropriate workplace affordances to support learning. Fuller and Unwin (2011) suggest that these provisions will allow workers to 'exert their individual agency in terms of how far they decide to participate in (and help to shape) the opportunities that the workplace offers to them' (p. 13). Nonetheless, these learning provisions need to extend beyond what individuals require for their immediate job tasks and encompass engagement in learning for broader organisational goals to assist workers with maintaining their competencies in order to remain employed and employable, as well as meet the workforce development needs that can appropriately address emerging changes in work and work practices.

9.7 Conclusion

Lee et al. (2004) argued that learning provisions need to consider both organisational structure and individual engagement by workers. This chapter suggests that workers' engagement in work learning is both effective and robust when they are addressing the kinds of changes that impact their practice, when they can secure the kinds of learning support they know they need and when that support is collaboratively enacted in ways that affirm individuality. As continuous change increasingly becomes the defining quality of contemporary work practice and, thereby, work and learning come to be increasingly indistinguishable, the ways in which workers' engagement in learning needs to be considered becomes increasingly work-centric. More than workplaces being understood as sites or contexts of learning, work per se must become understood as learning. The consideration of learning provision then becomes a more salient consideration of workers' engagement in work. Those who support work-learning provision in these times of continuous change must, of necessity, support workers' engagement in work as a way of learning.

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Chapter 10
Grasping Learning During Internships: The Case of Engineering Education

David Gijbels, Christian Harteis, Vincent Donche, Piet van den Bossche, Steffi Maes, and Katrin Temmen

Abstract Workplace learning through internships has since long been seen as a valuable element in the curriculum of engineering education programmes. The present study investigates how job characteristics of the workplace (such as job demands, job control and social support) are related to individual differences in the process of the learning in the workplace during internships and how these contribute to the perceived competences reported by the students themselves. A total of 48 third year engineering students of a university college in Germany who all just recently spent an internship of at least 16 weeks participated in this study by completing a questionnaire. The results of the correlational analyses indicate that feedback of supervisors or co-workers seems to be associated with how students regulate and process learning at the workplace. Job control and job demands are positively related to

D. Gijbels, Ph.D. (✉) • V. Donche, Ph.D.
Institute for Education and Information Sciences, University of Antwerp, Antwerpen, Belgium
e-mail: david.gijbels@uantwerpen.be; vincent.donche@uantwerpen.be

C. Harteis
Institute of Educational Science, University of Paderborn, Paderborn, Germany
e-mail: charteis@mail.uni-paderborn.de

P. van den Bossche, Ph.D.
Department of Educational Research and Development of Maastricht University, The Netherlands

Institute for Education and Information Sciences, University of Antwerp, Belgium
e-mail: Piet.vandenbossche@uantwerpen.be

S. Maes, M.Sc.
Studied Education and Training Sciences, University of Antwerp, Antwerpen, Belgium

K. Temmen
Department of the Didactics of Technology, College of Electrical Engineering, Paderborn, Germany
e-mail: katrin.temmen@uni-paderborn.de

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self-perceived competence, but neither of both seem to be correlated with different ways of active regulation and knowledge construction. Explanations and implications are discussed in this chapter.

10.1 Introduction

In a world of continual change, our contemporary job market is making heavy demands on graduates (Dall'Alba, 2009). Graduates in engineering are a case in point (Sheppard, Macatangay, Colbey, Sullivan, & Shulman 2008. As many other recently graduated knowledge workers, they are expected to be able to directly enter the engineering profession, operating in ill-defined and ever-changing environments, dealing with nonroutine and abstract work processes and handling decisions and responsibilities (Tynjälä & Gijbels, 2012; Tynjälä, 2008). Orientation and preparation for such a professional practice is an important aim for all engineering courses. In view of these developments, workplace learning through internships has long been seen as a valuable element in the curriculum (Dehing, Jochems, & Baartman, 2013). One specific characteristic of internships is their twofold orientation: Students participate in usual practices at workplaces and are supposed to contribute to work performance but also to gain learning experiences which relate theoretical knowledge to practical problem solving. Internships, thus, aim at utilizing work contexts for workplace learning purposes. Research on learning that takes place at work, through work and for work has considerably increased over the past two decades (Tynjälä, 2013). Nevertheless, many questions still remain unanswered. In order to help researchers to outline new research designs in this field, Tynjälä (2013) recently presented a 3-P model of workplace learning. The three Ps refer to the three basic components of the learning phenomenon: presage (student and context factors), process (how learning is approached) and product (results of the learning process).

The study reported in this chapter takes into account the 3 Ps in the context of learning at the workplace during internships in engineering education. The present study aims to investigate how job characteristics (i.e. *presage* components in the learning context such as job demands, job control and social support) are related to individual differences in the *process* of learning in the workplace during internships. Moreover, we want to further investigate how these contribute to the perceived competences reported by the students (as *product* variable).

10.2 The Application of the 3-P Model of Workplace Learning for the Study

The following paragraphs explore the 3-P model of workplace learning by explaining the presage, process and product variables that were included in the present study.

10.2.1 Presage: Job Demands, Job Control and Social Support as Indicators for the Learning Context

To investigate the influence of learning context, the present study relied on the demand-control-support (DCS) model (Johnsen & Hall, 1988; Karasek, 1979; Karasek & Theorell, 1990). Karasek's demand-control model (DC model) and the derived demand-control-support model (DCS model) are leading models in research into the psychology of work (Taris, Kompier, de Lange, Schaufeli, & Schreurs, 2003), which predict both stress and learning. The original DC model assumes that a work environment can be described in two dimensions: psychological job demands on the one hand and job control on the other.

Job demands refer to stress factors which are present in the work environment. Within the DCS model a demanding job means that someone has to complete a great deal of work within a limited space of time (De Witte, Verhofstadt, & Omey, 2005).

Job control refers to the opportunities an employee has to satisfy these job demands. These opportunities are represented by the scope the employee has for taking decisions (De Witte et al., 2005).

A work situation offers more learning potential if the dimensions of job demand and job control are in balance. Here, an employee has sufficient opportunities to adjust successfully to the challenges arising from the work situation. Such situations trigger 'active learning behaviour'. Taris and Kompier (2005) conclude that, according to Karasek, this means the learning of new skills and behaviours as well as the effective solution of problems, work commitment and motivation (De Witte et al., 2005). In this case, the employee has a great deal of job control and can, in a demanding work situation, try out different ways of solving problems at work. On the other hand, a combination of few job demands and low job control results in a passive situation. The low job demands ensure that little tension is experienced, and the low job control offers few opportunities for growth and development.

The original DC model has been extended by a third dimension, thanks to Johnson and Hall (1988). Work-related social support has proven to be an important interaction factor. *Social support* refers to the existence of good relations with colleagues, being able to rely on others, obtaining accurate information via others as well as gaining actual help, understanding and attention when difficulties are encountered (De Jonge, Bakker, & Schaufeli, 2003). In the present study, both the quality and the quantity of the feedback from both co-workers and supervisors are taken into account as a specific indicator of social support (e.g. see Steelman, Levy, & Snell, 2004; Van der Rijt, Van de Wiel, Van den Bossche, Segers, & Gijselaers, 2012). The most favourable effects on work-related learning are expected with a combination of high but balanced job demands and job control and high social support. This expectation is also known as Karasek's learning hypothesis.

10.2.2 Process: Dimensions of Knowledge Constructions and Regulation

While researchers on student learning have introduced concepts such as deep and surface-level learning as basic mechanisms to explain differences in the learning processes among students, the workplace researchers hardly ever refer to these concepts (Tynjälä, 2013). In the present study we build on the work of Oosterheert and Vermunt (2001) that was adapted by Gijbels, Donche, Van den Bossche, Islbroux and Sammels (2014) to the context of engineering education in order to investigate the different dimensions of knowledge construction and regulation that can take place in the process of learning in internships. Four dimensions can be distinguished: (1) external regulated knowledge construction, (2) self-regulated knowledge construction, (3) shared regulation of knowledge construction and (4) avoidance of learning. We shortly describe each of these dimensions below.

The first dimension 'external regulated knowledge construction' captures students' use of the mentor as an external source to regulate their own learning. In most internship contexts, mentors are present, often differently labelled as tutors, coaches or co-workers who are responsible for both coaching the learning process and judging students' performances. The second dimension focuses on the extent students engage in 'self-regulated knowledge construction' when being confronted with a specific problem or issue at the workplace. Students search for answers themselves and examine various information sources outside of the formal programme. This dimension has many characteristics in common of more self-regulated learning as it tries to capture what happens when students are confronted with challenges or questions during internship which triggers this learning activity. A third dimension is entitled 'shared regulation of knowledge construction' and encompasses all student activities that involve intentionally approaching experienced colleagues for both practical suggestions and developing ideas/views about engineering. The scale focuses on how knowledge construction during internships takes place through interaction with co-workers. Whereas the first dimension focuses on the mentor and the second on the individual learner, the third dimension concentrates on the extent students cooperate and interact with their colleagues in the workplace to further develop their understanding of a phenomenon or finding a practical solution for a problem they come across. The fourth dimension focuses on maladaptive learning behaviour as represented in the dimension of 'avoidance of learning'. In this case, students do not intend to take lessons from bad experiences for further performance improvement. Other students did find this an important event as it triggers to think about alternative ways of dealing with these less comfortable practice situations.

10.2.3 Product: Perceived Competence

In order to further explore the relationship between student learning and learning outcomes, we measured students' perceived competence in a generic way at the end of the internship from the students' perspective. Previous research already pointed at important associations between differences in learning at the workplace and a closely related construct of perceived competence, namely, students' self-efficacy (Thoonen, Sleegers, Oort, Peetsma, & Geijsel, 2011; Van Daal, Donche, & De Maeyer, 2014). The results of the recent study by Gijbels et al. (2014) in the Dutch-speaking part of Belgium indicated that students in engineering education perceive their competences to be higher when the internships take place in a context with high job demands and in which they receive supportive feedback from their supervisor and (especially) from their co-workers. During such internships, self-regulated knowledge construction and shared regulation of knowledge seemed to be the most important dimensions of knowledge construction and regulation. However, these conclusions should not be overstated until the findings could be repeatedly found in other contexts.

10.3 Research Questions

The general purpose of this study was to investigate relation between presage, process and product variables of learning in internships in engineering education in Germany by focusing exemplarily chosen constructs. Two perspectives appear relevant here: firstly, it is of interest if there are relations between presage and process variables to be found; secondly, it is of crucial interest to explore interrelatedness between presage and process variables on the one hand and product variables on the other hand. Hence, two research questions are to be formulated:

1. How are the included job-related variables (presage) related with different dimensions of knowledge construction and regulation (processes)?
2. To what extent are job-related variables (presage) and dimensions of knowledge construction and regulation (processes) related with self-perceived competence (product)?

10.4 Method

A convenience sample of 48 third year engineering students of a university college in Germany participated in this study who all just recently spent an internship of at least 16 weeks at medium- or large-sized enterprises. The purpose of this internship

Table 10.1 Job demands, job control and social support (presage)

Scale	Item	Alpha
Job demands (6 items)	My job demands ask/require from me to solve work-related problems within a limited time frame	.86
Job control (4 items)	To what extend do you have the ability to decide on the sequence of your tasks, decide when to interrupt your tasks?	.77
Quality of feedback supervisor (4 items)	I find the feedback of my supervisor very useful	.90
Availability of feedback supervisor (4 items)	My supervisor is too busy to provide me with feedback. (recoded)	.71
Quality of feedback co-workers (4 items)	The feedback that I receive from experienced colleagues is useful for my job	.95
Availability of feedback co-workers (4 items)	I have daily contact with experienced colleagues during my job	.88

is to provide students with typical skills required in industrial production and to give them an insight into the organization as well as working methods applied in industrial enterprises. Students' learning activities during this internship were measured by means of a German version of an earlier developed and validated Dutch questionnaire to measure student learning, job demands, job control and social support of students in engineering education (Gijbels et al., 2014; Gijbels, Raemdonck, Vervecken, & Van Herck, 2012). Job control is measured as the amount of say an employee has in his/her job (decision authority). The respondent is asked about the extent to which the job that the students perform at their learning workplace provides them with the opportunity to 'stop working when they like' or 'to determine their own way of working'. Job demands are measured by means of statements such as 'My job requires that I work very hard' (see also Table 10.1). Social support was measured based on scales that were originally used in the study by Van der Rijt et al. (2012) and was operationalized in terms of the quality and quantity of feedback that was received from both co-workers and supervisors.

Dimensions of student learning are measured in this questionnaire by means of a selected set of scales from the Inventory Learning to Teach Process (ILTP, Donche & Van Petegem, 2005; Oosterheert, Vermunt, & Denessen, 2002) as adapted by Gijbels et al. (2014) for the context of engineering education.

As a performance indicator, students' perceived competence was measured. We used the self-report measure that was developed for engineering in the study by Gijbels et al. (2014), to capture students' own perceptions of their general engineering competence.

The resulting questionnaire consists of 58 statements which were entered on a Likert scale from 1 (entirely disagree) to 7 (entirely agree). The resulting scales, number of items for each scale and an illustrative item for each scale and the Cronbach's alpha score for each scale are summarized in Tables 10.1, 10.2 and 10.3.

The questionnaires were distributed electronically and the participants had the choice between online submission and paper-and-pencil submission.

Table 10.2 Dimensions of knowledge construction and regulation (process)

Scale	Item example	Alpha
External regulated knowledge construction (4 items)	I ask my mentor what he/she doesn't like about my work during internship	.67
Self-regulated knowledge construction through self-regulated information seeking and actively relating theory and practice (4 items)	I try to find answers to my questions about my work during internship by consulting the literature on my own	.78
Shared regulation of knowledge construction of workplace experiences through contacting and being involved in discussions with peers (5 items)	Through discussion with experienced colleagues, I further develop my ideas about working as an engineer	.79
Avoidance of learning (recoded, 4 items)	I search for the cause of a bad work experience during internship	.83

Table 10.3 Self-perceived competence (product)

Scale	Item	Alpha
Perceived competence by student (5 items)	I am satisfied about my competencies as an engineer	.95

10.5 Results

This section indicates the results of the statistical analyses on differences in dimensions of learning during internships. Table 10.4, firstly, shows the correlations between the learning dimensions scales, Table 10.5 then shows the correlation between presage and process scales and Table 10.6 finally shows the correlations between presage respectively process scales and the product scale (all Pearson).

The correlations show meaningful patterns, since the scales indicating learning dimensions are positively intercorrelated, whereas avoidance orientation is negatively correlated to all other learning dimensions. Neither ceiling effects nor minimum effects are to be found, since the scales reach from 1 until 7. For the interpretation of the correlation coefficients presented below, it is important to acknowledge that the students agree to apply different regulation and processing activities at the workplace (i.e. means above 4) and show to a far lesser extent avoidance of learning (i.e. mean below 3).

As Table 10.5 at a first glance indicates, feedback of supervisors or co-workers seems to be associated with how students regulate and process learning at the workplace. Shared regulation of knowledge construction is found most clearly associated with both the availability and quality of feedback. It is remarkable that neither job control nor job demands are significantly correlated with different ways of active regulation and knowledge construction.

Table 10.6 indicates significant correlations only between job characteristics and self-perceived competence. Feedback and learning orientations correlate just in an insignificant amount.

Table 10.4 Mean scale scores, standard deviations and correlations (Pearson) between learning scales

	Mean	SD	(1)	(2)	(3)
(1) Self-regulated	4.85	1.31	1		
(2) External regulated	4.23	1.28	.379*	1	
(3) Shared regulated	4.68	1.28	.457**	.556**	1
(4) Avoidance of learning	2.67	1.23	−.530**	−.304*	−.548**

Note: *$p < .05$; **$p < .01$; 7-step Likert scale: 1 = low dimension … 7 = high dimension

Table 10.5 Correlations (Pearson) between the different job-related variables and the dimensions of knowledge construction and regulation

	Self-regulated	External regulated	Shared regulation	Avoidance of learning
Job control	.171	−.020	.154	−.322*
Job demands	.282	.090	.284	−.219
Quality feedback supervisor	.304*	.272	.438**	−.372*
Availability feedback supervisor	.053	.293*	.321*	−.196
Quality feedback co-workers	.240	.261	.544**	−.331*
Availability feedback co-workers	.235	.474**	.577**	−.397**

Note: *$p < .05$; **$p < .01$

Table 10.6 Correlations (Pearson) between job-related variables, dimensions of knowledge construction and perceived competence

	Self-perceived competence
Job control	.334**
Job demands	.475**
Quality of feedback supervisor	.179
Availability of feedback supervisor	.157
Quality of feedback co-worker	.185
Availability of feedback co-worker	.143
Self-regulated	−.079
External regulated	−.114
Shared regulation	−.090
Avoidance of learning	.056

Note: **p < .01

10.6 Discussion

The study revealed some remarkable results in that sense that they do not fully meet the theoretical assumptions. Below, we first will discuss the results on each of the research questions and then will rise some other (mainly methodological) points of discussion.

10.6.1 Research Question 1: Relations Between Presages and Processes

Table 10.5 shows the result of statistical correlation analyses between job-related issues and dimensions of knowledge construction and regulation. In order to keep the discussion clear, self-regulation, external regulation and shared regulation of knowledge (construction) may be called learning orientation for this discussion and may be interpreted as the contrast to avoidance of learning.

The most remarkable issue is that neither job control nor job demands are significantly correlated with any dimension of student learning. This finding suggests twofold thoughts. Firstly and in contrast to the learning hypothesis and to earlier research (e.g. Gijbels et al., 2014), students who differ in reporting work-related challenges in internships do not (statistically significantly) differ in their reports of dimensions of knowledge construction and regulation. This could mean that students who do not experience challenging and demanding work environments tend to learning orientations similar to those students who experience challenges during their internships – or that all students do (or do not) tend to learning orientations during their internships – independent from the challenges they face during their internships. The means shown in Table 10.4 suggest assuming that all tend to learning orientations during their internships. This may be interpreted in a way to understand learning orientations rather as kind of cognitive style in sense of a personal trait (Zhang & Sternberg, 2006) than to understand it as depending on influences from work environment. Secondly, the choice of dimensions of knowledge construction and regulation is obviously not depending on the job characteristic and quality of task but rather depends on the availability and quality of social support at the workplace.

Shared regulation of knowledge is positively correlated with availability as well as quality of feedback from colleagues and from supervisors. Without social support it becomes difficult to apply a shared regulation of knowledge. However, it shows that co-workers' feedback is not significantly correlated with self-regulated knowledge construction and regulation. The only significant correlation can be found between self-regulation and the quality of supervisors' feedback, suggesting that feedback from the supervisor seems to impact learning, while the feedback from the co-workers seems not to do in this study. This result again is not in line with the earlier study from Gijbels et al. (2014). Obviously, the students in this study take supervisors' feedback more serious than their co-workers' feedback. This special importance may provoke them to reflect upon work experiences. One possible reason for this may be seen in the fact that internship supervisors are serving not only as bosses but also as mentors for their students. It appears plausible, however, that external knowledge construction and regulation is positively correlated with the availability of supervisors' or co-workers' feedback. The items rather reflect students' active attempts to get information from colleagues or supervisors than the use they can make of these attempts.

10.6.2 Research Question 2: Relations Between Presages/Processes and Product

Whereas job characteristics do not show any significant correlation with processes of workplace learning as operationalized in this study, they are the only presage or process variables which correlate significantly with the self-perception of competence as product variable of workplace learning. Obviously, the students define their self-perception of competence through the tasks they are assigned to. First of all, students interpret challenging working tasks as an acknowledgement of their competence; additionally, these findings indicate that they are usually not assigned to overwhelming tasks. In the sense of Karasek's model, the students obviously feel a balance of high demands and high control. Hence, this subjective perception of that balance in accordance correlated with the feeling of competence can be interpreted as a compliment for their internships and their supervisors who assign them to appropriate working tasks.

However, it is interesting that correlations between process variables and self-perception of competence did not occur. Even though the students' reactions to the questionnaire show that feedback is correlated to dimensions of knowledge construction and regulation (as discussed above) – which are from a theoretical point of view related to learning processes – their reactions do not relate them to the self-perception of competence. Obviously, the student appropriately discriminates learning processes (knowledge construction and regulation) and learning outcomes (competence). Under such a perspective, competence arises not only from feedback provided during the internships but also – and obviously more importantly – from sources beyond feedback, e.g. reflection, previous knowledge and theoretical knowledge developed during their study programmes.

10.6.3 Methodological Issues

From a methodological view, the lack of any external judgement of the students' competence is to be acknowledged as major limitation of this study. The restriction towards the subjective self-perception of competence opens space for biases, since it remains unclear which reference parameters and scale bases the test persons apply and what quality of aspiration the test persons follow. Of course, an external judgement of competence is not necessarily a guarantee of a valid and reliable judgement, but it could be compared with self-reports and would so be an interesting supplementation to the findings. However, the present data collection was not integrated into a larger cooperation between university and enterprises. The contact to supervisors failed and the external judgement, thus, had to be resigned for pragmatic reasons.

The reliability of the scales is sufficient, and the constructs applied in the questionnaire, hence, worked appropriately and in a similar sufficient way as in former studies in which the questionnaire was developed. Thus, the translation from the

Flemish into the German version did not limit the quality of the questionnaire which may initiate the use in further studies. A larger sample will also allow more complex analysis that question interaction effects in future research.

10.7 Conclusions

It is clear from this exploratory study that individual differences in students' regulation and processing in the workplace are present. In line with theoretical and partly empirical findings, this study shows that not all engineering students engage in learning during internships in the same way. Students make use of different sources of regulation and engage in different activities regarding knowledge construction. They also make use of different sources of feedback at the workplace. Also in line with former research (e.g. Gijbels et al., 2014; Harteis, 2012), it was found that how students learn at the workplace is partly interrelated with the availability and quality of feedback from co-workers or supervisors.

The assumed relationship between student learning and self-perceived competence was however not present. These outcomes indicate that learning during internships in particular and workplace learning in general are complex processes in rich social and environmental settings. The 3-P model as suggested by Tynjälä (2013) aims at providing an appropriate pattern for the analysis of these processes and the investigation of influencing factors. The study described in this chapter focused on a narrow selection of the 3-P model and leads to interesting findings. This attempt of getting insight into student learning during internship may encourage developing a more comprehensive empirical approach which allows to test the 3-P model by structural equation modelling. However, such an approach demands a larger sample size as well as a higher commitment of both students and assessors of students' competence levels.

Nevertheless, the 3-P model of workplace learning appears suitable to appropriately distinguish acting from learning. It allows considering various product variables, so that achievement orientation may be considered in such an empirical study as well as learning orientation. It would be possible to gather data both on work performance – even on a collective level – and on learning outcomes.

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Chapter 11
Employing Agency in Academic Settings: Doctoral Students Shaping Their Own Experiences

Michael Goller and Christian Harteis

Abstract The majority of research on doctoral students' success is aimed at the identification of personal and/or situational factors that contribute to PhD candidates' attrition and persistence, respectively. By doing so, the literature has adopted a rather passive perspective towards PhD candidates and their development. The active role of candidates being agentic constructors of their academic career has been widely neglected. This study therefore focuses on how PhD students can take an active approach towards their academic development. A qualitative interview study with ten German faculty members was conducted to answer the following research questions: (1) How do supervisors conceptualise academic success of PhD students? (2) How does professional agency affect academic success of young researchers? (3) What individual and/or contextual factors affect the exercise of professional agency? Based on these interviews, evidence is reported on how doctoral candidates can indeed affect their academic development and eventually their success by exercising professional agency. Among others, the study participants mentioned proactive networking, negotiation of external demands and deliberate information and feedback seeking as important manifestations of professional agency in academic contexts.

11.1 Introduction

The work of doctoral candidates is quite unique from a workplace learning perspective. In their everyday work, PhD students have to engage with literature and research methods that have often not been part of their undergraduate or graduate

M. Goller (✉) • C. Harteis
Institute of Educational Science, University of Paderborn, Paderborn, Germany
e-mail: michael.goller@uni-paderborn.de; charteis@mail.uni-paderborn.de

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studies. Moreover, to earn a PhD, successful candidates have to demonstrate their ability to conduct and report original research with the aim of expanding the current level of human knowledge (Council of Graduate Schools, 2004; QAA, 2008; Wissenschaftsrat, 2011). This requires the candidates to synthesise newly learned knowledge and to creatively apply it to a set of research problems. Research therefore assembles the process of problem solving, and students are essentially employed to learn how to solve the problems connected to their research question. However, such a demanding task might pose difficulties for some students. Although reliable data does not exist (Destatis, 2012), it is estimated that approximately two thirds of those who start a PhD in Germany do not finish their degree (BMBF, 2008). Similar attrition rates have been reported in certain disciplines for other countries like the United States (e.g. Bair & Haworth, 2004).

High attrition rates are both an issue of concern on the individual and the institutional level. Individuals invest time and money into their degree which does not result in expected outcomes like a career track in academia or better employment opportunities outside academia. Furthermore, individuals often experience some kind of psychological damage because of a long-enduring feeling of failure (Lovitts, 2001; Willis & Carmichael, 2011). For universities each non-completed PhD results in sunk administration costs, time invested in supervision that could have been spend differently as well as a loss of potential research outcomes and reputation (Bair & Haworth, 2004; Malone, Nelson, & van Nelson, 2004).

Due to the relevance of the topic, many studies have focused on the identification of factors that contribute to doctoral students' attrition and persistence, respectively (for a review, see Bair & Haworth, 2004; for more recent studies, see, e.g. Ampaw & Jaeger, 2012; Wao, 2010). However, so far the literature has only adopted a rather passive perspective towards PhD students and their development (Hopwood, 2010a) by mostly focusing on the identification of stable non-psychological factors and/or contextual factors. The agentic role of PhD students being active constructors of their academic career has been widely neglected.

This study therefore focuses on how PhD students can actively take matters into their own hand by taking an agentic approach towards their academic development. To answer this research question, ten PhD supervisors were interviewed. A positive psychology approach (Seligman & Csikszentmihalyi, 2000) was adopted by focusing exclusively on factors that contribute to persistence and academic success rather than attrition.

This contribution is structured as follows: Section 11.2 gives an overview on research about PhD students as well as factors contributing to attrition and persistence, respectively. In Sect. 11.3 the concept of professional agency is introduced, and it is explained how young academics can actively influence their academic development. Section 11.4 develops the methodological approach used in this study before reporting the results in Sect. 11.5. The results are discussed in Sect. 11.6. This contribution concludes with a summary of the findings and a research outlook.

11.2 Research on PhD Students

The PhD is a postgraduate academic degree awarded by universities. The degree signals that its holder is able to do original academic research. In order to obtain a PhD, a candidate usually has to submit a written thesis documenting a theoretical and/or empirical research project that contributes to the current level of human knowledge. In its core, this requires successful candidates to show high initiative and creativity (Council of Graduate Schools, 2004; QAA, 2008; Wissenschaftsrat, 2011).

A high share of PhD students start pursuing the doctoral degree directly after finishing their graduate studies at a master-equivalent academic level. The process of becoming a PhD candidate can best be described as transition from a rather passive knowledge consumer who mainly sits in lectures or seminars to a relatively independent researcher with a focus on creating new knowledge by using scientific methods (Gardner, 2008). After commencement, the PhD can be characterised as a professional socialisation process. The candidate has to learn about discipline and working group-specific values, attitudes, norms as well as necessary skills and knowledge (Gardner, 2008, 2009).

A normal work day for a PhD student, employed by a university, is not limited to work on their chosen research topic (e.g. Jazvac-Martek, Chen, & McAlpine, 2011). For their German sample Gerhardt, Briede, and Mues (2005) report that on average only about 50 % of the working time of a PhD student is used for the dissertation project. About 20 % of the time accounts for other (research) projects, about 20 % for teaching and student supervision and about 10 % for administration tasks. Since this workload can easily be overwhelming, good self-management and self-planning abilities are essential. A range of studies showed that self-management and self-planning competencies are significantly related to doctoral students' success (Coromina, Capó, Guia, & Coenders, 2011; Gardner, 2009; Gardner, Hayes, & Neider, 2007; Pearson, 1996).

However, good self-management abilities do not prevent PhD candidates from encountering unexpected problems with their research and – associated with this – uncertainty about the dissertation's progress (e.g. Ingleton & Cadman, 2002). In fact, Gerhardt et al. (2005) report that almost 60 % of the doctoral candidates in their sample are behind their initial time plans. Other reasons for frustration are a general lack of time, negative affects, intellectual or writing blocks, resource constraints as well as the pressure of high standards and expectations (Jazvac-Martek et al., 2011; Robinson, 2008). It is therefore absolutely necessary that young researchers find strategies to deal with this kind of frustration (Bair & Haworth, 2004; Hopwood, 2010a). More successful PhD candidates seem to feature higher research self-efficacy (Brown, Lent, Ryan, & McPartland, 1996; Faghihi, Rakow, & Ethington, 1999; Hollingsworth & Fassinger, 2002) and a higher internal locus of control (Castro, Garcia, Cavazos, & Castro, 2011) than their less successful counterparts. It is important that doctoral students build up commitment to their research and some kind of never-give-up attitude (Bair & Haworth, 2004). Other important factors that might contribute to handling frustration, setbacks and disappointments

are a clear vision of the future (Gardner, 2009), clear career goals (Bair & Haworth, 2004) as well as a high general ambition (Gardner, 2009).

Apart from individual factors, social contacts, e.g. academic peers or supervisors, are highly important to cope with stress and frustration. The advisor or supervisor of the PhD thesis plays a key role in doctoral students' development. PhD advisors tend to be more active in the earlier stages of doctoral studies (Pearson, 1996). The advisor has a better understanding of the academic setting in general and the PhD candidate's research topic in particular (Kandiko & Kinchin, 2012). Thus, the advisor can offer important help and guidance with the choice of the research topic, with research problems as well as general academic matters. Research shows that a positive relationship with the advisor contributes to doctoral students' success (e.g. Bair & Haworth, 2004; Faghihi et al., 1999; Lan & Williams, 2005; Maton et al., 2011). Bair and Haworth (2004) report that, for instance, the frequent contacts, the ability to talk about encountered problems as well as a relationship of trust with the advisor are important predictors for successful degree completion. Additionally, Coromina et al. (2011) found evidence that the advisor's performance is positively correlated with doctoral student performance.

Besides the advisor, the contact to other individuals is highly connected to PhD completion and academic success. Bair and Haworth (2004), for instance, report that completers are more likely to be somehow involved with academic peers. Doctoral students with more relationships seem to have fewer difficulties with their academic progress as well as lower completion times in average (Jazvac-Martek et al., 2011). Especially colleagues act as main support resources for research (Coromina et al., 2011) by providing feedback or being a general resource for building up motivation (Jazvac-Martek et al., 2011). Weidman, Twale, and Stein (2001) argue that contacts outside the own current academic context are particularly important. Students who do not engage with a larger circle of peers may miss out on important academic experience (Pearson, 1996).

A high share of empirical studies reported here is concerned with individual or contextual factors that explain doctoral students' success. However, the proactive role of PhD candidates as agentic constructors of their academic career has been largely neglected. This is significant since another important finding of research on doctoral students' performance is that motivation and high levels of self-direction are perceived as very important factors (e.g. Bair & Haworth, 2004; Gardner et al., 2007). Such findings seem fully understandable since the PhD degree requires candidates to show high initiative as well as high creativity to plan, conduct and document a 3–6-year research project.

11.3 Professional Agency

A possible construct to conceptualise and investigate the proactive role of doctoral candidates is "professional agency". Professional agency can best be defined as the general capacity and disposition to make intentional choices, to initiate actions based on these choices and to exercise control over the self and the environment

(Eteläpelto, Vähäsantanen, Hökkä, & Paloniemi, 2013; Harteis & Goller, 2014). Exercising agency means to engage in self-directing behaviours that allow one to exert control over one's own professional life course.

In general, agency is about actively navigating the professional experiences using intentional activities (Hopwood, 2010b). The opposite of agency would be a rather reactive behaviour. Instead of making intentional choices and initiating purposeful activities, individuals that exercise passive or undeveloped agency tend to react and comply with external forces and conditions. Such individuals are highly dependent upon other people and experience themselves as being less effective in controlling their lives. In analogy to chess, DeCharms (1968) coined the term pawn for those individuals that have undeveloped agentic capacities and origin for their more agentic counterparts.

Agentic individuals perceive a high locus of control within themselves (Rotter, 1966). They are able to identify current needs, to picture goals and objectives as well as to translate those needs and objectives into appropriate activities (Hopwood, 2010b). Thus, exercising agency relates to becoming active in order to seize opportunities that are related to current needs and prospective objectives. The exercise of professional agency can therefore lead to new development opportunities at work (Harteis & Goller, 2014). Agentic individuals might, for instance, actively seek new learning experiences by participating in unfamiliar work tasks (see Goller & Billett, 2014, this volume) or by proactively asking for training opportunities.

A few studies report about agentic activities that are related to doctoral students' success. Malone, Nelson, and van Nelson (2004), for instance, found empirical evidence that students, who successfully completed their doctoral degree, took ownership of their own development in comparison to non-completers. Pearson (1996) and Grover (2007) state that it is important that students are proactively seeking assistance and advice. Additionally, Pearson (1996, 313) emphasises "that seeking assistance is more likely to be a sign of enterprise and independence rather than a sign of being dependent or in difficulty". Doctoral students can explicitly not expect that supervisor or academic peers are constantly monitoring their progress. They have to become proactive if they are in need of assistance. Other agentic activities might include an active approach towards networking (Hopwood, 2010a; Jazvac-Martek et al., 2011). As described above, establishing a wide network of academic contacts can provide important resources. Having contacts to experts in certain fields may allow doctoral students to obtain feedback on their own work or to discuss encountered problems. A more radical agentic activity might be the change of supervisors (Jazvac-Martek et al., 2011). Such a step might be necessary if a doctoral student realises that his or her current advisor might not be suited to supervise the PhD thesis in an appropriate way.

Other agentic activities are more connected to certain goals. Robinson (2008), for instance, reports about a student who envisioned a future position as faculty member in a college that focuses mainly on teaching and not research. This student planned to improve her teaching ability by seeking out more opportunities to teach while doing her PhD. Other students purposefully engaged in teaching or other voluntary academic activities with an intention "to build academic career capital" (Hopwood, 2010b, 835).

11.4 Research Questions and Methodology

This exploratory study was guided by the following research questions:

1. How do supervisors conceptualise academic success of PhD students?[1]
2. How does professional agency affect academic success of young researchers?
3. What individual and/or contextual factors affect the exercise of professional agency?

To answer these questions, interviews with ten German university professors were conducted in 2012. Tenured professors were chosen as research subjects because they can be understood as experts on the development of doctoral students. First, they have been successful doctoral students themselves who managed to stay in academia and to gain a full professorship. Second, their extensive experience in academia allowed them to engage with a high variety of different doctoral students. Third, they have been engaged in doctoral students' development through their function as advisors and supervisors.

All professors were approached based on the prior contact of one of the authors. Out of the 10 professors, 8 were males and 2 were females. The proportion of female professors in this sample is approximately equivalent to the overall proportion of female professors in Germany (Destatis, 2012). On average the interview participants were 59.1 years old, have earned their PhD 24.5 years ago and have served as full professors a time span of approximately 15 years. Three of the participants were retired at the time of the interviews. Most interviewees were professors of general educational science ($n=6$). Three participants were professors for vocational education, and one interviewee was a professor for organisational psychology. All together the participants were drawn from seven different universities across Germany.[2]

All interviews were conducted over the phone by the first author. A semi-structured interview guideline was used to ask several open-ended questions. The theoretically

[1] This question was asked since research of Gardner (2009) showed that apart from PhD completion a range of factors are accounted as doctoral students' success. In her research Gardner found different conceptualizations of success between different disciplines. As output criteria the faculty staff named research dissemination (Communication), job satisfaction (Oceanography), secure employment and dissemination (English), as well as a good position after graduation (Mathematics). It is interesting that only one of the 38 interviewed faculty member equated degree completion to success. This is surprising since the high quote of non-completers in the most disciplines is overwhelming.

[2] In comparison to many Anglo-American countries, the most German PhD students do not study in structured PhD programs (although such programs do exist). The majority of PhD students are employed by the university in a fixed-term position, whereby a full position is accompanied with teaching duties of 4 h a week during term time. The doctoral candidates' supervisor is not only their intellectual advisor and eventually examiner but also their direct legal superior. In general the university is based on academic self-administration ("Akademische Selbstverwaltung"), meaning that decisions concerning the development, staffing or teaching of the university have to be made in academic committees consisting out of faculty members, postdocs, doctoral students, non-research personnel and undergraduate students. For more information about the German university system, see Kaulisch and Hauss (2012) or Teichler, Arimoto and Cummings (2013).

based guideline was pilot tested on one professor. However, since the guideline did not change substantially after the pilot test, the pilot interview was included into the final interview corpus. With prior approval, all interviews were recorded for later transcription. The interviews lasted from 47 to 65 min.

Each interview was transcribed verbatim. The comprehensive text material was analysed using qualitative content analysis by Mayring (2004). At first, a deductive coding system was derived from the literature using the following structure: main category, category, subcategory, definition, typical example and coding rules. It included categories like "[success criteria] – [position after completion]", "[agentic efforts] – [self-management]" or "[individual characteristics] – [self-efficacy beliefs]". After five interviews were coded, the category system was revised. Categories that could not be assigned to the research material were removed, and other categories were refined or redefined. This coding cycle was additionally used to derive new codes based on themes emerging from the interviews (inductive category building). The final code system comprised nine main categories and 55 categories on the lowest level. By the end, 497 text passages were coded across all interviews. Only such text passages were coded that contained new information. Plain repetitions of arguments were not coded. Subsequently, all text passages were paraphrased and reduced to their core proposition within each subcategory.

Table 11.1 shows the distribution of all categories described in the findings section for all study participants. As can be seen, not all categories could be found in all interview transcripts. However, for all but one category, at least three different study participants mentioned certain aspects that could be assigned to the concerning category.

11.5 Findings

11.5.1 Success Criteria

Most interviewees distinguished between candidates that aim at staying at the university and eventually want to become a full professor and those that want to leave university after completing the degree to work in industry.

Dissemination of research results by means of publications in peer-reviewed national and international journals as well as presentations at distinguished conferences was mentioned as one of the most important success criterion for students with an academic career goal. In this context, it was additionally mentioned that successful doctoral students manage to significantly contribute to the current knowledge of their scientific community. Through this contribution, a certain standing within the research community can be achieved:

> I would describe it this way: That the student establishes him or herself within the scientific community. That means to be able to publish successfully and to successfully present at conferences in order to position him or herself within the scientific community. (P7, male)

Table 11.1 Distribution for reported categories and study participants

	Study participants										
Categories	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	*Total*
Success criteria											
Thesis completion	–	–	–	4	–	–	–	–	–	–	*4*
Research dissemination	–	2	2	–	2	–	4	–	1	–	*11*
Position after completion	1	1	1	–	–	–	1	1	–	–	*5*
Other	–	–	5	–	–	2	1	–	–	3	*11*
Agentic efforts											
Socialisation efforts	1	1	–	2	2	–	–	–	2	–	*8*
Self-management	4	–	–	2	–	1	3	9	–	–	*19*
Dealing with supervisor	6	1	6	6	2	2	1	1	–	1	*26*
Establishing and maintaining relations	1	1	–	1	5	–	2	–	5	1	*16*
Using relationships with colleagues	6	1	–	2	1	–	8	–	6	–	*24*
Developing relevant competencies	1	2	1	3	2	7	2	3	7	3	*31*
Research dissemination	4	1	1	2	7	–	7	2	4	1	*29*
General statements concerning agency	1	4	4	–	–	1	1	1	–	–	*12*
Identification of needs	1	1	–	1	1	1	1	–	–	2	*8*
Individual characteristics											
Self-efficacy beliefs	2	–	–	–	3	2	–	2	–	2	*11*
Job involvement and commitment	–	3	1	–	1	–	1	–	–	–	*6*
Frustration tolerance	1	1	–	–	–	1	2	–	2	–	*7*
Ambition and persistence	2	–	–	–	3	–	1	–	–	–	*6*
Career goals	6	4	–	3	3	5	6	2	2	2	*33*
Contextual factors											
Funding/type of position	1	1	–	6	2	1	–	4	–	1	*16*
Family and private life	4	–	–	–	3	1	1	2	2	–	*13*
Working group/team	–	–	–	2	1	–	1	–	6	1	*11*
Supervisor	7	3	2	–	–	3	1	–	1	2	*19*
Agency development	5	2	–	–	3	3	1	–	–	–	*14*
Total	*54*	*29*	*23*	*36*	*41*	*30*	*45*	*28*	*38*	*19*	*343*

To obtain a postdoc and eventually a tenured position after completing the PhD was the second most brought up success criterion. Other mentioned success criteria are a deep understanding of the academic system and a general understanding of science and research in combination with joy and satisfaction emerging from the daily academic work. Only one interviewee acknowledged the successful completion of the PhD itself as important achievement.

Success for candidates that want to work outside the academic system was mainly associated with short completion times and further career achievements (e.g. higher remuneration and/or more decision-making competences). A high level of scientific contribution and dissemination of research results was often mentioned as not being relevant for those candidates.

The majority of statements concerning agency were focused on candidates aiming to become a full-time, tenured researcher. Thus, the now following description of findings is limited to this group. Statements about candidates aiming to leave university to work in industry are not reported.

11.5.2 Agentic Efforts Contributing to Academic Success

In general all interviewees perceived doctoral students as inherently responsible for their own academic success. The nature of doctoral studies and the academic system requires PhD students to work independently and to agentically deal with demands related to their prospective career goals.

> I would not only say they have the opportunity to affect their success but rather they are in charge of it. I would go as far and say they are subjects of their success and failure. (P3, male)

11.5.2.1 Dealing with Supervisors

As supervisors the interviewed professors understood their roles as supporting the efforts of their PhD students in the best way possible. However, since supervision is only a small fraction of the overall work of faculty members, they emphasised that doctoral students have to actively disclose their needs and issues connected to their research as indicated in the following statement:

> They have to be sure what they want and they cannot wait till somebody is taking them by their hand or that they will be guided. They have to actively demand such things. (P4, female)

Doctoral students are expected to deliberatively report about research progress and emerging issues. An often described way to do this was handing in written material in order to receive feedback. However, one interviewee pointed out that feedback should not be demanded too often, but only if substantial progress was made.

Apart from their supporting roles, supervisors often tend to delegate research and/or administration work to their students. It is therefore important that doctoral students learn to negotiate these kinds of demands. Especially if tasks consume too much time and prevent dissertation-related research, doctoral students are advised to discuss this issue with their supervisors:

> … that they communicate their own time plans. Like this: Dear supervisor, in this time period I will be available for you, but in this other time period I ask you to be released from non-dissertation tasks. There I really want to have time for my research. Another important thing is to inform your own supervisor that some requests are ok but others not. An important ability is to say 'No'. (P1, male)

If external demands fully prevent own research efforts, some interviewees considered a change of supervisor as last resort.

11.5.2.2 Establishing and Maintaining Relations to Peers and Other Researchers

In almost all interviews the important role of academic peers and other researchers was acknowledged. Especially their potential function as sources for feedback and help was emphasised.

Academic peers, especially other PhD students and befriended postdocs, are often perceived as being less distant than the supervisor and having similar problems in regard to daily research. For many doctoral students, it is therefore easier to speak with those peers about current research problems, emerging methodological questions or even emotional issues. However, doctoral students cannot expect that peers automatically offer their help. Feedback and assistance has to be proactively sought:

> MG: "And obviously you can seek feedback if you need it."
> P2: "This can be done anyway, but sure, that requires that you are actually doing it." (P2, male)

However, trustful relationships with significant and knowledgeable peers do not exist automatically. Especially those peers that are interested in similar research questions or that have certain methodological knowledge might not always be part of the own working group. It is therefore important that doctoral students deliberatively establish and maintain an appropriate network of academic contacts that can be utilised as important research resources. Agentic doctoral students typically use such networks for exchanging new and relevant research findings, to discuss topics in depth or even to start research projects that sometimes end up in co-authored publications. Two interviewees summarised this as follows:

> And in academia it is always important to cultivate social contacts. That's where you get feedback or tips about new development etc. (P9, male)

> The other thing is, that I think, becoming a successful academic requires to know who works on research question that similar to one's own. And that it eventually comes to an exchange. That also means I cannot hide and work solely but rather keep my eyes and ears open and seek for new contacts. I cannot expect other academics that work on similar topics as I do to contact me. So if I realise that somebody works in the same area, why don't I just contact her? (P5, female)

Many interviewees named conferences, workshops or summer schools as important opportunities to meet new contacts. Doctoral students are advised therefore to deliberatively look for appropriate events that permit to establish and maintain their professional network.

11.5.2.3 Research Dissemination

All faculty members but one emphasised the importance of early dissemination of research conducted by doctoral students. Presentations at scientific conferences were mentioned as the most common way to present one's own research approaches,

new ideas and preliminary results. However, early publication of results in collected editions or scientific journals was also recognised as viable approach.

Research dissemination allows doctoral students to get early experience about core activities that characterise the research profession. Learning how to structure consistent arguments, to report empirical results and to defend one's own ideas was mentioned as important to become a successful researcher. In particular, the development of writing competencies was perceived as crucial as one faculty member reports:

> From my point of view, I would say that publishing early in the career helps to learn academic work. That's because you have to think about parts of your work, you have think how to obtain data if you work empirically. You also have to think about the academic writing. And this works best if it is practised on publications for collected editions or journals instead of ending up with a high pile of unfamiliar tasks at the end of your PhD. This may also explain some of the drop outs. They might have been overwhelmed with writing a complex thesis. They know about the theory, the have the data, they even have some text modules. However, they do not know how to compile all of this into a consistent publication. If you practice publishing from the very beginning on this can only be helpful. (P5, female)

Furthermore, research dissemination was perceived as an early way to take part in scientific discourses, since most conferences and journals review contributions and give extensive feedback about the quality of submitted contributions. One interviewee emphasises the importance of such feedback for professional development:

> Well, essentially it is learning by doing. That means, one should try relatively early in the career, yeah, try to publish in journals – not only the unpretentious ones. Of course, the quality requirements have to be fulfilled, but still, that one chooses also high-ranked journals to submit to and to publish in. This way, because of the sophisticated review systems of most high-ranked journals one gets quite some feedback with important information about the submitted article. This is a way to start professional learning cycles… (P7, male)

Other interviewees mentioned that conference talks and publications can also be used for regulation purposes. Especially fixed deadlines require students to concentrate on certain goals, to codify and specify yet vague ideas and concepts and analyse existing datasets. This way candidates can use conferences and publications as important milestones to structure their dissertation projects:

> Like I deliberately set appropriate goals in the sense of sub-goals. I mean always to look out for opportunities to publish stuff; or what conferences are important for me to present my self in order to network. From my perspective, if somebody is not doing this early enough and in a consequent way there is no way this person is getting tenure in his or her domain. (P7, male)

Another important effect of early dissemination of research is an increased recognition of the doctoral student within the relevant scientific community. Many interviewees emphasised that scientific recognition is especially important to gain university positions after finishing the doctoral degree. The quantity and quality of presentations as well as publications is used as indicators for overall academic quality for potential job candidates.

11.5.2.4 Self-Management

The work as doctoral student provides manifold opportunities to engage in a range of different activities like teaching, non-thesis-related research projects or committee work. However, it was often mentioned in the interviews that doctoral students are advised to spend their main time on research or activities that directly contribute to the completion of their PhD thesis.

Although the interviewees greatly acknowledged that the engagement in other kinds of research and non-research activities often allowed doctoral students to make important experience and to learn academically relevant skill sets, it also bears the risk to lose sight of the dissertation work. One professor expressed his concerns as follows:

> Anything is interesting and as long it is still time till the work contract ends, some tent to try all kind if things. However, other make concrete plans and learn to say 'no' to certain demands and concentrate on their thesis. (P8, male)

Especially side projects that allow to make fast progress and to get frequent positive feedback as well as affirmation may get more attention and more effort than dissertation projects that do not make similar progress.

It is therefore the doctoral student's task to actively prioritise and manage available time. An often mentioned strategy is to enumerate all relevant tasks and to schedule them around the core dissertation work. In some interviews, it was emphasised that successful candidates additionally manage to communicate their time demands and work-related priorities both to supervisors and family members. This way time can be set aside where students can work undisturbed on their thesis.

11.5.2.5 Other Agentic Efforts

The deliberate organisation of research stays abroad was also mentioned in some interviews. Especially for non-English native speakers, such research fellowships provide the opportunity to improve success-relevant language skills. However, as two interviewees reported, research stays were also deliberately used for learning new research-related competencies (like special methodologies) and to meet and work with experts in specific fields. In certain cases, our interviewees even experienced doctoral students that managed to use the time abroad for publications with the local researchers.

Many interviewees pointed out that most doctoral students lack methodological skills and knowledge when they start their PhD. Since most students in Germany do not study a structured postgraduate programme, the deliberate development of necessary research skills was seen to be highly relevant. Apart from self-study, the participation in research workshops and summer schools was often mentioned as useful strategies for competence development. However, students have to take the initiative in order to participate in such courses. Initiative in this context can range from discretely looking for appropriate courses to applying for funding.

Proactive socialisation was another important agentic effort that was mentioned in the interviews. More successful doctoral students are perceived as having better knowledge about academia in general and about the criteria that help to obtain long-term positions at the university. A possible way to obtain such information is to deliberatively participate in academic committee work or tenure procedures.

> A quite typical example for somebody who really strives for an academic career is somebody that eventually asks himself how to engage into academic committee work. Well, that's something that costs time, that somehow delays other work, something that is usually not really exciting, that's my opinion, but that's something where you can learn a lot. And that's, in my opinion, typical evidence that somebody is really interested in the university as institution. (P5, female)

11.5.2.6 Development of Agency

Although most interviewees pointed out that less successful doctoral students show less agentic behaviour, they also emphasised that few of the successful PhDs managed to exercise agency from the beginning. Particularly such activities like first conference attendances, first publications or the first participation in summer schools and workshops have been often initiated by the supervisor. However, more successful students learned the significance of such activities and subsequently showed initiative to take part in such opportunities without external intervention. In general, the study participants stressed that agentic behaviour can and has to be developed.

11.5.3 Individual and Contextual Factors Related to the Exercise of Agency

11.5.3.1 Individual Factors

Goals were mentioned as important antecedents for agentic behaviours. Especially the concrete goal to become a full professor after completing the PhD was observed to be an important driver for exercising agency that eventually results in academic success. PhD candidates that are not aware of their long-term goals may find it hard to set subgoals and to identify and realise key conditions for success (e.g. networking, dissemination of research). Without such knowledge about activities that are relevant for success, individuals have no chance to deliberatively engage in them:

> Well, the aim to stay in the academic system is absolutely important. That they – from the early beginning on – develop the prospect where they want to be in the future. And of course, you have to think about such questions: What is important to get tenure? It would be a little bit naïve to just start working and not to think about the future in the sense: 'How should I develop my profile?', 'In what directions do I want to go?' and 'What are the next steps?'. (P4, female)

However, in order to engage in those agentic behaviours that affect academic success, doctoral students have to be able to reflect about their current situation and to diagnose needs or deficits. Without such a sense of self, PhD candidates might not be able to identify those activities that help to achieve self-set goals. In this context, it is also important that candidates possess a certain degree of self-efficacy beliefs. The deliberate engagement in unfamiliar activities in order to reach goals requires the general confidence to succeed with these efforts.

Many interviewees named ambition and persistence as key personality factors that explain academic success and the engagement in agentic behaviours. Ambition can be understood as an important motivator to engage in certain kind of activities that may or may not lead to the desired outcome. Persistence on the other hand helps candidates to deal with reoccurring situations of frustration and failure. It has been agreed that the process of obtaining a PhD is characterised through a sequence of setbacks and periods of slow progress. Quite often the study participants stated that doctoral students usually experience at least one situation where they doubt the whole endeavour and consider to drop out. In such situations, doctoral students need a certain kind of frustration tolerance as indicated by one interviewee:

> Well, I'd say an important characteristic of researchers are a certain kind of persistence. I think this is a really important characteristic. That means to go through dry spells and to continue and not to be frustrated too quickly. (P7, male)

Few interviewees emphasised that PhD candidates have to be strongly committed to their topic and to research in general. Within their time as a doctoral student, the PhD has to have a high priority in the student's life. Without this level of commitment and job involvement, PhD candidates have been observed to not engage in agentic behaviours at the same level as their more committed counterparts.

11.5.3.2 Contextual Factors

The direct working situation has a strong effect on whether PhD candidates are able to exercise agency or not. The interviewees emphasised the role of the supervisor. Some supervisors tend to delegate tasks to their PhD students. Such an increased work load makes it difficult to follow individual schedules or to reach self-set goals. However, supervisors may also foster their students engagement in agentic behaviours, especially when candidates are encouraged to initiate their own projects or to disseminate their research:

> It's always a question of support. If I have a good supervisor that gives me the autonomy and sovereignty, it makes it easier. In comparison, it makes it considerably harder if I am in danger to only work for my supervisor and if my PhD is been understood as my private affair. (P1, male)

Other working group members can also affect the students' agency. One interviewee reported that more advanced, successful doctoral students or postdocs act as role models that sometimes show younger students the importance to take an active

approach towards their academic development. Teams that consist of less motivated or less successful colleagues might, on the other hand, not help to develop an agentic attitude:

> Well, I think it's the team context that's important. I mean in this ways that some colleagues act as role models but also that the team motivates each other. (P7, male)

It was also mentioned that the financial situation at the university, or the working group in specific, has an impact on the extent that agency can be exercised, especially travelling costs, attendance fees and other kinds of expenses, as these may prevent many doctoral students from taking part in conferences, workshops or summer schools when funding is not available.

The private setting of the doctoral students was also mentioned to affect how agency can be exercised. In situations where PhDs have to take care of children or parents, energy and time might not be channelled into research or research-related activities. Another impeding factor is partners that do not support efforts regarding the PhD. A partner, on the other hand, can also act as strong supporter to keep the doctoral students free of certain obligations in demanding time phases. Furthermore, the confidence in the partner as a provider for security and protection makes it easier to agentically explore certain opportunities.

11.6 Discussion

11.6.1 Research Question 1 (How Do Supervisors Conceptualise Academic Success of PhD Students?)

Our study revealed that the interviewed faculty members had different conceptualisations of academic success of doctoral candidates. Almost all interviewees distinguished between PhD candidates that plan to stay in the academic system and those who want to leave university and work in industry. For the former, almost all conceptualisations were linked to certain objective academic performance measures. Among these were research dissemination, contribution to current levels of knowledge, achievement of reputation within the scientific community, acquisition of postdocs and eventually tenured positions and job satisfaction. Interestingly only one interviewee explicitly perceived thesis completion as relevant success criterion. It seems that faculty members either take thesis completion for granted, which is not worth to be explicitly discussed, or that they perceive doctoral student's success as something that surpasses sole degree completion. In either way, these findings are similar to those reported by Gardner (2009). Gardner found evidence that success criteria differ between disciplines and that thesis completion plays only a minor role for faculty members. Our findings disclose that even faculty members in conceptually very similar domains (educational science, psychology) have slightly different conceptions of doctoral students' success. However, almost all success criteria are

mentioned in Gardner's study, as well as those reported in this study are connected to performance measures also used in tenure committees to decide about the qualification of job candidates. Success seems therefore to be highly related to candidates' chance of getting a long-term position at universities.

11.6.2 Research Question 2 (How Does Professional Agency Affect Academic Success of Young Researchers?)

All interviewed faculty members agreed that certain manifestations of professional agency have effects on the academic success of doctoral candidates. In fact the interviewees explained that the inherit nature of doctoral studies requires PhD candidates to become agentic architects of their academic development. Furthermore, the majority of the described manifestations of professional agency were directly related to formal or non-formal learning. This somehow confirms the assumption made above that the work of doctoral candidates can essentially be conceptualised as a 3–6-year long learning endeavour and that a boundary between work and learning is not existent during those years.

Proactive information and feedback seeking emerged from the interviews as a prominent way of how doctoral students can and do exercise agency. Feedback on research progress and the quality of written material is important for students to obtain a realistic perspective of their academic development, to get information about emerging problems and to get information on how to proceed. Especially in cases of setbacks or periods of lack of progress, proactive information and feedback seeking can help to overcome certain obstacles. An important source of feedback and information is the supervisor. They usually have a better understanding of the doctoral candidate's research topic and the academic world in general (cf., Kandiko & Kinchin, 2012). These findings may also explain why doctoral students that have frequent contacts to their supervisor have higher success rates than students with less frequent contacts (cf., Bair & Haworth, 2004). Furthermore, research could show that proactive information and feedback seeking was connected to performance and development in a range of occupational settings (e.g. Ashford & Cummings, 1983; Morrison, 1993; for more detail see Goller & Billett, 2014, this volume).

Apart from supervisors, academic peers or other colleagues are perceived as important sources for research-related feedback and information. As Coromina et al. (2011) as well as Jazvac-Martek et al. (2011) state, peers act both as important support resources for research and general resources for building up motivation. Doctoral candidates often perceive other PhDs and postdocs as less distant than supervisors and having similar problems as themselves. It might therefore be easier to discuss setbacks, failure or lack of progress with academic peers than with supervisors. This goes along with findings from research on workplace learning. Boud and Middleton (2003), for instance, report that supervisors are often not used as the first source for learning. The reason to choose colleagues over supervisors might be

grounded in issues of trust. A study conducted by van der Rijt et al. (2013) found evidence that trust was positively associated with likelihood to seek help and feedback at work. Additionally, our findings may also explain why other studies found positive effects of the quantity and quality of the academic network of PhD students on their academic success in general (e.g. Bair & Haworth, 2004; Jazvac-Martek et al., 2011; Pearson, 1996). However, the findings presented here emphasised that an academic network has to be deliberately established and that feedback and assistance has to be proactively sought. Similar findings have been reported by Grover (2007).

Proactive research dissemination was acknowledged as another agentic effort that can be pursued by doctoral students. Dissemination was both mentioned to be criteria for success as such as well as a means to achieve other kinds of success criteria. Presentations at academic conferences and publications in academic journals and collected editions are important means to earn reputation and prominence within the scientific community. Thus, dissemination is also some kind of requirement for success of networking efforts. However, dissemination was also mentioned in relationship to competence development. Some interviewees argued that early research dissemination helps to learn to structure arguments, to analyse data and to appropriately present one's own findings. Especially when students aim at becoming a tenured faculty member, such efforts can be understood as early approaches "to build academic career capital" (Hopwood, 2010b, 835).

Another approach to intentionally build such academic career capital, mentioned by the interviewees, was the participation in academic committee work. The deliberate engagement in such work was perceived as important to obtain necessary insights into tenure procedures and university work flows in general.

Although research dissemination, deliberate networking, academic committee work and even additional research projects with colleagues were perceived as useful for doctoral students' development and success, the interviewees emphasised that such efforts also have their downsides. It was especially stressed that such efforts may consume too much time and prevent work at PhD-related research. It was therefore mentioned that successful doctoral candidates deliberately manage their available time resources by prioritising thesis and non-thesis-related tasks. Especially the proactive negotiation of supervisors' demands and other external duties was seen as rather important. This finding confirms other studies that reported self-management and self-planning to be highly related to doctoral students' success (e.g. Coromina et al., 2011; Gardner, 2009; Gardner et al., 2007; Pearson, 1996).

Most of the interviewed faculty members explained that their supervision process follows a model of initial engagement and gradually fading out (e.g. Pearson, 1996). They acknowledged that PhD students need guidance especially at the beginning of their doctorate. Examples of this guidance range from pointing out suitable conferences and workshops to initiating co-authored publications. However, it was stressed that successful PhDs do not rely on external guidance in the long run. Successful candidates rather tend to take initiative and ownership on matters where they received guidance in the first place.

11.6.3 Research Question 3 (What Individual and/or Situational Factors Affect the Exercise of Professional Agency?)

It was strongly acknowledged that the existence of concrete professional goals is an important requirement of professional agency. Professional goals allow doctoral candidates to identify both success criteria and activities that are appropriate to meet those criteria. Furthermore, a clear vision of the future may help to build commitment, willingness and resilience in cases of temporary drawbacks and obstacles (Harteis & Goller, 2014). Findings of Robinson (2008) and Hopwood (2010b) illustrate this proposition. Both studies discuss doctoral candidates who have envisioned a clear future as academic teachers and then purposefully engaged in opportunities to develop teaching competencies.

However, the actual decision to engage in the identified activities still depend upon the beliefs of whether the engagement will result in anticipated outcomes (Vroom, 1964) and beliefs about the personal capacity to succeed (Bandura, 1982, 2001).

Other often mentioned individual characteristics were ambition and persistence. This might be understandable against the backdrop of the nature of doctoral degrees. A PhD is a degree that requires original research that extends the current level of knowledge. Inevitably, such an endeavour is closely connected to drawbacks and obstacles. Doctoral students must face and manage those situations.

Although the interviews revealed that professional agency affects doctoral students' success, all faculty members acknowledged that situational factors affect how and to what extent agency can be exercised. Especially in working conditions where PhD candidates have high external workloads, few financial resources and little autonomy in general, the engagement in agentic activities might not always be possible.

11.7 Limitations and Implication for Further Research

A major limitation of this research is the small sample size. Only ten faculty members were interviewed. Although all participants can draw upon long experience as researchers and PhD supervisors, no generalisation can be made based on the findings reported in this contribution. Another limitation that arises from the specific sample is the high age of the interviewees. The average age of the faculty members was almost 60 years. Although this speaks in favour of long experience within the academia, one could also argue that the interviewees are not experts of new developments that PhD students face in the current academic system. However, all but two interviewees were still engaged in supervisions of PhD students, some even more than 10 years after retirement.

All study participants argued based on their personal experience within the German academic system. Since the majority of doctoral candidates in Germany do not study in structured PhD programmes, it is questionable whether the results

presented here are transferable to academic systems where PhDs are mainly achieved through more structured programmes (e.g. the Anglo-American countries). Further, only participants with backgrounds in social science constituted the sample. The transfer of the findings presented in this contribution to other disciplines with different working cultures and requirements might not be possible.

All interviewees were explicitly asked to answer the interview questions based on their past experience with doctoral candidates or colleagues. However, many answers were quite general without referring to experienced episodes. It is therefore questionable whether the faculty members in our sample described real behaviour of doctoral students or agentic activities that they only assume to have effects on doctoral students' success. In this case, some results may only illustrate activities that are appreciated by our study participants and do not affect PhD candidates' success in general. Statements that students should concentrate on their PhD thesis and do not engage in peripheral projects might be a good example for this limitation. However, some interviewees emphasised that they had experienced certain agentic behaviours but could not give concrete examples due to memory gaps. Answers could therefore also be interpreted as generalised experience.

To provide further support for the findings reported in this contribution, additional research is necessary. We interviewed supervisors, and, thus, only an external perception of agency and its relationship to academic success could be provided. Future studies could interview both candidates that can be conceptualised as successful (completion of the degree, obtained a postdoc position, published research) as well as less successful candidates (non-completed degree, no published research). Aim of this study could be to investigate how those different groups of (former) doctoral candidates exercised professional agency and what contextual factors affected their agency. Based on this study, a quantitative research approach should be used to confirm the results based on this and forthcoming qualitative investigations.

11.8 Conclusion

This study investigated how PhD students can actively take matters into their own hands by taking an active approach towards their academic development. Based on ten interviews with German faculty members, we found evidence that doctoral students can indeed affect their academic development and eventually their success by exercising professional agency. Among others the study participants mentioned proactive networking, negotiation of external demands, and deliberate information and feedback seeking as important manifestations of professional agency in academic contexts. It was emphasised that further studies should investigate what kind of agentic efforts are exercised and how those efforts are connected to doctoral students' success.

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Chapter 12
Developing Medical Capacities and Dispositions Through Practice-Based Experiences

Jennifer Cleland, Joseph Leaman, and Stephen Billett

Abstract Experiences in clinical settings have long been featured in medical education. Students engage in these experiences across their undergraduate programmes and beyond their registration as doctors during specialty training. Such is the institutional, personal and financial investment in the provision of these practice-based experiences that it is important to understand more about how they can be used to most effectively develop medical capacities and dispositions initially and then continue to support them across medical working lives. Consequently, this chapter seeks to understand more fully something of practice-based experiences' contributions to initial and continuing medical education and learning. Quite specifically, it seeks to identify how three key educational purposes can be secured through experiences in clinical settings. These goals are those associated with assisting individuals to (1) identify whether they want to practise medicine and, if so, which specialty they wish to pursue; (2) develop the occupational capacities required to practise their preferred form of medicine; and (3) continue to learn and develop further their medical practice over lengthening professional lives. The data from interviews with new doctors beginning their second-year post-graduation clinical work in the UK medical training pathway (Foundation Year 2) are used to identify and illuminate how these experiences can be used to realise each of these three kinds of goals. The intention is to understand how best these experiences

J. Cleland (✉)
Medical Education Research, College of Life Sciences and Medicine, University of Aberdeen, Aberdeen, UK
e-mail: jen.cleland@bdn.ac.uk

J. Leaman
Raigmore Hospital, Inverness, UK
e-mail: jleaman@nhs.net

S. Billett
Professor of Adult and Vocational Education, School of Education and Professional Studies, Griffith University, Brisbane, Australia
e-mail: s.billett@griffith.edu.au

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might be afforded to, and taken up by, newly qualified doctors, and in what ways practice-based experiences need to be augmented to more fully secure those medical education goals.

12.1 Developing Medical Capacities

Experiences in clinical settings have long been featured in medical education. In Hellenic Greece, it seems students learnt medicine largely through experiences in practice. They acted as assistants to experienced medical practitioners and had particular roles to perform, often being left by those practitioners to nurse patients after medical interventions (Clarke, 1971). Hence, much of that preparation for learning to be a doctor was realised through authentic experiences of medical practice. However, because of the difficulty with securing sufficient time with experienced practitioners and medical practice, it was recognised that these practice-based experiences were not providing an adequate understanding of anatomy or providing comprehensive access to the required medical knowledge. Therefore, it became necessary to provide these classes for students to learn about human anatomy and also codify medical knowledge in books and thereby augment practice-based experiences. So, on their own, they were not sufficient.

Although medical education programmes are now largely located within universities, medical students engage in experiences in health-care settings intentionally associated with their initial preparation within medical degree programmes and also for further development through a period of residency that lead to registration as a doctor and then following that as part of speciality training. Yet, medical education programmes differ in their approach to providing clinical experiences and in the sequencing and duration of those experiences (Cooke, Irby & O'Brien, 2010). Nevertheless, a common and enduring feature of these programmes is the extensive use of practice-based experiences, which take time and require resources. Such is the institutional, personal and financial investment in these provisions that it is becoming increasingly important to understand more about how such clinical experiences can be used to initially develop medical students' capacities and dispositions. Also, there is a related need to identify how these experiences can be used to develop further those capacities across medical practitioners' working lives (i.e. continuing professional education/learning).

This chapter seeks to understand more fully something of the contribution of these experiences to initial medical education and ongoing professional development. Quite specifically, it seeks to understand how those experiences can contribute to securing three kinds of important medical educational purposes. These are assisting individuals to (1) identify whether they are suited to practising medicine and, if so, to what specialism or kind of practice they are most suited; (2) develop the occupational capacities required to practise their preferred form of medical specialism; and (3) continue to learn and develop further their medical practice across lengthening professional lives. Interview data from doctors engaging in their

second-year post-graduation (i.e. Year 2 of the UK Foundation Programme) experiences are used to identify and illuminate how these experiences can contribute to achieving these goals. To reaffirm, the intention here is to understand how best these experiences might be provided for new medical practitioners and also be augmented to more fully secure these three kinds of key educational goals.

Following the setting out of some assumptions associated with learning through practice, the chapter outlines the salience of each of these goals. That is, assisting the formation of professional identity and initial and further development of medical competence. Then, the potentials and limitations of learning through practice settings and experiences are briefly rehearsed drawing upon earlier research. This overview is followed by a consideration of the ways in which learning through experiences in medical settings can lead to these kinds of goals. Informing that discussion are some initial findings from interviews with foundation year medical practitioners. These are used to illustrate how practice-based experiences contribute to those goals.

Having described the method and procedures used to conduct these interviews and analyse the data, their contributions to each of these three goals are presented and discussed. In all, it is proposed that these experiences are essential and highly constitutive of the kinds of capacities required to be an effective doctor. However, other experiences also play roles in achieving those goals and actively mediate practice-based experiences in important ways. That is, associations and circumstances outside of practice settings and 'teaching' experiences within those settings perform important roles in augmenting and extending the particular worth of practice-based experiences.

12.2 Learning Through Practice

Educational institutions and processes have become ubiquitous and are highly privileged in most countries with advanced industrial economies. Therefore, it is necessary to be reminded about the important role that experiences in practice settings (e.g. hospitals) and practice (i.e. enacting health care) play in learning generally and, in particular, domain-specific occupational knowledge such as medicine. Importantly, there is no inherent privileging of experiences in education institutions over those provided in practice settings (Billett, 2013; Raizen, 1991). This is because, firstly, there is no separation between participating in any kind of goal-directed experiences and learning. That is, when people engage in activities and interactions, they induce change within themselves, which is referred to as learning (Lave, 1993; Rogoff, 1990). So, when individuals engage in activities which are wholly new to them, they likely generate new forms of knowledge or knowing, albeit these may be partially and not wholly coherent. Then, when individuals engage in activities with which they have undertaken before or are even familiar with, the kind of changes that occur are associated with owning and refining what people can do or establishing links and associations between things. Some theorists

refer to these two processes as securing viability with what has been experienced (von Glasersfeld, 1987). Piaget (1985) distinguished accommodation (i.e. experiencing something novel and creating a new cognitive structure to make sense of it) and assimilation (i.e. fitting what is experienced within an existing structure (e.g. ideas, practices)), which are analogous to engaging in activities that are variously routine (i.e. familiar) or nonroutine (i.e. novel). However, it is important to be reminded that what constitutes familiar or novel activities are person dependent, as is their legacies (i.e. learning) (Greeno, 1989). What for one individual is a novel experience for another it is quite routine. For instance, in talking to a clinical educator who is a physician in an emergency room in a major American hospital, he observed that what for him are routine accident and emergency cases, yet for his students these are novel and sometimes highly confronting and almost overwhelming experiences. Such propositions are well supported within literature from both individual (Anderson, 1982, 1993) and social (Martin & Scribner, 1991; Rogoff, 1990) constructivism. Not the least here is that the opportunities for rehearsal and repeated exposure are very important for human learning and development. These processes can have particular legacies in form of developing procedural capacities in ways that do not require conscious engagement to be enacted (i.e. automatisation) (Anderson, 1982; Sun, Merrill & Peterson, 2001) and also building propositional links and causal associations (Anderson, 1982; Groen & Patel, 1988) which are central to developing rich (or deep) understanding. So, it is important to realise that the legacies that arise from engaging with everyday experiences are not restricted to new experiences and that the opportunity for experiences that permit practice and rehearsal is generative of other aspects of development.

It is also important to note that there are limitations of learning through everyday practice. As was indicated in the account of learning medicine largely through practice in Hellenic Greece, there can be limitations in learning through practice. In that case, the lack of access to experts from whom to learn the procedures and concepts, as well as the ability to come to understand human physiology and anatomy, required specific educational interventions to be introduced for these learners. Similarly, in more contemporary studies, a series of limitations of learning through practice have been found in studies drawing upon the experiences of workers of different kinds from across a range of industries (Billett 2001). These workers identified limitations comprising: (1) learning that is inappropriate (i.e. bad, unhelpful, wrong); (2) lack of access to activities and guidance; (3) not understanding the goals for workplace performance, reluctance of experts to provide guidance, absence of expert guidance, limits in developing understanding in the workplace and reluctance of workers to participate. These limitations need to be understood and arrangements made to redress them or augment learning experiences in ways which overcome them.

The salient point is that these legacies (both good and bad) arise for individuals from them engaging in goal-directed activities and interactions (Scribner, 1984), which then lead to change in what individuals know and can do, for better or worse (see below). Moreover, learning arises from what experiences individuals have been able to access. Importantly for the development of occupational knowledge,

knowledge does not come from within individuals; it needs to be accessed and sourced in the world beyond individuals (Billett, 2003; Scribner, 1985). However, through engaging with workplace activities and interactions with others (e.g. other practitioners, patients, etc.), what has made available through those experiences is a way in which individuals come to construe and construct that knowledge. This process is referred to as inter-psychological (i.e. between the personal and the world beyond them) (Wertsch & Tulviste, 1992). For instance, because medical knowledge is a product of history and culture, with its concepts, norms and procedures manifested in particular medical situations, it needs to be accessed and engaged with (i.e. inter-psychologically) for it to be learnt. So, on the one hand, learning is an active and interdependent process (i.e. relying on mutual contributions between the individual and others or objects). It follows then that rich learning of medical knowledge, for instance, is likely dependent upon the: (1) kinds of activities and interactions that are available to students and (2) the quality of students' engagement with them. Richness is founded on the interdependence between the experiences afforded and individuals' engagement with them (Billett, 2006). So, such precepts suggest that, rather than assuming that the richness of learning experiences is premised upon them being intentionally educational (i.e. what is intentionally provided through educational programmes and institutions), it is through the inherent qualities of what experiences are provided or afforded and how individuals engage with those experiences. This conception also serves to remind that experiences provided in both educational institutions and practice settings are nothing more or less than invitations to change. Ultimately, how students or workers take up those invitations is most salient.

As noted above, the example of medical education in Hellenic Greece emphasised practice-based experiences. This example appears to illustrate how the vast majority of how the learning of occupations has progressed across human history. That is, experiences of the occupational practice and in the circumstances of work being enacted are by far the most common and sustained mode of learning occupations across the human history (Billett, 2010). In this way, the provision of practice experiences is central to humanity and human progress, not just on an individual basis but in its contribution to the development and remaking of occupations. Moreover, similar processes for learning occupations have been identified in Europe, Asia and, likely, occurred elsewhere. As what was suggested for the learning of medical practice in Hellenic Greece (Clarke 1971), local workplaces have been common sites for learning in Europe, India (Menon & Varma, 2010), Japan (Singleton, 1989) and China (Ebrey, 1996). It is also quite noteworthy to mention that across these accounts and others which describe processes of learning occupations, there is little evidence of direct teaching (Billett, 2011). Instead, the vast majority of this learning appears based on mimesis: observation and imitation, then practice.

That is, this development of occupational capacity and innovations in those occupations arose through learning processes they were not premised on being taught, but enacted interdependently between the social circumstance and the learner. So, it is important to advance a consideration of the contributions of

practice-based experiences to medical education and their efficacy not only in terms of what occurs in educational institutions, or being dependent on processes premised upon teaching, but also other kinds of premises. In particular, understanding how those practice-based experiences are generative of learning through interdependent processes seems essential. That is, these learning processes were not processes independent of other influences and contributions; they were intricately linked and associated with other sources – interdependent with them – and were enacted through accessing them. So, having outlined some of the premises upon which practice-based experiences might be helpful for securing the goals of medical education, it is helpful to consider what constitutes those goals. This consideration will be used to align the potential contributions of practice-based experiences to securing those goals.

12.3 Goals from Medical Education

Educational efforts are intended to be intentional and directed towards particular kinds of outcomes or intended purposes. That is, education processes and the selection of content and experiences for students should be premised on clear educational intents. Usually, within curriculum parlance, these intents are referred to variously (and not always consistently) as a hierarchy of aims, goals and objectives, in terms of degree of specificity of educational purposes (Marsh, 2004). Dewey (1916), who coined the term of vocational education, suggested that there were two key goals for the vocational aspects of education.

Firstly, to assist individuals identify an occupation to which they were suited (i.e. coming to identify with medical work or a specialism within it). He argued that individuals caught in uncongenial callings (i.e. those in which they were not suited or uninterested) are a waste of human talent and energy. For instance, in the occupational context of current medical education in the United Kingdom discussed here, individuals have to decide very early in their careers about which specialty (e.g. general practice, surgery, oncology, etc.) they will pursue, hence heightening the risk of practitioners being caught up in specialisations that they ultimately find uncongenial.

Secondly, he proposed that the other key goal for vocational education provisions is to secure the development of occupational capacities – the kinds of knowledge (e.g. concepts, practices and dispositions) that permit individuals to effectively practise their preferred occupation. It would seem that, in the case of occupations such as medicine, this knowledge comprises not only the canonical knowledge of medicine (i.e. the knowledge all medical practitioners would be expected to possess) but also the situated requirements for performance of medicine in the particular circumstances in which they practise. That is, the competence required to practise comprises both the canonical knowledge but also responding effectively to the situational requirements that constitute the practising of medicine in a particular circumstance. Although Dewey (1916) was focused on preparing people adequately

for working life, he also expressed beliefs about ongoing learning as being the single most important human vocation. Consequently, in responding to the challenge of contemporary work life, he would have added a third educational goal: sustaining the competence to sustain their vocations – the occupations that they identify with – across their professional lives. Certainly, in contemporary times with changing requirements of work and constant concerns about continuing professional development, for instance, this goal now seems as necessary as the two earlier ones. Given their centrality of those goals to medical education, these three goals are now worth considering more fully.

12.3.1 Identifying and Selecting an Occupation/Specialism

As noted above, Dewey (1916) held that it was important for individuals to find an occupation to which they were suited and met their interests. He stated that:

> A vocation means nothing but such direction in life activities as render them perceptibly significant to a person, because of the consequences they accomplish, and are also useful to his [sic] associates. (Dewey, 1916:307)

That is, it is important that educational experiences assist individuals to come to identify an occupation to which they are suited and in which they are interested and which constitutes a vocation for them. Importantly, whilst others might advise, suggest or even cajole somebody to take up an occupation such as medicine, ultimately, individuals have to assent to that occupation becoming their vocation.

> … being a teacher, a minister, a doctor, or a parent would not be vocational if the individual kept the practice at arm's length, divorced from his or her sense of identity, treating it in effect as one among many indistinguishable occupations. … (Hansen 1994: 263–64)

Hansen suggested that individuals who do not accept their occupation as their vocation would not necessarily conceive it as meaningless activities. They might regard it as strictly a job, which is what one of the informants in the enquiry reported, and as a necessity one has to accept, perhaps to secure the time or resources to do something they are more interested in (Hansen 1994). However, in this case, individuals may not invest the kinds of personal effort and intentionality required to become highly competent in that occupation (i.e. actively and deliberately seeking to hone and improve that practice and deliberately extend further their occupational knowledge). This kind of intentionality is perhaps most likely to be exercised when individuals' sense of self and investment in a thoughtful action is directed towards something which they see as being worthwhile (i.e. their vocation). So, the exercise of personal agency in such learning efforts is likely to be central to their intentionality and direction of their learning (Malle, Moses & Baldwin, 2001) and is likely to be optimised when individuals take their occupations as their vocations. Moreover, it is likely that much if not most of innovations across human history have arisen from personal interest, inquisitiveness and enquiry through practice, rather than in hybrid spaces were innovation is privileged (i.e. laboratories and the like).

Given the criticality of medical work for individuals and society and it being subject to constant change (for UK examples, see Department of Health DH, 2012; Francis, 2013; Greenaway, 2013), securing individuals' vocations and coming to effectively practise medicine is quite central to personal and societal purposes globally (e.g. AAMC, 1999; AMA, 2007; Australian Medical Council, 2010; Frank & Danoff , 2007; General Medical Council, 1993, 2003, 2009 and 2012; Department of Health, 2004). In this way, opportunities to participation in medical practice can assist to identify whether individuals are suited to medicine and also in which specialism they are interested and particularly suited. Hence, the contributions that practice-based experiences can make to this decision-making and formation of occupational subjectivity (i.e. their vocation) are likely to be salient to the richness of their learning but also as a means of effective expenditure of public, personal and societal investments in supporting individuals learning for their occupations. This development, however, is also associated with individuals developing the capacities and confidence to practise effectively that occupation and specialism.

12.3.2 Developing Capacities to Practise Medicine

As noted, the second goal is associated with developing the capacities required to effectively practise medicine. This comprises, as foreshadowed, securing the canonical knowledge of medicine and specialisms and also situated requirements for practising medicine and the particular specialism. As a means to consider what constitutes the development of those capacities, the literature on expertise is helpful in identifying not only the qualities of high performance (i.e. expertise) within a particular occupational domain but also in providing accounts of the kinds of knowledge needing to be learnt for securing that level of performance. Proposed here is that there are three dimensions of this medical knowledge, and they exist at both the canonical and situational levels: the conceptual, procedural and dispositional domain-specific medical knowledge and its situational manifestations.

Firstly, there is domain-specific conceptual knowledge – 'knowing that' (Ryle, 1949). It comprises concepts, facts and propositions and can be understood as ranging from surface to deep conceptual knowledge (e.g. Glaser, 1989). This form of knowledge is that which can be stated or declared and is sometimes referred to as declarative knowledge. At one level, it comprises simple factual knowledge such as the names or concepts (parts of the anatomy, medicine, diseases, etc.). At another level, often referred to as deep conceptual knowledge, are the links and associations amongst concepts in the form of propositional associations and causal links, which permit understandings of contingencies and relations and their associations. So, whereas factual information (i.e. the stuff of quiz shows) is important, a more important level of knowledge is the rich associations between concepts comprising what often referred to as deep understanding. So, diagnosing a patient's conditions and assigning and then monitoring their treatment and making adjustments and predicting prognoses are dependent on this kind of knowledge.

Secondly, is the domain-specific procedural knowledge or 'knowing how' (Ryle 1949). This form of knowledge also has extended across highly specific and strategic procedures (e.g. Anderson, 1993, Sun et al., 2001). Highly specific procedures are those activities which comprise a way of doing something quite specifically such as cleaning a wound, placing a dressing on, taking a temperature and recording a pulse. These highly specific procedures are often those which are learnt, and through practice (i.e. rehearsal), they become able to be enacted without the course to conscious thought. This developmental process is referred to as proceduralisation – the ability to perform highly routine and practical procedures (e.g. taking bloods, temperature, blood pressure), without recourse to the exercise of conscious mental processes. However, beyond the importance and development of specific procedures are higher orders of procedures that serve to guide and monitor performance through active engagement and develop capacities that can plan for, enacted and monitor the enactment of medical tasks. Again, these forms of knowledge likely arise from access to a range of experiences permitting the honing of specific procedures and understanding the requirements of more strategic use of procedural knowledge.

Thirdly, dispositional knowledge – 'knowing for' (i.e. values, attitudes) relates to canonical and instances of practice (e.g. Perkins, Jay & Tishman, 1993) – includes criticality, and these can include the kind of dispositional qualities required for medicine (e.g. patient confidentiality, diligence and care in record-keeping). These dispositions both energise and assist in the formation of goals for work performance, and as such an alignment between the kinds of dispositional values required for effective and ethical medical practice is likely to be found within the learning of appropriate dispositional qualities.

Although these three dimensions of knowledge are referred to above separately, which is often helpful for considering particular interventions directed towards their development, in reality all three forms of knowledge are interdependent. That is, when something is conceived or perceived, that process is shaped by dispositions (i.e. what is valued) and the kinds of concepts used to consider what is being experienced and the exercise of procedures in doing so (e.g. the effort to be expended in achieving goals, etc.). So, these three forms of knowledge interdependently are helpful for promoting appropriate occupational capacities. As such, they become the goals for what needs to be learnt to be an effective medical practitioner. Hence, one way of evaluating the educational worth of particular experiences is developing these capacities.

12.3.3 Sustaining Occupational Competence Across Working Life

The third educational purpose is concerned with ongoing learning about medical practice – sustaining occupational competence across working life. That is the kind of learning permitting medical practitioners to be current and develop further their capacities through learning from the new experiences, as well as building and

honing the capacities required to remain effective and current. As noted above, learning and work co-occur, and through everyday work, there are ongoing processes of learning and development. Hence, engaging in everyday medical work potentially contributes to this ongoing development of competence. However, these capacities can be developed further by particular sets of experiences including specific training programmes that assist in securing knowledge that might not be learnt through everyday work experiences. For instance, the clinical teaching interludes in hospitals can be of this kind. Here again, the interdependence between the work situation and the medical practitioner is evident. That is, specific kinds of experiences are afforded through work activities and also particular and intentional educational experiences, but without active engagement by individuals, the learning potential of these experiences may not be optimum. Hence, sustaining occupational competence is likely premised upon them being active and agentic learners. This requirement then raises the question of how students or practitioners can be prepared to be active and intentional learners both for their initial study and also across their working lives.

Consequently, it is the degree and means by which practice-based experiences are able to support the kinds of knowledge represented in these three educational goals which will ultimately be used to determine their effectiveness and how these experiences might be augmented in some ways to make them more effective. In many ways, much of the focus on engagement in practice-based experiences is about individuals coming to identify what constitutes their preferred occupation or specialism (i.e. their vocation). This can then assist them realise that vocation and sustain it across working life.

12.4 Investigating the Efficacy of Practice-Based Experiences for Medical Education

In the section that follows, the processes used to investigate these phenomena in a small cohort of new doctors are set out and described, before the findings advanced from this investigation are presented and discussed. First, the participants are described which is followed by the means through which the data were gathered through interviews and then the procedures used to analyse the interview data.

12.4.1 Participants

This was a qualitative study using individual interviews. The informants targeted for the practical enquiry study were doctors in Year 2 of the 2-year Foundation Programme. In the first 2 years of training post-graduation, the Foundation Programme (FP) (www.foundationprogramme.nhs.uk/pages/home) is intended to expose junior doctors to a broad range of specialties and health-care settings (Tooke, 2008), usually in the form of six practice-based rotations each lasting 4 months. Thus, our interviewees were relatively new doctors who had successfully

completed medical school, then entered into competitive national recruitment for places on the 2-year FP, with full General Medical Council (GMC) registration after successful completion of the first year. After the Foundation Programme, doctors enter into either core, specialty or general practice training.

We were particularly interested in this group of doctors for a number of reasons. First, they were about to make critical decisions about their careers by applying for core, specialty or GP training and, hence, may be at a stage of their development conducive to reflecting on their learning in practice. Second, they are working under a change in working patterns from a traditional on-call pattern to a shift system which has led to a reduction in total training hours (Morris-Stiff et al., 2004). The clinical apprenticeship with its reliance on time-related experiential training and subjective, observational assessment of clinical skills is no longer feasible (Chikwe, de Souza & Pepper, 2004). There has been a reported deterioration in the quality of learning opportunities as a result of these changes in working practice (Paice, 1998; Scallan, 2003). Third, a recent evaluation of the FP (Collins, 2010) identified a lack of clarity over the role of junior doctors within the FP, particularly in terms of a tension between service provision and education. Issues of role uncertainty and question marks over supervision appear to be particularly problematic in FY2, when doctors are expected to 'step up', to contribute more and extend their boundaries of competence.

12.4.2 Data Collection

The study was carried out in the United Kingdom in 2013. After receiving the necessary ethics clearance, we identified Foundation Programme Year 2 (FP2) doctors to be informants via the Northern Deanery, NHS Education for Scotland (NES, the training provider for the FP in Scotland) mailing lists. We emailed potential participants inviting them to take part in the study at the beginning of their FP2 (August 2013). The aim was to recruit FY2 doctors training in hospital environments only, but we sought to ensure our participants were from a range of programmes and environments (representing medical and surgical). We also aimed to secure a varied group of trainees in terms of gender and ethnicity to achieve a diversity of views and experiences. Of the 10 doctors interviewed, four were male and six female (this proportion of male to female actually reflects that of the Foundation Doctor population). Five were aged between 20 and 24 years, three were aged between 25 and 29 years and two were in the 30–34 age group. There were two graduates (one male and one female), whilst the other eight interviewees had studied medicine as their first degree (as is still the norm in the United Kingdom). Two of those interviewed had relatives who were doctors. Six had graduated from the medical school in the same region as their Foundation Programme. Two had studied at other UK medical schools. The remaining two interviewees had studied medicine overseas before coming to Britain for the Foundation Programme.

Interviews occurred 2–4 weeks after the informants had commenced FP2 and were held in a location convenient for the interviewee (usually a coffee shop within work premises). At the commencement of the interviews, we asked participants to

complete a personal details questionnaire collecting demographic information, education-related details and specific questions relating to training. An interview schedule was developed, trialled and then used to ensure consistency across two interviewers. The interviews continued until participants agreed they had shared their experiences sufficiently. Having worked through the interview schedule, the interviews were concluded and the informants thanked for their participation. The medium interview length was about an hour. All of the interviews were digitally audio-recorded with consent and anonymised then converted to tax copies through a transcription process.

12.4.3 Analysis of Data

We analysed content-related themes only, i.e. what participants said (Ritchie and Spencer 1994) using a themed approach that engaged in a range of different kinds of categorisation exercises linked to the three goals outlined earlier. We analysed the data manually and used peer verification of an initial coding framework based on analysis of two interviews which were then used to independently analyse two further interviews. The basis for categorising the data was through its reference to one of the three kinds of goals referred to above (i.e. identifying a preferred specialism, developing capacities to practise medicine and ongoing learning through work). In essence, the process is comprised of identifying a set of themes and then using one of the research team members to verify another's allocation of data to the particular themes. Discussions about the categorisation of data were conducted through written comments on transcripts which we shared across the research team and then discussions about bases for categorising data. The face validity of the data was enhanced by one of the research team being a familiar of the circumstances of the doctors' working environment and knowing a number of them through repeated encounters. Subsequently, reports from these independent analyses were circulated around the team and discussed in several teleconferences and one face-to-face meeting to secure consensus about the coding and analysis of data. Patterns and differences in the views and experiences of interviewees were explored, debated and agreed through discussion.

12.5 How Practice Experiences Contribute to Junior Doctors' Learning

The data from this small sample of junior doctors permits the identification of some contributions that experiences in practice settings afford these doctors' decision-making about their choice of medicine as a career and also the preferred specialisations they will pursue after their foundation year experiences. In addition, these data illuminate how these experiences assist them to achieve goals of developing further

their capacities to be effective doctors. Yet, in considering these data, it is helpful to be reminded that what is afforded to these doctors by their experience in clinical settings can comprise both positive and negative contributions. That is, affordances can be either supportive or can restrict, limit or impact negatively upon these doctors' decision-making and capacity building. Moreover, how each doctor construes and constructs these experiences as particular kinds of affordances and then elects how to engage with them are shaped by their particular intentionalities, interests and previous experiences (Malle, Moses & Baldwin, 2001). So, this experiencing will be person dependent in some ways. Hence, there are understandable variations in the reported experiences and their particular worth to the informants.

In the sections below, a summary of the contribution and illustrative examples aligned to each of the three goals discussed earlier are provided from the interview data.

12.5.1 Goal 1: Identifying Suitability to Occupation/Specialism

Some of these junior doctors' transcripts illustrated, firstly, how experiences in practice settings and of performing medical work lead to judgements about its congeniality for them. In this way, it reports experience of engaging in medical work led the participants to make judgements about the personal worthiness of their decisions about studying to become doctors and practice medicine. Secondly, those experiences also informed decisions about the particular specialisms they would pursue after their foundation years. The following quotation was provided by a new female doctor.

> When we are a student we don't have such a responsibility as a working adult. What we were focussing is just exams, get it passed, make sure you got knowledge. And the knowledge that is enough to survive as junior doctors and so on. You think you have big dreams – "I want to be like surgeons, I want to be this and that"- but once you start working with the working hours, with the working environment, the stress level you start realising that it's not that easy and I've realised that working in this field, as with medicine, it requires a lot of commitment to keep you going. (new female doctor#1)

Noteworthy in her response is the distinction made between being a student who although engaging in clinical experience had done so from the position of being a student, not as a practising doctor. She refers to the differences in imperatives (i.e. from exams to working as a doctor) and the demands of engaging in actual medical practice. So, despite having had a range of clinical experiences as a student, the demands arising from actually practising as a doctor have critical implications for judgements about becoming a doctor and, as will be seen shortly, decisions about specialisms. Another informant, a male, refers to the affirming experience of practising medicine and how this experience has led to the realisation that his career choice was well made. That is, it is aligned with his personal interests and goals.

> … you always knew that there was a reason why you got into it (medicine) in the first place. And when you start work that's when you realise that you've made the right decision, or at least I did, or I felt that way. (new male doctor #1)

Here, this informant refers in a different way than the first informant about how the experiences (and demands) of practising medicine have led to him making particular judgements about the career choice. Again, he refers to the actual experience of working in, rather than studying, medicine as being a basis for arriving at such a conclusion. All these suggest that contributions clinical experiences afford to those engaging as students may be quite different than to those actually practising medicine. Put plainly, the consequences of individuals practising medicine is reported as being distinct from when these informants were positioned and engaged as students. All of this supports the view that it is necessary to go beyond a consideration of the social and physical experience as being in somewhere deterministic. Instead, it is necessary to account for how individuals come to construe and engage with the experience which is dependent upon their imperatives, positioning and intentionality and goals for their engagement.

Moreover, beyond informing the worth of their decision to study and work in medicine, these same two junior doctors also report how their experiences in practice settings are shaping their decisions about what specialisations they will pursue. Noteworthy, the new female doctor changes the intended focus of her specialism quite considerably as a result of working as a doctor. Experiences in the previous year when working as a doctor has overturned career intentions generated over the 5 years of medical school, which included experiences in hospital settings. By encountering the practices, protocols and demands of being a surgeon, she has decided to pursue a very different form of specialism, seemingly one which is quite distinct from her initial preference of general surgery.

> Since I was student I had always been thinking of … becoming general surgeon. But once I start working in general surgery things changed. My interest in the surgical topics, the surgical skills is still very strong. But looking at the working environment, the working physical demands, mental strain, it's really tough. … So I don't feel like I would like to work in that way for 30 years so I start changing my mind. I still have strong interest like in anatomy and understand how it works and how it change. So I start thinking about radiology. So radiology is my current first choice. (new female doctor#1)

So, evident here is that experiences in the foundation year (the first-year post-graduation but before full registration) have not affirmed her initial preference for specialism: surgery. In this way, her experiences whilst highly informative might be described as being not particularly invitational. In contrast, the young male doctor has very positive experiences in his medical rotation, and these have both informed and affirmed his choice of specialism.

> I'll apply for Acute Care … hopefully apply to dual medical and anaesthetics. I'd quite like to do ITU. That was my last job and I loved it so I quite fancy, like, doing something in that area. (new male doctor #1)
>
> … you can see … the actions that you make, you can see the effect so I quite like the acute aspect of it. And the patients are quite sick and I think it's quite interesting whenever they're really sick- you can treat them, rather than, you know, watching and waiting for, like, a slow chronic treatment. I find that probably a bit less exciting. (new male doctor #1)

Then, there is the instance of a junior doctor reporting that reluctance and uncertainty about the occupation were redressed through practice-based experiences.

> I think it's only since I've started working, because I wasn't really sure where I wanted to go in med school so I can't really change it. So it's only now I've decided on obs and gynae, (new female doctor#2)

Hence, the qualities of experiences in practice settings have been central to his choice of specialism. He suggests that working with critically ill patients provides the kinds of work tasks he prefers and the satisfaction he seeks through his work. Hence, these experiences shaped his judgement about preferred specialisations. Of course, a consideration here is that if his experiences had not been positive whether he would have still pursued this specialism. In another study, differences of medical students' experiences in orthopaedic and paediatric wards – the former being confronting and intimidating, whilst the latter was encouraging and inclusive – led to choices about specialism (Richards, Sweet & Billett 2013). The medical students were drawn to paediatrics because of the positive invitational qualities exercised by paediatricians and seemed to reject orthopaedic work because of the difficulties (i.e. negative invitations) they experienced in interactions with orthopaedic surgeons.

12.5.2 Goal 2: Developing Occupational Capacities

The experiences provided through working in clinical settings are also reported as contributing to the development of the occupational capacities required to practise medicine. In particular, data referring to developing procedural capacities (i.e. how to achieve goals) of both specific and strategic kind are reported. Firstly, the junior female doctor refers to the development of both very specific procedures (i.e. drawing blood from patients) through to strategic procedures about managing patients' needs on busy medical ward that requires decisions to be made and priorities enacted.

> …when I first started, … the simplest job became the toughest job for me. So if I manage to get some bloods off from patient I'll be very happy then (laughs). But I feel like I'm enjoying it because I'm learning again. I like to learn as in when I learnt I see the patient, I practice it and I understand it and I know in the future if come across this case I have better knowledge, more confident in managing the patient or dealing with it, compared with like one year ago which I have no confidence. But now I feel like everyday I'm learning and seeing patients and new cases and I feel excited. (new female doctor#1)

Here, the junior doctor refers to the learning of a specific procedures (i.e. taking blood) from a patient group she had not previously encountered (i.e. children). She refers specifically to the opportunities provided to undertake this task and the satisfaction and confidence she gains from gaining competence in this procedure. She also elaborates how working as a doctor has developed more strategic procedures in the following long statement.

> I learnt most after a year of working … in the ward. Let's say after the ward round patient who needs to go home, they need medication to be prepared by a certain time. So things you have to consider not only yourself, you also have to consider about like pharmacies, what

> time they come and check the medication or how much time they need to prepare the medication. And if there is any patient coming in that didn't need the bed and then someone needs to clean the room so I have to judge the time. And also imaging scans, if in the ward if there are any sick patients that have to take priority first so if they need imaging scan do it right then. And then do they need any urgent bloods or do you need to communicate with anyone? Get the information first. Yeah, or any family members that would like to get an update from you. So I just look at it, any sick patient, I have to deal with sick patient first. And if I'm going to spend a lot of time with just one particular patient and I will still have a lot of jobs to be done I have to inform my senior colleague and ask for help from my other colleagues to make sure things are still progressing while I'm occupied with this patient. So I have to make it a balance between the two. Or plan ahead… things that I can do beforehand then I try to do it like the day before or two days ahead. (new female doctor#1)

Given what was stated above about the differences that the two junior doctors report between engaging as students and then practising doctors, it seems reasonable to impute that the authenticity of working as a doctor leads to the active learning in ways that are qualitatively distinct from when being a medical student. That is, the quality of engaging in goal-directed activities and interactions is such that junior doctors are pressed to engage in decision-making, considering options, problem-solving and making choices that are qualitatively distinct from when they were students. Both the process of engagement in and the legacy (i.e. learning) are likely to be influenced by the effort, intentionality and focus of their engagement in these goal-directed activities. Included here is the need to draw upon what they know and actively make decisions about responding to patient needs and in ways quite distinct from when they were students. That is, they draw upon their medical knowledge and ways of knowing it in a very contextualised and demanding way. Indeed, the majority of the informants volunteered that once they began making clinical decisions they wished they had given greater emphasis to foundational medical science (e.g. studied harder) as this kind of knowledge was of the kind that they needed to make those decisions.

> I think you always look back and think oh I wish I'd studied, you know, anatomy more… or done this more. But I think you don't realise what you need to know until you start work and you can do your best at medical school and still you'll spend ages learning something that you'll never use in clinical practice! (new male doctor#2)

In these ways, the informants provide accounts of the ways in which practice-based experiences contribute to the development of capacities, including making judgements about what kinds of knowledge is likely to be useful.

12.5.3 Goal 3: Sustaining Occupational Competence

The illustrative examples provided above also referred to sustaining occupational competence. That is, these junior doctors are engaged in an ongoing process of learning after graduating from a medical programme. Consequently, qualitatively, the examples above are also illustrative of how ongoing learning for medical practitioners can arise through their engagement in clinical practice. The example of having to learn how to take blood from children, when earlier experiences have been with

adults, is indicative of doctors' practice that might change and engage new kinds of patients or those with conditions that have not previously been encountered. Some informants referred to the worth of the teaching interludes provided in the hospital and emphasised the pertinence of those experiences to what they were practising or hoped to practise and also some of their preferences for being actively involved in those teaching interludes. In referring to these experiences, informants made the following observations.

> … it's weekly, and it's among your peers so you can interact a lot better, ask lots of questions, and you get to see [it] in practice every single day. So I think that will be really good. And then, plus it develops our own teaching (new female doctor#3)
>
> … me and the GPST (GP specialty trainees) prepare presentations and teach each other with a GP present, so they can put input into… teach us things that they've learned from being a GP, but at the same time we're helping each other learn (new female doctor#4)
>
> .... some GPs will have specialist interests, so we might say 'they've got a special interest, it would be good to utilise that' and get them to do something on that. And basically the other weeks, it's just kind of what we feel we want to learn about, what would be useful to us. So this week we did depression and alcohol misuse, because we thought that was kind of a common thing, even in a week, we'd seen lots of depression. And then next week we're doing skin conditions, dermatology, because […] it's something that none of us feel that confident in. (new female doctor#4)
>
> … they're not forcing learning onto us, it's us picking what we would find most useful for us in GP and for our careers ahead (new female doctor#4)

In these ways, the junior doctors refer to ongoing learning arising through processes of active engagement and then juxtapositioned with the application of what has been initially learnt in that session. Moreover, one of these informants refers to processes of learning through collaborative learning with more experienced practitioners, which permits joint problem-solving.

12.6 Contributions for Medical Education

What has been suggested in the data reported above is that practice experiences go beyond just exercising, practising and 'contextualising' what is or has been learnt in medical educational programmes. The data indicate that these experiences have specific qualities and make particular contributions. In the cases reported here, the informants referred to the difference between engaging in practice settings as students compared with when practising as doctors. The requirements, expectations and nature of their engagement are reported as being manifestly distinct. The authenticity of their experiencing activities and interactions in clinical settings is heightened tangibly and qualitatively different than when being engaged as students. This distinctiveness underlines the importance of understanding the process of experiencing and learning as a personal process and situated process. It also underlines the importance of the experience curriculum: how individuals construe and construct from what they are provided. Indicated here is the nature of personal engagement and intentionality being shaped by how they are positioned (e.g. as student or medical practitioner). Moreover, the data suggest that

practice-based experiences directly contribute to securing three key educational goals of (1) identifying preferred specialisms and suitedness to medicine, (2) developing medical capacities and (3) sustaining and developing further professional competence, albeit in personal particular ways.

Particular noteworthy here is the authenticity of engagement that clinical experiences afforded for securing learning in quite distinct ways than those provided whilst engaged in student-like activities. All of this suggests that there is a need to understand further the particular qualities or affordances of the kinds of experiences at different points in medical education and training. Given the differences between what was learnt when the junior doctors were students suggests that the process of experiencing is likely to be quite different at particular points in their learning trajectories. Considerations about how to optimise experiences in clinical settings in generating the kinds of knowledge required for medicine therefore become central to medical education and training policy and delivery.

The potency for decision-making and capacity building of particular experiences also opens up questions about other contributions afforded by other experiences that medical students and practitioners have. For instance, they may be particular consequences for medical students living together in students' quarters and being immersed in the process of learning medicine, which may play out differently for students who are more or less immersed in that process. For instance, students and junior doctors from overseas, such as the female junior doctor whose data is reported above, may have quite different experiences than those who share language, cultural preferences and high levels of common understanding (i.e. intersubjectivity). Then, there is the diversity of experiences that medical students and junior doctors bring to their clinical experiences. For instance, those who come from families or backgrounds with strong connections to medicine may have particular and potentially more informed or grounded bases to understand medical work and/or health-care settings than those who do not. All of this goes to suggest that there are issues associated with the organisation and ordering of practice-based experiences in medical education, yet there are also considerations associated with the ways in which individuals come to be positioned and engage in these clinical experiences.

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Chapter 13
E-Portfolio: A Practical Tool for Self-Directed, Reflective, and Collaborative Professional Learning

Anna Liza Daunert and Linda Price

Abstract This chapter discusses the role of an e-portfolio in professional learning and development. We begin by providing a better understanding of the concept of a portfolio by discussing its meaning, purpose, and uses in different contexts as well as the role of technological innovations, which paves the way for new practices in developing portfolios. This is followed by a comprehensive discussion about the use of electronic portfolios in light of recent research in order to provide an overview of the advantages and disadvantages of using e-portfolios. Current research suggests that e-portfolios are practical tools for supporting self-directed and reflective learning. In addition, e-portfolios have the potential to support collaborative learning among learners who are interested in sharing their works and in gaining feedback. At the end of the chapter, we discuss an approach to designing professional learning and development plans, which serves as a guide for individuals who are interested in taking control of their own professional learning and development.

13.1 Introduction

Learning is a continuous and lifelong process, which occurs in diverse situations and conditions. These learning processes and practices have always fascinated educators and researchers alike – from acquisition through modification and application of one's acquired knowledge and skills (see, e.g., Bransford, Brown, & Cocking, 2000). Given the diverse perspectives that explain this phenomenon throughout

A.L. Daunert (✉)
Institute of Educational Science, University of Paderborn, Paderborn, Germany
e-mail: anna.liza.daunert@upb.de

L. Price
Engineering Faculty, Lund University, Lund, Sweden

Institute of Educational Technology, Open University, Milton Keynes, UK

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human history, learning is evidently well discussed and researched (e.g., Price, 2014; Richardson, 2000). Aside from merely understanding learning per se, continuous efforts are exerted to examine and develop appropriate measures or strategies to support the learning processes that can improve the learning outcome or the performance of learners in various contexts, including adult learning (e.g., Denton, 2012; Gagné, Wager, Golas, & Keller, 2005; Maher & Gerbic, 2009; Price, 2014; Richardson, 2000).

Particularly, efforts are focused on formal or informal learning, that is, in the context of learning that prepares individuals for a particular profession that fosters learning while one practices his/her profession within or outside the workplace setting (e.g., Firssova, 2006; Herman & Kirkup, 2008). Formal learning or training, specifically within a university context, typically takes three to four years (depending on which degree is being pursued and in which country one is studying) to learn theories and to develop the competences required to practice one's future profession. However, honing specific competences required for a chosen profession typically occurs in a limited period of few months of internship or few years of apprenticeship (depending on the field of study and the curriculum of an educational institution). Hence, further learning opportunities are needed to compensate for the short period of formal preparation for a chosen profession as well as to foster continuous development of professional competences. Further learning opportunities can be within or outside the workplace setting in the form of either training or workshops or informal learning activities in the workplace. However, there are many factors or conditions that could either hinder or aid the development of competences in the workplace. Harteis (2002) argues that there are favorable workplace conditions that support competency development. Findings showed, based on a Delphi study, that working on projects and diverse tasks as well as taking certain responsibilities on tasks including decision making in the organization are among the favorable conditions that support competency development in the workplace (Harteis, 2002; see also Harteis & Gruber, 2004).

Accordingly, the essence of learning is a continuous and lifelong process. Many professionals are actively learning or developing their competences while practicing their profession. This we refer to as professional learning and development. Continuous efforts are thus needed, which are directed towards the development of appropriate measures in learning settings (such as the workplace) in order to foster and support professional learning and the development of competences among adult learners. Indeed, there are various strategies or approaches that are already practiced in different professional contexts to foster professional learning and professional growth. These practices are classified as traditional and contemporary practices. Traditional practices pertain to long-standing strategies in professional learning and development that utilize a didactic approach. Comparatively, contemporary practices describe the use of strategies that are developed as a consequence of the present social and technological conditions, particularly in relation to the use of technological innovations to support learning. Webster-Wright (2010) stresses that the differences between traditional professional development strategies and contemporary practices are in the aspiration to convey authentic meaning and experience as the

essence of professional learning. She argues that traditional professional development strategies are characterized by their focus on simple delivery of content or information. She used the term *innovative strategies* to describe contemporary practices that are characterized as transformational as they emphasize the development of the individual professional through collaborative approaches like mentoring.

In this chapter, we support the emerging practices of self-directed, reflective, and collaborative professional learning in both formal and informal contexts. We also uphold the principles and strategies that are utilized in traditional formal training practices, which take into account the individual learners – their needs, individual differences, and other learning conditions. Whether it is in formal or in informal learning context, it is necessary to consider the conditions of learning as essential factors for effective learning. These learning conditions are classified as internal and external factors: the internal factors include motivation and prior knowledge and skills, and the external factors include learning environment, learning contents, and materials (Gagné & Briggs, 1974; see also Gagné, 1977; Gagné et al., 2005). In the context of professional learning, it is important to consider that adult learners are diverse in many aspects. Among these aspects are levels of knowledge and skills, interests, specific skills, or competences that need improvement, pace in learning, learning opportunities in the workplace, and the time the learners are willing or able to invest to engage in professional learning.

Thus, as professional development becomes more valued in organizations or in society at large, it is not only appropriate that an organization finds ways to manage knowledge but to support the employees in developing their skills to continuously hone their competences needed for their professional growth. By carefully considering professional growth in various professional contexts, there is a need to consider measures that are appropriate not only for the formal learning settings (like company-offered trainings or workshops) but for the informal learning settings as well. Since learners in this learning context are adults or professionals who can take responsibility for their own learning, this condition opens up more possibilities to support and sustain professional learning and professional development. In this sense, we agree with the idea that "professional learning is essentially a *self-directed activity*" [italics added] (Webster-Wright, 2010, p. 11).

Moreover, given that the time needed and available time to engage in learning are among the necessary factors for professional learning, appropriate measures should therefore support adult learners to "take control of their own learning." It is important that "[learners] must learn to recognize when they understand and when they need more information" (Bransford et al., 2000, p. 12). In other words, each individual learner should decide where and when to learn, what information is important or what skills are needed, and how he or she can best engage in professional learning. In addition, the learner should also decide whether or not to learn individually or in a group with colleagues or peers. However, self-regulation of professional learning activities also demands an appropriate measure – that is, a measure that demands careful consideration of the design of a professional development plan and the use of a tool to support and to sustain effective and continuous professional learning. Hence, later in this chapter, we utilize the strategies of instructional design

to propose a specific approach to designing professional learning and development plans, which gives particular emphasis on self-regulation of learning and the use of an electronic portfolio (e-portfolio). The proposed approach and the use of an e-portfolio support the main aim of the chapter, that is, to foster and sustain continuous self-directed and reflective professional learning.

To summarize, this chapter discusses the role of an e-portfolio in professional learning and development. We begin by discussing the role of technological innovations, which paves the way for new practices in developing portfolios (i.e., the use of e-portfolios). We also provide a better understanding of the concept of a portfolio by discussing its meaning, purpose, and uses in different contexts. This is followed by a comprehensive discussion about the use of electronic portfolios in light of recent research, which provides an overview of the advantages and disadvantages of using e-portfolios. At the end of the chapter, we discuss an approach to designing professional learning and development plans, which serves as a guide for individuals who are interested in taking control of their own professional learning and development.

13.2 Information and Communication Technology in the Context of Professional Practice and Professional Learning

This section discusses the role of information and communication technologies in supporting learning processes and professional practices at large via the use of learning management systems or knowledge management tools. It provides a few examples of technological artifacts and specific tools that play a vital role in supporting knowledge management and e-learning activities. In addition, it emphasizes the necessity of utilizing technological innovations that support new practices in professional learning. In particular, this section argues that, if the main aim is to foster self-directed and reflective professional learning, learners should take full advantage of the use of electronic portfolios. This aim can be fulfilled by utilizing already existing knowledge management systems that serve the purpose of using e-portfolios in professional learning and development or by developing new learning platforms that is specifically designed for professional learning and development purposes.

Indeed, technological innovations and the widespread use of technologies continue to play an important role in various aspects of the society, which include supporting knowledge management activities and learning processes. Searching or acquiring new information is relatively easy in this digital age as are the technologies available to us to support our learning processes and activities (Price & Kirkwood, 2008). The widespread use of technological devices, such as laptops and smartphones in combination with the web-based tools or applications, such as knowledge management (KM) tools and learning management systems (LMS) in organizational and educational contexts, respectively, stresses the vital role of

technologies in the society (see, e.g., Alexander, 2006; Ertl, 2010). Considering the educational context, technology's influence is evident in the context of teaching and learning in higher education via the use of technological artifacts. Price and Kirkwood (2014) enlisted specific examples of these artifacts as follows:

> blended learning/e-learning/hybrid courses
> audio/podcasts
> video resources/lectures/games
> multimedia tools
> virtual laboratories/fieldwork
> blogs
> collaborative tools/wikis
> online discussion boards/conferences/forums
> e-Portfolios
> online course resources
> electronic voting/personal response systems, and
> assistive technologies (p. 553).

This illustrates the penetration of technology in higher education in a range of contexts and how a variety of technologies have been used to support learners in a variety of ways.

The findings of a recent survey conducted by Daunert and Harteis (2014) among preservice teachers, who were asked to report on their daily activities using different technologies, showed that ubiquitous social technologies were also useful for academic activities. For example, a social networking tool may also be used as a tool for communication and collaboration among students for academic purposes (Daunert & Harteis, 2014). Also, e-learning platforms are utilized to showcase learners' portfolios in higher education context (see, e.g., the e-portfolios developed by the students of the University of Michigan). Thus, technological innovations specifically LMS and KM tools support learners, i.e., to have easier access to learning materials anytime and anywhere, to organize and manage knowledge, and to collaborate with other learners. The use of such tools offers advantages for different types of learners in that learning materials can be stored and organized for future use or they can be shared with others. Hence, technology offers learners diverse opportunities to support learning.

There are volumes of literature and studies that discuss the use of LMS or e-learning that specifically focus on the learning practices of students in schools or in universities (e.g., Naidu, 2003; see also Daunert & Harteis, 2014; Greenhow, Robelia, & Hughes, 2009; Hiltz & Goldman, 2005). However, there is limited literature or empirical studies about the learning practices of adult learners in different professions who use such tools for professional learning and development. Hence, empirical studies that explore the use of appropriate technologies to support and foster professional learning and development are needed. However, it could be argued that the role of technology in the context of professional practice is already apparent through the use of KM tools in companies or businesses. The development and use of KM tools in organizations started to surface in the 1990s. But according to Easterby-Smith and Lyles (2005), the development of knowledge management has been "rapid and chaotic." In addition, most of the efforts to develop KM tools

that are utilized by organizations aim at running the business efficiently and, hence, not primarily to support professional learning. An example of this is the Business Suite software used for customer relationship management by SAP Corporation, (i.e., Applications and Products in Data Processing Corporation) which is a multinational software corporation founded in the 1970s.

Daft (2001) illustrates the evolution of organizational applications of information technology in organizations. He provides an overview of the use of information technology systems and applications from the operational level up to the management level. This emphasizes the use of technological systems or applications that aim for efficiency in the daily activities of employees, such as in organizing, sharing, and using information. These organizational applications have evolved from operational, programmed systems into strategic, non-programmed systems:

1. Operations
   (a) Transaction processing systems
   (b) Data warehousing
   (c) Data mining software
2. Business resource
   (a) Management information systems
   (b) Decision support systems
   (c) Executive information systems
3. Strategic weapon (as the highest level of application)
   (a) Internal: networking, intranets, and enterprise resource planning
   (b) External: extranets, e-commerce, and network structure (Daft, 2001, p. 241)

Thus, the emergence of the concept of learning organizations and organizational learning has made it possible for the development of tools that are useful for new knowledge management activities. For example, these can be used to manage or keep a record of the most important information in the organization and, in some cases, to provide a platform for employees to collaborate on a company project. Some examples of these KM tools that are widely used by organizations are: IT solutions like groupware and Information Management System (IMS), which often include decision support system. An IT solution like groupware, in particular, is a platform that facilitates group work such as e-mail, calendar, and global directory (e.g., Hüttenegger, 2006). Other examples of KM tools used by small to medium companies are Atlassian Software Systems, Brainstorm Software Ltd., and Interspire Knowledge Manager, among others. More examples of KM solutions or software can be found using a KM software finder like www.capterra.com or http://botw.org/top/Computers/Software/.

In specific contexts, like collaborative activities or project management, employees can possibly utilize these KM tools for learning purposes. For instance, individuals can use *Confluence*, which is specifically a tool for teams to collaborate on a project and to share files and notes, etc. (see https://www.atlassian.com/software). However, in the professional context in which technology can play a vital role to support deliberately designed as well as self-directed and reflective

professional learning, beyond merely documenting and managing knowledge – an appropriate tool to support the realization of this goal is needed. Hence, we propose the use of an e-portfolio as a tool to support professional learning and development because it is regarded as useful in supporting learning and development of skills (see, e.g., Denton, 2012; Ehiyazaryan-White, 2012; and Jenson, 2011). Empirical studies showed that e-portfolios can support professional learning and consequently the professional growth of learners (Bala, Adlina, Mansor, Stapa, & Zakaria, 2012; see also Brown, 2011; Duncan-Pitt & Sutherland, 2006; Johnsen, 2012; and Malita, 2009, among others) in that it can offer learners the opportunity to organize documentation of the learning processes, keep track of an individual's learning, and thus provide the opportunity to direct and manage their own learning. It also has the potential to support learners share works and learning experiences with others because technology enables ubiquitous access to one's own and other's learning artifacts.

13.3 E-Portfolio in Professional Learning and Development

In this section, we discuss the role of an e-portfolio as well as the advantages and disadvantages within the context of the learning and development of skills and competences in the light of the most recent literature and studies on the use of e-portfolios. First, we provide a short overview of the meaning of the word *portfolio*, the different definitions provided by different authors, and the working definition of *e-portfolio*. This is followed by a discussion on the role of e-portfolios in professional learning and an overview of the advantages and disadvantages in using them in professional learning. At the end of the chapter, we propose an approach to designing a professional learning and development plan with the use of an e-portfolio based on the ADDIE model of instructional design. The abbreviation stands for *A*nalyze, *D*esign, *D*evelop, *I*mplement, and *E*valuate. This is the most basic model of Instructional Systems Design (ISD) process, which includes five phases that are represented by the initial letters of each phase (e.g., Gagné et al., 2005).

Our main goal is to foster a professional learning approach that can be utilized by individuals to plan and direct their own learning and subsequently to utilize it for collaborative learning. The proposed approach supports deliberate planning of professional learning in that adult learners practice self-directed professional learning, which is personally and professionally meaningful to them. That is, each learner takes control of his or her own learning – i.e., from the phase of analyzing learning needs through the phase of evaluating the learning outcome and/or professional growth. Such an approach to designing professional learning processes should take full advantage of technological innovations (i.e., the use of e-portfolios) that are capable of supporting individual as well as group learning. Hence, it is important to discuss the concept of an e-portfolio and its role as a tool to support learning processes, which can cater to the specific needs of individual and group learners.

13.3.1 What Is an E-Portfolio?

Before examining the role of e-portfolios, we need to first discuss the role of portfolios more generally. There are different points of view on how a portfolio or an e-portfolio is defined. The explanation can be drawn from its meaning and the transition of the practices among various portfolio users and developers throughout time and in different contexts. In order to provide a clearer understanding of the concept of a portfolio or an e-portfolio, we need to consider the transition of the use of portfolios from the paper format into the electronic format as well as the different practices of portfolio developers in various contexts.

Portfolio can be defined as:

- "a large, thin, flat case for loose sheets of paper such as drawings or maps"
- "a set of pieces of creative work intended to demonstrate a person's ability to a potential employer"
- "a varied set of photographs of a model or actor intended to be shown to a potential employer" (The New Oxford American Dictionary, 2010, pp. 1362–1363)

These three definitions have something in common: they refer to a set or a collection of works that demonstrate one's abilities or skills for a particular purpose. The dictionary definition of portfolio clearly refers to artifacts or products of purposeful or intentional activities. In Lin's (2008) words, it is "a purposeful collection of examples of learning that provides evidence of someone's knowledge, skills, and dispositions" (p. 1).

Gibson and Barret (2003) posit that educators have used portfolios for many years long before electronic portfolios were introduced. However, technological innovations paved the way for new models of using and developing portfolios. This, in some situations, has caused confusion about the concept of a portfolio, particularly electronic portfolios. For instance, Duncan-Pitt and Sutherland (2006) point out the confusion in the concept of an e-portfolio because it pertains "equally to the system, the asset repository, the output and sometimes to the process itself" (p. 70). On the other hand, other authors argue that the concept of either a paper-based or an electronic portfolio is basically the same in that the use is similar and that e-portfolio is simply a technology-based portfolio. However, e-portfolios have advantages that hard copy portfolios do not have (Lin, 2008). Specifically, users of e-portfolios can work on their entries as well as access them and other learning artifacts anytime and anywhere.

Similarly, Gibson and Barrett (2003) explain that an e-portfolio is "essentially a new kind of container," which can be developed either by simply using generic tools or by using tools or systems that make use of databases or servers. Further, the European Institute for E-Learning (EIfEL) defines an e-portfolio as "a personal digital collection of information describing and illustrating a person's learning, career, experience and achievements." Since the learner purposefully collects and records his or her knowledge, skills, or own learning, the e-portfolio is privately owned and the developer or user has control over whether or not to share it with others (see European Institute for E-Learning (EIfEL), http://www.eife-l.org/about/europortfolio).

Hence, it can be inferred that the main reasons for having different types or structures of portfolios – and thus differing views on the concept – are the different contexts and purposes of using or developing portfolios. These different contexts and purposes have led to the development of *categories or classifications*. The adjectives, placed before the word portfolio, are considered as "identifiers." They are used to refer to the specific categories of portfolio such as *course or electronic* portfolio (Jafari, 2004; see also Duncan-Pitt & Sutherland, 2006) and others such as *career* portfolio, *teaching* portfolio, or *professional learning* portfolio. In this chapter, we use these identifiers to *categorize or classify* the types of portfolios. These categories form different conceptions of portfolio and consequently determine the portfolio's content and structure (e.g., the conception of a *professional learning* e-portfolio). Hence, a portfolio is formed into a specific structure according to the specific purpose and context in which it is used.

In summary, a portfolio – whether in paper or electronic format– refers to the whole package, which is the set of works, documentations, or artifacts that one has intentionally organized and collected. This is in order to fulfill one or a combination of the following specific objectives or purposes:

(a) To *document or record* learning experiences, reflections, and other learning artifacts
(b) To *monitor or keep track of* learning experiences and progress or professional growth
(c) To *demonstrate or showcase* abilities or skills, experiences, and achievements
(d) To *share* knowledge, ideas, reflections, or learning experiences with others
(e) To *collaborate with or support* other learners with similar interests
(f) To *assess or evaluate* learning processes, specifically the assessment or evaluation of learning progress or achievement by the learners themselves or by others

Through the use of electronic or digital entries like texts, images or graphics, audio or video, and hyperlinks, the concept of electronic portfolio has been developed. This is referred to in this chapter as *e-portfolio*. An e-portfolio is the tool itself as well as its contents. The tool and the contents are purposefully designed and collected depending on:

- The purpose or objective of developing or using it, e.g., to collect learning artifacts to showcase or demonstrate one's abilities or skills
- The theme that defines the content of the portfolio, i.e., what abilities or skills one wants to showcase, which defines the artifacts or collected works, for example, a set of photographs to showcase the skills of the photographer

In this chapter, we use the concept of *professional learning and professional development e-portfolio* to encompass a deliberately and purposefully collected and organized set of artifacts or documentations in electronic format that are intended to record and/or demonstrate as well as to monitor one's professional learning and development. The learning artifacts include a record of an individual's learning experiences, reflections, learning progress, and/or learning outcomes. In this context, the

professional learning and development e-portfolio can be utilized to specifically support an employee or a professional to direct or regulate and continuously monitor his or her own learning in the workplace and throughout his or her professional life. This tool can also be utilized regardless of the learning environment – i.e., in either the formal or informal context.

13.3.2 The Role of E-Portfolio in Professional Learning and Development: A Practical Tool for Self-Directed, Reflective, and Collaborative Professional Learning

Developing a portfolio, specifically its paper-based format, has already been a common practice in educational contexts (Gibson & Barrett, 2003). However, the use of the electronic format has recently gained the attention of not only educators but of other professions. For instance, Feeney and Pitman (2010) argue that because e-portfolios are useful for recording and facilitating "ongoing continuing professional development, lifelong learning, and performance," the tool has become of interest to healthcare organizations and professional regulators, too. The increasing interest in the use of e-portfolios in various contexts can be explained by the results of recent empirical studies that examined the advantages of using e-portfolios. These advantages have been based on the reported positive experiences of learners and the positive impact of using e-portfolios on learning and on the development of skills.

In particular, students reported positive experiences in using e-portfolios in monitoring and controlling themselves as well as in communicating with other learners, which they believe also contributed to their learning (Akçil & Arap, 2009). This is supported by Ayres (2012) narrative that the use of e-portfolios is beneficial to the convenor and the students because it supports students to control or direct the accomplishment of their required project and it is a simple and efficient tool for monitoring student progress. Similarly, Chau and Cheng (2010) point out that the use of e-portfolios helps keep a record and keep track of reflections, knowledge, and student experiences over a period of time. Thus, it is a helpful tool in making the learning process and progress visible for the learner and for others (Johnsen, 2012; see also Egan, 2012) by showing or demonstrating skills and accomplishments (Firssova, 2006; OKeeffe, 2012; Parker, Ndoye, & Ritzhaupt, 2012).

Studies on the use and development of e-portfolios also confirm their usefulness as a tool for providing regular feedback to students (Ayres, 2012; Parker et al., 2012). In addition, it is reported as a useful coaching support tool in the workplace because it helps optimize the coaching sessions, specifically by improving the flexibility and efficiency of coaching activities and increasing the involvement of the coach (Firssova, 2006). Duncan-Pitt and Sutherland (2006) also specify the positive impact of the use of e-portfolios on the skills of students, which they described as the development of "a more confident and reflexive group of students." They conclude that the students who developed e-portfolios are different from those they

normally see at earlier stages in their university education. The e-portfolio users understood the value of e-portfolios, which encouraged them to take the initiative in creating and sharing their ideas and experiences with other learners.

Further, reported advantages and positive impact on the use of e-portfolios also include the following:

(a) Teacher participants attributed their professional growth to the use of an e-portfolio platform. They specified the positive impact of online forum on their social and linguistic competences and on being able to access other teachers' materials as well as on the development of their ICT skills (Bala et al., 2012).
(b) The use of e-portfolios facilitated strategies for self-improvement and helped improve computer skills. Participants also reported the advantage of having the choice, ownership of artifacts, and completion of self-initiated task (Chau & Cheng, 2010).
(c) The use of an e-portfolios has been successful in providing learners a platform or "a space to construct a reflective narrative" of their learning processes. This has also offered learners an opportunity to revisit their entries anytime and to reflect upon them throughout their learning journey (Ehiyazaryan-White, 2012, p. 184).
(d) E-portfolios were helpful in supporting learners develop pedagogical and technological skills and abilities such as website development, portfolio preparation, presenting self and content (Genc & Tinmaz, 2010), as well as learning and reviewing technical skills such as modifying webpage or adding hyperlinks (Lin, 2008).
(e) E-portfolios were helpful tools for developing metacognitive strategies and providing a "more stress-free learning space" among students (Huang, Yang, Chiang, & Tzeng, 2012).
(f) The use of an e-portfolios has helped learners practice and experience "deeper levels of reflection or critical reflection" in writing (OKeeffe, 2012), helped learners develop critical and reflective thinking (Johnsen, 2012), specifically to reflect on their works, strengths, and weaknesses and to revisit their learning experiences and growth (Lin, 2008).
(g) E-portfolios provided a space or platform for learners to showcase achievement, creativity, and interests while helping low-motivated and less confident students learn through others' works as they organize, construct, and reflect on their own learning (Huang et al., 2012; Maher & Gerbic, 2009). In other words, e-portfolios are useful for communication, interaction, or collaboration with peers by sharing ideas or work and feedbacks, which can serve as guide to improving skills and gaining new knowledge (Lin, 2008; Maher & Gerbic, 2009)

Moreover, although there are many claimed advantages in using e-portfolios, there are also challenges encountered by learners, tutors, instructors, or coaches. These challenges, which we consider as disadvantages, can possibly hold back other professionals in using e-portfolios for professional learning. Reported disadvantages or challenges in using e-portfolios include the following:

(a) Lack of necessary IT skills among learners can negatively affect their perceptions of using e-portfolios (Akçil & Arap, 2009), which can consequently affect their actual use of the tool. Students reported that developing e-portfolios was challenging because they have to complete the activities and concentrate on developing web design skills simultaneously (Lin, 2008).
(b) Unclear purpose of using the portfolio for first-time users can affect student engagement: For instance, findings of a study showed that first-time users of e-portfolios perceived the diary component of an e-portfolio as "an unnecessary technological add-on", which affected their engagement in personal development planning. However, when supervisors started to provide feedback by using the platform, students' views became more positive and their engagement in the said activity seemed to improve, too (Ayres, 2012).
(c) There are also issues on making use of databases or servers in developing e-portfolios. On the one hand, there are limitations of available functions utilized by university-hosted platforms. These limitations can demotivate students with advance design skills because they limit the application of their technical skills and creativity. On the other hand, students with few or no such skills are even discouraged (Egan, 2012). As Johnsen (2012) argues, the use of old platforms can contribute to technical problems, but at the same time it is difficult for first-time users to complete an e-portfolio. Hence, Huang et al. (2012) suggest that before using e-portfolios, one should make sure that the learners are familiar with e-portfolios and that they should have appropriate technical skills. This can ensure that the lack of appropriate technical skills is not a barrier to appropriately using e-portfolios by the learner.
(d) Portfolio construction can be perceived as quite demanding and time consuming (Firssova, 2006; Genc & Tinmaz, 2010; Lin, 2008; OKeeffe, 2012; Parker et al., 2012). It is considered demanding because it "requires high writing and argumentation skills". However, experiences of workplace coaches illustrate that the use of e-portfolios is helpful in efficiently preparing for coaching sessions (Firssova, 2006).
(e) Motivating students to invest time and effort into using or developing e-portfolios could be challenging, specifically in disciplines that are not aware of its benefits and do not have the portfolio culture such as learners from engineering or computer science (Heinrich, Bhattacharya & Rayudu, 2007).

Based on the reported advantages and disadvantages of using e-portfolios, we can infer that the former outweigh the latter. In addition, we can infer that e-portfolios can primarily serve as a practical tool for self-directed, reflective, and collaborative professional learning. To summarize:

- An e-portfolio serves as a practical tool for *self-directed professional learning* because, in this context, its development encourages and supports individuals to direct and take control of their own learning (e.g., Ayres, 2012). The use of the tool also considers the fact that each learner experiences learning individually as a result of diverse factors, which include learning habits, time constraints, or

interest. It emphasizes the idea of self-initiated tasks or independent learning and ownership of the learning artifacts (Chau & Cheng, 2010). The use or development of an e-portfolio encourages and supports individuals to deliberately organize their own learning and work-related activities that offer learning opportunities and foster professional development or growth. It provides the individual learner a tool to manage knowledge and the learning processes as well as to continuously monitor one's learning progress and outcome.

- An e-portfolio serves as a practical tool for *reflective professional learning* because the use or development of an e-portfolio encourages and supports individuals to reflect on their own learning and their experiences with work-related activities that can offer learning opportunities and professional growth. The essential aim of e-portfolios is to enhance learners' reflection throughout their learning journey. Hence, it is useful for learners to practice its application early in their career journey as experience of developing reflection and synthesizing learning artifacts and experiences serve as "solid foundations from which they can continue to reflect and build upon as professionals in the workplace" (Pelliccione & Raison, 2009, p. 280).

  In addition, the use of e-portfolios can also be a useful scaffold for reflecting on required competences. Reflective activities are an inherent aspect as well as the heart and blood of portfolio use or development. Hence, reported experiences in e-portfolio development stress the reflective nature of their learning activities, such as reflecting on work, writing feedback, or learning experiences (e.g., Lin, 2008; Parker et al., 2012). However, first-time users need a reflective guide in developing the quality of their entries from merely descriptive and/or less thought entries into more "higher-order responses." A reflective guide for first-time users can improve the quality of their thoughts and the structure of their written reflections (Pelliccione & Raison, 2009).
- An e-portfolio serves as a practical tool for *collaborative professional learning* because it has the potential to support individuals in sharing their learning experiences and accomplishments with others. In addition, e-portfolios can be used as a tool to support learners to obtain feedback on their works from colleagues or from experts with similar interests. At the same time it can be used as a tool to provide colleagues or other learners with helpful feedback on their achievements and their reflections on those achievements. Thus, the main aim of using the tool for collaborative professional learning is to provide an opportunity or a platform for learners who want to engage in interactive and collaborative learning activities, such as sharing ideas or works that will help others (Lin, 2008; see also Huang et al., 2012) or being able to access the works of others in order to improve their own skills and competences (Bala et al., 2012; see also Huang et al., 2012; Lin, 2008).

Based on the reported experiences, e-portfolios foster and support deliberate, self-directed, reflective, and collaborative professional learning. Also, the specific objectives or purposes of the users or developers determine and define the role of

e-portfolio in their professional learning. We therefore argue that e-portfolios can foster and sustain continuous professional growth of the individual. The use of e-portfolios stresses the essence of taking control of one's own professional learning, i.e., primarily by keeping a record and keeping track of own learning, reflections, and professional growth.

In the following section, we propose an approach to designing a professional development plan in accord with the ADDIE model of instructional design. This proposed approach serves as a general guide for deliberately designing a goal-oriented self-directed professional learning and development plan, while specifically developing an e-portfolio for one's own specific purposes.

13.4 An Approach to Designing and Implementing Professional Learning (PL) and Professional Development (PD)

This section proposes an approach to supporting learners in the design and implementation and control of their own professional learning and development. This approach serves as a general guide for a goal-oriented design or development of a professional development plan as well as a goal-oriented collection of learning artifacts and reflections via the use of e-portfolios. Hence, it supports self-directed professional learning in that it can guide a learner's decision to design and implement own professional development plan as well as the development and use of an appropriate technology (such as utilizing an appropriate e-portfolio system) to support the learning processes.

The approach to designing and implementing professional learning and development, which we are proposing in this chapter, is based on the strategies of instructional design. The most well-known model of instructional design is the so-called ADDIE model, which is an abbreviation of each specific phase (Gagné et al., 2005). In this context, we propose the adaptation of the said model in combination with selected steps from the ISD model utilized by Rothwell and Kazanas (2008).

We argue that this approach can serve as a guide for deliberately designing and implementing a goal-oriented professional learning and development plan, which fosters self-directed professional learning and integrates the practical use of e-portfolios supporting lifelong learning. Accordingly, we also argue that a professional development plan (PDP) can also be prepared by learners themselves and not only by the Human Resources and Personnel Development Department of an organization. The idea of utilizing the ADDIE instructional design model for professional learning and development in this context supports the aim of fostering self-directed professional learning. The professional or learner designs and develops his or her own PDP and directs his or her own learning and the development of professional competences, which is the essence of self-directed professional learning. But before we discuss our proposed approach to designing a PDP, it is necessary to provide an overview of the concept of a professional development plan.

13.4.1 What Is a Professional Development Plan (PDP)?

A PDP is similar to a syllabus used in the educational context in that designing a PDP is basically similar to planning or designing instruction or learning processes. However, they also differ in some aspects, such as the nature of the content, goals, and the skills or competencies required for development. While a professional or an employee in a particular organization can design and develop his or her own PDP, the more widely known practice is the use of PDP that is created or provided by the HRD of the organization or by a trainer. This is typically implemented via a series of organized training sessions or workshops, coaching sessions, or courses. In both conditions (i.e., self-designed and self-directed PDP or predesigned company-supported PDP), a well-designed PDP necessarily involves an analysis of the learner's needs, an assessment of the learner's skills and competences, and an evaluation of these within the context of the organization. In other words, an analysis of the current circumstances of the learner should be carried out before any training is designed and developed. A necessary step is the capturing of an initial learner profile within the given context. This can also be called as an initial *professional development profile*, which serves as a "reality check" instrument that guides the design and development of the PDP (e.g., Gregorc, 1973) and as a reference point for the learner's progress.

Bredeson (2002) argues that the idea of a professional development plan as a "design and construction of opportunities for professional growth and improved practice" is not something new. It is, however, understood and practiced in different ways, such as staff training, staff development, workshops, professional development course, and so on. In the context of this chapter, we adapt Bredeson's definition of professional development as the working definition of a professional development plan, which is a plan or design of "*learning opportunities that engage [professionals'] creative and reflective capacities in ways that strengthen their practice*" (Bredeson, 2002, p. 663) and *further relevant competences*. The following section provides a more comprehensive discussion on this topic concerning the practical use of ADDIE instructional design model for professional learning and development.

13.4.2 Utilizing ADDIE Instructional Design Model for PL and PD

In this chapter, we adapt the main steps or phases of the ADDIE model of instructional design to emphasize our proposed approach to the planning and implementation of professional learning and development. We provide an overview of the proposed approach by integrating some appropriate steps adapted from Rothwell and Kazanas (2008) into the said model to plan and design a PDP. The main phases of the ADDIE model to be utilized include: *Analyze, Design, Develop, Implement,* and *Evaluate* (see detailed illustration by Gagné et al., 2005, pp. 21–22). The phases

of the model are interconnected and, thus, the model is not strictly linear. Each phase of the model has subcomponents, which describe specific steps of the instructional design process, for instance, from conducting needs analysis through implementation and evaluation.

The ISD model utilized by Rothwell and Kazanas similarly illustrates an interconnection of the steps in the instructional design process (see detailed illustration by Rothwell & Kazanas, 2008). The model presents the steps in a circular manner in order to show that one can start at any point in the process followed by any step. These steps are:

> Conducting a needs assessment
> Assessing relevant characteristics of learners
> Analyzing characteristics of a work setting
> Performing job, task, and content analysis
> Writing statements of performance objectives
> Developing performance measurements
> Sequencing performance objectives
> Specifying instructional strategies
> Designing instructional materials
> Evaluating instruction (Rothwell & Kazanas, 2008, p. 60)

Moreover, both models emphasize the importance of determining the needs of the learner and of analyzing them in order to determine whether instruction or an alternative measure is needed. Accordingly, the models' steps are recommended for the instructional design process. As to the approach adapted in this chapter, we mainly utilize the five phases of the ADDIE model (Gagné et al., 2005) and adapt selected steps of the ISD model utilized by Rothwell and Kazanas.

The phases outlined below are conducted with the additional action of constantly recurring evaluation, which is carried out throughout the whole process. That is, evaluation is utilized as process-oriented (formative) and outcome-oriented (summative) activity, which is conducted in all phases. The following is an overview of the five phases of the ADDIE model with selected sub-steps adapted from the ISD model, which serves as a simple guide for individual learners to engage in self-directed professional learning:

Analysis: This step includes conducting needs assessment and analysis of the present condition. We adapt here the steps of the ISD model, particularly, analyzing characteristics of a work setting and performing job, task, and content analysis (Rothwell & Kazanas, 2008). We recommend that this should be performed at the initial phase of the professional learning and development process. That is, the learner should specifically conduct an analysis of:

- Skills or competences for PL and PD and the expected outcome or the target skills or competences and determine own goals for PL and PD
- The characteristics of the work setting and perform job, task, and content analysis
- Time available, time needed, and other needed resources for PL and PD
- The initial profile and the possible appropriate solution, i.e., whether instruction or training is needed and/or other forms of learning activities

Also, it is necessary to conduct evaluation in this phase before moving on to the succeeding phases.

Design: This phase is similar to the preparation of a course syllabus. It includes writing and sequencing learning or performance objectives, specifying learning or training strategies, learning materials, as well as designing criteria and measurements for the learning outcome in the form of a working outline or a syllabus. In self-directed PL and PD, the learner should:

- Specify learning or performance outcomes by translating own PL and PD goals into specific learning objectives
- Determine and sequence topics or units and objectives as well as determine how much time is needed to fulfill each objective
- Define specific professional learning and development activities for each of the objectives
- Develop a table of specifications for assessing learning outcome and progress

This phase also includes deciding and choosing what appropriate e-portfolio platform and design is appropriate. Jafari (2004) recommends 3 necessary steps or tasks in developing a new e-portfolio system. Thus, if one decides to use a new e-portfolio system, one has to go through the following steps to design an appropriate software that will satisfy the desires and needs of the end user: (1) conceptual design, (2) software design, and (3) implementation plan (see Jafari, 2004, p. 40). However, he argues that the human aspect of the design component is very challenging and, thus, it requires a qualified expert. Therefore, without the required expertise, one can also select the most appropriate e-portfolio system from available systems that can satisfy one's desires and learning needs.

Development: This step should be carried out after accomplishing the design of the PDP. After the syllabus or outline has already been finalized, the learner should:

- Decide which learning activities and materials are needed
- Prepare and develop the needed learning activities and materials
- Develop or specify measurements for the learning outcome or performance

This phase includes the development or preparation of the e-portfolio platform/system as a tool for PL and PD.

Implementation: This step should be carried out after the e-portfolio system has been developed or prepared. In addition, other needed learning activities and materials should be ready for use. This step includes the actual learning process or the actual process of realizing the self-directed and self-designed PDP.

Evaluation: This step should be carried out throughout the whole process. The idea of evaluation is to continuously assess the quality of the plan, tools, and/or materials all throughout the learning process, specifically the effectiveness and efficiency of the plan, materials, or one's learning. Evaluation is carried out during each phase (i.e., formative evaluation) and upon completion of each phase and of the whole PDP (i.e., summative evaluation).

13.5 Summary and Conclusions

This chapter provides an overview of the role of e-portfolios in different learning contexts, specifically its potential use as a practical tool for self-directed, reflective, and collaborative professional learning and development. The role of technologies in light of continuous innovations and their ubiquity has paved the way for the development of e-portfolios that are able to foster and support professional learning and development in a digital age. In particular, e-portfolios can support professional learning that is able to foster and sustain self-directed, reflective, and collaborative professional learning as well as continuous professional development.

The chapter discusses using a model of instructional systems design as a valuable approach to designing a professional development plan within an e-portfolio context. The proposed approach places particular emphasis on the capacity of each learner to direct his or her own learning by designing one's own PDP and by integrating the use of an e-portfolio to support the learning processes. We argued that deliberate planning and preparation must be considered in order to use the tool appropriately and to sustain and foster effective professional learning and development. The first steps are the most crucial ones (e.g., analysis of needs, setting, or content analysis) because they do not only determine the succeeding steps but also the outcome. The initial learner profile will not only provide an overview but it is a necessary step in determining any discrepancy between the present situation and the desired outcome. Most importantly, it helps guide learners in deciding an appropriate course of action in the achievement of their own particular aspired goals and the fulfillment of their own learning needs.

Thus, by serving as a simple guide for deliberately designing and implementing a goal-oriented professional learning and development plan, the proposed approach supports the use or development of e-portfolios as practical tools for fostering and sustaining continuous professional learning. Studies have shown that e-portfolios can support professional learning and consequently the professional growth of the learners (Bala et al., 2012; see also Brown, 2011; Duncan-Pitt & Sutherland, 2006; Johnsen, 2012; and Malita, 2009, among others). In particular, the use of e-portfolios offers learners the opportunity to organize documentation of their learning and to monitor own learning. This consequently offers the opportunity for learners to direct and manage own learning as well as to easily collaborate with others if the learner decides to use e-portfolio for group learning purposes.

In summary, we can infer from various literatures on the use of portfolios that purposeful documentation of learning, artifacts, and reflection upon these are fundamental to the effective use of portfolios that foster lifelong learning (e.g., Bala et al., 2012; Parker et al., 2012; Pelliccione & Raison, 2009; among others). Hence, e-portfolios are appropriate practical tools for professional learning and development because they particularly support current demands of self-directed and reflective learning as well as collaborative learning activities. Also, the widespread use of technologies makes it easier for learners to have ubiquitous access to their e-portfolio entries and learning materials. In addition, the opportunity of having

access to others' artifacts and achievements as well as being able to revisit one's own reflections anytime and anywhere are among the important reasons why e-portfolios are practical tools for supporting self-directed, reflective, and collaborative professional learning.

Based on empirical findings (e.g., Ayres, 2012; Bala et al., 2012; Chau & Cheng, 2010; Huang et al., 2012; Lin, 2008; among others), we can infer that the advantages and positive impact of using e-portfolios on learning outweigh the disadvantages or challenges that were experienced or encountered by e-portfolio users or developers. Equally, e-portfolio activities are not without their disadvantages. They demand more time in order to engage in reflective activities and learners need to be more engaged in the learning process. However, reflecting on learning per se can promote good learning habits that are fundamental to continuous lifelong learning practices. The use of e-portfolios stresses the essence of self-directed professional learning in that learners can use the tool to take control of their own professional learning. It supports the learners to keep a record and to keep track of their own learning and professional growth. Hence, we argue that the use of e-portfolios fosters continuous professional growth through its capacity to support development and reflection upon competences and achievements.

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Part III
Methodological Issues

Chapter 14
The Integration of Work and Learning: Tackling the Complexity with Structural Equation Modelling

Eva Kyndt and Patrick Onghena

Abstract Researching professional learning within the paradigm of the integration of work and learning is interesting as it captures the complexity of workplace learning. However, it does require advanced statistical techniques that are able to model this complexity. Structural equation modelling (SEM) is one of the techniques that enable the examination of more complex relations. This book chapter aims at providing a basic introduction to SEM without using mathematical formulas and going into all the specific technicalities while at the same time staying true to the complexity of the presented analysis.

The current book chapter starts with a general and conceptual presentation of SEM, including the advantages and disadvantages of the technique. The goal of this introduction is to address the questions of why and when SEM should be used and which conditions need to be fulfilled for a valid application of this technique. After a discussion of the fit indices that are used to evaluate the models, the analyses of different types of models are presented by means of an authentic dataset. More specifically, data regarding employees' approaches to learning at work were used to illustrate confirmatory factor analysis (including measurement invariance across groups), path analysis, and the analysis of a full SEM model. The chapter concludes by discussing several possible extensions of SEM and their relevance for researching professional learning.

E. Kyndt (✉)
Centre for Research on Professional Learning & Development, and Lifelong Learning,
KU Leuven – University of Leuven, Leuven, Belgium
e-mail: eva.kyndt@ppw.kuleuven.be

P. Onghena
Methodology of Educational Sciences Research Group,
KU Leuven – University of Leuven, Leuven, Belgium

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14.1 Introduction

Throughout this book, the integration of learning and working takes a central role. Research into the learning potential of the workplace and the characteristics that promote or impede learning has already offered interesting insights (e.g. Hurtz & Williams, 2009; Kyndt & Baert, 2013; Lohman, 2000). Billett (2001) states that the workplace has to be designed in a way that people are invited and stimulated to learn. In addition, Tynjälä (2008) rightly pointed out that learning results from the interaction between the workplace and the individual: 'While the organisation of work sets the context and conditions for learning, it continues to be the reciprocal interaction between the individual and the workplace that determines learning' (Tynjälä, 2008, p. 141). When investigating professional learning, it is therefore important to pay attention to possible interactions and reciprocal and mediating relationships. Researching professional learning within the paradigm of the integration of work and learning is interesting as it captures the complexity of workplace learning. However, it does require more advanced statistical techniques that are able to model this complexity. Structural equation modelling (SEM) is one of the techniques that enable the examination of more complex relations. This book chapter aims at providing a basic introduction to SEM without using mathematical formulas and going into all the specific technicalities while at the same time staying true to the complexity of the presented analysis.

The current book chapter will start with presenting SEM at a conceptual level. We will present why and when SEM could be used, what the advantages and disadvantages are in comparison with regression analysis and which different types of models can be analysed with SEM. Subsequently, the analyses will be illustrated on a dataset that was collected to investigate the approaches to learning of employees in relation with their work motivation, perceived workload and choice independence. Furthermore, several applications of SEM within the research of professional learning will be discussed. Finally, the main conclusions will be summarised.

14.2 Structural Equation Modelling (SEM)

Structural equation modelling denotes a family of multivariate techniques including and combining factor analysis and path analysis in which the focus lies on theoretical constructs represented by latent factors (Hox & Bechger, 1998). Latent factors are unobserved constructs that are reflected by a set of observed variables. Within this section we will first focus on why and when SEM could be used. The different models within SEM will be introduced, and the assumptions of the analysis along with the conditions for conducting SEM will be discussed. Following, the fit indices used to evaluate the models are presented, and the use of modification indices for model improvement is considered.

The core of the SEM analysis involves specifying a theoretical model and subsequently testing whether this model is plausible given the sample data. This comparison is based on the comparison of the variance-covariance matrix of the theoretical model to the variance-covariance matrix that is observed in the sample data (Crockett, 2012). Therefore, SEM is sometimes also known as covariance structure analysis. SEM thus examines a model that represents the linear relationships among variables. Because SEM is based on the analysis of covariances, a SEM model in itself cannot establish causal effects (see Sect. 14.5).

14.2.1 Why and When Should We Use SEM?

The main reason for applying SEM instead of traditional regression analysis is the flexibility and ability to model more complex relationships between constructs. With SEM it is possible to specify 'path models with intervening variables between the independent and dependent variables, and latent factor as well' (Hox & Bechger, 1998, p. 6). Although the method of Baron and Kenny (1986) offers an alternative for assessing whether or not a variable mediates the relationship between two other variables, from a statistical point of view, analysing the different paths simultaneously will yield better results (Iacobucci, 2009). The estimates of the strength of the relationships are more precise, and there is less bias as each effect is estimated together with the other effects (Iacobucci, 2009). In other words, the same variance cannot be estimated twice, as it is the case when separate regression analyses are applied.

Chin (1998) states that for any given SEM model, alternative models that fit the data as well as the proposed model can be found that potentially provide substantially different explanations of the data. Therefore, it is important to note that SEM is traditionally not recommended for exploratory purposes. Clear hypotheses about the structure of the data both in terms of factors as in terms of paths between constructs are needed for sound and replicable applications (Hox & Bechger, 1998). The paths included in the model should be theoretically justified (Chin, 1998). Additionally, the more complex the specified model is, the higher the requirements in terms of sample size become. This issue will be discussed within the section focusing on the conditions that need to be fulfilled for the analysis.

SEM models comprise a measurement model and structural model. The measurement model relates the observed or manifest variables to the latent constructs while the structural or path model denotes the paths/relationships between the constructs. Fitting a measurement model is also known as confirmatory factor analysis (Hox & Bechger, 1998; Iacobucci, 2009). Full SEM models combine the two into one model. When performing SEM analyses, it is always convenient to start by drawing a path diagram; it can guide the analysis. Within this chapter, the generally accepted notation for representing SEM models will be used (Tacq, 1997). Within this notation, boxes represent the observed variables (e.g. the items in your questionnaire) and circles depict the latent constructs (e.g. the underlying construct

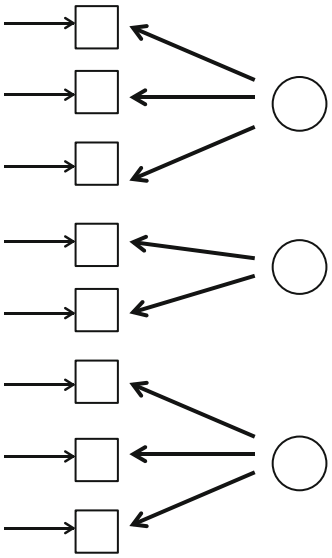

Fig. 14.1 Conceptual model for a confirmatory factor analysis

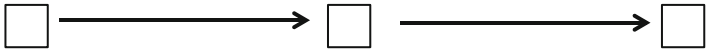

Fig. 14.2 Conceptual model for a path analysis with single mediation between two observed variables

you are trying to measure using different items). Within the measurement model, the arrows originate from the latent construct and point to the observed variables. The underlying idea is that the latent construct gives rise to or is reflected in the observed variables (Chin, 1998; Hox & Bechger, 1998; Iacobucci, 2009). Within the path model the single-headed arrows reflect the directional relationship between two constructs; double-headed arrows depict covariances.

Figure 14.1 represents a measurement model with three latent constructs and eight observed variables. The arrows on the left side of the observed variables indicate the residual error term originating from the fact that the observed variation is not completely explained by the latent construct.

Figure 14.2 depicts a conceptual model for a path analysis. The illustration shows a simple mediation model in which one variable mediates the relation between two other variables. Within a full SEM model (see below), the paths would connect latent constructs. A path analysis reflects the directional relations between observed variables (Cohen, Manion, & Morrison, 2011).

Figure 14.3 shows a full SEM model in which the measurement and the structural model are combined into one analysis.

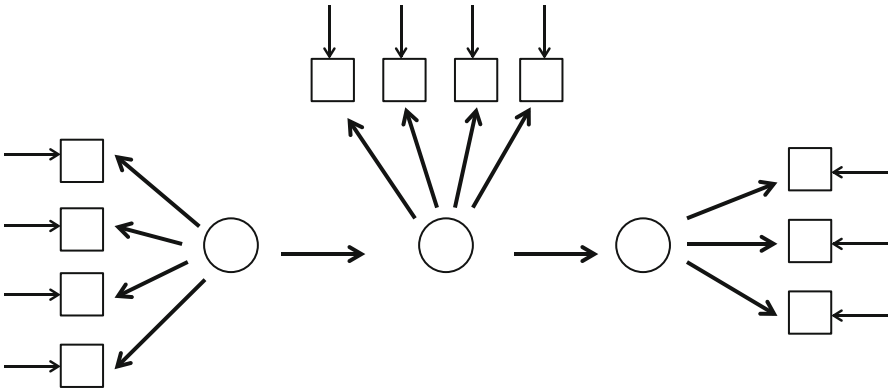

Fig. 14.3 Conceptual model for a full SEM model

14.2.2 Which Conditions Should Be Fulfilled?

When applying SEM and making inferences based on the analysis, it is important to consider the underlying assumptions of the analysis. First, SEM imposes the same statistical assumptions on the data as traditional regression analysis. In addition, *multivariate normality* is assumed. Secondly, SEM assumes that the correct model has been specified, meaning that no relevant variables are missing and that the directional relationships are specified correctly. A correct *model specification* foremost depends on the theoretical grounds of the research at hand. Moreover, the observed variables in SEM are assumed to reflect the latent construct and not to cause it (Kline, 2012). This also explains why the arrows in Figs. 14.1 and 14.3 point from the latent construct towards the observed variables and not vice versa. Changes in the latent construct should be reflected in all observed variables as they are conceptually related to each other. The observed variables in the SEM model cannot be indicators that compensate each other to form an artificial index or composite score (Kline, 2012). In the latter case of *formative indicators,* a change in one observed variable could cause a change in the construct but does not necessarily result in a change in the other observed variables. An example of a formative measure is when the success of an organisation is measured through the combination of an organisation's annual profits, the increase in number of staff members and an indication of the popularity of the company. It could be that the company grows more popular and at the same time a decrease in number of staff members occurs. The profits, number of staff members and popularity of the company might be good indicators, but they do not reflect a latent construct, as they are conceptually unrelated.

After the model has been specified, it is important to check whether the model can be identified, that is, 'whether a unique solutions to the model can be generated' (Crockett, 2012, p. 36). *Model identification* can be executed by following two guidelines developed by Bollen (1989 in Crockett, 2012). First, the structural model should be recursive; this means that all relationships within the structural model are unidirectional and no feedback loops are included. In other words, the dependent variables in the model cannot be a cause and an effect at the same time (Crockett, 2012; Kline, 2012). In addition, the observed variance-covariance matrix must contain more unique elements than the number of parameters that need to be estimated (i.e. factor loadings, latent constructs, paths between latent constructs, etc.). The number of unique elements in the variance-covariance matrix can be calculated using $p(p+1)/2$, where p equals the number of observed variables. The latter guideline is also known as the *t* rule (Crockett, 2012).

The invalidating effect of violating the statistical assumptions that SEM makes can be reduced by fulfilling conditions regarding sample size and missing values.

Sample size. The debate about the appropriate *sample sizes* for SEM is ongoing. For every 'rule of thumb' that exists, another occurs. In general, the rule is that the more complex the model, the more parameters that need to be estimated, the larger the sample size needs to be and, of course, larger is better (Iacobucci, 2010). The most correct and accurate method to assess the sample size is to assess the power of the analysis, as sample size depends on the specifications of the SEM model at hand (Chin, 1998). More information on power analysis can be found in MacCallum, Browne and Sugawara (1996). Iacobucci (2010) argues that the vague rule of thumb that the sample needs to be larger than 200, which was commonly accepted a while ago, is conservative and oversimplistic. In her article, she therefore argues that small samples of 50–100 could suffice. However, we would like to emphasise that this is only the case when you are testing a simple model with strong effects. One could wonder whether these simple models depict the true effects in an accurate way. The literature does offer some interesting rules of thumb that give an indication of an appropriate *sample size* in which the number of constructs or estimated parameters are taken into account. For the measurement model, the ratio of the sample size to the number of observed variables should at least be 10:1 (Hair, Black, Babin, Anderson, & Tatham, 2006). Bentler and Chou (1987) recommend that the ratio between the sample size and the number of parameters that need to be estimated should also be 10:1 or higher. More information on conducting SEM with small samples can be found in the article of Bentler and Yuan (1999). In addition, alternative estimation methods such as partial least squares (PLS) exist that are appropriate for small samples (see Sect. 14.4).

Missing values. By default, SEM only uses the data of participants without missing values. This approach assumes that if the dataset contains *missing values*, these values are missing completely at random. If this is not the case, one could adopt more advanced methods for handling missing values. For more information on this topic, the reader is referred to Allison (2003).

There is some evidence that SEM is robust to violations of the statistical assumptions if the sample size is large (more than 200 independent observations) and there are no

missing values (Hsu, Chen, & Hsieh, 2006; Hu, Bentler, & Kano, 1992; Yuan & Bentler, 1999; Yuan & Zhong, 2013). However, with highly discrete and/or skewed data, especially if sample size is small or moderate, it is recommended to apply more robust estimation techniques and alternative statistics (for more information on these alternatives, see Bentler & Yuan, 1999; Jung, 2013; Kline, 2012; Satorra, 1990).

14.2.3 Fit Indices

A wide variety of *fit indices* have been proposed to evaluate the proposed model in terms of goodness of fit and simplicity of the model. Some fit indices emphasise the fit of the model to the data, while others take into account whether the model is parsimonious (Hox & Bechger, 1998; Iacobucci, 2010). In general, there is some agreement on which fit indices should be reported. First, there is the chi-square test, which is the only inferential measure. The null hypothesis of the chi-square test is that the model fits the data, meaning that to conclude that your model fits the data the chi-square test should not be significant. However, the chi-square test is very sensitive to sample size (Hox & Bechger, 1998). As a consequence, when working with large samples, the statistical test will be significant in almost all real data applications (Hox & Bechger, 1998; Iacobucci, 2010). One might think that it would be advisable not to work with large samples; however, this is not a valid advice, as a sufficiently large sample size is necessary to support the precision of the parameter estimation (Iacobucci, 2010). Alternatively, it has been suggested that fit is acceptable when the *ratio of the chi-square test statistic to the degrees of freedom* is not larger than 3: $\chi^2/df \leq 3$ (Iacobucci, 2010).

Due to the sensitivity of the chi-square test, the fit of the model is always evaluated based on *multiple alternative indices*. Because all goodness-of-fit indices are some function of the chi-square test, the majority of these indices are also subjected to the sample size but to a much smaller degree than the chi-square test (Hox & Bechger, 1998). As the following indices are not inferential, no statistical hypothesis testing is involved, only guidelines or 'rules of thumb' can be offered (Hu & Bentler, 1999; Iacobucci, 2010). Table 14.1 summarises the different guidelines that are offered in the standard methodological literature. Below we will describe the most commonly used cut-off values. In general, authors are advised to report the *comparative fit index* (*CFI*) that captures the relative goodness of fit in comparison to a simpler model. In a sense it indicates whether making your model more complex actually pays off. Preferably, the CFI is close to or higher than .95 (Hu & Bentler, 1999; Iacobucci, 2010), but values starting from .90 are considered acceptable (Iacobucci, 2010). Some authors also report the Tucker-Lewis Index (TLI) also known as the Non-normed Fit Index (NNFI), which follows the same rules of thumb as the CFI. Next to the chi-square test and CFI, the *SRMR* or *Standardised Root Mean square Residual* is usually reported. The SRMR actually indicates to what extent your model does not fit the data. The higher the value, the worse the model fit. This SRMR largely depends on the factor loadings in the measurement model and is less

Table 14.1 Cut-off values for fit indices

Type fit index	Fit index	Adequate fit index
Absolute fit indexes	Standardised Root Mean Square Residual (SRMR)	SRMR ≤ .08 (Hu & Bentler, 1999; MacCallum et al., 1996) SRMR ≤ .05 = good (Byrne, 2001; Jaccard & Wan, 1996)
	Jöreskog-Sörbom Goodness-of-Fit Index (GFI)	CFI ≥ .95 (Browne & Cudeck, 1993; Hu & Bentler, 1999)
	Adjusted Goodness-of-Fit Index (AGFI)	AGFI ≥ .95 (Hu & Bentler, 1999)
Incremental fit indexes/ comparative fit indexes/ relative fit indices	Bentler Comparative Fit Index (CFI)	CFI ≥ .95 (Hu & Bentler, 1999) CFI ≥ .90 (Bentler, 1992; Byrne, 2001)
	Normed Fit Index (NFI)	NFI ≥ .95 (Hu & Bentler, 1999)
	Tucker-Lewis index (TLI) = NNFI: Non-normed Fit Index	TLI ≥ .95 (Hu & Bentler, 1999)
Parsimony-adjusted fit indexes	Root Mean Square Error of Approximation (RMSEA)	RMSEA ≤ .06 (Hu & Bentler, 1999) RMSEA .06 → .08 = reasonable error (Browne & Cudeck, 1993) RMSEA .08 → 1 = reasonable error (MacCallum et al., 1996)

prone to violations of the distributional assumption. The maximum value of this index equals 1 and (very) low values are preferred. Values below .08 indicate an acceptable model. Finally, most researchers also report the *Root Mean Square Error of Approximation* (*RMSEA*) and its 90 % confidence interval. The RMSEA was developed to provide an indication of the extent to which the model does not match the true model. Small values indicate a good match. An RMSEA smaller than .06 is advised, although a value lower than .08 can also be considered acceptable (Browne & Cudeck, 1993; MacCallum et al., 1996).

14.2.4 Modification Indices

When the model fit is not satisfactory, a researcher could choose to modify his model. This modification can be based on the parameter estimates (e.g. removing nonsignificant paths or observed variables with low loadings) or on the *modification indices* that indicate which parameter(s) should be added to the model to improve the model fit and how much the chi-square statistic is expected to minimally decrease when that parameter would be added (Hox & Bechger, 1998; Iacobucci, 2009). There is some debate on the use or misuse of *modification indices* (Hox & Bechger, 1998; Iacobucci, 2009). At first glance, these modification indices appear to be very helpful. Often these modification indices

are used to improve the model fit sequentially, up till the point that the model meets the requirements. A strong advice regarding the use of the modification indices for improving the model fit is that alterations to the hypothesised model based on the data should only be done when there are theoretical grounds that support these alterations (Chin, 1998; Hox & Bechger, 1998). However, some researchers seem to be very creative in evaluating the theoretical justification post hoc, leading to potentially incorrect models or models that are difficult to cross-validate because they rely too much on the data of the sample at hand (Hox & Bechger, 1998; Iacobucci, 2009). It is therefore proposed to use modification indices prudently and to compare different a priori constructed models (Hox & Bechger, 1998).

14.3 Analysing and Interpreting Data

Within this section the goal is to offer some guidelines for making decision about the data and the steps that could be followed within the analysis, as well as the interpretation of the results. However, bear in mind that how the model is built and the decisions taken within this process need to be theory driven. Crockett (2012) describes five sequential steps within SEM. The first two steps were discussed above: model specification and model identification. Subsequently, the model is estimated. Different estimation procedures can be used for the estimation of the variance-covariance matrix of the model, within this chapter the maximum likelihood estimation will be used. For an introduction into the different estimation methods, we refer the reader to Crockett (2012). Below, we will foremost focus on the fourth and fifth step: model testing and model modification. Model testing involves the evaluation of the plausibility of the theoretical model given the sample data (Crockett, 2012). This evaluation is based on multiple fit indices (cf. infra). The final step of model modification was already shortly introduced above and will also be illustrated below.

14.3.1 Illustration: Concept and Sample

The analyses will be illustrated with a data set that was collected to investigate the relationship between employees' approaches to learning at work and their work motivation, perceived workload and choice independence.

14.3.1.1 Concepts and Measurement Instruments

Within the literature three approaches to learning at work are distinguished: a deep approach, a surface-rational approach and a surface-disorganised approach. A deep approach to learning refers to the combination of an eagerness to learn and the use

of integrative strategies that contribute to personal understanding. The surface-rational approach reflects a preference for orderly, accurate and detailed work achieved by using surface learning strategies such as memorisation and a step-by-step approach. Finally, the surface-disorganised approach is considered a nonacademic orientation in combination with surface motives. It is associated with feeling overwhelmed and a sense of incompetence when executing task. These approaches to learning at work were measured by means of the *Approaches to learning at Work Questionnaire* (Kirby, Knapper, Evans, Carty, & Gadula, 2003).

Work motivation was conceptualised from the perspective of the self-determination theory. Within this study the focus lied on the reasons why someone does a particular job and a distinction between autonomous and controlled motivation is made. Work motivation was measured with the *Motivation at Work Scale* (Gagné et al., 2010). Perceived workload and choice independence were measured with the *Workplace Climate Questionnaire* (Kirby et al., 2003). The complete theoretical background, the rationale and the results of the actual study can be found in the article of Kyndt, Raes, Dochy and Janssens (2013).

14.3.1.2 Sample

The *sample* consisted of 358 employees from diverse companies (59 % female). The majority of the participants were employed in profit organisations (52 %), and 38 % were employed in nonprofit or social profit organisations (e.g. healthcare). The remaining 10 % of the participants were employed within the public sector. Participants were between 20 and 64 years old ($M = 37.85$, $SD = 10.64$); on average they had 11.22 years of seniority ($SD = 10.16$). Most respondents had a permanent full-time contract (83 %); others worked part time (14 %) or had a temporary contract (3 %). Finally, participants' initial level of education was diverse: '1 % did not obtain a diploma or finished elementary school, 25 % obtained a secondary degree, 40 % obtained a bachelor's degree (professional or academic), and 34 % obtained a master's degree' (Kyndt et al., 2013, p. 278).

14.3.1.3 Software and Output

For this illustration the analyses were performed with the *lavaan* package of R (Rosseel, 2012). *R* is a free software for statistical computing that can be downloaded from www.R-project.org (R Development Core Team, 2012). Figure 14.4 was plotted by means of the *qgraph* package (Epskamp, Cramer, Waldorp, Schmittmann, & Borsboom, 2012). The R code of this example can be found in the appendix. SEM analysis can also be performed with the AMOS package (Extension of SPSS; Arbuckle, 2011), SAS Calis procedure (SAS Institute Inc, 2008), Mplus (Muthén & Muthén, 1998–2010), EQS (Bentler, 2004) or Lisrel (Jöreskog & Sörbom, 1997). For this illustration, we chose to present the output as given by R so that the reader would recognise these output when undertaken the analysis themselves. This output presents more information than discussed

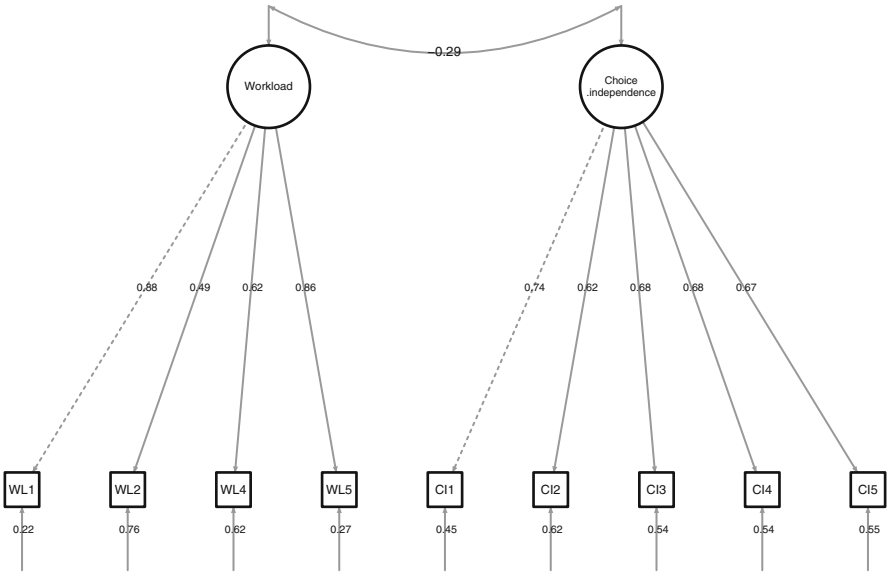

Fig. 14.4 Measurement model with standardised coefficients

within this introductory chapter; therefore, we have marked the values on which the interpretations are based. When performing the analysis in R, the first steps that need to be undertaken are setting a working directory, loading the data and installing the necessary packages.

14.3.2 Measurement Model: Confirmatory Factor Analysis

We will illustrate the *confirmatory factor analysis* with the simplest measurement that was included within the study, that is, the measurement of perceived workload and perceived choice independence of the employee (Kirby et al., 2003). Both constructs were measured by five items (i.e. observed variables) that were scored on a five-point Likert scale (see Table 14.2).

14.3.2.1 Confirming the Model

The results of the CFA show that the hypothesised measurement model fits the data reasonably well (Output 1). Although the chi-square test is statistically significant ($\chi^2 = 98.223$, df = 34, $p < .001$), the ratio between the test statistic and degrees of freedom (98.223/34 = 2.89) is below 3. In addition, the *CFI* and *TLI,* respectively, equal .94 and .92, which is above the proposed cut-off of .90. The *SRMR* and *RMSEA* are rather high (SRMR = .075, RMSEA = .073, CI 90 % [.056, .09]), but both are acceptable, although it is not a good sign that the values within the confidence interval exceed .08.

```
lavaan (0.5-12) converged normally after  31 iterations

Used       Total
  Number of observations                           354         359

  Estimator                                         ML
  Minimum Function Test Statistic               98.223
  Degrees of freedom                                34
  P-value (Chi-square)                           0.000

Model test baseline model:

  Minimum Function Test Statistic             1176.569
  Degrees of freedom                                45
  P-value                                        0.000

Full model versus baseline model:

  Comparative Fit Index (CFI)                    0.943
  Tucker-Lewis Index (TLI)                       0.925

Loglikelihood and Information Criteria:

  Loglikelihood user model (H0)              -4804.185
  Loglikelihood unrestricted model (H1)      -4755.074

  Number of free parameters                         21
  Akaike (AIC)                                9650.371
  Bayesian (BIC)                              9731.626
  Sample-size adjusted Bayesian (BIC)         9665.005

Root Mean Square Error of Approximation:

  RMSEA                                          0.073
  90 Percent Confidence Interval          0.056  0.090
  P-value RMSEA <= 0.05                          0.013

Standardized Root Mean Square Residual:

  SRMR                                           0.075


Parameter estimates:

  Information                                 Expected
  Standard Errors                             Standard


                   Estimate  Std.err  Z-value  P(>|z|)   Std.lv  Std.all
Latent variables:
  Workload =~
    WL1               1.000                               1.006    0.875
    WL2               0.611    0.063    9.686    0.000    0.615    0.512
    WL3               0.197    0.061    3.218    0.001    0.199    0.181
    WL4               0.769    0.062   12.432    0.000    0.774    0.633
    WL5               0.961    0.057   16.854    0.000    0.967    0.859

  Choice.independence =~
    CI1               1.000                               0.809    0.743
    CI2               0.815    0.079   10.353    0.000    0.659    0.619
    CI3               0.892    0.079   11.263    0.000    0.721    0.680
    CI4               0.808    0.072   11.240    0.000    0.653    0.678
    CI5               0.836    0.075   11.173    0.000    0.676    0.674

Covariances:
  Workload ~~
    Choic.ndpndnc    -0.231    0.054   -4.259    0.000   -0.284   -0.284

Variances:
    WL1               0.310    0.050                       0.310    0.234
    WL2               1.061    0.084                       1.061    0.737
    WL3               1.166    0.088                       1.166    0.967
    WL4               0.896    0.075                       0.896    0.600
    WL5               0.332    0.048                       0.332    0.262
    CI1               0.529    0.056                       0.529    0.447
    CI2               0.698    0.061                       0.698    0.616
    CI3               0.605    0.057                       0.605    0.538
    CI4               0.500    0.047                       0.500    0.540
    CI5               0.549    0.051                       0.549    0.546
    Workload          1.013    0.106                       1.000    1.000
    Choic.ndpndnc     0.654    0.089                       1.000    1.000
```

Output 1 CFA all items

Table 14.2 Items measurement model

Scale	Item nr.	Question
Workload	WL1	The workload here is too heavy
	WL2	It sometimes seems to me that my job requires me to do too many different things
	WL3	In this organisation you're expected to spend a lot of time learning things on your own
	WL4	There seems to be too much work to get through here
	WL5	There's a lot of pressure on you as an employee here
Choice independence	CI1	There is a real opportunity in this organisation for people to choose the particular tasks they work on
	CI2	The organisation really seems to encourage us to develop our own work-related interests as far as possible
	CI3	We seem to be given a lot of choice here in the work we have to do
	CI4	This organisation gives you a chance to go about your work in ways which suit your own way of learning
	CI5	Employees here have a great deal of choice over how they learn new tasks

Table 14.3 Model fit without item WL3

Instrument	χ^2/df	CFI	TLI	RMSEA 90 % CI	SRMR
Workload and choice independence	2.40	.97	.95	.063 [.043; .083]	.052

In sum, the measurement model shows an acceptable fit, but there is room for improvement. Because the SRMR is rather high, it could be interesting to examine the factor loadings of the different items and delete item(s) with low factor loadings. Ideally the standardised values of the factor loadings (see std.all in output) are around or above .50 (Hair et al., 2006; Maruyama, 1998). Within this solution, only item WL3 has a factor loading below .50. If we look at the questions in Table 14.2, we can observe that WL3 focuses on a different aspect in comparison with the other four items. WL3 is the only item that considers learning. Therefore, we decided to test a second measurement model in which item WL3 was excluded. The results show an improved fit (Table 14.3 and Output 2).

```
lavaan (0.5-12) converged normally after  31 iterations

                                                  Used       Total
  Number of observations                           355         359

  Estimator                                         ML
  Minimum Function Test Statistic               62.391
  Degrees of freedom                                26
  P-value (Chi-square)                           0.000

Model test baseline model:

  Minimum Function Test Statistic             1128.760
  Degrees of freedom                                36
  P-value                                        0.000

Full model versus baseline model:

  Comparative Fit Index (CFI)                    0.967
  Tucker-Lewis Index (TLI)                       0.954

Loglikelihood and Information Criteria:

  Loglikelihood user model (H0)              -4286.378
  Loglikelihood unrestricted model (H1)      -4255.182

  Number of free parameters                         19
  Akaike (AIC)                                8610.755
  Bayesian (BIC)                              8684.326
  Sample-size adjusted Bayesian (BIC)         8624.049

Root Mean Square Error of Approximation:

  RMSEA                                          0.063
  90 Percent Confidence Interval          0.043  0.083
  P-value RMSEA <= 0.05                          0.136

Standardized Root Mean Square Residual:

  SRMR                                           0.052


Parameter estimates:

  Information                                 Expected
  Standard Errors                             Standard


                   Estimate  Std.err  Z-value  P(>|z|)   Std.lv  Std.all
Latent variables:
  Workload =~
    WL1               1.000                               1.009    0.878
    WL2               0.604    0.063    9.590    0.000    0.609    0.508
    WL4               0.765    0.062   12.403    0.000    0.771    0.632
    WL5               0.954    0.057   16.700    0.000    0.962    0.855


  Choice.independence =~
    CI1               1.000                               0.806    0.742
    CI2               0.815    0.079   10.315    0.000    0.658    0.617
    CI3               0.893    0.079   11.242    0.000    0.720    0.679
    CI4               0.809    0.072   11.230    0.000    0.653    0.678
    CI5               0.837    0.075   11.155    0.000    0.675    0.673
```

Output 2 CFA without WL3

```
Covariances:
  Workload ~~
    Choic.ndpndnc    -0.237    0.054   -4.357    0.000   -0.291   -0.291

Variances:
    WL1               0.302    0.051                     0.302    0.229
    WL2               1.068    0.084                     1.068    0.742
    WL4               0.895    0.074                     0.895    0.601
    WL5               0.340    0.049                     0.340    0.268
    CI1               0.531    0.056                     0.531    0.450
    CI2               0.702    0.061                     0.702    0.619
    CI3               0.605    0.057                     0.605    0.539
    CI4               0.499    0.047                     0.499    0.540
    CI5               0.549    0.051                     0.549    0.547
    Workload          1.017    0.107                     1.000    1.000
    Choic.ndpndnc     0.650    0.088                     1.000    1.000
```

Output 2 (continued)

Table 14.4 Measurement invariance for males and females

Model					Model comparison			
	χ^2 (df)	CFI	RMSEA	BIC		$\Delta\chi^2$ (Δdf)	*p*-value	Δ CFI
Model 1	88.810** (52)	.966	.063	8833.54				
Model 2 (equal loadings)	100.039** (59)	.962	.063	8803.69	Model 1 vs. 2	11.228 (7)	.129	.004
Model 3 (+equal intercepts)	103.398** (66)	.965	.057	8765.96	Model 2 vs. 3	3.359 (7)	.850	−.003
Model 4 (+equal errors)	113.432*** (68)	.958	.061	8764.25	Model 3 vs. 4	10.034 (2)	<.01	.007

*p<.05; **p<.01; ***p<.001

Because both models show an acceptable fit, both could be accepted. The decision for the most appropriate measurement model should foremost be guided by theory. In this case, one could consider whether or not investing time in learning is an important aspect of the construct of perceived workload. In addition, you could also test which model is superior in a statistical sense. Because the first model can be considered an extension of the second model (i.e. the models are nested), the *chi-square test for model comparison* can be applied. By using a simple formula in Excel (=CHIDIST(Δ*chi-statistics*[1]; Δ*degrees of freedom*)), you can calculate whether the difference between the chi-square statistics of both models is statistically significant. In this example, the difference between the chi-square statistics equals 98.223−62.391 = 35.832, and the difference between the degrees of freedom equals 34−36 = 8. The significance test reveals that this difference is statistically significant (p<.001) indicating the second model is statistically superior to the first (a smaller chi-square value indicates a better fit). From a theoretical point of view, the conclusion is also supported because the emphasis within perceived workload lies on general workplace conditions, regardless of the fact that the effort had to be undertaken for learning specifically. Figure 14.4 depicts the measurement model.

[1] **Δ** = difference.

14.3.2.2 The Stability of the Model: Measurement Invariance

Recently, more and more attention has been given to the stability of the measurement model (Boeve-de Pauw, Jacobs, & Van Petegem, 2012; Coertjens, Donche, De Maeyer, Vanthournout, & Van Petegem, 2013). If the goal is to compare the constructs across groups and/or over time – which is often the case – it is important to determine whether a questionnaire measures the same constructs with the same structure across groups and/or over time. When *measurement invariance* is established, it can be accepted that different groups of participants (e.g. males and females) or the same participants across different measurement moments (longitudinal measurement invariance) interpret the individual questions and underlying constructs in a similar way.

Different levels (less to more demanding) of measurement invariance are described: configural, metric, scalar, and strict invariance. Configural invariance (Model 1) refers to the fact that the basic model structure is invariant across groups (Boeve-de Pauw et al., 2012). It shows that the participants conceptualise the constructs similarly. It basically shows that the same structure – the same items belong to the same construct – holds for both groups or both measurement moments. Configural invariance, however, does not ensure that the separate items are interpreted similarly because the factor loadings of the items can be different across groups or measurement moments.

To test whether metric invariance is achieved, one can compare the configural model to a model in which the factor loadings are constrained (Model 2) to be equal for each group or at each measurement moment. If constraining the factor loadings does not result in a significantly less good fit of the model, metric invariance can be claimed. A model is considered as good as the previous model if the difference between the *CFI*s of both models is smaller than .01. Ideally the difference in the chi-square test is also not significant; however, it is known that the chi-square statistic is sensitive to the size of the sample (Iacobucci, 2010).

Metric invariance indicates that the items are interpreted in a similar way across groups or measurement moments. When the aim is to compare means of the latent constructs across groups, it is necessary to achieve scalar invariance. Scalar invariance indicates that differences in means of the observed items are a consequence of the differences in means of the latent constructs. To identify scalar invariance, the model in which both the loadings and the intercepts of the items are constrained to be equal across groups or measurement moments (model 3) is compared to the model in which only the loadings (model 2) are constrained. When the model with constrained loadings and intercepts results into a too large decrease of the CFI, one could explore the option of freeing some of the intercepts and achieving partial intercept invariance. Advanced statistical models such as multiple-indicator growth analysis in case of longitudinal analysis can take these intercept variances into account (e.g. Coertjens et al., 2013). Finally, one can also check for invariance in error variances (strict invariance). However, in practice full measurement invariance is rarely achieved nor necessary (Boeve-de Pauw et al., 2012).

Measurement invariance *across groups* can be tested relatively easy in R with the *semTools* package (Pornprasertmanit, Miller, Schoemann, & Rosseel, 2013). The specific commands can be found in the Appendix.

```
Measurement invariance tests:

Model 1: configural invariance:
   chisq       df   pvalue      cfi    rmsea      bic
  88.810   52.000    0.001    0.966    0.063 8833.541

Model 2: weak invariance (equal loadings):
   chisq       df   pvalue      cfi    rmsea      bic
 100.039   59.000    0.001    0.962    0.063 8803.685

[Model 1 versus model 2]
  delta.chisq      delta.df delta.p.value     delta.cfi
       11.228         7.000         0.129         0.004
Model 3: strong invariance (equal loadings + intercepts):
   chisq       df   pvalue      cfi    rmsea      bic
 103.398   66.000    0.002    0.965    0.057 8765.959

[Model 1 versus model 3]
  delta.chisq      delta.df delta.p.value     delta.cfi
       14.588        14.000         0.407         0.001

[Model 2 versus model 3]
  delta.chisq      delta.df delta.p.value     delta.cfi
        3.359         7.000         0.850        -0.003
Model 4: equal loadings + intercepts + means:
   chisq       df   pvalue      cfi    rmsea      bic
 113.432   68.000    0.000    0.958    0.061 8764.254

[Model 1 versus model 4]
  delta.chisq      delta.df delta.p.value     delta.cfi
       24.622        16.000         0.077         0.008

[Model 3 versus model 4]
  delta.chisq      delta.df delta.p.value     delta.cfi
       10.034         2.000         0.007         0.007
```

Output 3 Measurement invariance

Within our illustration, we checked whether males and females interpreted the items and constructs in a similar way. In other words the measurement invariance across males and females was tested. The results can be found in Output 3 and are preferably reported by means of a table (see Table 14.4). The results in Table 14.4 show that the measurement of perceived workload and choice independence reaches scalar invariance. The differences between the *CFI*s are below .01 and the chi-square test for model comparison show that the different models do not differ significantly from each other.

Establishing *longitudinal measurement invariance* follows the same procedure as establishing measurement invariance over groups:

- Testing configural invariance
- Constraining factor loadings to be equal and comparing this to the configural invariance model (metric invariance)
- Constraining factor loadings and intercepts to be equal and comparing this to the metric invariance model (scalar invariance)

However, the difference with establishing measurement invariance across groups is that longitudinal measurement invariance is assessed for each scale separately and not the instrument as a whole (Coertjens, Donche, De Maeyer, Vanthournout & Van Petegem, 2012). Currently, longitudinal measurement invariance cannot be assessed by means of an R-package. This type of analysis is foremost executed with the Mplus

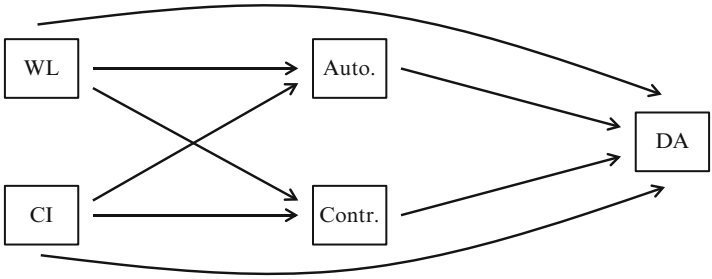

Fig. 14.5 Path diagram illustration path analysis (*Note*: *WL* workload, *CI* choice independence, *Auto.* autonomous motivation, *Contr.* controlled motivation, *DA* deep approach)

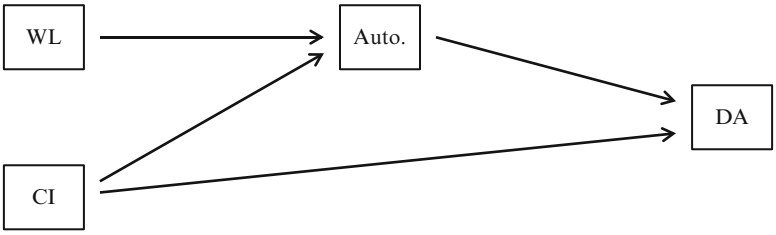

Fig. 14.6 Path diagram illustration path analysis without nonsignificant paths

software (Muthén & Muthén, 1998–2010). In our article on the development of a self-assessment instrument for the generic competences of vocational education students, an example of longitudinal measurement invariance testing relevant for the field of professional learning can be found (Kyndt et al., accepted).

14.3.3 Structural Model: Path Analysis

An illustration of a model including the two motivational scales as mediating variables is provided below. Figure 14.5 represent the path diagram of the model under examination.

The *path analysis* including the two mediating variables shows a fit that is not optimal. Moreover, because the model includes almost every possible relationship, the model cannot be considered parsimonious. The poor model fit is evident from a ratio between the chi-square and degrees of freedom that is too large (χ^2/df = 5.92) and an *RSMEA* of .12 which is also too large. Simplifying the model by excluding nonsignificant paths could be a solution to this problem. Based on the output (Output 4), we decided to exclude the path between controlled motivation and a deep approach to learning, and the path between workload and autonomous motivation. Because the interest lies in predicting employees' deep approach to learning and controlled motivation was inserted as a mediator between the perception of workload and choice independence, the paths from workload and choice independence to controlled motivation were also removed (Output 5). The new model that will be tested is represented by a path diagram in Fig. 14.6.

```
lavaan (0.5-12) converged normally after  19 iterations

  Number of observations                           359

  Estimator                                         ML
  Minimum Function Test Statistic                5.923
  Degrees of freedom                                 1
  P-value (Chi-square)                           0.015

Model test baseline model:

  Minimum Function Test Statistic              249.403
  Degrees of freedom                                 9
  P-value                                        0.000

Full model versus baseline model:

  Comparative Fit Index (CFI)                    0.980
  Tucker-Lewis Index (TLI)                       0.816

Loglikelihood and Information Criteria:

  Loglikelihood user model (H0)              -5099.399
  Loglikelihood unrestricted model (H1)      -5096.438

  Number of free parameters                         11
  Akaike (AIC)                               10220.798
  Bayesian (BIC)                             10263.515
  Sample-size adjusted Bayesian (BIC)        10228.617

Root Mean Square Error of Approximation:

  RMSEA                                          0.117
  90 Percent Confidence Interval          0.041  0.215
  P-value RMSEA <= 0.05                          0.069

Standardized Root Mean Square Residual:

  SRMR                                           0.029

Parameter estimates:

  Information                                 Expected
  Standard Errors                             Standard

                   Estimate  Std.err  Z-value  P(>|z|)   Std.lv  Std.all
Regressions:
  DA ~
    Autonomous        0.266    0.062    4.313    0.000    0.266    0.219
    Controlled        0.085    0.056    1.535    0.125    0.085    0.071
  Autonomous ~
    WL                0.067    0.049    1.349    0.177    0.067    0.063
    CI                0.529    0.051   10.400    0.000    0.529    0.485
  Controlled ~
    WL                0.242    0.055    4.410    0.000    0.242    0.227
    CI                0.181    0.056    3.208    0.001    0.181    0.165
  DA ~
    WL                0.199    0.059    3.347    0.001    0.199    0.155
    CI                0.488    0.069    7.115    0.000    0.488    0.369

Variances:
    DA               20.246    1.511                     20.246    0.711
    Autonomous       14.805    1.105                     14.805    0.768
    Controlled       18.208    1.359                     18.208    0.931
```

Output 4 Path analysis with mediating variables

This more parsimonious model shows a good fit (χ^2/df = 1.82, CFI = .99, TLI = .98, RMSEA = 0.048, CI 90 % [0; .058], SRMR = .02). All included paths are significant, indicating that perceived workload and choice independence predict employee's deep approaches to learning significantly. In addition, autonomous motivation was found to mediate this relationship.

```
lavaan (0.5-12) converged normally after  16 iterations

  Number of observations                           359

  Estimator                                         ML
  Minimum Function Test Statistic                1.815
  Degrees of freedom                                 1
  P-value (Chi-square)                           0.178

Model test baseline model:

  Minimum Function Test Statistic              215.652
  Degrees of freedom                                 5
  P-value                                        0.000

Full model versus baseline model:

  Comparative Fit Index (CFI)                    0.996
  Tucker-Lewis Index (TLI)                       0.981

Loglikelihood and Information Criteria:

  Loglikelihood user model (H0)              -4071.179
  Loglikelihood unrestricted model (H1)      -4070.271

  Number of free parameters                          6
  Akaike (AIC)                               8154.358
  Bayesian (BIC)                             8177.658
  Sample-size adjusted Bayesian (BIC)        8158.623

Root Mean Square Error of Approximation:

  RMSEA                                          0.048
  90 Percent Confidence Interval         0.000  0.158
  P-value RMSEA <= 0.05                          0.355

Standardized Root Mean Square Residual:

  SRMR                                           0.020

Parameter estimates:

  Information                                 Expected
  Standard Errors                             Standard

                   Estimate  Std.err  Z-value  P(>|z|)   Std.lv  Std.all
Regressions:
  DA ~
    Autonomous        0.278    0.062    4.506    0.000    0.278    0.229
  Autonomous ~
    CI                0.520    0.051   10.287    0.000    0.520    0.477
  DA ~
    WL                0.219    0.058    3.776    0.000    0.219    0.170
    CI                0.497    0.068    7.336    0.000    0.497    0.376

Variances:
    DA               20.376    1.521                     20.376    0.717
    Autonomous       14.881    1.111                     14.881    0.772
```

Output 5 Path analysis mediating variables without nonsignificant paths

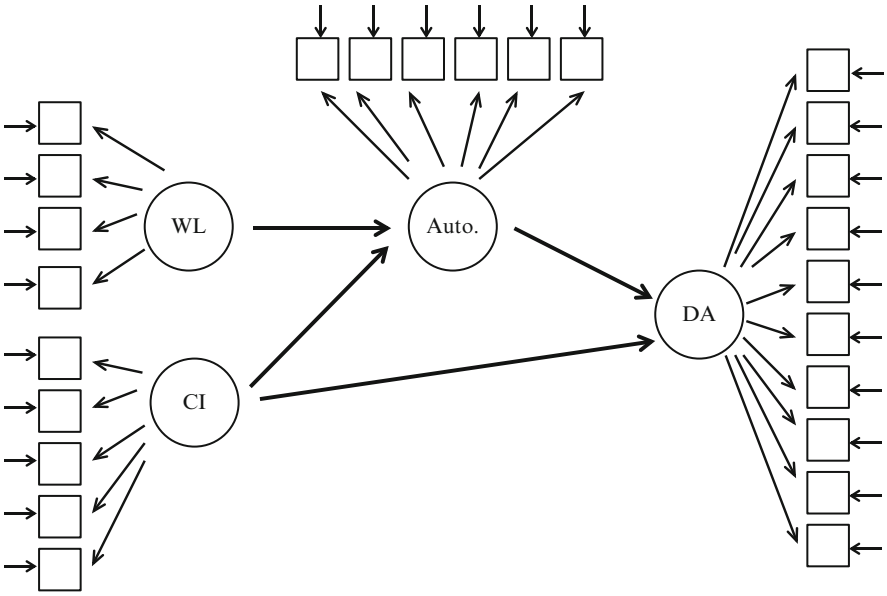

Fig. 14.7 Path diagram full SEM model

Full SEM Model

Finally, a *full SEM model* combines a measurement model and structural model that were presented above. As an illustration, the full SEM model of final path analysis will be examined (see Fig. 14.7).

The results show that this model does not adequately fit the data (χ^2/df = 2.47, CFI = .85, TLI = .84, RMSEA = 0.065, CI 90 % [.059; .071], SRMR = .075). The modification indices were checked to examine whether the model could be improved (Output 6).

```
lavaan (0.5-12) converged normally after  41 iterations

                                                  Used       Total
  Number of observations                           346         359

  Estimator                                         ML
  Minimum Function Test Statistic              665.646
  Degrees of freedom                               270
  P-value (Chi-square)                           0.000

Model test baseline model:

  Minimum Function Test Statistic             3011.588
  Degrees of freedom                               300
  P-value                                        0.000

Full model versus baseline model:

  Comparative Fit Index (CFI)                    0.854
  Tucker-Lewis Index (TLI)                       0.838

Loglikelihood and Information Criteria:

  Loglikelihood user model (H0)              -11147.345
  Loglikelihood unrestricted model (H1)      -10814.522

  Number of free parameters                         55
  Akaike (AIC)                               22404.690
  Bayesian (BIC)                             22616.244
  Sample-size adjusted Bayesian (BIC)        22441.768

Root Mean Square Error of Approximation:

  RMSEA                                          0.065
  90 Percent Confidence Interval         0.059  0.071
  P-value RMSEA <= 0.05                          0.000

Standardized Root Mean Square Residual:

  SRMR                                           0.075

Parameter estimates:

  Information                                 Expected
  Standard Errors                             Standard

                   Estimate  Std.err  Z-value  P(>|z|)   Std.lv  Std.all
Latent variables:
  Workload =~
    WL1               1.000                               1.004    0.873
    WL2               0.613    0.064    9.593    0.000    0.615    0.515
    WL4               0.762    0.063   12.171    0.000    0.765    0.631
    WL5               0.962    0.059   16.390    0.000    0.966    0.856
  Choice.independence =~
    CI1               1.000                               0.796    0.735
    CI2               0.839    0.080   10.543    0.000    0.667    0.628
    CI3               0.897    0.079   11.363    0.000    0.714    0.680
    CI4               0.804    0.072   11.200    0.000    0.640    0.669
    CI5               0.815    0.075   10.908    0.000    0.649    0.651
  Deep.approach =~
    ALWD1             1.000                               0.521    0.446
    ALWD2             0.559    0.132    4.243    0.000    0.292    0.292
    ALWD3             0.463    0.104    4.461    0.000    0.241    0.312
    ALWD4             0.350    0.107    3.260    0.001    0.182    0.213
    ALWD5             0.778    0.132    5.873    0.000    0.405    0.471
    ALWD6             1.065    0.162    6.588    0.000    0.555    0.590
    ALWD7             0.773    0.134    5.785    0.000    0.403    0.459
```

Output 6 Full SEM model

```
    ALWD8             1.160    0.181    6.417    0.000    0.605    0.557
    ALWD9             0.691    0.126    5.498    0.000    0.360    0.422
    ALWD10            1.046    0.170    6.153    0.000    0.545    0.513
  Autonomous.motivation =~
    Intrins1          1.000                                0.883    0.903
    Intrins2          0.970    0.042   23.369    0.000    0.857    0.916
    Intrins3          0.631    0.051   12.330    0.000    0.557    0.597
    Ident1            0.426    0.063    6.771    0.000    0.376    0.361
    Ident2            0.342    0.070    4.900    0.000    0.301    0.267
    Ident3            0.716    0.052   13.800    0.000    0.632    0.648

Regressions:
  Deep.approach ~
    Workload          0.093    0.032    2.901    0.004    0.180    0.180
    Choic.ndpndnc     0.387    0.069    5.573    0.000    0.591    0.591
    Autonms.mtvtn     0.163    0.044    3.706    0.000    0.276    0.276
  Autonomous.motivation ~
    Choic.ndpndnc     0.579    0.071    8.208    0.000    0.522    0.522

Covariances:
  Workload ~~
    Choic.ndpndnc    -0.211    0.053   -3.948    0.000   -0.264   -0.264

Variances:
    WL1               0.316    0.052                     0.316    0.239
    WL2               1.048    0.084                     1.048    0.735
    WL4               0.886    0.075                     0.886    0.602
    WL5               0.339    0.050                     0.339    0.266
    CI1               0.540    0.054                     0.540    0.460
    CI2               0.685    0.060                     0.685    0.606
    CI3               0.593    0.055                     0.593    0.538
    CI4               0.505    0.046                     0.505    0.552
    CI5               0.573    0.051                     0.573    0.577
    ALWD1             1.093    0.089                     1.093    0.801
    ALWD2             0.909    0.071                     0.909    0.914
    ALWD3             0.540    0.042                     0.540    0.903
    ALWD4             0.703    0.054                     0.703    0.955
    ALWD5             0.576    0.048                     0.576    0.778
    ALWD6             0.577    0.052                     0.577    0.652
    ALWD7             0.608    0.050                     0.608    0.789
    ALWD8             0.811    0.071                     0.811    0.689
    ALWD9             0.599    0.048                     0.599    0.822
    ALWD10            0.833    0.071                     0.833    0.737
    Intrins1          0.176    0.025                     0.176    0.184
    Intrins2          0.141    0.023                     0.141    0.161
    Intrins3          0.560    0.045                     0.560    0.643
    Ident1            0.944    0.073                     0.944    0.869
    Ident2            1.180    0.090                     1.180    0.928
    Ident3            0.552    0.045                     0.552    0.580
    Workload          1.007    0.108                     1.000    1.000
    Choic.ndpndnc     0.633    0.086                     1.000    1.000
    Deep.approach     0.120    0.034                     0.442    0.442
    Autonms.mtvtn     0.567    0.059                     0.728    0.728
```

Output 6 (continued)

The modification indices (Output 7) showed that the model could be improved by adding covariances between several observed variables. Only combinations of observed variables that reflected the same latent constructs were included because they can be considered in accordance with our theoretical model. For presentation purposes, only an excerpt of the output was included.

```
> modindices(FitSEMFull)
                    lhs op                  rhs     mi    epc sepc.lv sepc.all sepc.nox
1              Workload =~                  WL1     NA     NA      NA       NA       NA
2              Workload =~                  WL2  0.000  0.000   0.000    0.000    0.000
3              Workload =~                  WL4  0.000  0.000   0.000    0.000    0.000
4              Workload =~                  WL5  0.000  0.000   0.000    0.000    0.000
5              Workload =~                  CI1  4.339  0.107   0.107    0.099    0.099
6              Workload =~                  CI2  2.029  0.077   0.077    0.072    0.072
7              Workload =~                  CI3  0.245 -0.025  -0.026   -0.024   -0.024
8              Workload =~                  CI4 13.180 -0.171  -0.172   -0.180   -0.180
9              Workload =~                  CI5  0.009  0.005   0.005    0.005    0.005
10             Workload =~                ALWD1  0.563 -0.047  -0.047   -0.041   -0.041

----------

100 Autonomous.motivation =~               Ident3  0.000  0.000   0.000    0.000    0.000
101                   WL1 ~~                  WL1  0.000  0.000   0.000    0.000    0.000
102                   WL1 ~~                  WL2  1.644 -0.066  -0.066   -0.048   -0.048
103                   WL1 ~~                  WL4  0.000  0.001   0.001    0.001    0.001
104                   WL1 ~~                  WL5  5.857  0.248   0.248    0.191    0.191
105                   WL1 ~~                  CI1  0.025 -0.005  -0.005   -0.004   -0.004
106                   WL1 ~~                  CI2  0.079  0.010   0.010    0.008    0.008
107                   WL1 ~~                  CI3  0.111 -0.011  -0.011   -0.009   -0.009
108                   WL1 ~~                  CI4  2.462  0.047   0.047    0.043    0.043
109                   WL1 ~~                  CI5  0.410 -0.020  -0.020   -0.018   -0.018
110                   WL1 ~~                ALWD1  0.299  0.023   0.023    0.017    0.017
111                   WL1 ~~                ALWD2  2.124 -0.055  -0.055   -0.048   -0.048
112                   WL1 ~~                ALWD3  0.040 -0.006  -0.006   -0.006   -0.006
113                   WL1 ~~                ALWD4  0.018  0.004   0.004    0.004    0.004
114                   WL1 ~~                ALWD5  1.139  0.033   0.033    0.033    0.033
115                   WL1 ~~                ALWD6  0.238 -0.015  -0.015   -0.014   -0.014
116                   WL1 ~~                ALWD7  2.483 -0.049  -0.049   -0.049   -0.049
117                   WL1 ~~                ALWD8  0.061  0.009   0.009    0.007    0.007
118                   WL1 ~~                ALWD9  4.256 -0.064  -0.064   -0.065   -0.065
119                   WL1 ~~               ALWD10  0.649 -0.030  -0.030   -0.024   -0.024
120                   WL1 ~~             Intrins1  3.911  0.040   0.040    0.036    0.036

----------

320                ALWD2 ~~               Ident3  4.251 -0.082  -0.082   -0.084   -0.084
321                ALWD3 ~~                ALWD3  0.000  0.000   0.000    0.000    0.000
322                ALWD3 ~~                ALWD4  6.804  0.088   0.088    0.133    0.133
323                ALWD3 ~~                ALWD5  0.026  0.005   0.005    0.008    0.008
324                ALWD3 ~~                ALWD6  0.618 -0.026  -0.026   -0.036   -0.036
325                ALWD3 ~~                ALWD7  0.134  0.012   0.012    0.018    0.018
326                ALWD3 ~~                ALWD8  2.855 -0.066  -0.066   -0.079   -0.079
327                ALWD3 ~~                ALWD9 25.463  0.162   0.162    0.246    0.246
328                ALWD3 ~~               ALWD10  2.638  0.063   0.063    0.077    0.077
329                ALWD3 ~~             Intrins1  1.622 -0.027  -0.027   -0.035   -0.035
330                ALWD3 ~~             Intrins2  1.203 -0.022  -0.022   -0.030   -0.030
331                ALWD3 ~~             Intrins3  6.572  0.078   0.078    0.109    0.109
332                ALWD3 ~~               Ident1  0.054  0.009   0.009    0.011    0.011
333                ALWD3 ~~               Ident2  0.138 -0.016  -0.016   -0.019   -0.019
334                ALWD3 ~~               Ident3  2.674  0.050   0.050    0.066    0.066
335                ALWD4 ~~                ALWD4  0.000  0.000   0.000    0.000    0.000
336                ALWD4 ~~                ALWD5  4.119 -0.073  -0.073   -0.099   -0.099
337                ALWD4 ~~                ALWD6  1.033 -0.038  -0.038   -0.047   -0.047
338                ALWD4 ~~                ALWD7  8.945  0.110   0.110    0.146    0.146
339                ALWD4 ~~                ALWD8  0.409 -0.028  -0.028   -0.030   -0.030
340                ALWD4 ~~                ALWD9  4.627  0.078   0.078    0.107    0.107
341                ALWD4 ~~               ALWD10  5.275  0.101   0.101    0.110    0.110
342                ALWD4 ~~             Intrins1  1.608 -0.030  -0.030   -0.036   -0.036
343                ALWD4 ~~             Intrins2  0.140 -0.008  -0.008   -0.010   -0.010
344                ALWD4 ~~             Intrins3  2.865  0.059   0.059    0.073    0.073
345                ALWD4 ~~               Ident1  0.913  0.042   0.042    0.047    0.047
346                ALWD4 ~~               Ident2  5.746 -0.118  -0.118   -0.122   -0.122
347                ALWD4 ~~               Ident3  0.311 -0.019  -0.019   -0.023   -0.023
348                ALWD5 ~~                ALWD5  0.000  0.000   0.000    0.000    0.000
349                ALWD5 ~~                ALWD6  0.702 -0.030  -0.030   -0.037   -0.037
350                ALWD5 ~~                ALWD7  4.588 -0.075  -0.075   -0.099   -0.099
351                ALWD5 ~~                ALWD8  2.701 -0.069  -0.069   -0.074   -0.074
352                ALWD5 ~~                ALWD9  0.207  0.016   0.016    0.021    0.021
353                ALWD5 ~~               ALWD10  0.215  0.019   0.019    0.021    0.021
354                ALWD5 ~~             Intrins1  1.153 -0.024  -0.024   -0.028   -0.028
355                ALWD5 ~~             Intrins2  0.744  0.018   0.018    0.022    0.022
356                ALWD5 ~~             Intrins3  0.001 -0.001  -0.001   -0.001   -0.001
```

Output 7 Modification indices full SEM model

```
357                ALWD5 ~~               Ident1  0.382  0.025   0.025    0.028    0.028
358                ALWD5 ~~               Ident2  0.805  0.041   0.041    0.042    0.042
359                ALWD5 ~~               Ident3  0.013 -0.004  -0.004   -0.004   -0.004
360                ALWD6 ~~                ALWD6  0.000  0.000   0.000    0.000    0.000
361                ALWD6 ~~                ALWD7 10.839  0.121   0.121    0.147    0.147
362                ALWD6 ~~                ALWD8  0.050  0.010   0.010    0.010    0.010
363                ALWD6 ~~                ALWD9  0.667 -0.029  -0.029   -0.037   -0.037
364                ALWD6 ~~               ALWD10  0.750 -0.038  -0.038   -0.038   -0.038
365                ALWD6 ~~             Intrins1  0.196 -0.010  -0.010   -0.011   -0.011

-----------

400               ALWD10 ~~             Intrins2  0.357  0.015   0.015    0.015    0.015
401               ALWD10 ~~             Intrins3  2.201  0.058   0.058    0.059    0.059
402               ALWD10 ~~               Ident1  3.023  0.087   0.087    0.078    0.078
403               ALWD10 ~~               Ident2  2.416  0.087   0.087    0.072    0.072
404               ALWD10 ~~               Ident3  1.036 -0.040  -0.040   -0.038   -0.038
405             Intrins1 ~~             Intrins1  0.000  0.000   0.000    0.000    0.000
406             Intrins1 ~~             Intrins2 22.639  0.195   0.195    0.213    0.213
407             Intrins1 ~~             Intrins3  3.710 -0.049  -0.049   -0.053   -0.053
408             Intrins1 ~~               Ident1  2.662 -0.047  -0.047   -0.046   -0.046
409             Intrins1 ~~               Ident2  0.006  0.003   0.003    0.002    0.002
410             Intrins1 ~~               Ident3  1.611  0.034   0.034    0.036    0.036
411             Intrins2 ~~             Intrins2  0.000  0.000   0.000    0.000    0.000
412             Intrins2 ~~             Intrins3  2.425  0.038   0.038    0.043    0.043
413             Intrins2 ~~               Ident1 12.902 -0.099  -0.099   -0.102   -0.102
414             Intrins2 ~~               Ident2 10.067 -0.096  -0.096   -0.091   -0.091
415             Intrins2 ~~               Ident3  6.506 -0.066  -0.066   -0.072   -0.072
416             Intrins3 ~~             Intrins3  0.000  0.000   0.000    0.000    0.000
417             Intrins3 ~~               Ident1  4.778  0.088   0.088    0.091    0.091
418             Intrins3 ~~               Ident2  1.755 -0.060  -0.060   -0.057   -0.057
419             Intrins3 ~~               Ident3  0.078 -0.009  -0.009   -0.010   -0.010
420               Ident1 ~~               Ident1  0.000  0.000   0.000    0.000    0.000
421               Ident1 ~~               Ident2 46.922  0.392   0.392    0.334    0.334
422               Ident1 ~~               Ident3  7.649  0.112   0.112    0.110    0.110
423               Ident2 ~~               Ident2  0.000  0.000   0.000    0.000    0.000
424               Ident2 ~~               Ident3  0.000 -0.001  -0.001   -0.001   -0.001
425               Ident3 ~~               Ident3  0.000  0.000   0.000    0.000    0.000
426             Workload ~~             Workload  0.000  0.000   0.000    0.000    0.000
427             Workload ~~   Choice.independence  0.000  0.000   0.000    0.000    0.000
428             Workload ~~         Deep.approach     NA     NA      NA       NA       NA
429             Workload ~~ Autonomous.motivation  0.285  0.025   0.028    0.028    0.028
430   Choice.independence ~~   Choice.independence  0.000  0.000   0.000    0.000    0.000
431   Choice.independence ~~         Deep.approach     NA     NA      NA       NA       NA
432   Choice.independence ~~ Autonomous.motivation  0.285  0.075   0.107    0.107    0.107
433         Deep.approach ~~         Deep.approach  0.000  0.000   0.000    0.000    0.000
434         Deep.approach ~~ Autonomous.motivation     NA     NA      NA       NA       NA
435 Autonomous.motivation ~~ Autonomous.motivation  0.000  0.000   0.000    0.000    0.000
436         Deep.approach  ~ Autonomous.motivation  0.000  0.000   0.000    0.000    0.000
437         Deep.approach  ~             Workload  0.000  0.000   0.000    0.000    0.000
438         Deep.approach  ~   Choice.independence  0.000  0.000   0.000    0.000    0.000
439 Autonomous.motivation  ~         Deep.approach  0.285  0.285   0.168    0.168    0.168
440 Autonomous.motivation  ~             Workload  0.284  0.027   0.030    0.030    0.030
441 Autonomous.motivation  ~   Choice.independence  0.000  0.000   0.000    0.000    0.000
442             Workload  ~         Deep.approach  0.285  0.270   0.140    0.140    0.140
443             Workload  ~ Autonomous.motivation  0.285  0.044   0.039    0.039    0.039
444             Workload  ~   Choice.independence     NA     NA      NA       NA       NA
445   Choice.independence  ~         Deep.approach  0.284  0.811   0.531    0.531    0.531
446   Choice.independence  ~ Autonomous.motivation  0.285  0.132   0.147    0.147    0.147
447   Choice.independence  ~             Workload     NA     NA      NA       NA       NA
```

Output 7 (continued)

These modifications (Output 8) result in an acceptable model fit (χ^2/df = 1.94, CFI = .91, TLI = .90, RMSEA = 0.052, CI 90 % [.045; .059], SRMR = .064). When reporting on SEM analysis, it is not necessary to provide all coefficients of every model that was tested. It is however important that the reader gets an overview (with fit indices) of the different models that were tested. Only the coefficients of the final model should be reported. A table containing the coefficients, standardised coefficients, critical ratio and significance (level) is usually included. Table 14.5 provides an example of how the results of the final full SEM model could be presented.

```
lavaan (0.5-12) converged normally after  46 iterations

                                                  Used       Total
  Number of observations                           346         359

  Estimator                                         ML
  Minimum Function Test Statistic              505.367
  Degrees of freedom                               260
  P-value (Chi-square)                           0.000

Model test baseline model:

  Minimum Function Test Statistic             3011.588
  Degrees of freedom                               300
  P-value                                        0.000

Full model versus baseline model:

  Comparative Fit Index (CFI)                    0.910
  Tucker-Lewis Index (TLI)                       0.896

Loglikelihood and Information Criteria:

  Loglikelihood user model (H0)              -11067.206
  Loglikelihood unrestricted model (H1)      -10814.522

  Number of free parameters                         65
  Akaike (AIC)                               22264.411
  Bayesian (BIC)                             22514.430
  Sample-size adjusted Bayesian (BIC)        22308.231

Root Mean Square Error of Approximation:

  RMSEA                                          0.052
  90 Percent Confidence Interval          0.045  0.059
  P-value RMSEA <= 0.05                          0.288

Standardized Root Mean Square Residual:

  SRMR                                           0.064

Parameter estimates:

  Information                                 Expected
  Standard Errors                             Standard

                   Estimate  Std.err  Z-value  P(>|z|)   Std.lv  Std.all
Latent variables:
  Workload =~
    WL1               1.000                               1.011    0.879
    WL2               0.583    0.064    9.040    0.000    0.589    0.493
    WL4               0.738    0.063   11.694    0.000    0.746    0.615
    WL5               0.957    0.061   15.706    0.000    0.968    0.858
  Choice.independence =~
    CI1               1.000                               0.790    0.729
    CI2               0.854    0.080   10.623    0.000    0.674    0.634
    CI3               0.904    0.080   11.333    0.000    0.714    0.680
    CI4               0.810    0.073   11.171    0.000    0.640    0.669
    CI5               0.821    0.075   10.883    0.000    0.649    0.651
```

Output 8 Full SEM model after modification

```
  Deep.approach =~
    ALWD1             1.000                                    0.531    0.455
    ALWD2             0.566    0.129    4.385    0.000    0.301    0.302
    ALWD3             0.381    0.098    3.896    0.000    0.202    0.262
    ALWD4             0.274    0.103    2.670    0.008    0.146    0.170
    ALWD5             0.793    0.130    6.094    0.000    0.422    0.490
    ALWD6             0.981    0.151    6.501    0.000    0.521    0.554
    ALWD7             0.633    0.122    5.178    0.000    0.336    0.383
    ALWD8             1.156    0.176    6.580    0.000    0.615    0.567
    ALWD9             0.612    0.118    5.201    0.000    0.325    0.381
    ALWD10            1.018    0.164    6.225    0.000    0.541    0.509
  Autonomous.motivation =~
    Intrins1          1.000                                    0.770    0.788
    Intrins2          1.080    0.055   19.701    0.000    0.832    0.890
    Intrins3          0.736    0.074   10.006    0.000    0.567    0.608
    Ident1            0.739    0.094    7.858    0.000    0.569    0.547
    Ident2            0.500    0.092    5.467    0.000    0.385    0.342
    Ident3            0.802    0.072   11.170    0.000    0.618    0.634

Regressions:
  Deep.approach ~
    Workload          0.092    0.032    2.866    0.004    0.174    0.174
    Choic.ndpndnc     0.394    0.071    5.520    0.000    0.585    0.585
    Autonms.mtvtn     0.244    0.058    4.190    0.000    0.354    0.354
  Autonomous.motivation ~
    Choic.ndpndnc     0.546    0.067    8.095    0.000    0.559    0.559

Covariances:
  ALWD3 ~~
    ALWD9             0.168    0.034    4.888    0.000    0.168    0.285
  ALWD6 ~~
    ALWD7             0.140    0.038    3.648    0.000    0.140    0.220
  ALWD4 ~~
    ALWD7             0.126    0.037    3.389    0.001    0.126    0.184
  WL2 ~~
    WL4               0.195    0.059    3.276    0.001    0.195    0.196
  Intrins1 ~~
    Intrins2          0.121    0.043    2.843    0.004    0.121    0.472
  Ident1 ~~
    Ident2            0.271    0.060    4.500    0.000    0.271    0.294
  Intrins2 ~~
    Ident1           -0.198    0.039   -5.023    0.000   -0.198   -0.535
    Ident2           -0.105    0.030   -3.470    0.001   -0.105   -0.233
  Intrins1 ~~
    Ident1           -0.126    0.039   -3.256    0.001   -0.126   -0.241
    Ident3            0.095    0.027    3.460    0.001    0.095    0.209
  Workload ~~
    Choic.ndpndnc    -0.214    0.053   -3.998    0.000   -0.268   -0.268

Variances:
    WL1               0.302    0.056                     0.302    0.228
    WL2               1.080    0.086                     1.080    0.757
    WL4               0.915    0.077                     0.915    0.622
    WL5               0.335    0.053                     0.335    0.264
    CI1               0.549    0.054                     0.549    0.468
    CI2               0.675    0.059                     0.675    0.598
    CI3               0.593    0.054                     0.593    0.538
    CI4               0.505    0.046                     0.505    0.552
    CI5               0.573    0.051                     0.573    0.577
    ALWD1             1.082    0.089                     1.082    0.793
    ALWD2             0.903    0.071                     0.903    0.909
    ALWD3             0.557    0.043                     0.557    0.932
```

Output 8 (continued)

```
    ALWD4          0.715    0.055                0.715    0.971
    ALWD5          0.563    0.047                0.563    0.760
    ALWD6          0.613    0.054                0.613    0.693
    ALWD7          0.658    0.053                0.658    0.853
    ALWD8          0.798    0.070                0.798    0.679
    ALWD9          0.623    0.050                0.623    0.855
    ALWD10         0.837    0.071                0.837    0.741
    Intrins1       0.361    0.053                0.361    0.378
    Intrins2       0.181    0.047                0.181    0.208
    Intrins3       0.548    0.046                0.548    0.630
    Ident1         0.758    0.072                0.758    0.701
    Ident2         1.122    0.089                1.122    0.883
    Ident3         0.569    0.049                0.569    0.598
    Workload       1.022    0.110                1.000    1.000
    Choic.ndpndnc  0.624    0.086                1.000    1.000
    Deep.approach  0.097    0.030                0.344    0.344
    Autonms.mtvtn  0.408    0.062                0.687    0.687
```

Output 8 (continued)

Table 14.5 Coefficients final full SEM model

	Regression weight	Standard error	Standardised regression weight	Critical ratio[a]
Measurement model				
Workload = ~				
WL1	1	[b]	.88	[b]
WL2	.58	.06	.49	9.04
WL4	.74	.06	.62	11.69
WL5	.96	.06	.86	15.71
Choice independence = ~				
CI1	1	[b]	.73	[b]
CI2	.85	.08	.63	10.62
CI3	.90	.08	.68	11.33
CI4	.81	.07	.67	11.17
CI5	.82	.08	.65	10.88
Deep approach = ~				
ALWD1	1	[b]	.46	[b]
ALWD2	.57	.13	.30	4.39
ALWD3	.38	.10	.26	3.90
ALWD4	.27	.10	.17	2.67
ALWD5	.79	.13	.49	6.09
ALWD6	.98	.15	.55	6.50
ALWD7	.63	.12	.38	5.18
ALWD8	1.16	.18	.57	6.58
ALWD9	.61	.12	.38	5.20
ALWD10	1.02	.16	.51	6.23
Autonomous = ~				
Intrins1	1	[b]	.79	[b]
Intrins2	1.08	.06	.89	19.70

(continued)

Table 14.5 (continued)

	Regression weight	Standard error	Standardised regression weight	Critical ratio[a]
Intrins3	.74	.07	.61	10.01
Ident1	.74	.09	.55	7.86
Ident2	.50	.09	.34	5.47
Ident3	.80	.07	.63	11.17
Structural model				
Deep approach ~				
Workload	.09	.03	.17	2.87[c]
Choice independence	.39	.07	.59	5.52
Autonomous	.24	.06	.35	4.19
Autonomous ~				
Choice independence	.55	.07	.56	8.10
Covariances				
ALWD3 ~ ~ALWD9	.17	.03	.29	4.88
ALWD6 ~ ~ALWD7	.14	.04	.22	3.65
ALWD4 ~ ~ALWD7	.13	.04	.18	3.39
WL2 ~ ~WL4	.20	.06	.20	3.28
Intrins1 ~ ~Intrins2	.12	.04	.47	2.84
Ident1 ~ ~Ident2	.27	.06	.29	4.50
Intrins2 ~ ~Ident1	−.20	.04	−.54	−5.02
Intrins2 ~ ~Ident2	−.11	.03	−.23	−3.47
Intrins1 ~ ~Ident1	−.13	.04	−.24	−3.26
Intrins1 ~ ~Ident3	.10	.03	.21	3.46
Workload ~ ~ Choice independence	−.21	.05	−.27	−4.00

Note: Estimation Method: Maximum Likelihood

[a]All critical ratios except b: $p < .001$

[b]Value fixed at 1.00 for model identification purpose; hence, no standard error was computed

[c]Critical ratio: $p < .01$

14.4 Extensions of SEM and Their Application in Research on Professional Learning

Confirmatory factor analysis, path analysis and structural equation modelling have been commonly applied by researchers in various fields, including the field on professional learning. 'Basic' SEM models already offer a variety of possibilities because different types of relationships can be modelled based on the theoretical foundations of the study. In addition various extensions or specific forms of SEM offer a wide range of possibilities. Within this section, these extensions will be presented accompanied by examples of how these analyses can be applied within the field of professional learning.

Within the section on confirmatory factor analysis, we discussed the measurement invariance across groups. If this measurement invariance across groups is established, you could also investigate whether the SEM model is equal or different for different groups of participants. Establishing measurement invariance is important in this regard, as you would want to make sure that the differences that you find in the model reflect differences in the true constructs and relationships and not mere differences in measurement. With *multiple-group SEM*, it is possible to establish whether models are different for different groups of participants. The study of Hurtz and Williams (2009), for example, applied a multiple-group path analysis. This study examined attitudinal and motivational antecedents of employees' participation in development activities based on data collected within four organisations. A multiple-group path analysis was used to investigate whether the model differed for the four different organisations that were included in their study. They concluded that although the strengths of the different paths differed across organisations, the patterns were the same as the full SEM model that was based on the data from all four organisations (Hurtz & Williams, 2009). Within their study, they also examined whether their measurement was invariant across the groups and concluded that this was not the case. However, because the focus lied on identifying a general model looking at the relationship of the antecedents with participation and not on explaining organisational differences, Hurtz and Williams (2009) applied group-mean centring to remove organisational mean differences: they computed the difference between the employee score and the organisational mean of the scores and took this difference as their primary outcome variable. After applying this group-mean centring, measurement invariance was reached. However, it must be noted that no conclusions can be drawn regarding possible organisational differences. Alternatively to this approach, on the condition that metric invariance is achieved and the sample size is large enough, one could also adopt a full SEM model, sometimes also called multiple-indicator SEM model, because this allows the modelling of intercept variances. Multiple-group SEM analysis can also be applied to compare the models of males and females, high- and low-qualified employees, etc. In contrast, to multilevel SEM analysis (see below), multiple-group analysis does not require that the different groups are sampled at random. Multiple-group SEM can be conducted with the lavaan package (Rosseel, 2012).

Multilevel SEM requires a random sampling of groups because it assumes that the differences between organisations in terms of the intercept and slope are normally distributed around the average intercept or slope that holds for the population. For a basic introduction into multilevel analysis within professional learning, the reader is referred to Kyndt and Onghena (2014). In short, multilevel SEM combines multilevel analysis and SEM analysis. SEM analysis is not able to take the nested structure of the data into account (i.e. employees nested within organisations), while multilevel analysis is not able to examine more complex models. Multilevel analysis is comparable to regression analysis with regard to the type of relationships they investigate. In addition, multilevel analysis does not provide goodness-of-fit indices such as CFI, SRMR or RMSEA. One can only conclude that one model fits the data better in comparison with another model (Kyndt & Onghena, 2014). Within a

multilevel SEM, the model is estimated while the organisational clustering is taken into account. Taking the organisational clustering into account is important because 'if the nested structure of the data is ignored, it is more likely that statistical relations are observed in the sample that are in fact not true (type-1 error), in addition it might be that it is concluded that a relationships holds for individuals when they are actually true for groups (ecological fallacy)' (Kyndt & Onghena, 2014, p. 339). Moreover, within multilevel SEM, predictors on the level of the organisation can be combined with predictors at the individual level. A final difference between multilevel SEM and multilevel analysis is that multilevel SEM can also predict outcomes at the organisational level, whereas in traditional multilevel analysis, the outcomes or dependent variables need to be situated at the lowest level, that is, the individual level. Sometimes this latter issue is resolved by aggregating the individual scores to the organisational level (after the within-group agreement has been checked); however, by doing this a lot of statistical power is lost as well as potentially interesting individual differences within organisations. To our knowledge it is not possible to conduct multilevel SEM with the R software, it is possible with Mplus (Muthén & Muthén, 1998–2010). More information on multilevel SEM can be found in the article of Kaplan and Elliott (1997). Within educational sciences and labour psychology, different examples of empirical studies using multilevel SEM can be found (e.g. Johnsrud, Heck, & Rosser, 2000; Mauno, Kiuru, & Kinnunen, 2011; Sebastian & Allensworth, 2012). However, we were not able to detect a specific example within the field of professional learning.

The two above-presented extensions of SEM have something in common that they add to the complexity of the model; as a consequence, both techniques usually require very large samples (many organisations and many employees within the organisations). However, *partial least squares* (*PLS*) might be an interesting alternative to SEM if the sample size requirements cannot be met. Where SEM combines factor analysis and path models, PLS combines principal component analysis and path models (Garthwaite, 1994; Goutis, 1996; Hoyle, 1999; Iacobucci, 2010). Principal component analysis does not aim at reflecting latent constructs; rather, it tries to predict the component as good as possible. Factor analysis most commonly uses the maximum likelihood estimation, which considers the variance the different observed variables have in common, while principal component analysis takes all variance into account when estimating the component (Garthwaite, 1994; Hoyle, 1999). Because the focus lies on maximising the prediction and capturing as much variance as possible from the dependent variable, PLS is better suitable for exploratory rather than confirmatory purposes (Hoyle, 1999; Iacobucci, 2010). The loadings tend to be overestimated and path coefficients underestimated (Goutis, 1996; Iacobucci, 2010). In addition, no goodness-of-fit indices are provided. Similarly to multilevel analysis, it can only be judged which model is more suitable in comparison with another model. However, it is an interesting approach when you want to explore complex models with a limited number of observations. Gegenfurtner (2013) illustrates the use of PLS in his study on the relationship between motivation to transfer, retention, transfer and attitudes.

14.5 Discussion

Throughout this chapter we have tried to introduce the reader to SEM by means of an illustration within the field of professional learning. The models that are tested within this chapter are solely for the purpose of illustrating the method and should not be used for interpreting the relationships between the constructs. These results and interpretations can be found in the publication of the empirical study in which the relationships including control variables were examined (Kyndt et al., 2013). SEM offers researchers a lot of possibilities to investigate complex models. Within the paradigm of the integration of work and learning, advanced techniques such as multiple-group and multilevel SEM might be especially relevant, because these techniques allow the simultaneous examination of individual and organisational differences. These techniques are interesting if the goal is to investigate professional learning conceptualised as a reciprocal interaction between individual and organisation (Tynjälä, 2008).

However, despite all the possibilities SEM offers, it also has its limitations and possible pitfalls. The two most evident limitations are the necessity for a strong theoretical basis and the large samples that are needed especially when comprehensive models with many variables need to be estimated. Although simple models can be estimated with moderate to small samples, the added value of SEM foremost lies in estimating complex models (Hox & Bechger, 1998).

One of the most common pitfalls of SEM is that many researchers are tempted to interpret SEM models as causal models due to the impression the direction of the paths give. However, merely applying SEM to your data does not provide proof for the causality of the relationship (Bollen & Pearl, 2013). A SEM model can however raise doubts about a causal theory; when the SEM model is correctly specified and the covariance structure does not support the theoretical causal structure, it seems less plausible that the causal relationships exists. One can say that establishing covariance or correlations between the variables is a necessary but not sufficient condition for establishing causality. To be able to prove the causality of the relationships empirically, data that allow this type of conclusions need to be collected (e.g. longitudinal or experimental data). If SEM is applied to correlational data, the SEM model cannot be interpreted as a causal model (Iacobucci, 2009).

The aim of the current book chapter was to introduce the reader with the possibilities that SEM can offer within the field of research on professional learning. Within the paradigm of the integration of work and learning, the possibility to analyse more complex models can contribute to the theory development and further understanding of how learning and working are intertwined.

Appendix: R Code Illustration

```
## Setting up working directory and loading data
setwd("/Users/evakyndt/Book chapter SEM")
data<-read.table("chapter SEM.csv",header=TRUE,sep=";")
```

```
## Loading packages
install.packages("lavaan")
library("lavaan")
install.packages("qgraph")
library("qgraph")
install.packages("semTools")
library("semTools")

## Measurement model: Confirmatory factor analysis (Output 1)
CFAModel1 <- 'Workload=~WL1+WL2+WL3+WL4+WL5
Choice.independence=~CI1+CI2+CI3+CI4+CI5'

Fit1 <- cfa(CFAModel1, data=data)
summary(Fit1, fit.measures=TRUE, standardized=TRUE)
modindices(Fit1)

## CFA without WL3 (Output 2)
CFAModel2 <- 'Workload=~WL1+WL2+WL4+WL5
Choice.independence=~CI1+CI2+CI3+CI4+CI5'

Fit2 <- cfa(CFAModel2, data=data)
summary(Fit2, fit.measures=TRUE, standardized=TRUE)

## Plot CFA model (Figure 4)
qgraph.lavaan(Fit1,layout="tree", vsize.man=5, vsize.
  lat=12, include=4, curve=-0.4, edge.label.cex=0.6,
  titles=F)

## Testing measurement invariance across groups (Output 3)
measurementInvariance(CFAModel1, data=data, group="Sex")

## Path analysis mediation (Output 4)
SEMModel2 <- 'DA ~ Autonomous + Controlled
Autonomous ~ WL + CI
Controlled ~ WL + CI
DA ~ WL + CI'

FitSEM2 <- sem(SEMModel2, data=data)
summary(FitSEM2, fit.measures=TRUE, standardized=TRUE)

## Path analysis mediation without non-significant paths
(Output 5)
SEMModel3 <- 'DA~Autonomous
Autonomous ~ CI
DA ~ WL + CI'

FitSEM3 <- sem(SEMModel3, data=data)
summary(FitSEM3, fit.measures=TRUE, standardized=TRUE)

## Full SEM model (Output 6)
FullModel <- 'Workload=~WL1+WL2+WL4+WL5
```

```
Choice.independence=~CI1+CI2+CI3+CI4+CI5
Deep.approach=~ALWD1+ALWD2+ALWD3+ALWD4+ALWD5+ALWD6+ALWD
  7+ALWD8+ALWD9+ALWD10
Autonomous.motivation=~ Intrins1+Intrins2+Intrins3+Iden
  t1+Ident2+Ident3
Deep.approach~Workload+Choice.independence
Deep.approach~Autonomous.motivation
Autonomous.motivation~Choice.independence'

FitSEMFull <- sem(FullModel, data=data)
summary(FitSEMFull, fit.measures=TRUE, standardized=TRUE)

## Modification indices (Output 7)
modindices(FitSEMFull)

## Full SEM model after modification (Output 8)
FullModel2 <- 'Workload=~WL1+WL2+WL4+WL5
Choice.independence=~CI1+CI2+CI3+CI4+CI5
Deep.approach=~ALWD1+ALWD2+ALWD3+ALWD4+ALWD5+ALWD6+ALWD
7+ALWD8+ALWD9+ALWD10
Autonomous.motivation=~ Intrins1+Intrins2+Intrins3+Iden
  t1+Ident2+Ident3
Deep.approach~Workload+Choice.independence
Deep.approach~Autonomous.motivation
Autonomous.motivation~Choice.independence
ALWD3~~ALWD9
ALWD6~~ALWD7
ALWD4~~ALWD7
WL2~~WL4
Intrins1~~Intrins2
Ident1~~Ident2
Intrins2~~Ident1
Intrins2~~Ident2
Intrins1~~Ident1
Intrins1~~Ident3'

FitSEMFull2 <- sem(FullModel2, data=data)
summary(FitSEMFull2,fit.measures=TRUE,standardized=TRUE)
## references
citation("lavaan")
citation("qgraph")
citation("semTools")
```

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Chapter 15
Social Network Analyses of Learning at Workplaces

Tuire Palonen and Kai Hakkarainen

Abstract The purpose of this paper is to examine social network analysis from the perspective of expertise studies and workplace learning. While research on expertise has traditionally been individually oriented, the present paper explores its socially distributed dimensions. Expertise relies on transactive processes involving pursuit of a network of mutually supporting projects where earlier achievements are used to manage more demanding intellectual environments. The paper includes theoretical introduction, methodological considerations, and a minor review of SNA studies that are related to workplaces. The research of social networks stresses the importance of cross-boundary analyses of workplaces' networks and even experts' past relations in their former networks. Previous studies have indicated some relevance to study the significance of the worker's network positions. SNA studies have indicated evidence especially as regards the importance of cohesive network positions, mediator and boundary crossing roles, and the relationship between informal and formal power positions. Particularly, previous research has demonstrated a relationship between network structure and instrumental outcomes. As regards for network profits, individual-level results appear to be easier to evaluate than group- or organizational-level gains.

T. Palonen (✉)
Centre for Learning Research and Department of Teacher Education, University of Turku, Finland
e-mail: tuire.palonen@utu.fi; tuire.palonen@spindel.fi

K. Hakkarainen
Department of Education, University of Turku, Turku, Finland
e-mail: kai.hakkarainen@utu.fi

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15.1 Introduction

15.1.1 Superior Performance and Relational Expertise

The purpose of the present paper is to examine workplace learning from the perspective of sociocultural research on expertise in general and networked expertise of professional communities in particular (Hytönen, Hakkarainen & Palonen, 2011; Palonen, Hakkarainen, Talvitie, & Lehtinen, 2004; Rissanen, Palonen, & Hakkarainen, 2010; Rissanen, Palonen, Pitkänen, Kuhn, & Hakkarainen, 2013; Tuomainen, Palonen, & Hakkarainen, 2010). An advanced knowledge society requires mastery of ever more sophisticated knowledge and expertise. Professionals have to constantly update their knowledge and develop their skills and competencies so as to cope with unforeseen obstacles and challenges emerging at turbulent and rapidly transforming environment. A significant proportion of professionals, also beyond those knowledge workers taking traditionally part in research and development, are working with complex knowledge-creating tasks and projects. Productive participation in rapidly developing global knowledge society requires that they repeatedly appropriate intellectual skills and competencies. Therefore, expertise development wears an important social facet. Outstanding skills and knowledge do only emerge after there is a social mechanism through which certain individuals are more or less collectively recognized to be experts in the field. Expertise is constituted as a socially initiated nomination by the experts' constituency (Agnew, Ford, & Hayes, 1994). The ascription of expert status is based on perceived differences in knowledge and skills so that the expert can only be defined relationally to the knowledge and skills of other members inside a shared context. Expertise in that sense implies not only particular cognitive components but also an acknowledged role as expert within the constituency (Edwards, 2005; Mieg, 2006). To conclude, expertise might be reasonable to understand both from the approach of excellent performance and high skills but also as regards how it fits to its environment, i.e., from the point of relational expertise.

15.1.2 The Volume and Structure of the Ties in Workplaces

Connections or ties between actors indicate the access to critical resources of a community (Gruber, Lehtinen, Palonen, & Degner, 2008). Ties facilitate an intensive flow of information across the wider network of actors in the same field, helping to gather richer information than would be possible for an individual working alone. According to Larson (1992) and Hansen (1999), social dimensions like reputation, trust, reciprocity, or interdependence of the transaction are pivotal in the exchange structures of organizations in general. The quality of information resources, however, does not only depend on the volume of information flow but on the patterns of connections as well. The same amount of ties can be much more or less fruitful for

professionals depending on who is involved in his or her network. Larger patters of connections form a kind of potential network, which can be activated if needed (Gruber et al., 2008).

The development of expertise involves cultivating collective capacities for pursuing purposeful and coordinated societal actions that involve applying cultural knowledge in particular settings of professional activity. Expertise may be defined as mastery of a well-organized body of usable knowledge that a participant can (and does) utilize to selectively focus on the critical aspects of a complex problem and, thereby, reach an exceptionally high level of performance (Chi, 2006; Ericsson, 2003, 2006; Glaser & Chi, 1988). The knowledge is embodied in instruments and practices of expert communities and networks.

15.1.2.1 Socially Distributed Expertise

Rather than representing mere individual capabilities, higher-level professional competencies may be seen as appropriations, within individuals, of capabilities of professional communities and networks in which they participate in. Participation in distributed networks of professional knowing augments the participants' cognitive capacities to the extent that enables solving significantly more complex problems that would otherwise be possible. The participants' professional competencies are materially, socially, and temporally distributed (Pea, 1993). The materially distributed aspect of human mind can be explicated with the following analogy. Originally one thought of the power of an individual computer, located in one box, or those nearby (for mind-as-a-computer metaphor, see Boden, 2004; Gardner, 2003). But the networking of computers has opened new heights of collective capabilities; the network functions as a supercomputer. Human minds, with their limited cognitive characteristics, attain vastly greater power when they are integrated with heterogeneous networks of tools and artifacts and with the other minds of humans in their communities (Donald, 2001). Expertise is socially distributed in terms of people sharing their efforts in various communities and networks and creating collective cognitive systems together. Further, it is temporarily distributed; human cognitive efforts always capitalize on intergenerational emergence of knowledge practices as well as personal and collective transactive processes (Hakkarainen, Hytönen, Makkonen, Seitamaa-Hakkarainen, & White, 2013).

Social neuroscience implies that there prevail certain kinds of internal-external correspondence in terms of human brains being shaped by and adapted to the surrounding cultural environment (Wexler, 2006). Human activity is embedded in cognitive-cultural macrostructures consisting of individuals, communities, and networks as well as evolving tools, external symbol systems, and cultural environments. In order to cope with increasing complexity of professional challenges, it has often been necessary to create whole epistemic systems for enabling expert communities to complete successfully world transforming projects (Hughes, 1998, 2004). Due to revolutionary development of socio-digital tools and networks, the instruments and tools of professional activity have been constantly changing

together with changing social structures and practices of activity, in many cases collectivizing traditionally individual professional activity. Adopting novel instruments and their systems as instruments of professional expert's activity is a challenging, long-standing developmental process on its own (Béguin & Rabardel, 2000; Ritella & Hakkarainen, 2012).

15.1.2.2 Merging People and Artifacts

Beyond merging people and artifacts to hybrid systems of brains, bodies, and environmental elements (Clark, 2008), there is another aspect of distributed cognition, i.e., the fusing of minds in social communities and networks (Hutchins, 1995; John-Steiner, 2000; Pea, 1993). In nature, humans appear to be unique hypercollaborative (Tomasello, 2009) and ultrasocial (Rogoff, 2003) beings whose cognition is thoroughly collaborative based on pro-social motivation and shared intentionality (Tomasello & Carpenter, 2007; Tomasello, 2009). Even if individual experts' cognitive resources remain limited, collective activity allows specialization, cognitive division of labor, and sharing of intellectual efforts that provide qualitatively stronger creative resources than would otherwise be humanly possible. Significant human achievements appear across domains to be correspondingly based on social distribution of cognitive efforts and collective merging and fusing of cognitions into higher-level systems. In the background of each creative achievement, there is always a smaller or a larger network people and their knowledge, intelligence, and creativity which is accumulated across time and embodied in artifacts, tools, practices, and epistemic systems. The relational perspective nicely highlights the socially distributed nature of human creativity that was acknowledged by Herbert Simon: "To make interesting scientific discoveries, you should acquire as many good friends as possible, who are as energetic, intelligent, and knowledgeable as they can. Then sit back and relax. You will find that all the programs you need are stored in your friends, and will execute productively and creatively as long as you don't interfere too much. The work I have done with more than eighty collaborators will testify to the power of that heuristic" (quoted by John-Steiner, 2000).

15.1.2.3 Social-Emotional Dimension

Professional collaboration does not, however, always function as smoothly that indicated by Herbert Simon. In many cases, tremendous efforts are needed for making collaboration to function well, and there occur various tensions and conflicts. In spite of tensions, ruptures, and disagreements that characterize all professional activities (Kramer, 1999), partners of collaboration are likely, all the time, scaffolding each other. They create supporting structures that allow them to do something that they would not be able to do on their own (John-Steiner, 2000). Through sustained collaborative activity, the participants' activities and creative efforts may become coupled so tightly that they "live in each other's minds," as John-Steiner

has observed. Further, it is important to acknowledge that scaffolding is not only an epistemic activity but that involves a *socio-emotional* dimension as well. Highly regarded creative experts need other people that help to soften their sharp corners, provide a supporting shoulder in a difficult moment, and help to sustain a sufficient level of internal stability so that they can completely focus on their work. Networking efforts going often beyond boundaries of an immediate workplace community often allow professionals to change the ecology of their learning and development. In order to keep up and develop professional competence, it is necessary to deliberately build a *social network*. Senior professionals may facilitate learning and activity of their junior colleagues by "lending" their personal social network (and, thereby, also their reputation) to younger ones (Gruber et al., 2008; Palonen et al., 2004).

15.1.2.4 Expert Roles

The mainstream psychological approach examined expertise *entirely* as an objectively measurable superior individual problem-solving capacity (Ericsson, 2009); in many cases, it was deliberately focused on analyzing merely individual aspects of expertise and disregarded the abovementioned critical aspects of professional expertise (sacrificing relevance for methodological rigor). From a sociological perspective, in contrast, expertise may be seen relationally as a *role in a workplace community* (Hakkarainen, Palonen, Paavola, & Lehtinen, 2004; Mieg, 2001, 2006) needed for solving emerging and partially unforeseen complex problems. In professional organizations, expertise is examined relationally by assessing whether professionals complement one another's expertise (i.e., have sufficient heterogeneously distributed expertise, Johnson, Heinmann, & O'Neill, 2000) so that they are able to capitalize on productive division of labor and master collectively strategic competence. In rapidly changing environment, what a professional knows and masters in relation to workmates than any specific pieces of knowledge and competence matters more (although those could sometimes be important).

15.1.2.5 Communities of Networked Expertise

In order to examine the relational aspect of expertise, investigators have to rely on specific methodological tools and instruments, such as social network analysis (SNA); addressing such methodological issues of studying networked expertise is an important aim of this paper. Such methods enable investigators tracing relations between personal and collective aspects of expertise in a way that ethnographic case studies of professional communities do not tend to reach. Some sociocultural investigations of collective expertise give an impression that knowledge and competence belong entirely to a community; methodological individualism of traditional expert studies replaces with methodological collectivism. Nevertheless, a striking result of many studies of workplace expertise has been the extent to which knowledge and

competence tend to concentrate to one and few central actors who have an extremely large amount of knowledge and competence (Palonen, et al., 2004). In many cases, such experts are not only centrally located within their own professional community (or close to other central actors), but they also keep up rich and multifaceted personal social networks extending to various external communities and organizations (Hakkarainen et al., 2004; Nardi, Whittaker, & Schwarz, 2000; Palonen et al., 2004; Tuomainen et al., 2010). Building such extended networks represents such professionals' agentic efforts of creating personal learning networks in interaction with which their professional development takes place.

On the basis of above considerations, Hakkarainen and his colleagues (2004) have developed a framework of "networked expertise" a term that means "higher-level cognitive competencies that arise, in appropriate environments, from sustained collaborative efforts to solve problems and build knowledge together. Networked expertise is relational in nature; it emerges from the tailoring and fine-tuning of individual competencies to specific conditions of the environment of the activity, and it is represented as a joint or shared competence of communities and organized groups of experts *and professionals.* … heterogeneous networks involve – in addition to human actors – collectively developed knowledge artifacts and knowledge embedded in tools and practices. Networked expertise coevolves with the transformation of social communities, a process …that may be facilitated by encouraging the participants to reflect on their current social *and cognitive practices.*" (p. 9). Cultivation of such expertise, which makes knowledge sharing as an integrated aspect of an expert's cognitive-cultural operating system, appears to play a crucial role in the cultivation of human collective creativity. We have ourselves investigated networked aspects of expertise regarding knowledge workers of telecommunication companies (Palonen et al, 2004), special-education teachers (Tuomainen et al., 2010; Tuomainen, Palonen, & Hakkarainen, 2012), primary school teachers (Ryymin, Palonen, & Hakkarainen, 2008), Finnish magicians (Rissanen et al., 2013), academic researchers (Hakkarainen et al., 2009, 2013; Pyhältö, Stubb, & Lonka, 2009; Rehrl, Palonen, Lehtinen, & Gruber, 2014), professors (Palonen & Lehtinen, 2001), and diplomats (Hytönen et al., 2011).

15.1.2.6 Experts' Personal Networks

The network study approach connects the social context to individual capacity by describing how people create, maintain, cultivate, and activate their personal social networks (e.g., Brown & Duguid, 1999, 2001; Hakkarainen et al., 2004). Instead of relying on the shelter of the workplaces and institutes, the expertise is cultivated and covered in experts' own personal social networks. Experts nurture and profile their own expertise by reactivating and strengthening some relevant links depending on what kind of work they are doing (McCarty, 2002; Nardi et al., 2000). In order to engage in networking efforts for stretching their abilities and developing their expertise, professionals have to believe that their efforts matter and that they are

able to initiate, implement, and attain their purposeful actions and desired objectives within their professional community. In other words, they need to have minimum level of personal and collective self-efficacy (Bandura, 2006). Especially important is that the professionals experience that their contributions are valued, socially recognized, and reciprocated with efforts of their professional communities and networks.

15.1.2.7 Knowledge Communities and Their Boundaries

Knowledge-creating processes involve deliberate efforts in spanning boundaries of prevailing knowledge by creating novel and often far-reaching networking linkages to experts, communities, and networks representing heterogeneous knowledge and competence. Productive "sparks" of collective creativity are likely to emerge when an unexpected "boundary encounter" between different knowledge communities takes place (Miettinen, 2006) and/or there happens actual crossing of boundaries between communities (Engeström, Engeström, & Kärkkäinen, 1995) that result in cross-fertilizing heterogeneous knowledge practices or hybridizing expertise of two or more domains of knowledge (Howells, 1999). While new information flows through weak (or occasional) networking linkages, actual sharing of knowledge practices requires gradual building of reciprocal interactive relations of working with a joint epistemic object; in this regard, mutual appropriation of concepts, instrument, and practices may be essential. Rather than the traditional pursuit of stable practices of teamwork, it is typical for concurrent knowledge-intensive work to rely on "negotiated knotworking" (Engeström, Engeström, & Vähäaho, 1999), i.e., "rapidly pulsating, distributed and partially improvised orchestration of collaborative performance between otherwise loosely connected actors and activity systems" (Engeström, 2004, p. 153). Such processes of creating new collaborative partnership with participants representing heterogeneous expertise constitute an important aspect of collaborative emergence. Collective activity appears to rely on an invisible network in creative intelligence that breaks organizational, institutional, disciplinary, and cultural boundaries.

Above, we examined some basic features of human expertise and its material and social dimensions. Yet, in present-day society, the highest levels of expertise are continuously evolving. In rapidly changing environment, professionals need to function as adaptive experts constantly stretching their abilities so as to keep up with emerging requirement. While individual experts have often a critical role in pursuit of novelty and innovation, it takes place on a fertile ground provided by collaborative activity (Paavola, Lipponen, & Hakkarainen, 2004). Knowing takes place more and more often in specific kinds of social communities and more and more complex expanded networks to support knowledge-creation efforts. Well-functioning innovative professional communities have cultivated methods and practices of facilitating professional development and networked expertise of all employees. Networked professional development is not just an individual but also collective concern. It may be argued that truly innovative professional communities

have cultivated shared practices (routines, standard operating procedures, collective habits) that channel and direct the participants' activity in a way that facilitates the development of expertise. As Herbert Simon (1977, 2002) has argued, excellence may be pursued in institutions by making pursuit of novelty and innovation as an everyday social practices; this process is driven by a central characteristic of experts' collective activity. It is important to consider the nature of communities which nurture such activity.

15.1.2.8 Methods to Study Experts' Networks and Communities

A few studies have pointed to the important role of particular social contacts for the long-term development of individuals in expertise research (Mieg, 2006) and in high ability research (Sosniak, 2006). While results of such studies are very encouraging and indicate the fundamental adaptability of the human cognitive system, a common limitation is the relatively narrow nature of the experimental tasks used to measure expertise. In parallel of providing objectively measurable criteria of assessing level of expertise (Ericsson, 2009; Ericsson & Smith, 1991), focus on a narrowly defined specific skills has meant abstracting from many relevant collective and socially distributed aspects of expertise crucial in professional context (Engeström, 2004; Hakkarainen et al., 2004). As mentioned above, professional organizations are not predominantly interested in individual expertise, but evaluate expertise relationally, capitalizing on heterogeneously distributed knowledge and competence (Hakkarainen et al., 2004). Because investigators have mostly focused on analyzing personal aspects of expertise, research on collective expertise is still in its infancy. In this chapter, we will survey methodological tools of social network analysis (SNA, Wasserman & Faust, 1994) that allow investigators to address many distributed and relational aspects of expertise; at the same, it partially supersedes older approaches to investigation of such phenomena. In addition to presenting the potential behind SNA, we aim to study whether there is real empirical evidence produced by earlier studies around SNA. Can it contribute to research on workplace learning in general and examining its socially shared and distributed aspects in particular?

15.2 Methodological Considerations

In psychological sciences, research methods, so to speak, appear to define the phenomenon (research object) investigated. To a significant degree, research instruments determine and shape psychological theories generated by researchers (Gigerenzer, 1994). The predominating experimental methods have focused on analyzing the individual aspects of expertise by relying on protocol analysis (Ericsson & Simon, 1993), cognitive task analysis (Grandall, Klein, & Hoffman, 2006), and other research techniques. Such investigations have provided interesting and

valuable results regarding task-specific cognitive adaptations that participation in sustained deliberate practice bring about (Ericsson & Lehmann, 1996); such findings appear to encourage and empower professionals and other learners seeking to cultivate their expertise to surpass themselves. Real-world expertise has previously been examined by participation observation and other ethnographic methods (Clancey, 2006). Some of the most interesting investigations are longitudinally oriented and involve examination for expert performance gradually changes as a function of systematic practice and training (Ericsson, 2006). It is challenging, however, that the timescale of the development of expertise is very long; it may take a decade or more.

We have earlier been developing frameworks and methods for analyzing networked and collaboratively emergent aspects of expertise. Social network analysis addresses relational rather than individual phenomena (Hakkarainen et al., 2004; Palonen, 2003). Such investigations may be carried out at multiple levels. Participants' personal social networks may be examined by interviews in which they are asked to visualize their egocentric networks and explain networking linkages. Social networks of coherent communities can be analyzed by networking questionnaires that allow examination of prevailing weak and strong networking linkages as well as identification of key actors of the community to whom the others go for advice and from whom the participants get new knowledge and novel insights (Palonen et al, 2004). From the methodological perspective, it is relevant that such methods allow assessing an individual participant's expertise and creative contribution through reliance on ties incoming from a whole community so as to avoid potentially biases of self-reports (Ericsson & Simon, 1993). Corresponding methods can also be used to trace networking linkages among artifacts (e.g., coauthorship or citation networks) that expert activity produces. It is common to use SNA to identify either central or peripheral actors from whom more detailed information is acquired through interviews or observations.

In this paper, our framework focuses on social networks including cohesion approach, structural equivalence techniques, and personal (egocentric) networks. Some empirical evidence based on earlier studies is sought for analyzing organizational-, community-, and individual-level results regarding expertise and workplace learning.

15.2.1 Social Network Analysis

SNA is an increasingly used approach to investigate both the social structure of interaction within subgroups and the attributes that are related to the actors inside a community. Although SNA allows us to study practically all kinds of connections, the method has especially been used to uncover the patterning of people's interaction that leads to various types of applications, such as interorganizational relations, the spread of contagious diseases, social support, the diffusion of information, and animal social organization, i.e., SNA facilitates the analysis of structural data.

Social relations may be considered to represent relational dyadic attributes, whereas the methods of mainstream social science, such as regular self-report questionnaires, are concerned with monadic attributes. The relations, i.e., dyadic attributes, may represent, for instance, kinship, social roles, affective or cognitive properties, actions, flows, distance, or co-occurrence. Relational structure models can be used to describe social and other phenomena where interactions between units are observed. These models allow researchers to represent pairwise relational structures of social actors (individuals, teams, organizations, etc.), where the relationships are defined by social interactions, e.g., collaborating, seeking advice, mediating information, and providing friendship.

15.2.2 The Whole Network Approach and Egocentric Networks

A social network is defined as a set of actors and the relations that hold them together. In *the whole network approach*, the actors are tied together via resource, e.g., information and exchange. The essential aim is to reveal the importance of repeated exchange relations that form the basis of both dyadic (between individuals) and structural (in the network) embeddedness. The continuous flow of communication creates a structure, which is then studied. In *the egocentric approach*, the network is examined from the perspective of one person (ego), and the focus is on his or her links to other people (alters). According to the latter approach, the network is "owned" by an ego. The network members (alters) consist of the people who have reported that ego is part of their network or who are nominated by the ego himself or herself. Although the analysis of relational structures focused on the pattern of relationships between the actors involved, the relations often are strongly affected by the monadic attributes possessed by the actors, e.g., age, gender, or educational status, length of work expertise, or level of expertise in the domain. The complexity of the situation is increased by the fact that it is often, a priori, unclear which attributes influence the relationship patterns, and whether these attributes have been measured.

In cohesion approach, density is a basic concept. It is a simple way to measure a network: the more actors have relationship with one another, the denser will be the network. When studying centralization, it is possible to focus either on centrality of an individual actor or centralization of a network structure (e.g., team, workplace, or geographical location). The centrality of an individual shows the most popular actors, those who stand at the center of attention and are highly chosen individuals in contrast to the isolates, who are rarely or not at all chosen. For example, Freeman's betweenness (Borgatti, Everett, & Freeman, 1996) has been used as an indicator of the information gatekeepers' positions. The measure is based on the concept of path distance, which can be understood better if we think communication as an information flow consisting of the individual connections. In SNA interactions between two nonadjacent actors, i.e., actors who are not directly interacting, depend on the other actors, who lie on the paths between these two. An actor has a high betweenness

value if he or she often lies between other actors, who are not directly connected to each other, given that the shortest distance between two actors in the network (the geodesic) is used to calculate the betweenness (Wasserman & Faust, 1994, pp. 188–192). The term centralization refers to the extent to which a whole graph has a centralized structure. Centralization measures are always related to individual centrality measures. The concepts of density and centralization focus on differing aspects of overall compactness of a graph. Density describes the general level of cohesion in a graph, while centralization describes the extent to which this cohesion is organized around particular focal points. Centralization and density, therefore, are important complementary measures (Scott, 1991; Wasserman & Faust, 1994, pp. 169–219).

In searching for the most active and visible key workers, we can, for example, calculate the centrality values to look at the amount of addressed and received information and knowledge. We have ourselves often set up an advice size variable, measured by flows of advice (to whom workers go for work-related advice) as a performance measure for the study. It can be treated as a rough estimate of workers' relative importance or cognitive centrality in the organization (Burt, 2000; Krackhardt, 1990). The relationships of various network dimensions tend to be were different even among the same actors when looking at how cohesion is distributed. Further, knowledge exchange dimensions are positively correlated with each other. The values are often reported to be highest between various instrumental, i.e., work-related network dimensions, and lowest between expressive ties (friendship) and instrumental dimensions (Ibarra, 1992; Ibarra & Andrews, 1993; Ibarra, Kilduff & Tsai, 2005). The notion of important and central network actors is obvious. As indicated above, the social networks are not random, but they are concentrated on some important and influential persons, "stars" (Scott, 1991), or "hubs" (Barabasi, 2002). These central actors have key roles in their communities. Figure 15.1 indicates some features that are related to cohesion view.

Structurally equivalent people, in turn, occupy the same position in the social structure and are so proximate to the extent that they have the same pattern of relations with occupants of other positions. So, two people are structurally equivalent if they have identical relations with all other individuals in the study population, e.g., at the workplace. Actors who are structurally equivalent do not need to be in direct contact with each other. Many methods that are concerned with this kind of notion of *social position* or *social role* translate into procedures for analyzing actors' structural similarities and patterns of relations in multi-relational networks. Although the methods are mathematically and formally diverse, they share a common goal of representing patterns in complex social network data in a simplified form to reveal a subset of actors who are similarly embedded in networks of relations and to describe the associations among relations in multi-relational networks (Wasserman & Faust, 1994, pp. 345–393).

In real life, it is rare that two actors would have exactly equivalent position. Therefore, a stochastic criterion might be a more accurately referred method to find structurally similar actors (Frank, 1996). Since it often is a priori unclear, which attributes@ influence the relationship patterns, stochastic modeling can also be used

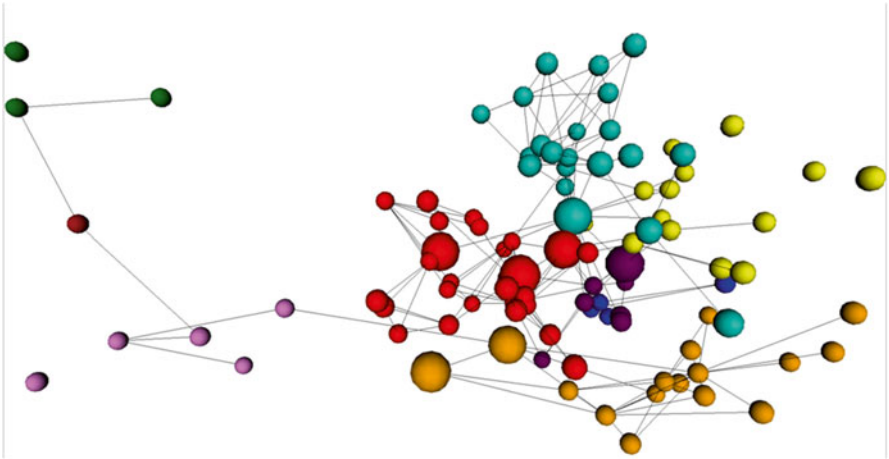

Fig. 15.1 The visualization is a snap-shot of a 3D multidimensional scaling map where *spheres* represent individuals and *lines* are reciprocal ties between them. The group that is located highest up has plenty of internal cohesion. In turn, some other subgroups are only loosely connected and have low internal cohesion. Further, there are some isolates in the picture, some particular spheres bridging these to the rest of the network. The most central members of the network are indicated in the figure with *bigger spheres*

to find latent classes, that is to say, some kinds of clusters or "colors" in which the workers belonging to the same class have the same probability distribution as that of their relations to other workers. The stochastic block model has two parts: the division of the set of actors into latent classes (the coloration) and the probability distribution of the relations within and between these classes (Nowicki & Snijders, 2001; Snijders & Nowicki, 2001).

Structural similarity can be understood as "radio channels" inside of a professional community. Those having similar network positions may be seen, so to speak, listening to the same radio channel. They may or may not be tied to other listeners of the same channel, but overall cohesive groups are not evidently needed. Evidence exists concerning that similar network positions are tied to some kind of hierarchy among network members (Wasserman & Faust, 1994). The structural position has been shown to be an important indicator of power, because a good network position provides access to information, people, and other resources (Burt, 1987; Lomi, Snijders, Steglich, & Torló, 2011). Although the stochastic methods appear to be superior, those have only seldom used in empirical studies.

15.2.3 Data Gathering

The SNA data can be gathered in many ways, e.g., through a social networking questionnaire in which interpersonal collaboration and informal discussion can be addressed (see Fig. 15.2). The questionnaire consists of a list of names in which rows

Fig. 15.2 An example of a SNA questionnaire

represent names whereas columns represent different types of networking relations, e.g., concerning advice seeking, information exchange, collaboration, or social support. By questionnaire, the information can be collected, e.g., about the networking practices, with a focus on tracing how the knowledge sharing takes places in some communities or organizations. Each of the network dimensions can be studied separately, but the features can also be combined if correlation between them is observed.

Beyond networking questionnaires, it is possible to use, for example, citation counts, interviews, and electronic log files (Nurmela, Lehtinen, & Palonen, 1999; Nurmela, Palonen, Lehtinen, & Hakkarainen 2003). It would also be possible to have a sample of informants, who report the information needed. They could, for instance, be asked to keep a record or diary of their networking encounters and systematically documents different aspects of networking events. Such an approach is close to event-contingent sampling of experiences (Bolger, Davis, & Rafaeli, 2003; Reis & Gable, 2000): repeated sampling of such events would allow overcoming retrospective biases that decrease reliability of questionnaire studies. If not carefully planned, the gathering and working with network data can be very time-consuming as network techniques are usually analyzed in the form of case-by-case matrices. The samplings, used mainly in the form of snowball sampling, are sensitive to research design and, as well, become large without showing the saturation expected.

In egocentric network analysis, data can be gathered, e.g., via interviews, in which network members are free listed. For interviewees, this appears to be a natural way to report their personal network members. People tend to classify their collaborators into groups, and often members of one group do not know members of another. In attribute-based analyses, the data are often summaries of attributes of network members that are then compared to the same or other attributes of respondents. One typical question asked concerns the type or content of the relation with each network member. Structural analyses can be gathered, e.g., as lists of the names in which respondents mark with whom they are having a relationship (such as advice seeking, collaboration, social support). It is to be noticed that gathering whole network data is a time-consuming task if the network is large.

We shall next take a look at empirical findings around SNA on the field of workplace learning and expertise development. The text is organized in two parts: (1) individual-level view, i.e., relational expertise approach, and (2) group- or team-level view. The short review is based on Internet search by using keywords of SNA and workplace. Further references have been followed that have been cited in the literature found by these keywords. In the following, we refer to results that are frequently reported, newly found, or crucial for the field.

15.3 SNA's Empirical Contribution for Relational Expertise and Workplace Learning

The research of social networks stresses the importance of cross-boundary analyses of workplaces' networks and even experts' past relations in their former networks. Previous studies have indicated some relevance to study the significance of the worker's network positions. SNA studies have indicated especially the importance of cohesive network positions, mediator and boundary crossing roles, the relationship between informal and formal power positions, personal characteristics and how they are related to persons' network position, and the different roles of strong and weak network ties in knowledge mediation. Particularly, previous research has demonstrated a relationship between network structure and instrumental outcomes.

15.3.1 Individual-Level Results

First, the central position in knowledge exchange network has been indicated as a patterned set of cohesive advice and information flows. In organizational settings, the structure of knowledge exchange is often a nested one. Information circulates within a work group more than between groups, within a division more than between divisions, and so on. At the individual level, knowledge diffusion occurs among

tightly linked workers (Burt, 1999, 2000; Friedman & Podolny, 1992; Palonen et al., 2004). Consequently, informal communities of practice have an essential role in knowledge exchange. Secondly, not only dense network flows but also the importance of nonredundant sources of information has been highlighted. Burt's (1992) argument about "structural holes" reveals how gaps between nonredundant contacts can generate control and information benefits. The information benefits are various, when there are people bridging diverse groups that have little or no interaction. Boundary crossing workers have access to more and varying information, and they are likely to hear about more valuable information sooner than other workers. They are also more likely to be exposed to a range of interpretations and, thus, be more accurate in their judgments about the trustworthiness and validity of the information available (Burt, 1999).

In the report of Friedman and Podolny (1992), a moderately high correlation between a central position within the team and boundary spanning has been found. Those who are most influential within the teams appear to be the most likely to occupy boundary-spanning roles. Plenty of empirical investigations has supported Burt's theoretical position demonstrating the diverse benefits which stem from bridging unconnected others at the individual level of analysis (Burt, 1997, 2004, 2007; Fleming, Mingo, & Chen, 2007; Mizruchi & Stearns, 2001; Rodan & Galunic, 2004; Seibert, Kraimer, & Liden, 2001; Soda & Bizzi, 2012).

In the same way, the structural position has shown to be an important resource of power (Burkhardt & Brass, 1990). There is evidence that individual characteristics, such as high self-monitoring (Mehra, Kilduff, & Brass, 2001), or entrepreneurial personality (Burt, 1998) correlate with network agency. There has been shown that correlation exists between individual cognitive and social structures (Janicik, 1997; Krackhardt, 1990). There is also empirical evidence according to which personal network characteristics are closely related with individual experiences and with differences in learning (Janicik, 1997). The nature of the knowledge exchanged and the strength of ties among members of the network are shown to be very important considerations (Hansen, 1999; Uzzi, 1997). Strong ties represent the reciprocal, redundant, and specialized information flow, whereas weak ties guarantee an adequate number of ties with the result that new information can also be captured in the network. The strong ties provide the best net effect in the case of complex knowledge, whereas weak ties may be more effective in transmitting well-coded knowledge.

The majority of SNA studies have focused on positive or neutral relations, whereas negative relations have been studied very seldom. There are, however, some studies that report how persons who hinder another person's work performance are related to social networks (Brass & Labianca, 1999; Labianca, Brass, & Gray, 1998). Negative relations are important factors in understanding attitudes and behaviors because they are more salient than positive relations. Individual job performance is positively related to centrality in advice networks and negatively related to centrality in hindrance networks composed of relationships tending to thwart task behaviors (Sparrowe, Liden, Waynemaria, & Kraimer, 2001).

15.3.2 Group-Level Results

Networking studies also examine group network structure and performance in work settings. Baldwin, Bedell, and Johnson's (1997) MBA team study found that team interaction patterns consistent with cohesive work groups were positively related to the team's final grade. However, an individual MBA team member's centrality in an "adversarial" network was negatively related to his or her satisfaction. At the group level, the number of adversarial relations within the team was negatively related to perceptions of team effectiveness, but positively related to the team grade. Labianca et al. (1998) found that the number of negative (avoidance) relationships with outgroup members was positively related to perceptions of intergroup conflict. Hindrance network density has found to be significantly and negatively related to group performance (Sparrowe et al., 2001).

Moliterno and Mahony (2011) acknowledged that network theoretic constructs tend to be isomorphic. As it is beneficial for an individual to bridge unconnected individuals, we would expect that it is likewise beneficial for a group to bridge unconnected groups. However, the latter perspective has not so often been highlighted. According to Burt's (1992) theory, brokers are capable of filtering and maneuvering information so that they can have access to superior information. Brokers gain advantage as long as they keep information to themselves or charge a "brokerage fee" that unconnected others must pay for the information (Burt, 1997; Buskens & van de Rijt, 2008; Fernandez & Gould, 1994). On the contrary to this view, work groups function effectively when members equally share knowledge with one another, do not engage in self-oriented behaviors, and collaborate instead of competing (Bizzi, 2013; Stasser & Titus, 1985).

There are some studies that report opposite results as regards profits for individual- and group-level indicators. Balkundi and Harrison (2006) performed a meta-analytical study and supported that density in both instrumental and affective networks relates to aggregate performance, whereas Sparrowe et al. (2001) and Cummings and Cross (2003) found evidence that centralization relates to group performance in negative way. Moliterno and Mahony (2011) showed that although previous studies addressed the nested nature of individual networks in groups, they were not empirical works employing multilevel methodology and examining the cross-level bridges between variables and different levels of analysis. Therefore, although individual-level structural holes are supposed to exercise positive effects, we may expect that at group level, the results are negatively associated with individual outcomes (Bizzi, 2013).

The individualistic, competitive, manipulative, and power-oriented behaviors of employees occupying structural hole positions may be beneficial when considering independent individuals, but not necessarily when it comes to group functioning and group climate. Group composition variables exercise a constraining effect on individuals, making them perceive less autonomy, and negatively affect satisfaction and performance (Bizzi, 2013).

15.4 Visions and Limitations Regarding SNA Approach to Workplace Learning

In organizational sciences, networks are considered a potential source of learning, facilitating learning by promoting skill transfer or by producing novel synthesis of existing information. It appears that heterogeneous networks and multiplex relationships facilitate such learning, but very close, long-term relationships are likely to result in network homogeneity, reducing the diversity of experiences and turnover in networks (Beckman & Haunschild, 2002). Similar results have been found in small group research (Jehn, Northcraft, & Neale, 1999). This would provide a clear contribution to the methods and tools such as SNA. However, though the SNA studies have provided interesting cases of fieldwork, they have not become part of the larger interpretations of communication studies or learning research. One reason for this is the level at which the data have been gathered. To be able to follow complex communication processes, more detailed and richer datasets combined with qualitative methods should be collected. In spite of these limitations, the contribution that SNA methods have provided for fieldwork in organizations is promising. The concrete tools to describe patterns of interaction have been helpful. In particular, the visualizations have shown their strength in laying out abstract networks in a readable way (for visualizations, see Freeman, 2000).

It appears that SNA studies could contribute academic world by adding our understanding of the complex phenomena, such as connections among experts in the professional communities. SNA methods have potential to facilitate interaction and knowledge exchange in working organizations. In recent years, resolution of social media has become better, and obviously this has had influence on informal work communities, adding transparency. Social media has, however, a distinct role inside and outside of the working organizations. Making invisible issues visible can be helpful, but at the same time it may be a risk (Kaplan & Haenlein, 2010). The "glass house generation" seems to be willing to show everything what they do or who they like or what they think (Brzozowski, Sandholm & Hogg, 2009). By using SNA, it is, e.g., possible to create an album for working organizations that indicates how the knowledge is exchanged in the workplace by using visualizations or organigraphs (Mintzberg & Van der Heyden, 1999) that are the organizations' x-ray pictures (Slaughter, Yu, & Koehly, 2009). Yet, it is important to distinguish that SNA has strong tools in making invisible things visible but only limited knowledge to provide advice of optimal network structures and especially how to create these.

Further, it seems obvious that there are some biases in SNA related to its use, e.g., as concerning the routine coordinators (it might show too high effect), experts with special competencies on the not widely known expert field (it might show too low effects), and social overemphasizing in general. A need to get independent indicator for expertise and skilful communication is obvious. There should have to be possibilities to evaluate SNA results with tools, which are not themselves leaning to same principles. Complex and rapidly changing networks entail challenges to research methodology. Until now collaboration among members of an organization

has often been studied through examining the routine exchanges of various kinds of resources, such as information, pieces of advice, emotional support, and so on. Local practices and regularities of these transfers and exchanges are assumed to shape the structure of collaboration, e.g., in multifunctional or multidisciplinary workgroups. Recently, specific statistical tools and models have been developed to identify these exchanges in order to analyze structures of collaborative activities that go beyond individual resources. These approaches allow an examination of participation in collective action at the level of subcultures rather than mere dyads. In networks, this kind of approach allows an examination of indirect or generalized structural relation of exchange.

The new methods, therefore, provide an important contribution toward the theory of collective action since they extend our understanding of how collegial action creates local social structures. Simultaneously, network analysis also provides rigorous methods for tracing how social structures mediated activities of individuals, groups, and communities. Resulting information might help individuals and communities to find indirect ways to manage their resources, including information, advice seeking, emotional support, and many others.

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Chapter 16
Learning Through Interactional Participatory Configurations: Contributions from Video Analysis

Laurent Filliettaz

Abstract This chapter focuses on the role and place of guidance and mentoring in learning as it may occur in the circumstances of professional practice. Recent literature in the field of workplace learning has stressed the importance of guidance in the process of learning in and from practice. Workers do not only learn just by conducting specific tasks individually; they learn when adequate resources are afforded to them and when more experienced workers are able to assist them in their practice. Hence, there is considerable importance to investigate the specific qualities of guidance at work and to understand how novice workers engage with these resources. In this particular context, the chapter advances two main ideas. The first idea is to consider that a close examination of the conditions under which mentors and students engage in face-to-face interactions provides a relevant theoretical basis for exploring the relational interdependences between these actors. These interdependences may be described and analysed as "interactional participatory configurations". The second idea the chapter puts forward is to consider that video analysis should be seen as a rich and relevant methodological resource for describing how interactional participatory practices emerge, unfold and transform in the conditions of professional practice. These resources, it is proposed, bring complementary insights to the understanding of the importance of participation and guidance in vocational and professional learning as it occurs in the workplace. Transcripts of video data collected in the field of vocational training of early childhood educators are used as empirical illustrations of the proposed analytical frame.

Keywords Guidance • Vocational education • Interaction • Discourse • Video analysis • Early childhood education

L. Filliettaz (✉)
Faculty of Psychology and Educational Sciences,
Department of Adult Education, University of Geneva, Geneva, Switzerland
e-mail: laurent.filliettaz@unige.ch

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16.1 Introduction

This chapter seeks to explore some aspects of the complex relations existing between learning and work. It investigates 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 purposes. These considerations have become of particular interest in a context where increasing aspects of professional practice are being connected to educational purposes. These connections certainly have a long tradition and history, particularly in Western apprenticeship programs, where the workplace is conceptualised as a legitimate and rich context for the development of professional competences (Fuller & Unwin, 2013). But these connections between learning and work have also been under particular scrutiny in the context of tertiary education, where an increasing number of vocational training programmes are engaging students with practicum experiences. These experiences, which complement formal teaching periods, occur in the circumstances of practice and are subject to complex forms of learning outcomes, which are highly dependent on individual and contextual factors (Akkerman & Bakker, 2012; Billett, Sweet, & Glover, 2013; Tynjälä, 2008). Hence, discourses on professional learning appear as highly concerned by the conditions under which learning arises in and through professional practice itself.

More specifically, the chapter focuses on the role and place of guidance and mentoring in learning as it may occur in the circumstances of professional practice. Recent literature in the field of workplace learning has stressed the importance of guidance in the process of learning in and from practice (Billett, 2001a, 2001b; Fuller & Unwin, 2003). Workers do not only learn just by conducting specific tasks individually; they learn when adequate resources are afforded to them and when more experienced workers are able to share their knowledge and skills and assist them in their practice. Hence, there is considerable importance to investigate the specific qualities of guidance at work and to understand how novice workers engage with these resources. In this particular context, the chapter advances two main ideas. The first idea is to consider that a close examination of the conditions under which mentors and students engage in face-to-face interactions provides a relevant theoretical basis for exploring the relational interdependences between these actors. These interdependences may be described and analysed as "interactional participatory configurations". The second idea the chapter puts forward is to consider that video analysis should be seen as a rich and relevant methodological resource for describing how interactional participatory practices emerge, unfold and transform in the conditions of professional practice. These resources, it is proposed, bring complementary insights to the understanding of the importance of participation and guidance in vocational and professional learning as it occurs in the workplace.

These theoretical and methodological considerations will be explored here in a specific empirical domain, that of early childhood education, and more particularly in the provision of initial vocational education and training to early childhood educators in the context of Switzerland. In the Swiss VET system, early childhood

educators are trained at tertiary level, in what is called higher vocational education. Students move back and forth periods of teaching in vocational schools and periods of practical training in institutions caring for pre-school children. During their practicums, students are supervised by mentors, who assist them in their early days at work and make sure they meet the pedagogical objectives assigned by the curriculum. In this chapter, we will use empirical material collected in a research project recently initiated at the University of Geneva[1] to understand (1) how mentors are shaping specific participation configurations for students as a way to mediate their access to professional practice and, reciprocally, (2) how students are able to align to these configurations and make use of the opportunities afforded to them.

To achieve these goals, the chapter will first briefly refer back to existing literature about the role of mentoring and guidance for learning through the circumstances of work (1). The concept of "interactional participatory configuration" will then be defined and specified, as an extension and contribution to this body of literature and as an illustration of a specific theoretical perspective inspired by interaction and discourse analysis (2). Video analysis, closely aligned to this specific theoretical perspective, will then be presented as a fruitful resource for exploring the ways interactional participatory configurations are established in practice. Here, the main specificities and methodological potentialities of video analysis will be outlined (3). In the next section, an empirical illustration of these claims will be provided: by using audio-video material collected in the context of the above-mentioned research programme, specific interactional patterns will be identified and described, by which guidance is provided to students in the context of early childhood education training practices (4). Finally, in a concluding section, the theoretical as well as practical implications of the presented approach will be discussed (5) and more general considerations about the relations between learning and work will be developed.

16.2 The Role of Guidance and Mentoring in Professional and Vocational Education

When considering the body of knowledge available in the literature, one first aspect that draws attention is the rather paradoxical position of the topic of guidance in vocational education practices and research. The paradox lies in the mismatch that exists between theoretical assumptions that have become largely dominant within sociocultural approaches to learning and the relatively low level of empirical

[1] This research programme is sponsored by the Swiss National Science Foundation (Nr. CRSII1-136291) under the general title "Young people's interactional competences in institutional practices: between school and the workplace" (IC-You). The related subproject is entitled "Building interactional competences in Vocational Education and Training (VET) programs: the case of early childhood educators". The author is grateful to all the members of the research team involved in this subproject: Isabelle Durand, Stefano Losa, Vassiliki Markaki, Vanessa Rémery, Dominique Trébert and Marianne Zogmal.

knowledge available on naturally occurring mentoring practices in the conditions of work. On the one hand, there is a large body of research that assumes the configuring role of "the other" in learning processes. The Vygotskian framework (Vygotsky, 1978) and its famous concept of the zone of proximal development or Bruner's concept of "scaffolding" (Wood, Bruner, & Ross, 1976), for instance, stress the idea that individuals do not learn on their own but only when interacting with more experienced partners. These claims have deeply influenced research conducted in vocational and professional education, where it is now widely assumed theoretically that workers do not learn just by engaging in work production tasks but when adequate resources are afforded to them by co-workers. But on the other side, little empirical knowledge seems to be available to date regarding the specific conditions in which guidance is provided in the conditions of professional practice. In many workplaces, the fact that experienced workers assist newcomers in the profession is taken for granted and not necessarily seen as an activity per se, associated with specific and complex forms of actions and skills. Workers are often expected to be competent "guidance providers", but they are not necessarily trained and qualified to do so. This does not mean that formal training constitutes the main or sole means by which guidance skills may be acquired. However, as a matter of fact, work organisations afford little resources to assist guidance providers in their tasks. Consequently, there is often a lack of social recognition attached to the role of mentors and insufficient understanding of the specific skills attached to such roles.

Amongst the fields that have recently attempted to go beyond these evidences and shed light on empirical aspects of guidance and mentoring at work, anthropology, professional didactics and workplace learning theories provide useful resources for conceptualising the role and place of guidance in vocational and professional education.

One first significant contribution to the literature on the role of guidance in vocational and professional education is the idea that guidance should be conceptualised as related to professional practice itself and as a dynamic and transformative process. This idea has been put forward by Lave and Wenger (1991) and their famous concept of "legitimate peripheral participation" (LPP). The concept of LPP suggests that access to professional practice constitutes a precondition for learning. It is by engaging in professional practice progressively that newcomers access and experience the body of knowledge associated to the practice itself. And it is by transforming the conditions in which participation occurs over time that newcomers experience changes in the ways they are socially positioned within specific communities. From that perspective, guidance can be defined as the process through which newcomers navigate a community of practice and are progressively invited to become full members rather than peripheral participants.

Closely aligned to Lave and Wenger's conceptions, Kunégel (2011) also attempted to account for the practical and dynamic nature of guidance in the workplace. In his PhD study, conducted within the framework of Francophone professional didactics (Pastré, 2011; Pastré, Mayen, & Vergnaud, 2006), Kunégel observed and described in detail how mentors provide guidance to apprentices in the context of small-size car mechanics workshops in France. The research results consist in describing a set

of basic actions through which guidance may be exerted and expressed in context (i.e. instructions, prescriptions, demonstrations, evaluations, etc.). They also illustrate the dynamic and transformative nature of these actions as they evolve in time. Kunégel's work, for instance, establishes a model capturing the sorts of relations between apprentices and mentors at various stages of the apprenticeship pathway. Six successive steps are distinguished, including a phase of "familiarisation", a phase of "instruction" and a phase of "attribution of work production tasks". At each step, the relation between mentors and apprentices is expected to take a different shape and displays specific properties. The main interest of this model is to show that there seems to be a strong alignment between the level of competences apprentices are expected to have acquired and the sorts of verbal and nonverbal interactions existing between apprentices and their supervisors. The other interesting contribution of this model is that it proposes to see these interpersonal configurations as evolving in time and not as given or static realities.

Another particularly interesting contribution to reflections on guidance can be found in Billett's work dedicated to workplace learning. Billett conceptualises the ingredients to learning in the workplace as "relational dependencies" (Billett, 2001a, 2001b). In line with sociocultural approaches, learning is conceptualised as related to "participatory practices" by which workers gain access to specific actions in workplace contexts. But, as pointed by Billett (2001a), "it is inadequate to believe that learning simply by just doing it will suffice" (p. 7). Both social and personal factors may either support or on the contrary hinder learning opportunities. Social factors are designated as "affordances". Affordances include, for instance, the sorts of guidance provided to novice workers, the type of expertise available or not and more globally the range of resources workplace contexts are able to make available to learners. Personal factors are referred to as "engagement". Engagement is related to the specific ways individual workers elect to make use of the resources afforded to them in the workplace. These individual factors include, for instance, personal values, prior experiences and personal epistemologies. Affordances and engagement are seen as key determinants of learning in the workplace and as shaped by a relation of interdependence. From that standpoint, the provision of guidance plays a significant but not a sufficient role in workplace learning. It is significant in the sense that it constitutes a key resource for learning, but not sufficient in the sense that workers have to engage with these resources to make progress and learn.

As mentioned above, strong and convincing conceptualisations exist in the literature that have proposed to see guidance as a *practice*, related to *participation* in social action and as a *dynamic* and *reciprocal* process involving both individual and contextual ingredients. However, there is a need for understanding in more detail how participation and the relational dependencies that relate to it unfold in everyday situations and how they may be enacted in specific workplace contexts. In what follows, we introduce a range of complementary theoretical and methodological ingredients that are closely aligned to a sociocultural perspective on guidance and that may contribute to our understanding on the role of guidance in vocational and professional education.

16.3 Conceptualising Interactional Participatory Configurations

In an earlier work dedicated to apprenticeship in the Swiss dual VET system (Filliettaz, 2010a, 2010b, 2010c, 2011a, 2011b, 2013), we have proposed to approach the provision of guidance as an *interactional accomplishment*, namely, as a social, cognitive and semiotic process that is mediated through the ongoing performance of verbal and nonverbal interactions between learners and mentors. Over the last couple of years, we have attempted to bring numerous illustrations on how such verbal and nonverbal interactions unfold in the context of guided learning at work.

Elaborating on this earlier work, it is proposed here that the relational dependencies and workplace participatory practices associated with the provision of guidance can best be described through the emergence of "interactional participatory configurations". Interactional participatory configurations are specific forms of local arrangements, through which participants to social encounters establish the principles that rule the ways they interact with each other. These rules set rights and obligations to participants and have to be recognised by them as resources for organising participation in the context of joint actions (Durand, Trébert, & Filliettaz, forthcoming; Filliettaz, Losa, & Duc, 2013; Filliettaz, Rémery, & Trébert, forthcoming; Losa, Duc, & Filliettaz, in press). From there, interactional participatory configurations are based on a plurality of components. They result from (1) the specific nature of activities accomplished in context and the purposes attached to these activities, (2) the situated identities endorsed by participants when they engage in these activities and finally (3) the conditions under which participants access specific positions from which they may or may not communicate with each other. Concepts borrowed from the field of the microsociology of everyday life provide useful references to elaborate these ingredients.

First, the ways participants engage in interaction are highly dependent on the sorts of activities they recognise as being accomplished in context. This aspect of participation in interaction has been particularly well investigated in Erving Goffman's work dedicated to what is called "frame analysis" (Goffman, 1974). Goffman's theory stresses the idea that the meaning of ordinary perceptions and human behaviour is highly premised in light of natural and social "frames". These "frames" include culturally acquired knowledge about social and natural phenomenon and their particular meaning. Individuals constantly make use of this knowledge to answer the question "what is going on here?" They rely on these premises to interpret social reality and to adapt their own conducts to such interpretations. In other words, it is by applying "frames" to these experiences that individuals may participate adequately to the sort of activity they interpret as being accomplished in context. Developing William James' and Gregory Bateson's phenomenological thinking, Goffman considers that these framing processes are complex and dynamic. These processes are complex in the sense that, in a given situation, multiple actions may be going on at the same time and, consequently, numerous activity frames may be relevant to interpret what is going on. Another way to illustrate this complexity

is to recognise that, apart from "primary frames", which may be recognised directly and without reference to another meaning system, a large number of activities observable in social life rely on "transpositions" or "transformations" of more elementary frames. This is the case, for instance, in simulations or in drama plays, where multiple levels of interpretation must be recognised, to adjust an adequate frame to the ongoing activities. Apart from being complex, framing processes are also conceptualised by Goffman as never given or fixed; they are vulnerable to change. People may misunderstand the meaning of contextual arrangements; they may also be abused or influenced to produce false interpretations; finally, they may also revise the meaning they attribute to the reality they experience in social life. From such a dynamic perspective, "frames" can be seen as the result of a process of "framing" through which participants jointly negotiate how to interpret the conditions in which social action takes place.

In close connection to the framing issue related to the experience of social life, interactional participatory configurations are also shaped by the specific *roles* and *situated identities* attached to the sorts of activities accomplished in interaction. This particular aspect has also been scrutinised by social theorists, as a way to understand how participants to interaction position themselves according to each other and with regard to broader cultural and institutional arrangements. Following Goffman again, these processes of positioning are not perceived as determined by preexisting social roles, but endorsed by participants in interaction itself (Bucholtz & Hall, 2005; Goffman, 1961; Sacks, 1992). It is by "doing being" a person of a certain kind (e.g. a doctor, a teacher, a mentor, etc.) that participants endorse particular identities in social action and that they place co-participants in a reciprocal position (e.g. a patient, a student, a mentee). Situated roles, when they are endorsed, project specific expectations regarding what is recognised as a valuable and relevant form of engagement. It is by adopting the conducts related to these expectations – or by failing to do so – that participants endorse these specific roles and display their ability to behave according to these norms and values.

Finally, one should also consider that participatory configurations as they are accomplished in and through interaction also rely on the conditions under which participants gain access to talk and broader communication processes in context. Goffman (1981) referred to these aspects of interaction as "footing". The concept of footing develops the idea according to which participants to social encounters have to position themselves according to each other and with respect to what they interpret as going on in interaction. This footing problem is made particularly complex in the sense that social encounters are not always clearly delimited portions of reality and may involve a large number of participants endorsing variable and specific reciprocal positions. With regard to such a complexity, categories referring to language and talk deserve to be reconsidered. For instance, in a social encounter gathering more than two individuals, participants may not only endorse alternatively the roles of "speaker" or "hearers". They may simultaneously speak and hear, or be addressed or unaddressed recipients, identified as ratified participants or not. They may also be mere "bystanders", observing or "overhearing" what is going on. In other terms, it is proposed by Goffman that social encounters are shaped by "participation frameworks"

and that these frameworks specify the positions participants may or may not endorse depending on the context of interaction and its local meaning.

From there, it appears that what we call interactional participatory configurations combine practical, social and communicational ingredients. Interactional participatory configurations emerge when participants apply activity frames to their encounters, when they endorse specific identities related to such frames and when they align to positions related to specific participation frameworks. These arrangements are neither given nor determined or fixed. They are locally accomplished in interaction and collectively established by participants themselves. Capturing the local and ongoing conditions in which these participation configurations emerge and transform deserves specific methodological resources. In the next section, we propose to consider video analysis as a relevant contribution to such resources.

16.4 Video Analysis as Methodological Resource

Within the multidisciplinary area of interaction and discourse analysis, a growing number of researchers collect and investigate audio-video data to bring answers to their questions. Inspired by ethnographic approaches, video analysis conducted in an interactional perspective aims at gaining access to social actions in the naturally occurring conditions in which they are performed. Following Heath, Hindmarsh and Luff (2010), the main contributions of video analysis to qualitative research rely on empirical access to three properties recognised as central to social interactions: (1) their indexical relations to contexts, (2) their dynamic unfolding in organised sequences and finally, (3) the multimodal nature of their accomplishment. These properties will be briefly elaborated below.

First, video data provide a relevant basis for investigating participation in interaction in the sense that it captures visible conducts or situated actions as they refer to specific contexts. Situated actions are said to be indexical with these contexts in the sense that they entertain multiple and complex relations with the social and material conditions in which they are accomplished. On the one hand, visible actions are often seen as being shaped by these contexts in the sense that historic, cultural and material arrangements exert a form of influence on the ways actions are performed. But on the other hand, visible actions are also shaping these contexts in the sense that participants may use their conducts as resources to make visible how they interpret specific contextual arrangements. In observing the concreted actions amongst members and describing how these members communicate and interact, video analysts examine what members produce together, what they hold each other accountable for and how they make sense of actions of others. In doing so, they identify patterns of practice that make visible what members need to know, produce and interpret to participate in socially appropriate ways.

A second important contribution of video data analysis to the exploration of social interaction is the possibility it affords to access local dynamicity and the fact that interactions unfold in time, step by step, and in a nonarbitrary order. These

dimensions of social interactions have been thoroughly investigated by conversation analysis and ethnomethodologists, through the concept of *sequential organisation* (Sacks, 1992; Schegloff, 2007). By exploring the organisation of sequences in interaction, conversation analysts understand that social actions jointly accomplished by a plurality of participants do not unfold in an arbitrary way but reflect a specific social order. To align to this social order and to make it visible, participants engage in fine-grained coordination procedures in which they take turns, use adequate places for leaving the floor to co-participants and orient to the successive steps by which action is accomplished. From there, conversation analysts consider the sequential organisation of talk-in-interaction as the dynamic process through which participants make their actions publically accountable and shape interpretations about what they perceive as relevant in the context. The machinery of turn-taking in interaction becomes a resource for interpreting how participants orient to each other and accomplish a joint understanding of their actions.

One last potentiality associated with video analysis is related to the fine-grained details through which visible conducts may be captured and the semiotic complexity associated with these details. Indeed, the sequential organisation of interaction and its contribution to the configuration of local contexts does not exclusively rely on talk and linguistic units; on the contrary, it also involves a wide range of other semiotic systems participants may use as resources for coordinating their participation and which are made accessible through video caption. To refer to this multitude of semiotic resources combined in interaction, the concept of *multimodality* has recently emerged as a solid reference point within discourse theories. Multimodal discourse and interaction analysts originate from a variety of subdomains of linguistics such as conversation analysis (Goodwin, 2000), mediated discourse analysis (Levine & Scollon, 2004; Norris, 2004) or social semiotics (Kress & Van Leeuwen, 1996). These various disciplines have developed distinct approaches to discourse and interaction, but they also share a tendency to break away from a logocentric view on interaction. The concept of multimodality relates to the plurality of semiotic modes combined in human behaviour (gestures, gazes, body movements, spatial displays, images, objects, voices, texts, etc.) and to the local arrangements through which they are used as tools for accomplishing social actions. For multimodal discourse and interaction analysts, participants are constantly engaged in complex meaning-making processes in which they have to produce a joint understanding of their actions. It is by using and combining a plurality of modes that they produce and interpret meaning in context and that they elect to orient to specific resources (or not). Considering that these choices are not arbitrary but also, to some extent, shaped by the specific potentialities of these resources themselves and the conditions in which they are used, participants also express forms of agencies through the specific ways they make use of semiotic tools in interaction.

To sum up, it is proposed here that video data and the specific analytic potentialities it affords bring useful resources for the study of interactional participatory configurations. Video data make available for analysts how participants adopt specific conducts in context, how these conducts evolve in time and unfold in sequential order and how semiotic resources of different sorts are used and combined in this

dynamic unfolding. It is precisely by accomplishing these processes observable in the data that participants share mutually acceptable frames for their encounters and negotiate the various ingredients composing the participatory configuration through which they shape interaction.

Referring again to the context of mentoring in early childhood education, specific empirical questions emerge from such a theoretical perspective: what are the typical interactional participatory configurations through which guidance occurs in the workplace? To what extent do mentors and students contribute to the establishment of such configurations? How do these configurations unfold in time? And through what specific semiotic means are they accomplished and transformed? These questions, we believe, bring relevant insights to our understanding of the "relational dependencies" associated with "participatory practices" in workplace learning (Billett, 2001b).

16.5 Exploring Interactional Participatory Configurations in Early Childhood Education

To address this set of empirical questions, specific sorts of audio-video material have been collected, in the context of a vocational training programme addressed to early childhood educators in Geneva. As indicated in the figure below, three students were followed and observed during their first year of training, in the context of a practicum taking place in institutions caring for pre-school children aged between 0 and 4 years old (Fig. 16.1).

Each student (A, B, C) was observed three times during a period of 8 weeks, equivalent to the duration of their placement. Students were video recorded in

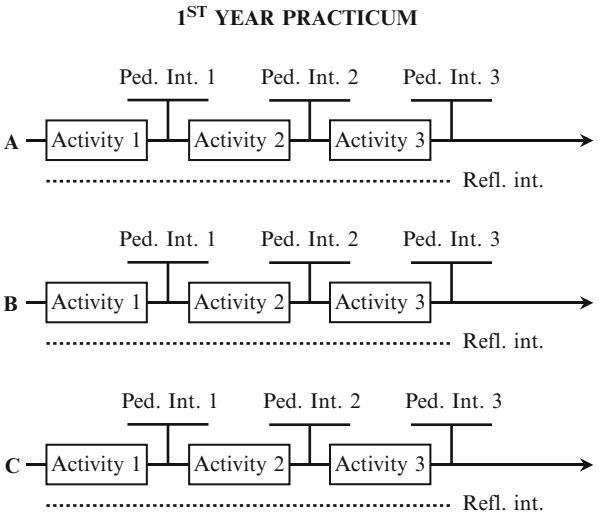


Fig. 16.1 Audio-video data available

specific contexts, in which they conducted educational activities with children. These recordings document both play activities, during which students supervise children playing freely, and more directed activities consisting, for instance, in craft, structured games or psychomotor activities. These activities were prepared and conducted by the students, in presence of and with support from their mentor.

Complementary to these video recordings, two sorts of interview data were also collected as a way to enrich our understanding of guidance provision at work. The first sort of interview data consisted in audio recordings of pedagogical meetings, held on weekly bases between students and their mentor. These meetings are planed in the curriculum and provide space for students and mentors to reflect about their practical experience, to assess learning objectives and to plan future activities. In each site, three pedagogical interviews were recorded, between each different activities observed. The second sort of interview data collected consisted in reflexive interviews conducted by researchers at the end of the observation process. In each institution, students and their mentor were confronted to excerpts of video recordings of their activity and could comment on their strategies, difficulties, emotions. They could also express the rationale underlying their contributions to interactions as they were observable in the video data.

This procedure was replicated a second time, with the three same students, during another practicum taking place on the third and last year of training, briefly before the final exams. In sum, the complete data set includes approximately 22 h of video recordings of activities, 13 h of pedagogical interviews between students and mentors and 7 h reflexive interviews led by researchers.

A close examination of the video data and detailed transcripts based on these data provides a rich empirical base for examining how mentors afford guidance to students and how students engage with these resources when leading activities with children. Consistent with the proposed theoretical frame presented above, three main "interactional participatory configurations" were identified, placing the participants in distinct and specific participation positions. In what follows, these participatory configurations will be defined and illustrated with excerpts of transcripts captured in the data.

16.5.1 Observation and Feedback

One first interactional configuration through which guidance may be accomplished in the conditions of work can be referred to as *observation and feedback*. In such participatory configurations, mentors set themselves outside an educational activity conducted by the student. They observe the students from an external position and provide feedback to students, either during or after the activity. Specific participation positions emerge in such configurations, both for mentors and students.

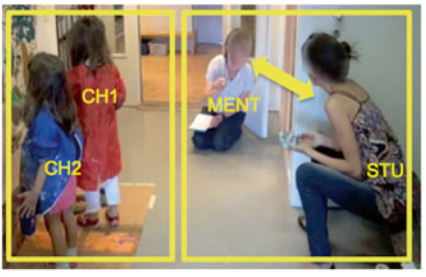
To illustrate these participatory positions, one first excerpt of data, related to student A, will be used. This excerpt was observed in a daycare centre for children aged between 3 and 4 years old, which offered placement for this student.

The observed activity, planned by the student, is addressed to a small group of three girls and consists in a painting experience where children use their hands instead of brushes. Large sheets of paper have been placed on the wall and the children are using their hands to paint trees. In the excerpt transcribed below, children move back and forth between the wall and the student to clean their hands, while the mentor observes how the painting activity unfolds.

(1) "There is fresh paint on the ground" (P-A1, 45:00–45:43)[2]

1.	STU:	it's beautiful\
2.	CH1:	now I will use pink/ ((*comes to STU and cleans her hands*)) **[#1]**
3.	STU:	you want to clean this finger/ ((*STU helps CH1 to clean her hands*))
4.	CH1:	yes\
5.	CH1:	((*goes back to the painting wall*)) are you using pink or green\
6.	CH2:	green\
7.	CH1:	I will take some pink\
8.	MENT:	((*MENT leans forward and addresses STU*)) XXXX
9.	STU:	((*STU leans forward and listens to MENT*))
10.	MENT:	((*MENT leans forward*)) **[#2]** there is fresh paint on the ground you should clean it\ ((*points with the finger to the ground*))
11.	STU:	ouch\ ((*takes a towel and cleans the ground*))
12.	MENT:	only the fresh ones\
13.	STU:	yes\((*continues to clean the ground*))
14.	CH1:	and now pink\ ((*comes to STU and cleans her hands*))
15.	STU:	you want pink/ wait a minute\ ((*helps CH1 to clean her hands*))

#1: CH1 approaches STU to clean her hands (''now I will use pink'')



#2: MENT leans forward and addresses STU (''there is fresh paint on the ground'')

Excerpt (1) illustrates one specific form of relational interdependence between the student and her mentor. The mentor affords an autonomous participation space to the student and installs the conditions for the student to lead a painting activity

[2]Transcripts are translated from French. Transcriptions conventions are listed in the Appendix.

with children. The student, on her side, clearly engages with this participation space and endorses the active educative role associated with this participation space. Her active engagement is made visible through the specific ways she behaves and orients her participation in interaction: she establishes eye contact with children (see #1), makes comments on their paintings ("it's beautiful", l. 1) and helps them clean their hands when changing colour ("you want to clean this finger?", l. 3). From what it appears in the data, children themselves recognise the student as the leader of the painting activity: they address the student, place her in a ratified recipient position (l. 2) and align sequentially to her questions ("you want to clean this finger?", l. 3) by providing relevant answers ("yes", l. 4).

A complex layering of frames emerges from the ways participants engage in interaction at this stage. The mentor obviously remains outside the painting activity conducted by the student with children. She is observing the activity but not taking part and leading it. This external participant position seems to be ratified by other participants: neither the student nor the children are addressing the mentor verbally nor orient their gaze or body towards her. However, the mentor does not remain inactive: she sits on the ground, observes what is happening and takes notes in a notebook (see #1). In doing so, she endorses typical conducts associated with the social role of a "trainer" and brings visibility to another activity frame that shapes "what is happening here": the frame of vocational education, associated with specific training purposes. In sum, the way participants shape participation at the beginning of this excerpt displays two coexisting activity frames: (1) the painting activity frame, in which the student engages with children, and (2) the vocational training frame, gathering the student and her mentor.

But interestingly, the different layers associated with this complex framing configuration are not completely split but, to some extent, intersect with each other. As observed in the data, the mentor is not sitting as a passive observer during the entire unfolding of this excerpt. When noticing that children carry fresh paint on her shoes and leave marks on the ground, she leans forward to the student, self-selects herself as speaker and addresses instructions to the student ("there is fresh paint on the ground you should clean it", l. 10). In doing so, she assists the student's activity by solving practical problems she had neither anticipated nor noticed before. These scaffolds bring additional visibility to the training frame shaping participation. The specific modalities through which these interventions take shape deserve particular attention. Indeed, it can be observed that the mentor addresses the student at a particular point in time when the student is not interacting with children. Her intervention is carefully prepared, by establishing eye contact and changing body orientations (see #2). And finally, the instructions are voiced very silently so that they can be heard and understood by the student exclusively. In other terms, the mentor endorses a training role in which guidance is not supposed to be noticed by children and affect their actions. It is shaped as an element taking place aside from the painting activity itself. The student aligns to the verbal exchange initiated by the mentor and sequentially responds by satisfying the instructions (l. 11, 13). In doing so, she aligns to the specific framing offered by the mentor.

This first excerpt illustrates how mentors may provide guidance by placing students in an active position and by assigning to themselves an external observation position. This excerpt also illustrates how these observation positions are not radically external to the students' actions, but provide local opportunities for assisted participation.

16.5.2 Joint Action

A distinct form of guidance provision can be observed in participatory configurations in which mentors are not positioned as external observers but actively engage together with students in educational activities addressed to children. Such an interactional participatory configuration can be designated as *joint action*, considering that both students and mentors jointly accomplish educational activities in which training and learning opportunities may occur.

A second excerpt of data may be used to illustrate how such participatory configurations emerge and unfold. Excerpt (2) was observed in a kindergarten involving student B, her mentor and a group of children aged approximately 3 years old. The activity conducted by the student consists in a "mini-bowling" play, where children are expected to throw coloured balls and use plastic bottles as targets. Children have been gathered in a large room and are listening to the student's instructions. These instructions consist in grabbing soft coloured balls and throwing them towards plastic bottles that have been placed at the other end of the room. At the end of these instructions, children stand up and start to play with balls.

(2) "Lisa, go and grab a ball" (S-A1, 34:30–34:45)

1.	STU:	are you ready kids/ **[#1]**
2.	CHI:	yes\
3.	STU:	so you can grab a ball/
4.		((*STU stands up*))
5.		you can take a ball and throw it at the bottles to try to make them fall
6.	CHI:	((*all the children except Lisa stand up and throw balls at the bottles*))
7.	STU>MON:	yes congratulations Monika you made a bottle fall/
8.	MENT>LIS:	Lisa/ go and grab a ball/ ((*points with her finger towards the box containing the balls*)) **[#2]**
9.		go and grab a ball Lisa\
10.	LIS:	((*Lisa stands up and approaches the box*))
11.	MENT:	((*MENT stands up and approaches the box with Lisa*))
12.	DAN>STU:	I made bottles fall/
13.	STU>DAN:	you made two bottles fall congratulations/

#1: STU and MENT are providing instructions to children before the activity starts (''are you ready kids?'')

#2: MENT addresses LIS while STU engages with the group of children (''Lisa, go and grab a ball!'')

Similarly to what could be observed in excerpt (1), the mentor again affords an active participation space to the student and installs the conditions for the student to lead the activity. The student engages with this participation space and endorses an active role of leadership in conducting the activity: she establishes eye contact with the group of children sitting on mattresses (see #1), addresses instructions to participants ("you can take a ball and throw it at the bottles to try to make them fall", l. 5) and leads the progression by conducting a transition form the instruction phase to the start of the play ("are you ready kids?", l. 1; "so you can grab a ball", l. 3). The children also recognise the student as actively engaged in conducting the activity: they orient their bodies and gaze towards the student (see #1) and respond sequentially to her instructions, either verbally ("yes", l. 2) or with body movements and physical actions (l. 6).

But contrary to the participatory configuration characterising excerpt (1), the mentor assisting student B does not remain outside the primary frame of the educational activity. On the contrary, she is actively taking part to such an activity, as indicated by the conducts she makes visible in the context. For instance, her body position and orientation show that the mentor is not sitting outside the group as a bystander but takes place within the group and as a component of it. She also addresses the children directly and guides them through the activity ("Lisa, go and grab a ball!", l. 8). Interestingly, the children themselves recognise the mentor as a participant in the game: they also establish visual contact with the mentor (see #1 and #2) and align to her instructions when required (l. 10). From there, it appears that the student is not alone in leading the activity but that both the student and the mentor engage in a complex coordination process to produce a joint accomplishment of the bowling play.

Such a joint action participatory configuration becomes particularly visible at the end of the instruction phase, when children are expected to engage with the play (l. 1–3). At this point in time, complex changes occur in the ways participants take actions: a group of children immediately stands up, approaches the box containing the soft balls and starts to use them, but one little girl, called Lisa, stays still in a sitting position. The student orients her attention to the group of children ("yes congratulations Monika you made a bottle fall", l. 7), whereas the mentor aligns with Lisa, establishes eye contact with her and guides her through the game ("Lisa, go and grab a ball", l. 8). A so-called schisming configuration emerges

from such a multifocused gathering (Egbert, 1997), where a plurality of interactions take place in various regions of the material environment, according to distinct sequential unfolding. Both the student and the mentor take in charge distinct facets of the ongoing activity and produce complementary forms of participation to make it work.

Interestingly, training purposes are not absent from this complex coordination process. By bringing back Lisa into the play, the mentor takes in charge aspects of the activity that are difficult to cope with: the fact, for instance, that children may respond differently to instructions and that collective activities may unfold at different paces, in different places, with different participants. In other terms, the mentor is providing assistance to the student in the sense that she contributes to attenuate the complex and unpredictable nature of educational activities. The student can then keep focusing on the group and move on with her plans. What makes the provision of guidance distinctive here is that it is not accomplished from an external observation position, but from within the educational activity frame itself. In such participatory configurations referred to as joint actions, guidance provision becomes almost invisible or transparent in the sense that it takes shape through the accomplishment of professional practice.

16.5.3 Demonstration and Imitation

When mentors and students are working collaboratively for accomplishing educational activities with children, mentors sometimes use the unfolding of such activities as opportunities to demonstrate ways of doing and bringing ostensibly to the attention of the students specific resources for their actions. Fortunately, it also happens that students identify the displayed resources and use them at later stages in their practicum experiences. They may, for instance, reproduce aspects of practice that have been previously demonstrated by mentors. Such a combination of *demonstration* and *imitation* frames a specific participation configuration, distinct from the two previous ones described above.

To illustrate how demonstration and imitation participatory configuration emerge and unfold in interaction, we will refer to excerpts of data collected in a third institution, with student C. These data relate to a psychomotor activity, prepared and conducted by the student with a group of children aged between 1 and 2 years old. The activity consists for children to explore a material environment in which various objects have been placed, such as mattresses, toboggans, tunnels, bowls of different sizes, etc. The student and her mentor are jointly assisting the children in their free exploration of these objects. At the beginning of excerpt (3), Lea, one of the little girls in the group, approaches a smooth cylinder laying on the ground, which children have not used so far. The mentor notices Lea's interest for the cylinder and shows her how to play with it.

(3) "Look we can place the cylinder another way" (M-A3, 36:10–37:55)

1.	MENT:	look we can place the cylinder another way ((*approaches the cylinder and places it in a vertical position*))
2.		who wants to go inside/ . come Lea\ ((*takes Lea and places her in the centre of the cylinder*)) ouh::: **[#1]**
3.	ALI:	((*Alix et Maria are approaching the cylinder*))
4.	MENT:	shall we place Alix inside/ . OK we place Alix with Lea\ ((*takes Alix and places her in the centre of the cylinder*))
[…]		
5.	MENT:	both of you have been kidnapped by a cylinder\
6.		((*shakes the cylinder*)) attention oh oh oh::: ((*shakes the cylinder again*)) oh oh oh oh:::
7.	LEA:	((*Lea expresses fear*))
8.	MENT:	oh you don't like it so OK we stop\ shall we do "In the boat"/ ((*sings a song while rocking the cylinder*)) *in-a-boat-ALI-and-LEA-in-a-boat-ALI-and-LEA-when-the-boat-faces-big-waves-the-boat-makes-splash-and-turns-around* **[#2]**
9.	LEA:	again boat/
10.	MENT:	do you want to get out of here/
11.	LEA:	again/
12.	MENT:	oh again/ wait I will do it one more time and then it's Maya's turn all right/

#1: STU observes how MENT places Lea and Alix in the centre of the cylinder

#2: MENT sings a song while rocking the cylinder

Although the psychomotor activity is supposed to be in the hands of the student, who planned it and who prepared the material, the mentor is clearly taking an active role of leadership at this stage. She initiates a change in the position of the cylinder (l. 1), places Lea and Alix in the centre of it (l. 2–4) and frames a narrative

event in which the two little girls are "kidnapped" by the cylinder (l. 5). She then starts moving the cylinder according to a famous song in which a boat is rocking in the waves (l. 8). Children taking part in the situation also explicitly recognise the mentor as leading the activity: both Lea and Alix respond to the mentor's offer to be placed in the centre of the cylinder and align to the participatory positions afforded to them (see #1).

In this particular configuration, the student is loosely engaged in the psychomotor activity. She is orienting her attention towards her mentor and observes her using the cylinder (see #1 and #2). It is noteworthy though that the student is placed by the mentor herself in an observing position, the mentor accomplishing her actions ostensibly so that they can be noticed by the student ("look we can place the cylinder another way", l. 1). It is based on these premises that a specific participatory configuration is afforded by the mentor, taking the shape of a *demonstration*. Interestingly, approximately twenty minutes after this demonstration, another episode of the psychomotor activity takes place in relation to the cylinder, and during which, the student reproduces the sequence of actions earlier displayed by the mentor.

(4) "I don't know Isabel's song" (M-A3, 54:58–56:00)

1.	LEA:	((*approaches the cylinder and touches it*)) here/
2.	STU:	would you like to go inside/
3.	LEA:	((*LEA shakes her head in approval*))
4.	STU:	wait a minute\ step back I will put it over your head\
5.		((*raises the cylinder and tries to insert it around LEA's body*)) **[#1]**
6.		come/
7.	LEA:	((*LEA steps back and seems to be afraid*))
8.	STU:	it's frightening isn't it/ ((*places the cylinder back on the ground*)) Come I will help you to go inside\ ((*takes LEA in her arms and places her in the centre of the cylinder*))
9.	ALI:	((*ALI approaches and expresses interest for the cylinder*)) ah-li-li/ ah-li-li/
10.	STU:	you too/
11.	STU:	((*takes ALI in her arms and places her in the centre of the cylinder*)) be careful/ don't shake your feet too much\
12.	LEA:	again/
13.	STU:	again *In the boat/* . I don't know Isabel's song\ ((*sings the song while rocking the cylinder*)) *in-a-boat-ALI-and-LEA-in-a-boat-ALI-and-LEA-when-the-boat-faces-big-waves-the-boat-makes-splash-and-turns-around* **[#2]**
14.	MENT:	((*MENT observes the scene with a smile*))

#1: STU raises the cylinder and tries to insert it around LEA's body

#2: STU sings the song while rocking the cylinder: MEN observes the scene with a smile

In the excerpt transcribed below, the participants endorse a distinct and reverse participation position in comparison with excerpt (3). At this stage, the student is not anymore observing the mentor performing the action with children, but she is actively leading the activity involving these same children. It is now the mentor who sits away from the cylinder and observes how the student plays with the two little girls.

In many aspects, it is visible here how the students imitates the action she previously observed from her mentor. For instance, a similar sequential pattern of interaction unfolds as the one that occurred previously: the student places the cylinder in a vertical position (l. 5); she places the same two girls in the centre (l. 5, 8, 11) and shakes the cylinder in reference with the boat song (l. 13). The reproduction of this sequential pattern is very much initiated by children themselves: it is Lea who first touches the cylinder and makes visible that she wants to go inside (l. 1, 3); Alix again steps forward and asks to be part of the game, together with Maria (l. 8). The student aligns to these requests and responds by reusing the resources previously displayed by the mentor. She also makes explicit reference to these resources when it comes to reusing them ("again in the boat? I don't know Isabel's song", l. 13).

Interestingly, the student is not only reproducing literally the sequential pattern of action observed previously. She is also adapting it to the local contingencies of the situation. For instance, when Lea expresses interest for the cylinder game, the student experiments a distinct technique for placing the child in the centre of the cylinder: she raises the cylinder over Lea's head instead of pulling Lea in her arms and placing her in the cylinder (l. 5). But Lea reacts with fear to this way of doing (l. 7), steps back and forces the student to come back to the technique used by the mentor (l. 8).

In sum, these two last excerpts illustrate how the joint accomplishment of educational activities by students and mentors generates opportunities to share repertoires of techniques and strategies: the mentor ostensibly displays resources for conducting psychomotor activities with children, and the student recycles these resources by enacting them in her own practice. These mechanisms also illustrate that this sharing of repertoires is based not only on imitation and reproduction but also involves a process of appropriation and recreation. Consistent with other research results (Billett, forthcoming), these mechanisms emphasise the importance of mimesis in vocational learning and the creative and social aspects related to these mechanisms of imitation in learning.

16.6 Bridging the Gap Between Learning and Working

This chapter has attempted to make the ordinary practices of mentoring students in the workplace more visible by understanding how mentors afford learning opportunities in practice and how students engage with these resources. To do so, mentoring practices have been conceptualised not as abstract categories, but as interactional accomplishments, namely, fine-grained situated and visible conducts enacted through verbal and multimodal interactions.

Approaching mentoring practices as situated interactions emphasises the complex framing process going on when mentors and students are "doing guidance" in the circumstances of work. More specifically, the approach adopted illuminates the complex ways educational practices involving adults and children intersect with vocational training purposes involving novices and experienced professionals. What makes these sorts of settings particularly rich, complex and potentially profitable in terms of learning is the fact that, as we saw from the data analysis, two layers of framing are constantly shaping the ways participants engage in interaction: (1) an educational frame addressed to children and taking the form of a wide range of activities (painting, bowling, playing, etc.) and (2) a vocational training frame involving the student and the mentor and enacted through specific and distinct educational purposes (learning how to use paint, how to cope with multiactivity and how to expand the ways children may explore the material environment). These two layers are constantly intersecting when it comes to train and learn in the circumstances of practice.

The collected data and analysis suggest that participants bring local and distinct responses to these complex framing issues. Some of the mentors observed set themselves outside the educational frame and endorse an observer position to accomplish training practices. Some others participate in these activities and position themselves as partners of a joint action collectively conducted together with students. Finally, some other mentors use these joint actions to share their repertoires of resources and make these resources ostensibly visible to students. In sum, what we have proposed to refer to as "interactional participatory configurations" can be regarded as specific resources used by participants for navigating the contextual complexity they are faced with. It is by negotiating shared participatory positions that they reconcile the premises and expectations associated with both learning and work.

As this chapter argues, interactional competences, namely, the capacity participants have to engage in complex coordination procedures in context, play a significant role in the establishment, negotiation and constant transformation of participatory practices in vocational education. Recognising the importance of these interactional competences may serve relevant purposes for early childhood educators in general and for workers endorsing mentoring functions at work in particular. For instance, this could help in understanding why mentoring practices are sometimes so difficult to observe and why so little attention has been paid to the empirical conditions in which they unfold. From what we see in the data, this lack of visibility can be explained by the fact that mentors do not always endorse training roles by producing explicit sorts of guiding instructions. They often give to the provision of guidance the shape of professional practice itself and

exert guidance through the affordance of participatory positions. If guidance is difficult to observe empirically, it is then, to some extent, because it is framed in interaction as transparent and invisible by participants themselves. From there, using video analysis as research method could bring additional visibility and social recognition to mechanisms that are central to learning through work but are yet to be fully understood.

These methods can also open rich and original avenues for the development of formal or informal training practices addressed to mentors themselves. Analysing video-based material and observing diverse interactional participatory configurations related to this material provide a stimulating empirical base for reflecting on mentors' personal strategies for assisting students in their workplace activities. Recently, we have attempted to move into that direction by organising focus groups with mentors and confronting them with excerpts of video borrowed from the above-mentioned research programme. These focus groups show how participants are able to elaborate their own mentoring skills by observing others' interactions and attitudes. They also provide opportunities for mentors to discuss convergences and differences about what they see as relevant ways of shaping students' participation in workplace contexts. These forms of video-based focus groups bring alternatives to the teaching of norms, prescriptions and preestablished recipes that dominate traditional forms of training in this filed. They can be seen as promising resources for transposing descriptive research results into non-prescriptive training contents.

Appendix: Transcription Conventions

CAP	Accented segments
/	Raising intonation
\	Falling intonation
XX	Uninterpretable segments
(hesitation)	Uncertain sequence of transcription
:	Lengthened syllable
.	Pause lasting less than one second
..	Pause lasting between one and two seconds
Underlined	Overlapping talk
((*comments*))	Comments regarding nonverbal behaviour
[#1]	Reference to the numbered illustration in the transcript

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Chapter 17
Using Diaries in Research on Work and Learning

Andreas Rausch

Abstract In recent years, the diary method has attracted increasing attention in research on work and learning. Since workplace learning is often only a by-product of working processes, data collection in situ seems to be a promising approach compared to retrospective instruments. This chapter provides a systematic overview of the manifold options when using diaries in research on work and learning. Exemplary implementations of diary instruments are presented, and future perspectives of the diary method and related measures are discussed. By discussing benefits and pitfalls of the method, this contribution aims at helping and encouraging other researchers to use diaries in their research.

17.1 Introduction

Research on informal learning in the workplace has gained increasing attention over the last decades. There is a wide consensus that learning in the workplace differs from learning in formalised settings such as classrooms in several respects. First, the outcomes of learning in the workplace, i.e. acquired competence, often remain implicit in that people find it difficult to express what they have learned (Frensch & Rünger, 2003; Simons, 2005). People usually refer to these kinds of competence in more colloquial concepts such as experience rather than learning outcomes. Second, the processes of learning in the workplace often remain unconscious in that people do not recognise when and how they have learned (Eraut, 2004; Marsick & Watkins, 1990). In the workplace, people usually pursue working goals, i.e. changing the work situation, instead of learning goals, i.e. changing oneself (Achtenhagen et al., 1992; Elliott & Dweck, 1988; Kell, 1989; Koestner & McClelland, 1990). Thus,

A. Rausch (✉)
Department of Business Education and Educational Management, University of Bamberg, Bamberg, Germany
e-mail: andreas.rausch@uni-bamberg.de

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learning usually remains an unconscious by-product (Eraut, 2004; Simons, 2005). From the workers' point of view, the term learning seems to be reserved for formalised settings and thus not appropriate for the workplace (Eraut, 2000; Rausch & Schley, 2011; Simons, 2005; Tynjälä, 2008). Instead, the process of acquiring experience in the workplace is more often regarded as problem-solving or 'deliberative learning' as referred to by Eraut (2004, p. 250). Finally—to mention only a few characteristics—the opportunities and circumstances of learning vary widely across workplaces because workplaces themselves show large heterogeneity due to occupation, commercial sector, company, work organisation, task characteristics and other factors. Altogether, these characteristics of workplace learning make high demands on research regarding workplace learning.

Reviews of research on workplace learning show that retrospective measures, such as questionnaires and interviews, are the dominant methods (Berings, Doornbos, & Simons, 2006; Sawchuk, 2009). However, retrospective methods assume that the respondents are able to deliver a valid and balanced judgment on varying situations, their respective experience and related outcomes over long periods of time (Brandstätter, 1981). Each retrospective self-report requires (a) the selection of the events of interest, (b) the recall of all those events and (c) the aggregation with regard to the variable of interest (Reis & Wheeler, 1991; Schwarz, 1990). Everyday events that raise no particular attention in the moment they occur are probably never memorised (Jobe, 2000). Hence, self-reports on such events are likely to be subject to ad-hoc construction, i.e. the conscious or unconscious 'filling' or 'straightening' of memory gaps, rather than the result of an unbiased reconstruction (Tourangeau, 2000). Superficially, people do not seem to have difficulties in giving generalised and aggregated retrospective self-reports on what they experience in their daily work. However, empirical studies on the relation between data gained from retrospective self-reports and aggregated data collected close to real time by means of diary methods show a different picture. Fisher (2002) cites a collection of studies in which retrospective reports and aggregated real-time data on emotions in the workplace shared only 36–58 % of their variance. Similar results are found for coping behaviour (Stone et al., 1998), media use (Greenberg et al., 2005), smoking behaviour (Shiffman et al., 1997), problem-solving behaviour (Van Gog, Paas, & van Merriënboer, 2005) and a vast array of medical phenomena (Shiffman, Stone, & Hufford, 2008). In a study on learning and emotions in the workplace, Rausch (2012) compared data on work task proportion, work task characteristics and emotional states throughout work tasks obtained once from an online diary and once from retrospective questionnaires. During a two-week period, the participants—16 trainees at different stages of their apprenticeship as industrial clerks—entered a total of 787 work tasks into the Internet-based diary application. A supplemental questionnaire was administered after the diary period. The questionnaire included standard scales of job analysis as well as items taken from the diary. All questions referred to the past 2 weeks, i.e. the diary period. The retrospective appraisal of time budgets, which were spent for several types of tasks, turned out to be quite accurate, but the evaluation of task characteristics showed almost no and that of emotional experience only a few noteworthy correlations. Though the

referenced period of time was only 2 weeks, the results revealed a poor concordance of retrospective and real-time measures with regard to influences of workplace learning. Furthermore, retrospective self-reports are also subject to situational influences in the moment of measurement. In one of the most frequently cited studies, Schwarz and Clore (1983) report that telephone interviews conducted on sunny spring days resulted in higher life satisfaction than interviews on rainy spring days. Brief, Butcher and Roberson (1995) reported similar findings from a quasi-experimental field study on work satisfaction. A positive mood induction (coffee and cookies while answering the questionnaire) increased the past year's work satisfaction significantly. Accordingly, if the requested features of workplace learning are difficult to recall, aggregate or evaluate in retrospective, the answers are likely to be biased by overall work satisfaction as well as by situational influences while completing the questionnaire. Questionnaire instruments are undoubtedly of great help in any empirical study on workplace learning. They may be used to measure objective conditions and features of the workplace or biographical and dispositional influences as well as general attitudes or work satisfaction of the individual. However, if one is interested in everyday incidents of learning in the workplace, collecting data on site and (near) real time seems to be a more promising approach. One such approach of collecting data on site and (near) real time is the diary method. The following section gives a description of the method and an overview of its variety ranging from tightly scheduled experience sampling to open-ended requests for reflection. This general description is followed by exemplary implementations of diaries focusing on tasks, social interaction, problem cases and interruptions in the workplace. In the final section, some future perspectives of the diary method are discussed. The aim of this chapter is to encourage and help researchers to use diaries in their own studies on workplace learning.

17.2 Diaries as Research Instruments

This section gives an overview of the wide range of research diaries, which is partly based on the editorial in a special issue on diary methods published in the German journal *Empirische Pädagogik* (*Empirical Pedagogic*) by Rausch, Kögler and Laireiter (2012).

Originally, keeping a diary includes making repeated, casual and usually private notes about personal experiences, observations, feelings, etc. (Iida, Shrout, Laurenceau & Bolger, 2012). In the context of contemporary social sciences, a variety of different methods are subsumed under the label 'diary', some of which are far from this everyday understanding. First and foremost, one has to separate studies in which a diary serves exclusively as a research instrument from studies in which a diary is (also) part of an intentional treatment, e.g. portfolios aiming to increase self-awareness or reflection. The focus of this chapter is on diaries as a research instrument, which aims to collect data on a particular phenomenon without influencing this phenomenon. However, collateral effects on the phenomenon of

interest usually cannot be excluded even for research diaries and will be discussed later on. From a diagnostic perspective, all types of diaries refer to a data collection procedure in which the participants themselves record certain internal or external events according to specific guidelines and at a specific time or condition defined by the researcher (Laireiter & Thiele, 1995; Seemann, 1997).

Given this broad definition, in situ survey methods developed in other fields of research can be interpreted as variations of diaries as well. *Ecological momentary assessment (EMA)*, introduced by Stone and Shiffman in 1994, can hardly be distinguished from the diary method in the sense described above (Shiffman et al., 2008). *Ambulatory assessment* derived from psychology and psychophysiology is characterised by the combination of self-reports and physiological data such as heart rate (Fahrenberg, Myrtek, Pawlik & Perrez, 2007). The widely known *experience sampling method (ESM)* developed by Csikszentmihalyi and colleagues in the late 1970s (Hektner, Schmidt & Csikszentmihalyi, 2007) can also be interpreted as a type of diary. Fisher and To (2012) distinguish ESM from diary methods in that the latter usually have only one report per day. However, this distinction is not adopted here. If anything, the extent and form of a single entry seem to be a distinctive feature. Diaries usually request more complex entries that might also include free text, whereas ESM usually contains only a few closed items that can be answered very quickly. This is also seen as the main difference between ESM and the less known, but quite similar, *time sampling diary (TSD)* which was also independently developed in the late 1970s by Brandstätter (2001). Finally, the *continuous state sampling method (CSSM)* developed for classroom research by Sembill and colleagues in the 1990s (Sembill, 2004) can be interpreted as variations of the diary method as well. CSSM implies very brief self-reports by means of closed questions in very short intervals of 5–10 min, usually by means of electronic devices. Regardless, there are significant overlaps and smooth transitions between the methods.

Diary methods are particularly helpful when detecting phenomena that are difficult to observe or not accessible to observation at all, e.g. subjective and internal processes such as feelings. Furthermore, observations in a person's natural environment may be limited for practical reasons or are simply not reasonable because the phenomena of interest occur very infrequently and unpredictably (Hormuth, 1986). As mentioned earlier, diary methods also help to capture events, which cannot be reliably remembered in retrospective (Jobe, 2000; Shiffman et al., 2008; Tourangeau, 2000). Altogether, the main benefits are (a) higher ecological validity, (b) the analysis of situational influences, (c) the analysis of changes over time periods and (d) the analysis of interpersonal differences (Beal & Weiss, 2003; Bolger, Davis & Rafaeli, 2003; Fisher & To, 2012; Hormuth, 1986; Ohly, Sonnentag, Niessen & Zapf, 2010; Reis & Gable, 2000; Schmitz, 2006; Scollon, Kim-Prieto & Diener, 2003; Seemann, 1997; Shiffman et al., 2008; Wheeler & Reis, 1991). However, participation in a diary study often demands a great deal of time and effort, which may lead to reactivity (an atypical change of the natural process) or to psychological reactance (e.g. dropout or even sabotage) (Brandstätter, 2007; Fahrenberg & Myrtek, 2001; Schmitz & Wiese, 2006). These downsides call for a careful evaluation of the

respective diary design. In the following subsections, the key design elements of a diary instrument are discussed.

17.2.1 Phenomenon of Interest, Item Format and Situational Adaptability

The phenomenon of interest within a particular field of research usually determines the name of the respective diary, e.g. working diary, interaction diary, stress diary, gratitude diary, etc.; however, it may be advisable to choose a more general term when communicating with participants in order to avoid (unintended) reactivity or priming. In any case, the variables of each diary entry refer to key features of the phenomenon, which have to be investigated and decided on prior to the diary study. The state of knowledge in the respective field of research suggests whether a study is hypothesis generating (explorative) or rather hypothesis testing, while usually a combination of both is reasonable. The phenomenon of interest can be assigned to either the subjective internal sphere (e.g. emotion, cognition, learning, etc.) or the more objective external sphere (situational conditions). In either case, one usually also measures variables of the other sphere, too, because in the majority of investigations, the interactions between external conditions and subjective experience are of vital interest.

After having decided on the item content, the *item format* has to be defined. Basically, item formats may vary between long free text responses (string variables), standardised Likert scales (ordinal variables) or simple check boxes (dichotomous variables). In a review of diary studies in organisational research, Ohly et al. (2010) find fully standardised items to be the most popular choice. A manageable quantity and complexity of items ensures quick entries on the part of the user and therefore increases motivation, compliance and acceptance. Standardised items also avoid the time-consuming content analysis of open answers by the researcher (Laireiter & Thiele, 1995). However, creating appropriate standardised items implies a proper model of the phenomena, its features, influences, etc. that, again, point to the state of knowledge in the respective field. In explorative studies with a more uncertain theoretical underpinning, a greater share of free text responses appears advisable.

In order to easily measure, analyse and compare the diary data, it is beneficial to create standardised items that fit all possible situations and differ only in the extent of agreement (e.g. when the phenomenon of interest is *social interaction in the workplace*, the following item can be answered for each entry: 'To what extent did you receive feedback during this interaction?': 1 = *no feedback at all* to 6 = *very detailed feedback*). However, if the phenomenon under research is complex and can take different shapes, it may be difficult to create universal items. A poor fit of an item to a given situation may confuse, unsettle or annoy the participants (e.g. being requested to indicate *how helpful* received feedback was in a particular interaction when there was no feedback at all). In such cases, the diary should be adaptive to

different situations. There are two basic strategies to ensure *situational adaptability*: (a) *Ex-post categorisation by the researcher on the basis of content analysis of free text responses*: Not only is this procedure very time-consuming, but it is also reliant on sufficient information provided by the participants. Especially for free text fields this is not always the case. (b) *Ad-hoc categorisation by the participants on the basis of a list to choose from*: This approach requires extensive preparatory work, since the list of categories should be both mutually exclusive and exhaustive. From experience with time budget studies, it is recommended that no more than ten categories should be presented to provide clarity and the category "other" should be selected for no more than 5 % of the entries (Frieling & Sonntag, 1999). Consequently, the categories should be named and described significantly and sufficiently, and the participants should be instructed in advance. Depending on the media decision (see below), situation-specific items can be presented after the participants choose a situation type. However, one has to keep in mind that the possibility for comparing different situations—which seems to be a reasonable objective—will diminish if the items are situation specific. An alternative would be to narrow the focus of the study to selected situations (e.g. receiving feedback instead of any social interaction).

17.2.2 Sampling Method, Reference Time and Time Delays

After the definition of the content and format of a single diary entry, another key decision has to be made regarding the *sampling method*, i.e. the trigger of a diary entry. Basically, two strategies can be distinguished, and each can be further differentiated. *Time-based sampling* refers to a method of data collection in which an entry is triggered by a time schedule set by the researcher. In case the participants can anticipate these times (e.g. 10 am, 1 pm, 4 pm, etc.), the schedule is referred to as *time based/fixed* or *interval contingent* depending on the author. Accordingly, the *continuous state sampling method* (CSSM) introduced by Sembill and colleagues to conduct process analyses in classroom research can be interpreted as high-frequency fixed time sampling at intervals of 5–10 min varying across the studies. If the sampling times cannot be anticipated accurately but instead appear set at random, the sampling is referred to as *time based/variable* or *signal contingent*. Csikszentmihalyi and colleagues used this procedure in most of their classical studies. However, within such externally predetermined schedules, work processes or other circumstances at the time of the request may impede a diary entry. Moreover, one may accidently or even systematically miss the phenomenon of interest especially if it occurs rather infrequently during the day. Finally, the external regulation of the sampling times may also affect the participants' experience of self-determination and thus lead to decreased compliance. Consequently, for a number of studies, *event-based* sampling may be more appropriate than *time-based* sampling. *Event-based* sampling is a method of data collection in which the participant is requested to make a diary entry each time a predefined event occurs; again, an event can be internal (e.g. stress, happiness, etc.) or external (e.g. interruption, problem case, etc.). In using event-based sampling, it is essential to ensure that the participants

share the same understanding of the phenomenon and thus the event that triggers a diary entry. However, this may also draw the participants' attention to the phenomenon and lead to higher reactivity compared to less-informed participants in time-based schedules. In addition, one can hardly estimate a return rate without knowing the real frequency of the phenomenon. Finally, if some of the participants experience the triggering events very often and therefore are requested to make many entries, reactivity and reactance may become more likely. In this case, participants may be allowed to limit the number of entries per day to a maximum number. If so, they should be requested to indicate or estimate how many additional events could not be recorded that day. This may be reported within a daily closing section of the diary to be filled in at the end of each workday (Beal & Weiss, 2003; Bolger et al., 2003; Iida et al., 2012; Laireiter & Thiele, 1995; Reis & Gable, 2000; Shiffman et al., 2008; Wheeler & Reis, 1991; for an extensive discussion of the pros and cons of different sampling methods, see Fisher & To, 2012).

Closely connected with the sampling method, though rarely addressed, is the question of the *reference time* of each entry. The question is whether the participant should, for example, specify (a) how he or she feels exactly at the time of the entry or (b)—in case of event sampling—at a particular situation during the event, for instance, how someone felt at the moment a problem was detected (see example below). Besides these points of time, there are options to reference a period of time by asking (c) for an average experience during the last 15 min or (d) for an average experience since the last entry. This decision also raises the question of a possible time lag between an event of interest and the respective entry. The greater the *time delay* is between experience and recording, the stronger the recall bias. Ultimately, even an entry at or near real time remains to a certain extent retrospective (Beal & Weiss, 2003, p. 446) though in high-frequency time sampling, like within CSSM, the difference between (a) and (d) is hardly perceptible from the participants' point of view. In contrast, in event-based sampling, a time delay is quite normal because the event that is to be recorded usually stretches over a certain period of time (such as a social interaction or the experience of stress) and is usually captured after its termination (Beal & Weiss, 2003). Such design-related time delays are often inevitable and must be distinguished from illicit and maybe undetected time delays due to a lack of compliance. Electronic diaries can help detect or inhibit such delayed entries. This points to the next subsection.

17.2.3 Recording Method

The choice of the recording method also plays an important part. Paper-and-pencil diaries, electronically triggered paper-and-pencil diaries, mobile devices and Internet-based diary applications are the most commonly applied recording methods.

Paper-and-pencil diaries have a long tradition and offer the advantage of being easy to operate. However, there are some major drawbacks to this recording method: (a) Entries may be simply forgotten resulting in missing data. (b) Forgotten entries

or missing compliance may provoke delayed entries. Participants often tend to do their diary entries only after a certain period of time (e.g. at the end of a day or accumulated after several days). This was impressively confirmed in a study with a hidden computer chip in a paper diary (Stone, Shiffman, Schwartz, Broderick & Hufford, 2002). These delays may lead to significant biases and undermine the original purpose of the diary method. (c) During the fieldwork period, there is no information on the quantity and quality of the entries, which makes the maintenance of the sample more difficult. (d) During the field phase, data protection cannot be guaranteed because other people in the field may look at the diary. Respective concerns could, in turn, result in biased data, e.g. in the sense of social desirability. (e) Finally, in addition to the production of the paper diaries, there may be a huge effort for data entry even for small sample sizes (Bolger et al., 2003).

Electronically triggered paper-and-pencil diaries are used for time-based sampling methods. An electronic signalling device, which reminds the participants to make an entry, supplements the paper-based diary. These combined methods were common in the 1970s and 1980s. There were high costs for the signalling devices (known as a 'pager' or 'beeper') and high efforts for administrating them. Moreover, back then the electronic trigger had a rather 'deterrent effect' on the participants. However, it enabled unforeseeable entries in signal-contingent schedules or prevented forgetting entries in fixed schedules (Bolger et al., 2003). Nowadays, one would rather switch to a fully digital solution.

Mobile devices, such as smartphones or personal digital assistants (PDAs), replaced the combination of paper-and-pencil diaries and signalling devices. In excess of only signalling the time for a diary entry, the data is entered directly into the mobile device. If the participants have their own private smartphone, software applications ('apps') might be provided for download and installation. Software may either be developed in-house for the purpose of the study or available software may be adapted if applicable. However, the technological expertise required for in-house development, adaptation and administration should not be underestimated. Besides the signalling of data entry, additional advantages are (a) the logging of the date of the actual entry, (b) restricting delayed entries, (c) checking entries for plausibility during the entry and (d) presenting, changing or blinding out items or changing sequences adaptively during a diary entry (Bolger et al., 2003). Some devices also enable the supplemental collection of physiological data such as heart rate, blood pressure and the like (Beal & Weiss, 2003; cf. 'Ambulatory Assessment'). Many of the disadvantages identified in previous overviews are technical in nature and are now considered to be outdated, although the willingness to enter long texts on the small terminals is still likely to be low. Additional audio recordings (e.g. think aloud protocols) would be a possible alternative. With modern speech recognition software, subsequent transcription should also be comfortable.

Internet-based diaries, apart from the mobility, have basically the same features like mobile devices. Bolger et al. (2003) rightly point out that the borders between the two classes disappear with regard to increasing mobile Internet access, e.g. via smartphones. Still, one should be aware of the more limited display size and the rather tedious procedures of text input compared to personal computers. Hence,

advantages of computer-based diaries are (a) the possible presentation of more complex or even pictorial items and (b) the ease of text input via keyboard, which also makes it possible for the participants to enter a long free text response. The lack of mobility, of course, assumes that the participants are always on or in the vicinity of their computers, e.g. when being taught in computer rooms or when working in the office. With the recent technological developments in the field of tablet computers, these boundaries vanish more and more, and the advantages of mobile devices are combined with the advantages of local devices. However, the use of any electronic input device, in any case, requires more or less high technical skills for the users (Ohly et al., 2010).

Table 17.1 provides an overview of the discussed parameters of a diary and common options (in continuation of Laireiter & Thiele, 1995; Rausch et al., 2012; and similar overviews).

Table 17.1 may serve as a morphological box within the planning of a diary study; however, not every combination appears reasonable. In any case, the distinction of whether the diary is intended to be a diagnostic tool or part of an intervention programme is crucial for the choice of the parameters. In the former case, possible treatment effects of the diary are biases of the natural processes (reactivity), whereas in the latter case these treatment effects are intended as part of an intervention. Furthermore, the balance between the effort for one record (i.e. quantity and complexity of items), the frequency of records and the length of the diary period is another important issue. If keeping the diary is too time-consuming and annoying, the participant burden may result in subject noncompliance, psychological reactance or participant burnout (Iida et al., 2012, p. 282 f.).

17.2.4 Overall Study Design and Additional Support Measures

Besides the composition of the diary itself, the success of a diary study also relies on additional measures. In line with Laireiter and Thiele (1995) and Rausch et al. (2012), there are three areas of recommendations:

1. *Introduction and briefing*: In the preparation of a diary study, a proper introduction and briefing of the participants is of the utmost importance. First of all, the objectives of a study should be revealed as much as possible. Of course, some hypotheses may have to be concealed prior to the study because otherwise there could be serious biases. Second, it is important to gain the participants' trust concerning issues of data protection and anonymity. Third, there should be clear and comprehensible instructions on how to use the diary. These include the clarification of the variables and the triggers of a recording, the discussion of examples, rehearsals and the clarification of remaining questions. Fourth, the researchers should openly address the efforts of keeping the diary and, again, point out the scientific value and a personal appreciation for the participants. The introduction aims at a trustful relationship. At the end, there should be a kind of an implicit or explicit contract between the participants and the researchers.

Table 17.1 Overview of the main parameters of a diary and the common options

Parameter	Common options
Phenomena of interest	*Subjective internal sphere*: emotion, cognition, action, learning, etc.
	Objective external sphere: situational conditions, behaviour, etc.
Item format	*Free text responses*: string variables
	Standardised Likert scales: ordinal variables
	Simple check boxes: dichotomous variables
Situational adaptability	*Generally applicable items* that fit all possible situations and differ only in the extent of agreement (e.g. interest, newness)
	Distinction of situations: (a) ex-post categorisation by the researcher on the basis of content analysis or *(b) ad-hoc categorisation by the participants* on the basis of a list of situations to choose from
Sampling method	*Time-based sampling: (a) fixed* = disclosed sampling schedule, i.e. predictable from the participant's point of view; *(b) variable* = random from the participant's point of view; possible option to allow for delayed responses or temporary withdrawal
	Event-based sampling: predefined triggers instead of a time schedule; possible option to allow participants to decide on their own whether to make a record or not, for instance, depending on the representativeness of the event
Reference time	*Point in time*: (a) experience exactly at the time of the entry or (b) at a particular point during the event (in case of event sampling)
	Period of time: (c) average experience during the last x minutes or (d) average experience since the last entry
Time delays	*Immediate recording*: record made immediately after signalling or after the triggering event; possible option to control for time delays by means of electronic recording methods
	Delayed recording: Time delays between trigger and record are permitted and controlled for
Enquiry period	*One-time enquiry period for process analysis*: if participants are requested to make several entries a day, the enquiry period should not be longer than 2 or 3 weeks
	Continuous enquiry period for change analysis: within sustained intervention studies over longer periods, possible diary biases should be controlled in a multigroup design
	Multiple enquiry periods for change analysis: several diary periods with longer intervals without data collection in between
Recording method	Paper-and-pencil diaries
	Electronically triggered paper-and-pencil diaries
	Mobile devices
	Internet-based diary applications

2. *Participant motivation*: Besides gratitude and appreciation, which are aimed on intrinsic motivation, more 'manifest' values are commonly granted. For instance, credit points are a common 'currency' in studies with students. Whenever monetary incentives are used, one should make sure that the offered amount at least in some degree reflects the actual efforts. Amounts of 50–100 EUR for a 2- or 4-week enquiry period appear appropriate depending on the position of the participants. It might be fair for trainees or skilled employees but rather insulting for

CEOs. Furthermore, offering personalised feedback on one's data is usually a very appreciated reward for participating in a diary study.

3. *Sample preservation*: We experienced that personal attendance is essential for keeping participants on track. Mediated communication such as email or telephone might be an alternative, but personal communication should be preferred whenever possible. Participants should have the possibility to easily clarify questions regarding the diary, and researchers should have the possibility to remind the participants of the 'contract' in case of deficient participation. Again, a trustful and respectful climate is most important, and one also has to respect the decision of a participant to opt out of a study. In work organisations, it is important that the management supports a study, for instance, by calling for participation or granting time for keeping the diary. However, management should not force anybody to participate because the assumable lack of compliance may result in poor data quality. Consequently, the management should not be informed about who participated and to what extent. This points back to the introduction in which questions like these must be addressed.

17.3 Exemplary Diary Instruments

The following section starts with an overview of several diary studies on work and learning which were conducted by our research group. The focus will be on the composition and the design of the diaries rather than on results from data analyses since this would go beyond the scope of this chapter. However, before presenting the details of the different diary implementations, some basic information on our diary studies is provided in Table 17.2.

17.3.1 Work Task Diary

The work task diaries, which were used in the first three studies, aimed at gaining insight into apprentices' learning from everyday work tasks. In doing so, each task had to be rated with regard to certain task characteristics and, in addition, be assessed in terms of learning from the respective task. Regression analyses were conducted to explain subjective learning from work tasks by their task characteristics (Rausch, 2013).

In study 1 and study 3, a list of task types was developed from interviews and observations before the actual diary study. The task types had to be mutually exclusive and exhaustive. A description of and examples for each category as well as a discussion in the workshop prior to the study helped to ensure the accuracy of the categorisation. Table 17.3 gives an overview of the task categories used in study 3.

An analysis of the additional free text descriptions of each task confirmed the overall accuracy of the task categorisations made by the participants. Furthermore,

Table 17.2 Overview of diary studies from our research group

	Study 1	Study 2	Study 3	Study 4	Study 5	Study 6
Diary	Work task diaries			Social interaction diary	Problem-solving diary	Interruption diary
Phenomena of interest	Work task characteristics, emotional states, subjective learning outcomes			Characteristics of social interactions, emotional states, subjective learning outcomes	Characteristics of job-related problems, emotional states, subjective learning outcomes	Characteristics of daily interruptions in the workplace, emotional states
Context	Telecommunication service provider	Community bank	Automotive company	Municipal utility company	Automotive company	Potassium mining company
Target group(s)	Apprentices ("retail salespersons")	Apprentices ("bank clerks")	Apprentices ("industrial clerks")	Apprentices (diverse)	Apprentices and skilled employees in office work	Skilled employees in commercial departments
Number and format of items[a]	Open format: 1 Closed format: 12	Open format: 1 Closed format: 10	Open format: 1 Closed format: 13 + circumplex item on emotional states (see below)	Open format: 2 Closed format: 12 + circumplex item on emotional states (see below)	Open format: 4 Closed format: 29 + circumplex item on emotional states (see below)	Open format: 0 Closed format: 13 + circumplex item on emotional states (see below)

Sampling	Event sampling; request to choose about 5 typical tasks each day	Event sampling; request to choose about 5 typical tasks each day	Event sampling; request to choose about 5 typical tasks each day	Event sampling; request to record 5 typical interactions each day	Event sampling; request to record 1 or 2 job-related problems each day	Event sampling; request to record every interruption
Diary period	6 weeks	10 workdays (within 4 weeks)	10 workdays (within 4 weeks)	10 workdays (within 4 weeks)	10 workdays (within 4 weeks)	5 subsequent workdays (1 week)
Media choice	Internet based	Paper and pencil	Internet based	Paper and pencil	Internet based	Paper and pencil
Sample (participants)	18 apprentices	10 apprentices	20 apprentices	22 apprentices in commercial trades; 28 apprentices in technical trades	13 (8 apprentices; 5 skilled employees)	15 skilled employees
Sample (records)	557 work tasks	1,204 work tasks	836 work tasks	2,077 interactions	64 problem cases	433 interruptions

[a]not including administrative items like date, time or user ID

Table 17.3 Task categories used in study 3

Task category	Description (condensed)
(1) Nonspecific task	Work tasks which are quite typical in any company but which do not require occupation-specific knowledge and skills, e.g. collecting and distributing internal mail, running errands or even watering the flowers
(2) Occupation-specific routine task	Work tasks which consist of the perpetual repetition of small and prescribed operations. Still—in contrast to the task type above—these tasks require a minimum of occupation-specific knowledge and experience, e.g. filing, sorting or checking information, processing a stack of files like accounting incoming invoices
(3) Occupation-specific casework	Work tasks in the form of holistic cases, which include multiple operations and decisions, e.g. case-related business letters, creating spreadsheets or presentations
(4) Occupation-specific communication with externals	Work tasks, which, to a large part, consist of synchronous communication with other departments, customers, suppliers or other external persons (face to face or by phone, Skype, etc.), e.g. requesting information, providing information, consultation, or sales conversation
(5) Apprentices' project	This task type regards a company-specific arrangement. Apprentices are in charge of larger, mostly internal projects. At the time of the study, they organised the company's participation in a big marathon event
(6) Official team meeting	This category refers to formally organised and scheduled meetings (in contrast to informal gatherings and the like)
(7) Guided learning in the workplace	Guided learning refers to any learning activities, which are reliant on some other person who shows or explains something, serves as a model or provides guidance or feedback. In contrast to work tasks, those activities are oriented towards learning
(8) Self-directed learning in the workplace	Self-directed learning in the workplace contains any learning activity that is predominantly executed on one's own, e.g. read up on new products, new software or new workflows, reading textbooks or doing homework for vocational schools. In contrast to work tasks, those activities are oriented towards learning
(9) Other	Choose this category if no other category is applicable

Note: translated from German by the author

less than 5 % of the tasks were categorised as 'other', which argues for the exhaustiveness of the categories. In further analyses, this categorisation provides the basis for the comparison of task types (e.g. which task type is perceived as most interesting?). Moreover, when analysing the influence of work task characteristics on learning, one can focus on those task types, which represent work tasks in the narrow sense (task types 1–4 in Table 17.3), and thus exclude learning tasks such as guided or self-directed learning (task types 7 and 8 in Table 17.3). The list of task characteristics and the respective items were slightly changed from study to study. Table 17.4 shows the items, which were used in study 3 (see also Rausch, 2013).

In addition, a bundle of items referred to as *circumplex item of emotional states* was also implemented in study 3 and will be presented later on.

Table 17.4 Standardised task item and response format in study 3

Item (abbr.)	Question	1 (=minimum)	6 (=maximum)
(1) Novelty	I have completed this task	very often before.	never before.
(2) Difficulty	Given my current knowledge, this task	was easy to handle.	was difficult to handle.
(3) Scope of action	During this task, I had	no scope at all.	a lot of scope.
(4) Time pressure	This task was completed	with no time pressure at all.	under very high time pressure.
(5) Assistance from others	In completing this task	I needed no help at all.	I needed a lot of help.
(6) Interestingness	I experienced this task as	very uninteresting.	very interesting.
(7) Feedback	For this task, I received	no feedback at all.	very detailed feedback.
(8) Errors made	During this task	I made no errors at all.	I made many and/or major errors.
(9) Questions remaining	Are there questions remaining regarding this task?	No questions remaining at all.	A lot of questions remaining.
(10) Learning Potential	From this task	I learned nothing at all.	I learned a lot.

Note: translated from German by the author

Altogether, the procedure of identifying and providing a list of definable situations as well as the gradual revision of the standardised task items resulted in an efficient instrument to investigate work and learning at work.

17.3.2 Social Interaction Diary

One of the results of studies 1–3 was the significance of social interaction for learning in the workplace. Hence, we wanted to learn more about the characteristic of those interactions. Therefore, it was necessary to focus the diary as well. Since items that characterise interactions would not readily fit for noninteractive tasks and vice versa, the diary was focused exclusively on social interactions. The participants in study 4 were requested to record five typical interactions each day and in doing so complete several items on interaction characteristics. Figures 17.1, 17.2 and 17.3 show the details of the two-sided paper-and-pencil form for recording a social interaction.

In case an interaction was not initiated by the trainee himself/herself but by another person, the role of that person was to be indicated by underlining it in the list of interaction partners on the left side. This procedure turned out to be too

RECORD OF AN INTERACTION

Date: ___ . ___ . **Beginning:** ___ : ___ h **Duration:** approx. ____ minutes

Please indicate whether there was a prior appointment for this interaction or whether it occurred spontaneously (Choose one answer):

☐ There was a fixed appointment beforehand.

☐ There was a fixed appointment, but the interaction took place at a different time.

☐ There was a non-specific announcement beforehand.

☐ The interaction occurred spontaneously.

Who participated in this interaction?
(Please enter number of persons)

__ Full-time trainer(s)

__ Colleague(s) from the same department

__ Other trainee(s)

__ Colleague(s) from another department

__ External(s) (e.g., customer, supplier)

__ Other(s): _____

Who initiated the interaction?

☐ Me myself ☐ Other person

(In case of "other person", please underline in the list on the left side.)

Were there any disturbances or interruptions during the interaction?
(e.g., phone calls, interposed questions of others)

☐ Yes ☐ No

Fig. 17.1 Interaction diary (part 1 of 3; translated from German by the author)

complicated as in 11.6 % of all interactions that were not self-initiated the respective information is missing.

Regarding the specification of the content of an interaction, in 17 % of the entries, "other" was chosen. This is quite a lot and suggests that the formal list is not exhaustive. The open-ended question in the lower part of Fig. 17.2 served to validate the selection of closed-ended answers in the section above and also gave hints to additional options to be presented in a revised version of the interaction diary.

The classification of what was learned is inspired by a typology of workplace learning presented by Hodkinson and Hodkinson (2004). The classification was missing in 5.83 % of all appropriate cases, taking into account that there was no classification to be expected in cases when nothing was learned at all. This is above average for missing values. Hence, the participants either had problems with the classification or simply overlooked it. Again, the open-ended text on what was learned was asked to validate the selection. However, only very little text was provided by the participants, and their descriptions hardly allow any inferences on the requested classification. The last part of the interaction diary focused on the emotional states throughout the interaction. The applied *circumplex item of emotional states* is presented later on since all diaries incorporated that module.

To summarise, the interaction diary still needs some refinements compared to the work task diary, which was gradually developed over several studies. Nevertheless, the data—2.077 interaction entries from 50 trainees—offer multiple insights into the daily social interactions in the workplace within apprenticeship.

What were the contents of the interaction? (Multiple answers possible)

- ☐ An actual **work task demanded cooperation** without any noteworthy problem.
- ☐ A **concrete problem / an exception** in the completion of a work task popped up.
- ☐ Instruction for **new procedures / new work tasks** that were unknown before.
- ☐ **Planning and coordinating** upcoming workflows.
- ☐ I received **Feedback** concerning my past work performance. → ☐ Appreciation → ☐ Criticism
- ☐ General **issues concerning my apprenticeship program** (e.g., progression through departments, vocational school, holidays, official report portfolio, exams)
- ☐ **Small talk / gossip** without a concrete relation to work tasks.
- ☐ **Other content:** _____

Please describe the content of the interaction with your own words:

_____

_____

_____

_____

Fig. 17.2 Interaction diary (part 2 of 3; translated from German by the author)

17.3.3 Problem Diary

Another study focused on problem-solving within office work in order to develop authentic problem cases for the development of test instruments on problem-solving competence. Furthermore, problem-solving is also considered a major source of learning in the workplace. The problem diary is different from the other diaries in that each entry requires much more time from the participants, but on the other hand fewer entries were requested within the study. The participants, apprentices and skilled workers in a commercial department of an industrial enterprise, were requested to record only one or two job-related problems each day over a period of ten workdays. Thirteen participants recorded a total of 64 problem cases using the Internet-based diary. Another special feature was the option to record a job-related problem without its solution and retrieve the record from the database at a later date to complement the record after the problem was solved.

The structure and the items of the diary reflected general approaches to problem-solving (Bransford & Stein, 1984; Dörner, 1997; Fischer, Greiff & Funke, 2012), but they were also adapted to the particular context of office work in commercial departments. Each record of a problem case consisted of five parts. The first part demanded a very brief description of the problem that served as a heading for the

Further characteristics of the interaction (reverse side)

What was your **speech proportion**?	I hardly said anything.					I talked all the time.
	1	2	3	4	5	6
Did you ask **questions** throughout the interaction?	I asked no questions at all					I asked a great many questions
	1	2	3	4	5	6
How did you experience the **atmosphere** of the interaction?	very tense					very open
	1	2	3	4	5	6
Did you experience **time pressure** throughout the interaction?	very high pressure					no pressure at all
	1	2	3	4	5	6
Did you experience this interaction as **helpful** for your work?	not helpful at all					very helpful
	1	2	3	4	5	6
Did you learn anything from this interaction?	learned nothing at all					learned a great deal
	1	**2**	**3**	**4**	**5**	**6**

In case of any other answer than "1" in the previous question, please **describe in your own words what you have learned!**

How would you categorize what you have learned? (Choose *one* answer)

- ☐ Learned something completely new.
- ☐ Learned new aspects / variants / cases of something already known.
- ☐ Learned to apply something, which was already known, more efficiently.

Fig. 17.3 Interaction diary (part 3 of 3; translated from German by the author)

database entry and subsequent retrieval. Furthermore, the participants were to rate the frequency during which they face these kinds of problems, the possible consequences of the problem at hand and its urgency. The second part focused on the detection of the problem. It asked for a free text description of how the participant became aware of the problem. After this, the participants were requested to indicate how they felt right after the detection of the problem by the help of the *circumplex item of emotional states* (see below). The third part focused on characteristics of the problem, especially the perceived complexity. For this purpose, we operationalised the characteristics of complex or ill-defined problems stated in the relevant literature (Dörner, 1997) and calculated a complexity index by adding the agreement on the single statements. Table 17.5 shows the respective items and the related characteristics, which were not visible in the diary. The answer options for all items were *Yes* [=2], *Partly* [=1] and *No* [=0].

The complexity index was calculated as the sum of agreement (maximum: 7*2 = 14) divided by 14, so that the resulting index varied between 0 and 1. The average complexity across all 64 problems was found to be moderate ($M = .30$; SD = .19), which is not surprising because typical problems recorded on a daily basis were not expected to be too complex (Rausch, Schley & Warwas, submitted).

Table 17.5 Items on the subjective complexity of a job-related problem

Item	Complexity characteristic
Initially, I did not know how the problem could be solved	Lacking knowledge of instruments (problem vs. task)
Initially, I did not know what exactly constitutes the problem	Lacking knowledge of causes
Initially, I did not know exactly the magnitude of the problem	Lacking knowledge of consequences
Initially, I did not know what a proper solution could look like	Lacking knowledge of desirable goal states (dialectic barrier)
There were several, partly conflicting goals to be attained	Polytely (multiple goals given)
Many variables were cross-linked with each other	Interdependence
The situation developed a dynamic of its own (it changes even without any intervention)	Dynamic of its own

Note: translated from German by the author

In the fourth section of the diary, we focused on the solution of the problem. First of all, we wanted to know how the participants rate the quality of the solution (from 1 = *very bad* to 6 = *very good*). Furthermore, we wanted to know who or what contributed to the solution. Building on a theoretical framework of sources of problem-solving action plans (Rausch, 2011, p. 98), we presented the following options, which were rated from 1 = *no help at all* to 6 = *very great help*: (a) support from others; (b) my previous experience with similar problems; (c) my intense deliberations, ponderings and reflections; (d) my own specific knowledge and skills in this domain; (e) my search through various sources of information; (f) my determined use of trial and error; and (g) good fortune. Support from others was by far the most important source of problem-solving, whereas trial and error plays a minor role. Further results can be found in Rausch et al. (submitted).

In the last section of the diary, the participants were requested to rate whether they have learned something from this problem, to describe what they learned in their own words and to categorise whether what they have learned was (a) something completely new, (b) new aspects/variants/cases of something already known or (c) apply something, which was already known, more efficiently (see last three items of the interaction diary presented in Figure 17.3).

Altogether, the problem diary offered interesting insights into daily problem-solving in office work (Rausch et al., submitted). However, it is assumed that a somewhat limited understanding of the term ‘problem’ reduced the response rate. When asked for reasons why no further problems were recorded, the participants stated that there were no more problems, which is surprising. In future research, workshops prior to the study should address this issue even more than already done so in our workshops. On the other hand, maybe there are actually no more problems to report on. Ultimately, the estimation of the actual quantity of daily problems and thus the calculation of a response rate appear especially difficult in this study because the definition of the term ‘problem’ is subjective in nature. This is not—or much less—the case with tasks or social interactions.

17.3.4 Interruption Diary

Our most recent diary study focused on interruptions in the workplace. The participants, skilled employees in the back-office of an industrial enterprise, were requested to record every interruption over a period of five workdays. The one-page form for recording an interruption consisted of only closed questions in order to make one entry as time-efficient as possible. The catalogue of items was developed on the basis of interviews and observations in preparation of the diary study. The items aimed at the person who caused the interruption (supervisor, colleague, oneself, etc.), the medium (telephone, email, face to face), the content (asking for information, providing information, informal meetings, etc.), emotional states during the interruption and a list of possible effects such as increased time pressure, additional work, changed priorities, etc. For gaining additional information on the response rate, at the end of each workday, the participants estimated how many (%) of the actual interruptions during that day they recorded in the diary. Again, like in the problem diary, the definition of the triggering event—an interruption—is a subjective construct. Self-interruptions, phone calls concerning inquired information and an informal meeting in the corridor, all these events might be perceived as an interruption by one participant or as a welcome change by another one. Again, the clarification of the triggering event is a crucial task for the workshops before the diary period.

17.3.5 The Circumplex Item of Emotional States

In all of our studies, the relation between situational characteristics and emotional states plays an important role. Thus, we developed a standardised tool to economically measure emotional states in situ. The complex item follows typical circumplex models of emotions in that several emotional states are arranged according to two axes—valence (positive vs. negative) and arousal (active vs. passive). In our studies, participants can choose between one and up to three out of eight emotional states and indicate the intensity of each emotional state on a scale from *a little* [=1] to *very* [=3]. In our graphical presentation, the outer bigger dots represent higher intensity [=3], and the smaller inner dots represent low intensity [=1], while each emotional state that is not chosen is automatically coded as zero [=0]. What appears difficult to explain in written form turns out to be easily explainable with the help of a few examples. The circumplex item was administered in studies 3, 4, 5 and 6. The participants never expressed any difficulties with handling it. Figure 17.4 shows the application in the interaction diary (study 4). There is also a Flash®-based Internet application for online diaries (see Rausch, 2012, p. 118). Again, all text is translated from German by the author.

In our diary studies, we use this item on emotional states as a fixed module. This allows for the comparison of emotional states across studies (benchmarking), which in turn leads to a more holistic understanding of emotions in the workplace.

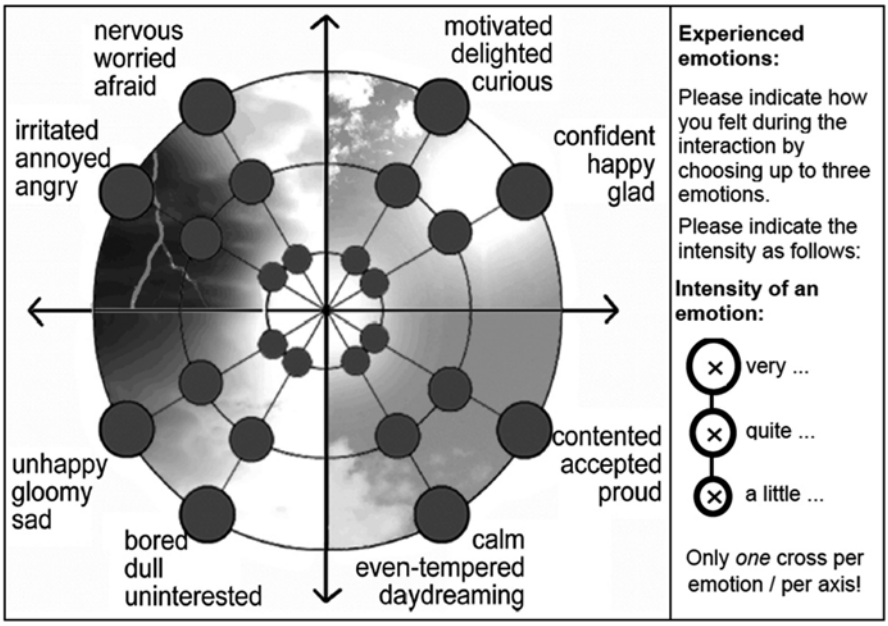

Fig. 17.4 Circumplex item of emotional states (taken from the interaction diary)

17.4 Conclusions and Future Perspectives for Using Diaries in Research on Working and Learning

This chapter started with a systematic overview of parameters and common options when designing diaries and then provided examples from our own research group. This last section contains some conclusions and future perspectives for using diaries in research on working and learning.

17.4.1 Customisation Versus Standardisation

When designing diaries, there is a conflicting relationship between customisation and standardisation. On the one hand, a diary should definitely respect the specific situation of the respective sample. For instance, when predefining task categories, as was the case in study 3, one should consider special tasks that are assigned regularly such as the 'apprentices' project' (see Table 17.3). Otherwise, participants will have problems when classifying those tasks; in the best case, they would assign them to 'other tasks', and a high percentage of this category will serve as feedback that the category system needs refinement. In the worst case, different participants would classify those tasks in different ways. This in turn impacts the objectivity, reliability

and thus validity of the category system. This supports the argument for customisation. On the other hand, a pronounced customisation constrains the possibility to compare and replicate the results of different diary studies.

Modularisation could offer a way out of this dilemma between customisation and standardisation. When designing a diary, the researcher should reuse existing bundles of items (modules) from previously used diaries, whenever they meet the requirements of the study. Regarding our own diaries, examples of such modules could be seen in the list of task categories (Table 17.3), the items on task characteristics (Table 17.4), the items on complexity (Table 17.5) and particularly the circumplex item on emotional states (Fig. 17.4). In contrast, our categorisation of what was learned (see bottom of Fig. 17.3) is not satisfying yet, because it always depends on the subjective 'grain size' of what is meant by 'task', as the following example shows. Imagine an apprentice who already has experiences in issuing invoices to customers on the basis of all necessary data. In one particular task, she/he has to calculate the costs of carriage on his/her own for the first time. If the calculation of the costs of carriage is considered a self-contained task, one would check mark 'Learned something completely new'. If the calculation of carriage was considered as a sub-step of issuing invoices or just as applied mathematics, it could be categorised as 'new aspect/new variant/new case of something already known'. Thus, it is likely that these categorisations are not very reliable because the participants may have different subjective conceptions. This in turn impairs the validity as well. We would be happy to adopt reasonable categorisations from other instruments. Such a modular design principle—developing an instrument by picking from a range of modules—would surely propel the diary method. Currently, if you want to measure some personality trait via self-report questionnaire, you usually do not have to develop a new questionnaire either, but instead choose one that already exists and is known to be reliable and valid.

17.4.2 Multi-method Designs and Methodological Issues

While focusing only on the diary instrument, diary studies usually incorporate further methods such as self-report questionnaires at one or more times of measurement. From our experience, such a multi-method design is strongly recommended. Thus, the situational influences can be complemented by individual influences, such as personality traits, performance scores, formal status/position, biographical data and the like. This allows for the simultaneous investigation of situational and individual influences, for instance, by means of multilevel analysis. Moreover, it is possible to measure similar or theoretically identical constructs, both in situ and retrospectively, in order to investigate methodological questions. As an example, one could ask for emotional experience several times a day within a classic ESM study. Every evening, the participants could be requested to evaluate their average emotional experience during the actual day, and, in addition, one could ask for an average emotional experience during the past week. Such research designs allow for

the evaluation of retrospective self-reports. Possibly conflicting results raise interesting methodological issues. In such cases, researchers usually argue for a higher reliability and validity on part of process measures such as the diary method.

17.4.3 Technological Developments and Ethical Issues

The development of the diary method has always been closely linked to technological developments, starting from electronically triggered paper-and-pencil diaries in the 1970s and 1980s of the past century to the use of smartphones currently. Thus, actual trends in technology might show the direction of future developments of the diary method. For instance, considering the laborious procedure of producing longer texts via touchscreen, recent applications in language recognition on smartphones point to promising alternatives. Still, the resulting data is textual and thus can be conventionally processed and analysed. However, combining recent technologies of ubiquitous computing, a much more detailed picture with even less intervention seems possible. A permanent audio and video recording of the environment (e.g. Google glass®) and a permanent recording of physiological data (e.g. pulse watch, cardiograph, polygraph) would offer very detailed insights without disturbing the natural process too much. Only the psychological experience would have to be explicitly inquired, in addition—for instance, by presenting the circumplex item of emotional states via a touchscreen wristwatch. As promising this future might look, there are two fundamental concerns. First, the ideal of a "God's eye view" (Johnson, 1990) can never be attained since biases and uncertainties regarding the interpretation of the collected data will also remain. Second, and to my mind much more importantly, the research design outlined above raises ethical issues. As ubiquitous computing becomes the standard, a participant might not even recognise that she/he is under observation. Apart from the expression of her/his psychological experience, all the other data is recorded anyway. Moreover, conclusions on the psychological experience might be drawn from voluntary statements in social networks (e.g. Facebook). Regarding today's evident impossibility of data privacy, those ethical issues are not to be underestimated. An important task in diary studies—today and in the future—is informing participants which data is processed and for what purpose. Doing so also reduces reactivity and reactance.

In the course of this chapter, I have tried to give an overview of several options when using diaries as research instruments by means of examples from diary studies on working and learning in our research group. I also discussed some future perspectives for using diaries and related methods in research. In conclusion, I am convinced that there are manifold benefits when collecting data near the process (in situ) and I hope this contribution helps and encourages other researchers to use diaries in their research as well.

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Part IV
Conclusion

Chapter 18
Interdependence on the Boundaries Between Working and Learning

Stephen Billett

Abstract This chapter discusses how many of the contributions to this edited volume infer, emphasise or directly state that interdependencies between societal and personal factors shape how individuals work and learn, but also of the relations between working and learning. Hence, when taken as a central explanatory concept, interdependencies seem ubiquitous to much of the discussion, theorisations and accounts of work and learning and the boundaries between them found within this volume. For this reason, it is necessary to elaborate what constitutes interdependencies and the ways in which they constitute a comprehensive explanatory account of processes of working and learning. This elaboration is achieved through defining and delineating the central role of interdependencies in both work and learning, and the relations between them, followed by a set of three premises upon which such an explanation is founded. Then, an elaboration is advanced of these interdependencies in terms of the suggestion and projection of the social world and also the personal process of construing and constructing what is experienced and in responding to it in personally agentic ways. Central to this interdependence is the active and engaged participation by individuals in both work and learning. This intentional and often agentic participation stands as a key mechanism that both creates and of that interdependence. Throughout, and in making this case, the contributions to this volume are drawn upon and discussed in terms of how interdependencies are central to their accounts of the relations between working and learning.

S. Billett (✉)
Professor of Adult and Vocational Education, School of Education and Professional Studies, Griffith University, Brisbane, Australia
e-mail: s.billett@griffith.edu.au

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18.1 Interdependence, Work and Learning

In this chapter, a consideration of interdependencies, largely between personal and social contributions, is advanced as a salient principle for understanding the personal and social contributions to work and learning and the relations between them. As an explanatory concept, interdependence captures much of what is proposed in the contributions within this edited volume about the boundaries between learning and working. Indeed, this extends from individuals' construction of both working and learning, through to their negotiation of those boundaries and how they are portrayed through conceptual accounts and captured empirically in chapters within this book. Indeed, for many chapters, considerations of both personal (i.e. individual) and social (i.e. situational, cultural, historical) contributions are central to what is proposed, conceptualised or concluded (i.e. Baumgartner and Seifried [2014]; Billett [2014]; Filliettaz [2014]; Forsman, Collin and Eteläpelto [2014]; Gerholz and Brahm [2014]; Goller and Billett [2014]; Goller and Harteis [2014]). These considerations include the descriptions of what constitutes occupations, the manifestation and enactment of work in specific circumstances of its practice (Schley & Van Woerkom, 2014) and the learning that arises from it. Interdependencies, for instance, are central to accounts of tolerance of errors in a particular workplace, on the one hand, and individuals' (i.e. workers, supervisors, managers, etc.) ability and/or willingness to engage with and learn from errors (Baumgartner & Seifried, 2014). Similarly, relational interdependences associated with engineering students' experiences in higher education (Gijbels et al., 2014), junior medical doctors' participation in medical work (Cleland, Leaman, & Billett, 2014) and workers' engagement in continuing education and training (Tyler, Choy, Smith, & Dymock, 2014) all offer instances of these interdependencies. Reconciliations between the different interests and motivations of managers and workers in sustaining both workplace performance and workers' employability were evident in the accounts reported in these chapters. Strong bases for interdependence are exercised between the needs of the workplace, as expressed by managers, to respond to emerging challenges and sustaining its functions effectively, and the needs and interests of those who work in them, and how workers report sustaining their employability is manifested personally. Moreover, Goller and Harteis (2014) describe how these relations extend into boundaries between the works of doctoral students as relations amongst supervisors' perceptions and expectations; the nature and exercise of personal agency by candidates are themselves shaped by interdependencies between personal (i.e. students' needs and aspirations) and contextual factors (i.e. institutional norms and practices) that were also central to the chapter. They identify how these interdependencies play out relationally for candidates depending upon how both institutional facts associated with university, supervisor and discipline expectations play out on the one hand, and the interest, capacities and direction of the candidates on the other.

In these ways, this review chapter proposes that all these instances can be conceptualised as the negotiated and, therefore, relational interdependencies between the social and personal factors that shape the co-occurrence of working and learning.

That is, learning is inherent to the process and outcomes of individuals' engagement in working and that how workers, students and managers interact with the social experience they encounter in their workplaces and educational programmes and what they bring to that encounter together shape that working and learning. Consequently, it is proposed that central to the interdependencies that constitute both work and learning is how workers construe and construct what they experience in workplace activities and interactions. These construals and constructions are shaped by their previous or pre-mediate interactions with the social and brute (i.e. natural and physical) world, beyond the skin, whose legacies are applied to what is experienced subsequently. Overtime, these pre-mediate social experiences become embodied variously as personal experiences (Valsiner, 2000), cognitive and sensory representations in memory (Barsalou, 2009) and even possibly neural legacies (Damasio, 2010) as well as particular kinds of procedural capacities individual develop (Sun, Merrill, & Peterson, 2001) that are all the product of personal experiencing. It is this personal sociohistorical conception of what individuals know and can do that negotiates the immediate social world as they engage in work and study which thereby furthers their learning and processes of becoming a worker. Similarly, the immediate social experiences of work and working (i.e. its activities and interactions) are founded on a wealth of practices derived from their historic and cultural origins albeit manifested in the particular circumstances of working individuals encounter in and through their work. It is the interdependencies between these sets of factors elaborated here as a means to understand the important relations between working and learning.

In making its case, firstly, the conception of interdependence is outlined and illustrated. Then, the conceptual premises for how work and learning are accounted for in this way are set out and illustrated using examples from contributions to this monograph. Following this, an account of the relations between work and learning as interdependence is advanced, again drawing upon contributions to this book.

18.2 Interdependence Between the Personal and Social

As a starting point, it is helpful to understand what constitutes interdependence and its explanatory power for elaborating the co-occurrence of both work and learning. In short, interdependencies constitute dependent relationships between sets of factors. In this case, both the processes of work and of learning are shaped by a dependent relationship between personal and social factors. To initially develop and maintain their occupational competence across their working lives, individuals need to engage in a process of actively and continually constructing, refining and transforming their domains of the occupational knowledge required for their work and working lives. This process requires them to access the occupational knowledge that has arisen across history and culture and is manifested in particular work situations. They could not secure and appropriate this knowledge if it did not exist within and is made accessible to them through the suggestions of the social world. So individuals

are dependent upon having access to and securing that knowledge. On the other hand, without individuals accessing, learning and transforming that knowledge, historically and culturally derived practices would become moribund, and their value would exhaust. In consideration of the relations between learning and work, there are two outcomes or legacies from the interdependence between these sets of personal and social factors: (1) individual change (i.e. learning) and (2) the remaking of the culturally derived work practices that individuals engage in and potentially their transformation (Billett, 2006). So this interdependence is central to both individual and societal continuity and development. Yet these processes require contributions from both the social, on the one hand, and persons, on the other.[1] These changes (i.e. individual and societal) are interdependent because alone neither the suggestions from the social world, including its norms, forms and practices, nor the personal contributions of individuals regardless of their agency and intentionality are sufficient for initially learning the requirements of occupations and then refining and developing them further throughout working life, there alone the ongoing everyday process of remaking and transforming the occupation, as it is practised and how that is manifested in particular workplace settings (Billett, Smith, & Barker, 2005). For instance, in this volume, Gijbels et al. (2014) identify the personal legacies of these kinds of experiences in terms of individuals' capacities and differences and how these shape students' responses to what is experienced in engineering programmes. Moreover, they propose that these differences are not just associated with perceptions of self-competence, but are foundationally grounded (i.e. within the social world). So interdependencies between social and personal factors are necessary for individuals' learning and societal continuity.

These interdependencies are those that are variously established, negated, overcome and transgressed in the negotiating the relations between learning and work. Indeed, much of these two forms of changes (i.e. learning and remaking culture) are enacted through different kinds and forms of interdependencies that comprise the contributions and agency of the social world (e.g. workplaces, and educational institutions, more experienced workers, teachers) and the capacities, ways of knowing and intentionality of individual learners. For instance, in their chapter, Baumgartner and Seifried (2014) refer to the duality comprising the contextual influences that constitute the error climate in particular work settings, on the one hand, and individual workers' reaction to error making, on the other. However, although the interdependencies between the person and the social are central to explaining the relations and co-occurrences of learning and work, including those between more or less experienced workers, there are other kinds of interdependencies that are central to the provision of professional and vocational learning and education. These include interdependencies

[1] It is also possible to suggest that brute facts (i.e. those of nature) should be included as a third set of factors. These are both personal and societal. Human maturation contributes to the way in which individuals construe and construct knowledge (i.e. physical strength, sensory processes, etc.). Many occupational practices are societal responses to the brute world (e.g. the need for shelter, sustenance, care when sick, etc). However, for the purposes of this chapter, these are located within the sets of personal and societal factors outlined here.

amongst key social institutions, such as workplaces and educational institutions, and amongst such institutions. For instance, in their contribution, Gerholz and Brahm (2014) refer to independencies between workplaces and schools in providing the range and kinds of experiences that constitute the key strengths of the dual system of apprenticeship. Moreover, these relationships sit within a societal sentiment in Germany that transcends both educational institutions and workplaces based on a valuing of work and its learning: the Beruf concept (Deissinger, 2000). Within this societal sentiment is an acknowledgement of the importance of skills, their learning through experiences in both educational and workplace settings. Hence, unlike many other countries, a societal sentiment underpins the efforts made within the German workplaces to support the dual system by providing rich learning experiences for the development of skills which have been and remain central to national economic and social well-being (Sennett, 2008). There is a realisation of the importance of the interdependence between the contributions to skilfulness arising from apprentices having experiences in both settings, which extends to apprentices taking a low wage which is reciprocated by thorough training (Deissinger, 1994, 2002).

In addition, and as noted, many of the contributions to this monograph identify, elaborate and discuss the extent and kinds of interdependencies that transcend the boundaries between learning and work. As noted, for some chapters, this issue of interdependence is central to their conceptual accounts for understanding the relations between work and learning. This interdependence is also evident in how researchers go about gathering and analysing their data. For instance, Kyndt and Onghena (2014) identify the complexity of understanding the relations and boundaries between work and learning and the selection of particular quantitative methodologies advanced as a means of understanding the contributions of and relations amongst these factors. From a qualitative perspective, Filliettaz (2014) advances methodological concepts and also offers procedures for analysing these interdependencies as people engage in work and learn, albeit mediated by both their own conceptions and the suggestions of more experienced workers. His analysis is guided by the concept of interactional participatory configurations, which he uses to analyse the nature, extent and consequences of interactions in workplaces. Then, as Rausch (2014) notes, the circumstances of gathering data are not just dependent upon informants, but relational factors which include the weather, time of day and how they come to engage with an artefact such as a diary, which includes the range of writing competence possessed by the informants, their interests in providing data and the premises through which they provide the data. Indeed, most if not all of the contributions included here refer to concepts that are analogous to interdependencies when seeking to ground the conceptualisations or findings about the boundaries between work and learning. As such, it offers a broadly applicable explanatory account that can be used to understand, illustrate and elaborate the relations that create and enact boundaries between learning and working. However, before progressing to set out more fully this case, it is also necessary to initially set out some premises by which this discussion advances.

18.3 Premises Underpinning Interdependencies at Work and in Learning

The account of the role of interdependencies between social and personal factors advanced in this chapter is founded upon a set of premises that require to be stated upfront. These are threefold: (1) learning is ongoing and inevitable, (2) work and learning co-occur and (3) remaking occupational practices also co-occurs through work and learning.

Firstly, learning – or change in individuals' ways of knowing and doing things – is ongoing and inevitable as they experience, consider, act and monitor their reactions. Hence, rather than the process of learning being reified as some hybrid process and with particular outcomes, and is privileged in particular ways, it is held to be common and foundational process and outcome of human cognition (i.e. thinking and acting). As humans engage in the process of experiencing what they encounter in everyday life, whether the results of the suggestion of the social or brute world beyond them or some internally driven perturbation they wish to resolve, changes arise in what we know, how we know and subsequent respond to what we experience. Through those actions, we construe what we experience and will be, by degree, driven to construct responses to what has been experienced. Much of the responses in everyday life are confirming, reinforcing, honing and otherwise assimilating what we experience with what we know. However, when we experience something perceived to be novel or unfamiliar, new forms of learning or accommodations to what we know are generated. These processes of experiencing and responding lead to changes, in what we know or can do, which are referred to as learning. Although commonly acknowledged, this process is variously labelled, being described as overcoming disequilibrium (Piaget, 1971), typification (Schutz, 1970), securing viability (Van Lehn, 1989; von Glasersfeld, 1987) or achieving ontological security (Giddens, 1991), to name a few, and from diverse disciplines (i.e. respectively, genetic epistemology, phenomenological sociology, cognitive constructivism and sociology). When engaging in their everyday lives, and undertaking tasks and performing roles that are well known to them and in circumstances with which they are familiar, this learning is most likely to be of the former type. That is, confirming, reinforcing and honing what we already know. Yet, in everyday life, new tasks, roles and information become available even when the overall circumstances do not change. Dynamic social roles, availability of new knowledge and changes brought around by environment, social institutions and those locally bring about new experiences which are generative of new learning.

Yet what we experience, as suggested by the social and brute world, is projected with greater or lesser degree of suggestibility. As Berger and Luckman (1967) note, the social world is unable to project its suggestion with uniformity or any confidence in its potency. The suggestion of the social world requires recipients to comprehend its norms, forms and practices. If individuals do not understand the language, the discourse or the forms that comprise a suggestion, there can be no guarantee that what is being projected will be even perceived, there alone

construed and constructed in ways that would constitute the appropriation of what is being transmitted. Even the brute force of nature can, in some circumstances, be mediated by the means of its engagement. For the cyclist battling the wind, the brute fact of nature is far stronger than for the person watching the cyclist from the house and behind windows. So, with few exceptions, there can be no certainty that what is being projected by the social and brute worlds will be unequivocally experienced and the suggestion transmitted in ways which cannot be deflected brushed aside to some degree. The exception from the social world is when the suggestion is accompanied by forceful intrusion (i.e. the gun in the face, the knife in the back), but even then what is suggested is unlikely to be successful except in controlling the will of others whilst that force is in place. Indeed, we are reminded that, in his later writings, Foucault (1986) questions the power of surveillance, suggesting that it could not control desire. Yet even the most willing participant may simply misunderstand or misinterpret the suggestion from the social world and be unable to take up that suggestion. The exception from the brute world is maturation. Yes, all humans mature and their physical, cognitive and neural capacities change over time in ways that are inevitable. Yet, whilst not being able to be wished away (Searle, 1995), that very process of maturation is subject to individuals' physiological and psychological responses.

In this way, both the suggestions of the social and brute worlds are mediated by what individuals already know, ways of knowing, capacities and dispositions. Valsiner (1998) reminds us, given the amount of social suggestion to which we are constantly subjected, that we have to manage our engagement with that suggestion. He notes how we continually have to rebuff, reject or otherwise ignore the social suggestions to which we are subjected. Indeed, we engage in acts such as averting gaze (Glenberg, Schroeder, & Robertson, 1998), to avoid being overwhelmed by the experiences being projected by the social world. Indeed, how and what we engage with and equally rebuff or ignore is not given in the nature of things it is based upon personal preferences, interests and imperatives, as Gerholz and Brahm (2014) show. What for one individual is a compelling experience, for another it is banal and unworthy of their attention. The same kind of engagement also underpins what a number of the contributions referred to as reflection (Schley & Van Woerkom, 2014). Most likely, what is referred to by these authors comprises processes of introspection that necessarily arise from and are engaged with on the basis of individuals' prior experience and their mediations of what they subsequently experience. However, the degree of engagement in introspection, effortful, is mediated by individuals' interest and the opportunities for them to engage in that process either in more less productive means. So, whilst the term reflection is used widely, its actual engagement by individuals is likely to be personal and situationally dependent.

The second key premise is that learning and working co-occur. It follows from the premises above about individuals' participation in work activities and interactions which requires them to identify, categorise and respond to those goals and select particular means of achieving them, which may be variously familiar or novel; concurrently, they are engaging in processes that change what they know and can do (i.e. learning). The degree by which that learning is about confirming,

refining, reinforcing and proceduralising what they already know is dependent upon the relations between individuals' capacities, interests, intentions, energy and dispositions, on the one hand, and what the world suggests to them about the particular task, on the other. So these dualities are both person dependent and locally situated and exercised. For instance, here, Gerholz and Brahm (2014) note how learning experiences are premised upon what individuals already know and can do and that of the processes and outcomes are different between when workers are faced with something new and when engaging with tasks with which they are familiar. These authors referred to the former as generating adaptive learning, and the latter supporting routinisation. Hence, what constitutes the 'same' experience might constitute something quite distinct for individuals depending on the processes they elect to use in construing and constructing that experience. Hence, rather than particular experience being taken as 'given', its meaning, learning potential and legacies will always be shaped by the person construing and constructing from them. For instance, Rausch (2014) notes how the use of diaries is shaped by both the socially derived artefact comprising the diary and how individuals elect to engage with them, which are both relational and interdependent. Interaction between the person and the diary is absolutely central to the analysis of the efficacy of these diaries in Rausch's chapter. In the same way, e-portfolios comprise a social artefact and student engagement with them (Daunert & Price, 2014) as a process of collaborative (i.e. interdependent) approach to learning.

The relational nature of particular valuing learning processes and work-related goals for learning is evident in the discussion about preferred forms of continuing education and training in Tyler, Choy, Smith and Dymock's (2014) contribution to this volume. These authors note how the particular valuing of these provisions for ongoing learning was premised upon very distinct bases. For instance, workplace managers often viewed training programmes as ordered and organise means of securing forms of learning that met the enterprises' goals. However, typically, workers' preferences were based on different premises, usually associated with maintaining their employability and seeking workplace advancement. Their preference for the most effective means of securing these goals was largely through work-based experiences, often with the support of more experienced co-workers or supervisors. So, whilst both groups identified the need for particular kinds of experiences to assist in sustaining their employability and recognised the importance of the applicability of what is learnt for immediate workplace purposes, the preferred goals for and means of supporting this learning were quite distinct.

Similarly, in this volume, Gerholz and Brahm (2014) refer to the object of reflection as being something which both exists and is perceived on the bases of personal engagements. At the same time, without those experiences, in their various combinations of familiar and novel, the processes of learning would be more truncated. These processes represent sets of interdependencies between the person and the physical and social world in which they engage, which are inevitably relational that emphasise the co-occurrence of learning and work. For instance, the degree by which hairdressers were found to be able to go beyond providing the kinds of cuts provided in a salon was dependent upon their roles in that salon and thereby extends what they know and can do, should they wish to engage in procedures that are new to them. Indeed, in this

volume, Filliettaz (2014) notes not only are the everyday processes of apprenticeship person interdependent in this way, but that the relationships between apprentices and more experienced workers are relationally interdependent and also dynamic. That is, the particular qualities of working together are constructed between these individuals and how they progress and develop are person- and situationally interdependent. Indeed, this progression and changing set of relations seems central to the apprenticeship process of learning, which includes negotiating rules and changing forms of interdependence. He writes, 'At each step, the relation between mentors and apprentices is expected to take a different shape and display specific properties' (Filliettaz, 2014, p.) So an important and qualifying point here is that whilst learning co-occurs with working, the qualities and characteristics of what is being learnt and its alignment with the kinds of knowledge needed to be learnt for particular occupational purposes, situational requirements or individuals' career trajectories are not assured through such processes. Consequently, whilst learning occurs continuously, there is the need for both individual intentionality and support and guidance of different kinds to be afforded for this ongoing learning to meet those kinds of goals. Most likely, without both individual intentionality and particular experiences, the kinds of learning design through workplace experiences will not be realised.

The third premise is the co-occurrence between learning and the remaking and transformation of culture. In addition to the co-occurrence between working and learning, the remaking and transformation of cultural practices also occur continuously, as individuals engage with their work. That is, as humans engage in their socially generated activities and roles (e.g. occupational tasks), these are constantly being remade in particular circumstances, at particular points in time and when addressing a specific set of issues which they encounter in particular situations they are remaking that occupational practice. So the continuity of cultural practices such as occupations and their variations across different kinds of work settings are actively remade as individuals go about their work (and learning). Moreover, whilst much of this remaking is a process of reproducing, albeit adapting to particular circumstances, occupational practices, there is also an element of that remaking which is transformational, particularly when new tasks, roles, technologies or problems arise, for which accommodations of those practices are required. Again, as with novel learning, when addressing issues that confront the existing occupational practice and demand significant change, some transformations are required. Wertsch (1998) refers to how the advent of fibreglass poles into the sport of pole vaulting transformed the way that these athletes not only used the pole but also the entire technique of pole vaulting. Similarly, in work activities, as individuals engage in enacting their occupations, they are constantly remaking and sustaining it, and when confronting changes, they are adapting it to emerging requirements as part of that remaking. For instance, in the Tyler, Choy, Smith and Dymock (2014) study, workplace managers are reported as increasing having to make decisions about the further development of their staff, thereby extending the scope and requirements of their roles. Certainly, as new means of working or achieving goals are identified, they transform the practice in particular circumstances and work situations (Billett et al., 2005). Yet much of this transformation occurs incrementally as workers in all occupations adapt what they do to changing circumstances, procedures and goals.

Each of these three premises emphasises interdependencies between what exists in the world 'beyond the skin' (i.e. brute and institutional fact), projected as experiences, and how those experiences are responded to (i.e. construed and constructed) by individuals. For something to be experienced and respond to comprise a duality that is interdependent. As noted above, without individuals remaking and transforming cultural practices, such as the occupation they practice, they would be unable to serve changing human needs. Yet, without the social norms forms and practices and their suggestions, people would not be able to advance individually or collectively. So, beyond the most brutal or pervasive of suggestions that individuals cannot ignore, much of what is experienced can be engaged with relationally by individuals. Yet, without those suggestions and their projections, individuals would be severely limited in their efforts to advance their individual and collective goals. Consequently, although much is made in contemporary literature and policy about developing independent thinking, learning and learners, perhaps more important and descriptive of what occurs when individuals engage in both work and learning are interdependent thinking, learning and learners. Indeed, it seems that whether referring to individuals' learning, that learning for occupational practice, which arises from the social world, or the remaking and transformation of those occupations, these arise through interdependence. Moreover, there are also interdependencies between social institutions such as workplaces and educational institutions and also different kinds of educational institutions which stand as being central to the development of learning for and through work, as is evident in the contributions to this monograph. For instance, the dual system approach to apprenticeship referred to by Gerholz and Brahm (2014), and above, is founded on relations between unions and employers, and also between legislated arrangements and workplace practices. These relations range from consensus to regulation.

18.4 Active and Intentional Engagement at the Boundary Between Learning and Working

Given that both processes of work and learning are held to co-occur and arise interdependently, a consideration of the relations between these concepts necessarily requires an explanation and illustration that considers and explores these interdependencies. Indeed, the contributions within this edited monograph provide a range of instances that both illustrate and elaborate these interdependencies and in doing so offer accounts of different kinds of interdependencies, some of which are between individuals and social partners, amongst individuals and social practices and then also across social or institutional practices, some of which have already been introduced.

The focus and direction of individuals' agency (i.e. their intentional actions) play key roles in the active and constructive processes of learning and remaking cultural practices. Bases of this intentionality are likely found in individuals' subjectivities and capacities that arise from their socially derived life histories or ontogeneses (Billett, Smith & Barker, 2005). Yet its exercise occurs within interdependencies within the

sets of social factors outlined above. Workers need to engage in the socioculturally derived and supported practices that make up the workplace to secure the knowledge required for work, yet do so relationally and in ways that are person dependent (Gijbels et al., 2014). Other contributions to this volume also emphasise the key role of individual intentionality or agency in negotiating the boundaries within learning and working (Baumgartner & Seifried, 2014; Cleland, Leaman & Billett, 2014; Forsman, Collin & Eteläpelto, 2014; Goller & Billett, 2014). These accounts typically propose that this intentionality and agency stand as bases that drive workers' learning and participation processes. These same kinds of agency relations are observed in the process of research higher degree students' candidature (Goller & Harteis, 2014). They found that doctoral students exercised considerable agency, not only in the conduct of their studies but also in the way they began to construct nascent academic careers.

However, the social practices that constitute their workplace also require personal agency to enact and advance the purposes and goals of the workplace, including transforming its practices to respond to emerging challenges. Workers' needs and practices of ongoing learning are interdependent with the goals and practices of the workplace. Indeed, these two sets of contributions to individual (i.e. worker) and cultural (i.e. workplace) development (i.e. learning and change) are inherently relational. Individual's potentially unique interpretations and enactments of what they experience in their work reveal limits to social agency. That is, the capacity of the social world to secure its suggestion is neither comprehensive, unambiguously nor completely when and because it is reliant upon individual interpretation (Valsiner, 2000). Yet individuals' personal agency is bounded by the extent of discretion that the enactment their work affords them. That is, individuals' freedom and capacity to secure to exercise their agency within the inevitable constraints of their work and workplace. Forsman, Collin and Eteläpelto (2014) draw upon Archer in this volume to propose that the relational bases for interpretation are found very much within individuals' internal conversation, which alludes to intra-psychological processes (i.e. those intra-mental processes within individual) in action. So, for instance in their chapter, Baumgartner and Seifried (2014), conceptualisation accommodates both the particular contextual influences and individuals' reactions to error making. The relational character of their conceptualisation is evident in their need to identify predictions of how individuals come to engage with errors and use this engagement and workplace reactions to errors as bases for understanding what they are learning, and the kinds of learning that arises from such errors. Indeed, these authors identify the foundations of these relational responses, through attempting to capture both socio-demographic and organisational characteristics: error climate and individuals' self-concept. What they propose here is that the process of learning through errors cannot be fully understood without accounting for both sets of factors and the relations between them, that is, the relations between error climate and how individuals deal with errors.

However, the complexities of individual's contributions to and mediations of the nature and exercise of personal and social agency at work make them more than one half of a duality. The relational character of individual's capacities to influence the interdependence that substantiates this duality warrants deeper consideration.

This is because it is only through their participation in and learning through work that the cultural transformations that comprise changes to work practices can be enacted, hence the need to go beyond accounts of learning that privilege situational contributions. Instead, a more comprehensive and convincing account of learning throughout working life (e.g. professional development) needs to include and reaffirm individuals' mediating roles (Billett, 2014). This mediating role is often absent or underrepresented in contemporary conceptions such as activity systems (Engestrom, 1993), communities of practice (Wenger, 1998) and distributed cognition (Salomon, 1997). Acknowledging the utility of the sociohistorical genesis of knowledge (e.g. Cole [1998]), its particular manifestation in instances of work practice and the situated character of competence (Billett, 2001) are all important. Indeed, Palonen and Hakkaraien (2014) propose that networking expertise is inherently relational. They do so making reference to the concept of relational expertise as advanced by Hakkarainen et al. (2004). However, the current emphasis on the mediating qualities of situated social experience offers and incomplete and insufficient explanation. This emphasis misunderstands and underrepresents how society's contributions to learning and human development are enacted. Further, accounts privileging the mediation of the situational also ignore how brute facts (e.g. desire, age, disability, perceptual ability) make up part of their cognitive experience and shape workers' construal of and engagement with what is experienced.

Through including their contributions and mediations, the 'subject' that is often missing or de-emphasised in contemporary theoretical accounts, particularly those emphasising social contributions, is reinserted and given its important standing. Moreover, in proposing the agency and uniqueness of the individual worker, a fundamental question for the social sciences is engaged – what brings about change: society or individuals? Here, personal and social changes are held to be realised through negotiations between both individual and social agency, in particular situations and moments in history, and as shaped by personal histories, as well as being mediated by them. In all, considerations of self and personal agency are brought to centre stage to propose a more comprehensive account of the sociogeneses of knowledge, learning and the remaking of work. The learning required to maintain competence throughout working life – professional development – is advanced as being best understood through the relational interdependence between the personal and social.

One way to exercise and illuminate these ideas is to consider how individuals think about and participate in paid work as is discussed in this volume. Examples, such as that provided by Forsman, Collin and Eteläpelto (2014), indicate the different ways in which this interdependence is played out when working with others and towards tasks whose goal is not fixed or unambiguous. What they propose is that rather than just the pushiness or assertiveness, which individual agency might be taken to comprise, it is used in other ways which are both strategic and situationally appropriate. Elsewhere, in research that sought to understand learning in workplace settings, individuals were identified as engaging in a highly committed manner in work that many would view as being low status or low paid (e.g. coal production workers, process workers, call centre workers) (Billett, 2002). These workers often reported, through interviews, dissatisfaction with their workplace (e.g. conditions

and the actions of other workers and employers). Yet they also claimed in those interviews and demonstrated, through observation, high levels of commitment to and an interest in their work. The sense is of workers who take their work seriously, aim to do a good job and who want to be accepted by their peers as good performers. That is, they engage in this work in ways that exercise their agency, yet are directed to their subjectivities (e.g. approval of peers) and identity (e.g. seen as being a good team worker). So how should we think about these individuals? Are they cultural dopes, who have been duped into self-exploitation and false consciousness as structural accounts suggest? Or are these individuals intentionally exercising agency consistent with their identities and subjectivities? If the former view is taken, it suggests that we should value individuals' vocational practice and engagement in terms of its extrinsic worth (e.g. its status, standing, purposes). That is, some forms of work are highly paid, have high status and are viewed as worthy of individuals' engagement and the exercise of their interest, passion, desire and agency, and some are not, through processes which are often referred to as being self-motivated (Gerholz & Brahm, 2014). Certainly, as with the effortful and engaged personal processes of thinking and acting that authors refer to as reflection, these processes are inevitably shaped by individuals' personal construals and constructions (Schley & Van Woerkom, 2014). These same kinds of relations are seen in the process of research higher degree candidature as described by Goller and Harteis (2014).

However, not all forms of work are taken to be worthwhile. The sociologist Wright Mills (1973) claims that 'For most employees, work has a generally unpleasant quality. If there is little Calvinist compulsion to work among property-less factory workers or clerks, there is also little Renaissance exuberance in the work of the insurance clerk, freight handler, or department store saleslady' (1973, p. 3). This view is consistent with what contemporary accounts propose about service work (e.g. Rifkin [1995]), such as the work of call centre workers. However, such accounts are sometimes generated without seeking the perspectives of those to whom they pertain (e.g. workers) or by those who do not fully understanding what they do (e.g. those who do not practice). For instance, call centre work can be complex, varied and subject to skilfulness and the operators working in a collaborative and agentic way, and do so with personal pride and the kinds of capacities which are attributed to the professions (Billett, 2002). That is, this work can have many qualities that elsewhere enjoy higher pay and status (i.e. worthwhile work). Moreover, other workers report finding significant value in work which others would dismiss as being low status and unworthy of their serious attention (Billett, Smith, & Barker, 2005; Somerville, 2003). Therefore, valuing work solely by its socially suggested value seems precarious, and one-sided. Salary levels and status certainly do not assure social or personal worth. From a values perspective, for instance, it might be claimed that auditors' work is non-emancipatory and, therefore, not worthy of higher education or a societally esteemed view. This view suggests that individuals' work should be valued on an objectified measure of social standing or worth. However, to somebody from a low socio-economic background or somebody who achieved poorly at school, becoming an auditor might be personally or socially emancipatory. Although doctors, lawyers and accountants are seen as having desirable occupations and having potentially positive social purposes

(like call centre workers), they are not immune to bad practice and the exercise of self-interest. Similarly, although a high degree of discretion being permitted to workers is often held as being desirable, it too can be a perilous measure. A trade union official, although granted high levels of discretion in her work, and which was closely aligned to her personal goals and values, was being exploited by the breadth and discretion her work practice (Billett, Barker & Hernon-Tinning, 2004). Even though her work was of social worth, being directed towards social justice, and she enjoyed significant discretion in the scope of the work, this work made almost intolerable demands upon her.

To propose that conceptions of worthwhile work are confined to that which is highly paid, and of assumed social benefit, likely renders the majority of workers as engaging in worthless pursuits, as Wright Mills (1973) suggests. However, across different kinds of work, individuals want to be seen as performing effectively, often gaining a sense of identity and sense of self through their work and its relationship to their lives in the community outside the workplace (Pusey, 2003). That is, their sense of self or subjectivity is tightly linked to how they think about and engage in their work. In one study, a group of males were facing redundancy. Given the shortage of work in the region that attracted that level of pay and carried similar masculine qualities, the threat to these workers was more than loss of income. It included threats to their sense of self – their standing as males in the community (Billett, 2002). In another study, whilst claiming that their work was only a means to an end, workers elaborated in great detail upon just how their work was central to their identity, sense of self and standing in the community (Billett & Pavlova, 2005).

Therefore, it seems no more problematic to value work for its worth in terms of individuals' identity and subjectivities than for its worth in terms of more socially objectified and commodified purposes, such as societal standing and level of remuneration. Such a claim is consistent with that advanced by Dewey (1916), who proposed vocations as being directions in life, a personal journey linked to individuals' goals and interests. He proposed that all kinds of human activity should be seen as being potentially valid vocations, from the practice of professionals, to the trades, to the act of parenting. The validity resides in what these activities mean to, and how they suit, individuals engaged in them: how they suit individuals' senses of self and identity. For Dewey, the opposite of vocation is not leisure, but activity that is aimless and capricious and involves dependence on others rather than cumulative achievement for the individual (Quicke, 1999). To engage in paid pursuits that individuals are not suited to or interested in is to waste individuals' potential and is akin to slavery, he argues. Yet advancing individual agency as a means through which individuals can be fulfilled is not to absolve social problems such as inequity, nor is it about creating a false sense of equity, democracy and fulfilment and denying alienation (Ratner, 2000). It is about humanising social relations and social structures and locating a legitimate and appropriate role for individuals in directing their cognition, learning and the remaking of culture. So it is proposed here that human agency and intentionality are salient for enacting the interdependencies that remake work and advance learning.

18.5 Interdependencies in Sum

In sum, interdependencies seem central to much of what has been directly referred to in this volume and, by inference, more broadly to considerations of the relations between learning and work. Moreover, there are a range of forms of interdependencies including those between (1) individuals and the social world in which they engage, (2) more experienced and novice workers, (3) work and workers, (4) across different kinds of educational institutions and (5) educational institutions and workplaces. They are also central to how many of the contributions to this edited volume on the boundary between learning and work infer, emphasise or directly explain how the contributions of and relations between societal and personal factors shape individuals working and learning. Hence, when taken as a central explanatory concept, interdependencies seem ubiquitous to much of the discussion, theorisations and accounts of work and learning and the boundaries between them found within this volume. Therefore, it has been necessary to elaborate what constitutes interdependencies and the ways in which they constitute a comprehensive explanatory account of processes of working and learning. This has been advanced through defining and delineating their central role in both work and learning, and the three premises upon which such an explanation is founded. Then, a consideration of these interdependencies in terms of the suggestion and projection of the social world and also the personal process of construing and constructing what is experienced in responding to it in personally agentic ways has been advanced. Central here is the active and engaged participation by individuals in both work and learning, as a key mechanism of that interdependence.

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