Chapter 36
Self-Regulation and Competence in Formal and Informal Contexts of Vocational and Professional Education

Petri Nokelainen, Heidi Kaisvuo, and Laura Pylväs

36.1 Introduction

According to Hager (2011), theories of workplace learning have evolved over last two decades from individual to multiple types of learning in both formal and informal contexts. The first set of theories focused on individual's capacities on cognitive aspects of work performance (e.g. Argyris and Schön 1974; Marsick and Watkins 1990). Hager (2011, pp. 20–23) identifies three issues defining these theories: (1) the individual as the unit of analysis for understanding learning, (2) learning as a product or 'thing' (relating to acquisition and transfer metaphors) and (3) learning as independent of context. The second set of theories shifted the focus from the individual towards the role of social, cultural and organisational factors in workplace learning (e.g. Dewey 1916; Vygotsky 1978; Lave and Wenger 1990; Engeström 1987; Fuller and Unwin 2003). The aforementioned three issues could be rephrased as follows: (1) both individual and social as the unit of analysis for understanding learning (relating to participation metaphor), (2) learning as a process and (3) learning as dependent of context.

Hager (2011) notes that although some works (e.g. Eraut 2000; Evans et al. 2011; Billett 2001) mostly belong to the second set of theories, they also combine themes, especially the role of individual, from the first set of theories. According to Billett (2011), self and personal agency play a central role in workplace learning. He states (p. 70) that 'the change or learning that arises from everyday and novel events is associated with how individuals direct their intentionalities and agency when engaging with what they experience through these events'. Hager (2011) also identifies the fourth issue, workplace learning as emergent, in the third set of most recent

P. Nokelainen (✉) • H. Kaisvuo • L. Pylväs
School of Education, University of Tampere, Tampere, Finland
e-mail: petri.nokelainen@uta.fi

theories (e.g. Engeström 2008), which view learning as an ongoing process that is not fully decidable in advance.

On the basis of the above, we can conclude that individual capacities play an important role when investigating collaborative learning processes in both formal and informal contexts of vocational and professional education. Current research on individual learning capacities focuses on the concepts of metacognition, self-regulation and self-regulated learning. Dinsmore et al. (2008) identify metacognition as research on individual's cognition, self-regulation as research on behaviour resulting from individual-environment interaction and self-regulated learning research combining these two approaches. Kaplan (2008) suggests that these concepts should be seen as subtypes of *self-regulated action*, allowing investigation of different dimensions of self-regulatory processes at the same time. In this chapter, we use the terms 'metacognition', 'self-regulation' and 'self-regulated learning' under the conceptual umbrella of 'self-regulated action', but our focus is on social cognitive perspective on self-regulation.

The purpose of this chapter is to discuss the connection between self-regulation and competence in both formal and informal contexts of vocational and professional education. Our goal is to show via existing research that especially social cognitive dimension of self-regulated action has theoretical linkages to a multifaceted and holistic approach to competence and that self-regulatory abilities play a role in the development of vocational competence. First, we introduce different theoretical approaches to self-regulated action. Then, we proceed to describe current research on competence in the context of vocational skills competitions and link it to the dimensions of self-regulated action. We conclude the chapter by presenting the results of an empirical study that investigates the relation of self-regulation and competence in the context of air traffic control.

36.2   Social Cognitive Perspective on Self-Regulation

Over the past decades, several different models of self-regulated action have been developed: Boekaerts' model of adaptable learning (1992, 1995, 1996a, b), Borkowski's process-oriented model of metacognition (Borkowski and Muthukrishna 1992; Borkowski 1996; Borkowski and Burke 1996; Borkowski et al. 2000), Pintrich's general framework for self-regulated learning (Pintrich 2000), Winne's four-stage model of self-regulated learning (Winne and Hadwin 1998) and Zimmerman's social cognitive model of self-regulation (1994, 1998, 2000, 2002, 2008). Puustinen and Pulkkinen (2001) compared the models of Boekaerts, Borkowski, Pintrich, Winne and Zimmerman on four criteria: background, theories, definitions and components included in the models and empirical work. The results of their work showed that Pintrich and Zimmerman's models were both inspired by the social cognitive theory (Bandura 1986).

From a social cognitive perspective, self-regulation has been defined as self-generated thoughts, feelings and actions planned and cyclically adapted based on

performance feedback to attain self-set goals (Zimmerman 2000). It is a multifaceted, complex process integrating several processes, which are hypothesised to operate in a cyclical feedback loop, whereby a learner gathers and uses feedback information to make adjustments during current and future learning attempts. Zimmerman and Schunk (2008) have defined self-regulation as the control of one's present conduct based on motives related to a subsequent goal or ideal that an individual has set for him- or herself. Self-regulation is the control that people have over their behaviour, cognition, emotions and motivation through the use of personal strategies to achieve the goals they have established.

According to Kuhl and Fuhrmann's *volition theory* (1998, p. 15), volition can be expressed in two ways. The first mode of volition supporting the maintenance of an active goal is called *self-control* or *action control*. The other mode, supporting the maintenance of one's actions in line with one's integrated self, is called *self-regulation*. Central coordination of processing across a variety of psychological subsystems is the defining characteristic common to either mode of volition. (See also Kuhl 1984, 1992.) When using the term self-regulation in a broader sense, Kuhl and Fuhrmann (1998) mean concurrent satisfaction of a majority of short- and long-term personal needs which represent an integrated self when pursuing a goal.

Self-regulation has been shown to be essential to the learning process (Järvelä and Järvenoja 2011; Zimmerman 2008; see also Kaisvuo 2014). It can help learners in creating better learning habits and strengthening their study skills (Wolters 2011), applying learning strategies to enhance academic outcomes, monitoring their performance (Harris et al. 2005) and evaluate their academic progress (De Bruin et al. 2001). Self-regulation intermediates between cognitive and affective attributes and it involves processes such as setting goals for learning and using effective strategies to organise information to be remembered (Ruohotie 2000, Ruohotie 2003, pp. 251–253). Zimmerman and Schunk (2008) have defined self-regulated learning as the process by which learners personally activate and sustain cognitions, affects and behaviours that are systematically oriented towards the attainment of learning goals. Self-regulated learning skills help to describe the ways how people approach tasks, apply strategies, monitor their performance and interpret the outcomes of their efforts towards achieving specific learning goals. When people have self-regulatory skills, they can modify their performance based on their personal characteristics and environmental conditions (Zimmerman 2000). We agree with Kaplan (2008) that self-regulated learning is not only limited to academic contexts but can occur wherever learning – both formal and informal – takes place.

36.2.1 Phases and Processes of Self-Regulation

The cyclical model of self-regulation includes three general phases: *forethought*, *performance* and *self-reflection* (see Zimmerman 2000; Zimmerman and Campillo 2003; Zimmerman and Moylan 2009; Pintrich and Zusho 2002). According to Zimmerman and Campillo (2003) and Zimmerman and Moylan (2009), during *the*

forethought phase, the person analyses the learning task and set specific goals towards completing that task. Goal-setting is defined as deciding on specific outcomes of learning or performance (Locke and Latham 1990). Beliefs of personal capabilities affect the type of goals that individuals select and their commitment to them (Zimmerman 1995). When individuals feel capable of performing a particular task, they are more likely to set challenging and specific goals (Zimmerman et al. 1992). Encouraging in setting process goals will have both achievement and motivational advantages, because of directing attention to executing the essential aspects of a particular task. Process goals encourage learners to keep track of how well they perform a strategy, evaluate goal progress and judge perceptions of competence (Locke and Latham 1990). Outcomes expectations are beliefs about the success of a given task (Zimmerman 2011). When people learn unfamiliar topics, they may not know the best ways to approach the task or what goals might be the most appropriate.

In *the performance phase*, a person employs strategies to make progress on the learning task and monitor the efficacy of those strategies as well as motivation for continuing progress towards the goals of the task (Zimmerman and Campillo 2003). Self-observation (Schunk 1983; Zimmerman and Paulsen 1995) is a performance control phase process that involves selectively attending to particular aspects of one's behaviour or performance. It is an important process, because it helps learners to discriminate between effective and ineffective performances and helps to isolate the source of error or confusion when one is performing poorly.

In the final *self-reflection phase*, a person evaluates his/her performance on the learning task with respect to the efficacy of the strategies that they chose. During this stage, emotions are managed as the outcomes of the learning experience. These self-reflections influence future planning and goals, initiating the cycle to begin again (Zimmerman and Campillo 2003). Self-efficacy beliefs not only influence the goals people set for themselves but also their evaluative reactions of goal progress (Zimmerman and Bandura 1994). After performing a task or an activity, people will often evaluate or reflect cognitively on the perceived causes of that performance. These causes are termed causal attributions (Zimmerman 2000).

Performance involves self-regulatory processes occurring during motoric efforts and affecting attention and action. Self-reflection includes self-regulatory processes that occur after performance efforts and influence a person's response to that experience. These self-reflections influence forethought processes and beliefs regarding subsequent efforts to learning and completing a self-regulatory feedback cycle (Zimmerman and Cleary 2009, pp. 248–249).

The phases and subprocesses of self-regulation are illustrated in Fig. 36.1. The cyclical model was originally presented by Zimmerman (2000), Zimmerman and Campillo (2003) included the subprocesses and Zimmerman and Moylan (2009) revised the model. The model is grounded in social cognitive theory and it has a focus on the influences on motivation on self-regulation. The cycle is complete when the self-reflection processes influence forethought processes during a subsequent learning attempt. Self-efficacy beliefs exist within this system of self-regulatory beliefs and processes. These beliefs are critical to the forethought phase
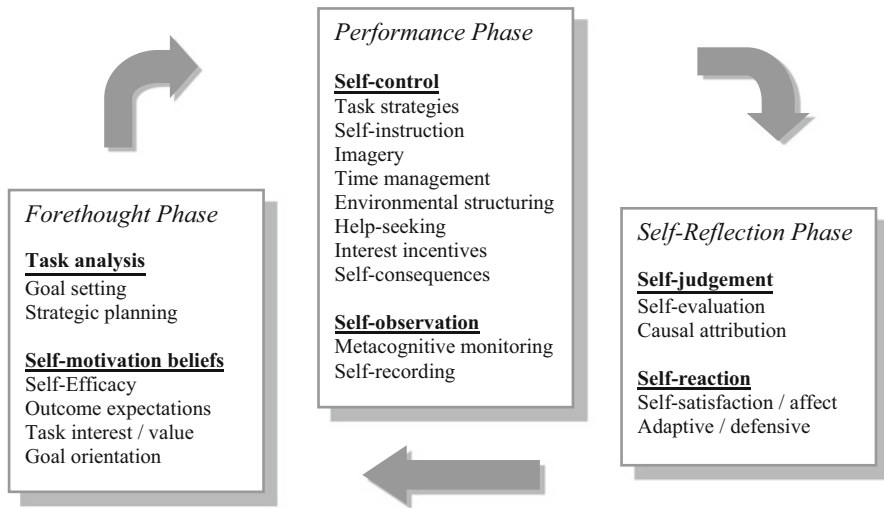
Fig. 36.1 Phases and subprocesses of self-regulation (Adapted from Zimmerman and Moylan 2009, see also Kaisvuo 2014, p. 55)

process, because they can sustain high levels of motivation and resilience in learners when they encounter obstacles or difficulties in learning (Zimmerman and Campillo 2003; see also Zimmerman and Moylan 2009).

36.3   The Relation of Motivation and Self-Regulation

Motivation is a system of self-regulatory mechanisms including selection, activation and sustained direction of behaviour towards certain goals. Individuals motivated to attain a goal are more likely to believe in their capabilities to attain that goal (Bandura 1997). Motivation is the reason which makes people act. Several researchers have suggested that the only thing directly affecting academic achievement is motivation, and all other factors affect achievement only through their effect on motivation (e.g. Tucker et al. 2002, p. 477.) Motivation is primarily concerned with how behaviour is activated and maintained (Bandura 1997). It has been defined by social cognitive researchers as a process in which goal-directed behaviour is instigated and sustained (Pintrich and Schunk 2002). When people are motivated to learn, they are more likely to invest the necessary time and energy needed to learn and apply appropriate self-regulatory skills, and when they are able to successfully employ self-regulation strategies, they are often more motivated to complete learning tasks (Zimmerman 2000). Motivation is an important variable, because it has been consistently associated with academic competence (Linnenbrink and Pintrich 2002).

Many theories distinguish between extrinsic and intrinsic motivation. When individuals are intrinsically motivated, they engage in an activity, because they are interested in the activity and enjoy it. When extrinsically motivated, individuals engage in activities for instrumental or some other reasons, such as receiving a reward (Deci et al. 1999). Also Davis et al. (1989) have clarified that the motivation structure consists of intrinsic and extrinsic motivation. Extrinsic motivation means the process of performing the activity because of the reinforcement value of outcomes. This type of motivation is linked to the perceived usefulness of the action in relation to the outcomes. Intrinsic motivation is the process of performing the activity and the activity is performed, because it is enjoyable.

White (1959, p. 297) was the first to define the term 'competence' in his seminal article as '… an organism's capacity to interact effectively with its environment'. He was also the first one to make a connection between competence and motivation and, more interestingly, to notice that the motivation needed to attain competence was related to how person interacts with his/her environment. Mulder (2014, p. 112) states that '… without performance motivation, or the will to master a certain level of professional skill, there would be no professional learning at all'. However, majority of the research on the effects of environmental events on intrinsic motivation has focused on the issue of autonomy versus control rather than that of competence (Deci 1971). Deci (1971, 1975) has found out that if people are paid to do something, they would otherwise have done out of interest and they will be less likely to do it in future without being paid. There has been some controversy in the literature in the past decade concerning the generality of this effect. Deci later combined with Ryan (Deci and Ryan 1985) to develop *a theory of self-determination* and intrinsic behaviour to explain the suppression effect and to suggest conditions of personal development and purposive behaviour in which it might be avoided.

Deci and his associates (Deci and Ryan 1985; Deci et al. 2001; Ryan and Deci 2000) have put forward *a cognitive evaluation theory* as a part of their self-determination theory to explain the reduction of intrinsic motivation by extrinsic rewards. It has been further elaborated (Ryan and Deci 2000) in ways which point to the same convergence in different approaches as is suggested by the generalisation of cognitive process theory from the micro to the macro level of intrinsic motivation. Events which increase a sense of competence or self-determination will enhance intrinsic motivation, while rewards for taking part in or completing an activity would reduce intrinsic interest by lessening self-determination. However, quality-dependent extrinsic rewards could increase rather than decrease feelings of competence and thus be less likely to suppress intrinsic interest.

Dividing motivation into intrinsic and extrinsic is not completely simple, because extrinsic rewards decrease intrinsic motivation in many situations (Deci 1975). Ryan and Deci (2000) have concluded that extrinsic motivation can vary greatly in its relative autonomy. For example, people who do their work, because they see its value for their chosen future career are extrinsically motivated, as are those who do the work only, because they are adhering to their parents' control. The effects on intrinsic motivation will differ according to whether the extrinsic rewards entail

personal endorsement and a feeling of choice or whether they result from compliance with external regulation.

Zimmerman and Schunk (2008) have provided a foundation about the importance of motivation in the context of self-regulated learning and the challenges of maintaining and self-regulating motivation itself. Both self-regulation and motivation are highly influenced by prior achievement experiences. Self-regulated learners are those who are metacognitively, motivationally and behaviourally active in their own learning processes and in achieving their own goals. Also Warshaw and Davis (1985, p. 214) have identified that motivation encompasses a system of self-regulatory processes that involves selection, activation and sustained behaviour towards goals.

In addition to self-regulation, motivation can have a pivotal impact on academic outcomes (Zimmerman 2008), and it can manifest itself in various forms such as effort, persistence and choice of activities. This hypothesis has been consistently confirmed by researchers over the past few decades (Bandura 1997; Pajares 1996; Schunk and Hanson 1985). When people believe they can perform a task in a proficient manner, they will become more engaged in the activity, work harder and sustain high levels of effort even when obstacles are encountered. In terms of effort, rate of performance and expenditure of energy have typically been employed in research (Zimmerman 1995). Schunk (1985) has used Bandura's theory to render an understanding of what he terms *motivated learning*, which means that motivated learners are pushed to acquire skills and knowledge during activities rather than simply completing the activities.

36.4 The Relation of Self-Regulation and Competence

Traditionally, Finnish education system and working life have been following the policy that focuses on formal qualifications. A work and learning outcomes-based approach have formed the basis of Finnish vocational education and training for a couple of decades. When the national core curriculum of vocational qualifications was reformed in 1993–1994, the former syllabuses, study units and subjects were replaced by vocational study modules and competence-based objectives and assessment criteria that are based on the operational entities of working life. Since those years, the aim of all reforms affecting curricula and competence-based qualification requirements has been to further a learning outcomes-based approach. Current key areas in developing the VET qualification system in Finland include (1) qualifications' and the qualification structure's relevance to work and the ability to react to changes, (2) holistic approach to the qualification system and the clarity of the qualification structure, (3) common approach to structuring qualifications and (4) the flexibility of qualifications and the qualification structure (Finnish National Board of Education 2015).

The concept of competence and various conceptions of professional competence are discussed in an international context in the first chapter of this volume. The

research results of the empirical studies in the current chapter are mostly based on the data collected in the Finnish context of education and working life where the concept of competence refers to individual characteristics that explain the effectiveness or success of tasks and work situations defined by certain criteria (Ruohotie 2005). Occupational competence refers in the Finnish context to the performance potential or ability to perform in professional tasks valued by the organisation (Ruohotie 2005; Heckhausen 2005; Kanfer and Ackerman 2005).

In the Finnish context, Hanhinen (2010) has described working life skills and knowledge using the concepts of *qualification*, *competence* and *vocational proficiency*. *Vocational proficiency* or *vocational know-how* is realised in a job performance as know-how or ability combining *qualifications* and *competence* (Hanhinen 2010, p. 96). A *qualification* can be defined as a skill and knowledge requirement, set by working life. Similarly, a *competence* is the potential to cope with the demands of the work, based on an individual's cognitive abilities (procedural knowledge, declarative knowledge, intelligence) and affective and conative aptitudes (temperament, emotion, motivation and will) (Hanhinen 2010, p. 96; Ruohotie 2005). Laitinen (2014) has studied the intercultural competence of polytechnic institute teachers. She examines the concept of competence on the basis of Hanhinen's (2010) classification, defining competence as 'a phenomenon, arising as a result of the interaction between hereditary tendencies, the operational environment and an individual's own behaviour based on self-regulation, the maintaining and reproduction as well as the utilisation of which require emotion- and will-based aptitudes' (Laitinen 2014, p. 40). Paloniemi (2006) has also defined vocational competence to broadly cover knowledge, skills, attitudes and aptitudes.

According to Mulder (2014), the different concepts of occupational competence have been helpful in mapping different occupations as well as competence-based learning and its practices. They can also be combined in practice in educational planning. How the different views relate to each other depends on the goal and context of occupational competence.

Due to the different approaches, Le Deist and Winterton (2005) and Winterton (2009) support a more holistic view of competence. A more holistic view allows one to strive towards understanding the concept on more global terms. The fragmentation of the concept has been visible, for example, in the formation of the European qualification framework. Competence was seen as a narrow-ranging concept, and emphasis was given to learning outcomes instead of competence (Winterton 2009). Le Deist and Winterton (2005) and Winterton (2009) have created a holistic classification for competence, which is described in Table 36.1. If the concept of competence is used without qualification, it is used to refer to different dimensions in the context of work. *Cognitive competence* covers knowledge and understanding, and *functional competence* includes skills (i.e. practical know-how). *Social competence* includes the competencies related to behaviour and attitudes. *Metacompetence* differs from the others in the regard that its purpose is to promote the gaining of other competencies.

Zimmerman (1998) discerns six areas in which learners can regulate their behaviour: motives, methods, time consumption, outcomes, physical environment

Table 36.1 A holistic classification of the concept of competence

	Occupational	Personal
Conceptual	Cognitive competence	Metacompetence
Operational	Functional competence	Social competence

Le Deist and Winterton (2005, p. 39)

and social environment. If all of these aspects are determined by someone other than the learner him-/herself, the source of control is external (e.g. supervisors or teachers). Naturally, learning can still take place but self-regulation cannot occur. Especially self-efficacy, an important component of the first (forethought) phase of self-regulation cycle (Zimmerman 2000), has a strong impact on thought, affect, motivation and action. As personal level metacompetence and social competence have both a significant role in competence development (Table 36.1), it is viable to state that self-regulation is related to both of these competencies as it provides basis for purposeful action (Bandura 1991).

According to Gagné (2010), in order to excel, one needs, in addition to deliberate practice (Ericsson et al. 1993), both gifts and ability to keep things under control. Self-regulation plays an important role as an indirect factor between competencies and direct formal, non-formal and informal learning processes (e.g. vocational studies, leisure time activities and work) aimed to develop them. This assumption is supported by international studies in the context of skills competitions, where vocational secondary level students' competition scores are statistically contrasted to their self-reported self-regulatory abilities.

An international comparative study of 38 countries ($N=409$) showed that WorldSkills Competition (WSC) medal winners self-assessed self-regulatory dimensions higher than other competitors. Results of statistical analysis showed that medal winners had the highest self-reported level of extrinsic motivation [$\chi^2(2, 341)=11.080$, $p=.004$], and they also reported the highest average rating for success due to ability [$\chi^2(2, 341)=8.104$, $p=.017$]. Most successful competitors also had higher self-reported levels of volition (perseverance) than other competitors [$\chi^2(2, 342)=8.777$, $p=.012$] (Nokelainen et al. 2012).

Also a study in the Finnish context emphasised the significance of the WSC competitors' ($N=152$) personality traits (e.g. self-regulation) in the development of exceptional vocational talent (Nokelainen 2016). Competitors who were unable to cultivate a strong desire to display their skills (both mastery-approach and performance-approach goal orientations) and, in addition, had difficulty concentrating on the task (performance-avoidance goal orientation) were unable to realise their full potential in competitive situations. The results indicate that the highest-performing competitors have a higher level of perseverance and more effective time management skills (volition) than their lower-achieving peers. Further, competitors who rely heavily on domain-specific external support (teachers, trainers) are most likely to underperform in stressful environments, such as workplaces.

Another study in the context of UK included survey data from 76 vocational education students who participated in training and competitions to be selected for

the WSC UK team (Nokelainen et al. 2013). In parallel with the findings of the previous study, results showed that the most important contributors to vocational excellence were motivational in nature. According to this study, the medal winners seemed to be partly motivated by not wanting to appear incompetent to others (performance-avoidance goal orientation) $[\chi^2(2, 37) = 11.374, p = .003]$.

36.5 Self-Regulation and Competence in the Context of Working Life: A Case Study of Finnish Air Traffic Controllers

Nokelainen (2016) has constructed a Developmental Model of Vocational Excellence (DMVE) to explore the acquisition of professional and vocational excellence (Fig. 36.2). Relating to the above-discussed concepts of self-regulation and competence, DMVE builds on research into individual attributes and characteristics and the dimensions of intelligence, including Zimmerman's research on self-regulation (Zimmerman 1998, 2000, 2008, 2011), Gagné's research on development of talent (Gagné 2004, 2010), Ericsson's research on development of expertise (Ericsson et al. 1993; Ericsson 2006) and Gardner's research on multiple intelligences (Gardner 1983, 1999).

The model maps the development of competence in terms of cognitive skills and affective abilities (expressed as multiple intelligences domains), work skills, influential individuals and factors related to self-regulation (motivation, volition and self-reflection). Interestingly, a recent review from Dunlosky et al. (2013) confirms a positive relation between self-regulated learning (e.g. time management strategies and self-testing) and learning outcomes. However, we stress here that self-regulation
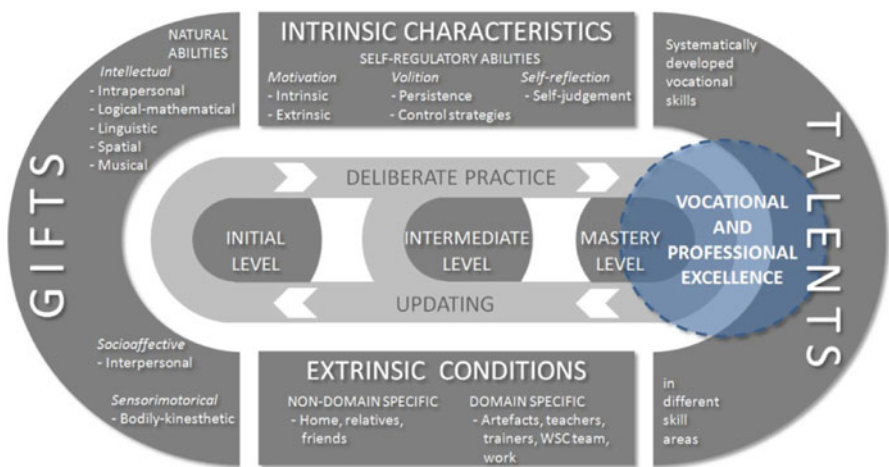

Fig. 36.2 Developmental model of vocational and professional excellence (Nokelainen 2016)

is one aspect of a broader concept of regulatory processes, including also co-regulation and socially shared regulation (e.g. Järvelä and Hadwin 2013).

Empirical findings in the context of WorldSkills Competitions (WSC) emphasised the significance of the WSC competitors' personality traits (especially natural abilities and self-regulation) and external factors (especially support from parents, teachers and trainers) in the development of exceptional vocational talent (Nokelainen 2016). The results indicate that the highest-performing competitors have a higher level of perseverance and more effective time management skills (volition) than do their lower-achieving peers. Further, competitors who rely heavily on domain-specific external support (teachers, trainers) are most likely to underperform in controlled environments, such as competitions.

DMVE has also been applied in the context of workplace learning. Pylväs et al. (2015) used the model to analyse on-the-job performance in the domain of highly skilled and safety-critical vocation of air traffic controller (ATCO). The target population of the Pylväs et al. (2015) study consisted of Finnish ($N = 300$) air traffic controllers of which 28 were interviewed (8 females, 28.6 % and 20 males, 71.4 %). Their average age was 37.9 years ($SD = 38.0$). The study analysed the role of natural abilities (gifts), intrinsic characteristics (self-regulatory abilities) and extrinsic conditions (domain- and non-domain-specific factors) in ATCOs' vocational development (initial interest, perseverance and mastery). Next, we present the research results relating to self-regulatory abilities in ATCO job performance.

ATCOs simultaneously control aircraft taking off and landing and make observations of the work environment with the help of various kinds of information technology equipment (Finavia 2013). In order to understand ATCOs' job profiles, the study began in 2011 by interviewing three key persons (manager, air traffic controller and trainer, HR specialist) who had more than 10 years work experience in the field. A semi-structured interview instrument was developed on the basis of the key personnel interviews and existing research. The interviews of 28 ATCOs were conducted in four Finnish airports. The airports were selected to represent different types of airports and ATCO job profiles in Finland. The research data also included the interviewees' employee assessments.

Due to highly selective entrance tests (Wickens et al. 1997), all operative ATCOs are considered experts in their vocational field. However, the work-related performance of the participants was classified in two levels: 'expertise' and 'excellence'. Individuals, who have performed exceptionally well over a long period of time, represented vocational excellence in this study. A panel of experienced operative superiors evaluated the participants' performance level of expertise ($n = 9$, 32.1 %) and excellence ($n = 17$, 60.7 %). The classification was made on the basis of ATCOs' on-the-job performance. The panel used the following criteria to judge the merits of the participants: (1) safe working (low number of critical incident reports), (2) effective air traffic control (aim at the maximum capacity), (3) overall perception of air traffic services, (4) understanding the guidelines and regulations and (5) self-initiative and commitment. This job performance-related information (missing $n = 2$, 7.1 %) was concealed from the researchers until the content analysis of the interview data was completed. The selection of interviewees within the target units

was random, as the participation in interview sessions was based on their predetermined work shifts.

The qualitative interview data analysis took the form of quantitative and qualitative content analysis. The empirical data was thematically categorised according to the theoretical concepts related to the theoretical models used in the study. The unit of analysis, a meaningful piece of text in the interview transcript (e.g. 'The most important thing is to stay motivated. To be good or even better than before'.), was assigned a code relating to a theoretical concept (e.g. 'intrinsic goal orientation'). Qualitative content analysis was applied to examine latent and more context-dependent meanings (Schreier 2014) in the data. A specific technique, Bayesian Classification Modelling (BCM, see Nokelainen 2008), was used to select the most probable predictors of vocational excellence and to increase the research validity of qualitative methods in a confirmatory way. The input data matrix for BCM contained the following variables: 12 characteristics (such as 'intrinsic goal orientation', 'volition' and 'control beliefs', 'job performance', 'entrance examination success' and 'study success'). The numerical values for the 12-characteristic variables were based on the code frequencies (later referred to '$n_{categories}$') from the preceding theoretical concept analysis.

The findings of this study are in parallel with earlier research related to vocational excellence (Nokelainen et al. 2013; Nokelainen 2016). All participants recognised cognitive skills (logical-mathematical skills, problem-solving skills, perceptive skills, learning skills, simultaneous skills), self-reflection (control beliefs, stress tolerance), volition (perseverance and determination, exactness and carefulness, ability to concentrate, time management skills) and goal orientation (extrinsic and intrinsic motivational factors) as the most important characteristics in vocational expertise of air traffic controller. Interpersonal skills (social skills), intrapersonal skills (ability to understand and analyse one's own performance) and spatial skills (conceptual understanding of three-dimensional information) were also among the acknowledged characteristics in this specific vocational field. However, the main differences between the ATCOs representing vocational expertise and those representing vocational excellence were related to self-regulation. Particularly, goal orientation and volition proved to be stronger among the employees representing vocational excellence.

Both qualitative and Bayesian analyses illustrated that the employees representing vocational excellence had a stronger (particularly intrinsic) goal orientation than the employees representing vocational expertise. Intrinsic goal orientation ($n_{categories}$ = 48, 15.1 %) was linked to individual ambition as well as strong interest in air traffic control and aviation. Extrinsic goal orientation ($n_{categories}$ = 44, 13.8 %) consisted of various factors such as professional benefits (working hours, salary), professional status and professional responsibility. Volition ($n_{categories}$ = 46, 14.5 %) was also considered as one of ATCOs' most important vocational characteristics. Concentrating on the work requires not only volition and sustainability but also the ability to regulate attention from peak to quiet traffic periods. Determination and perseverance is needed in problem-solving and decision-making as air traffic controller needs to be able to trust one's own skills in any circumstances. In addition,

ATCOs' work requires exactness, carefulness and time management skills in order to meet the official requirements of air traffic control. In the interviews, volitional differences between the ATCOs were related to exactness, carefulness and time management skills. In Bayesian analysis, volition appeared slightly higher among the employees representing vocational excellence.

The theoretical framework with relation to self-reflection included control beliefs and stress tolerance. Success in working life was more often seen as a result of one's efforts (control beliefs, $n_{categories} = 24$, 7.5 %) than as a result of one's abilities (efficacy beliefs, $n_{categories} = 8$, 2.5 %). Active self-reflecting and practicing, leading to vocational routines, were considered to increase the potential for success in working life. However, unsuccessful performance was more often seen as a result of difficult circumstances (bad weather, non-functioning equipment, etc.) than under one's own control. Based on the results of Bayesian analysis, attribution interpretations turned out to be one of the main differences between the employees representing vocational expertise and those representing excellence. The ATCOs representing vocational expertise emphasised the significance of effort for success during the training period and the importance of abilities for success in working life. The ATCOs representing vocational excellence did not see effort as having a big role in training success. Furthermore, they did not stress the importance of effort or ability during working life. Stress tolerance and regulation, calmness and good nerves, in particular, were considered vital characteristics in ATCOs' work. The interviewees underlined the importance of resistance to pressure in decision-making: the ability to make quick decisions and take the responsibility for the decisions. An important part of ATCOs' work is to be able to mentally process the stress after unsuccessful performances.

36.6 Conclusions

In this chapter, we have discussed the concepts of self-regulation and competence in the context of workplace learning. Research indicates that self-regulative abilities enable professionals to be effective lifelong learners (e.g. Pintrich and De Groot 1990; Schunk and Zimmerman 1994). Improving perceptions of personal control leads to the strengthening of intrinsic motivation, the improvement of learning outcomes and the development of responsibility and a sense of self-efficacy (Nokelainen 2008). We argue that self-regulation plays an important role in the development of competence, as it is needed to acquire competencies, unified sets of knowledge, skills and views (see Mulder 2014).

Learning is most natural and effective when it is experienced as meaningful and relevant and when the learning environment supports the learning and encourages self-regulation and self-control. According to Zimmerman (1994), self-regulation is only possible in a context that allows people to make their own choices and be in control. If learners are not given the opportunity to exercise control and the freedom

to choose their own strategies, they will not learn to regulate their own behaviour, and they will not develop enthusiasm for taking initiative.

Results of several studies on self-regulation and competence in the context of vocational skills competitions (Nokelainen et al. 2012; Nokelainen et al. 2013; Nokelainen 2016) and air traffic controllers work (Pylväs et al. 2015) indicate that greater account may need to be taken of the significance of self-regulatory skills in addition to vocation-specific skills. Both vocational and professional education students and professionals are assumed to be aware of the potential usefulness of self-regulation processes, but they also need motivation to self-regulate (e.g. Zimmerman 2001). Therefore, workplaces as well as vocational and professional education learning environments should be designed in a way that they offer possibilities for choice, challenge, collaboration, making meaning, taking initiative in one's actions and receiving constructive feedback and rewards.

According to Nokelainen (2016), characteristics of vocational talent development are controllable and, thus, manageable through educational policies: (1) attributing success mainly to uncontrollable instead of controllable factors, (2) using maladaptive instead of adaptive patterns of learning and (3) focusing on the self instead of focusing on the task. He suggests that on individual level, focused mental training in these areas (i.e. courses focusing on 'soft skills') may improve the match between vocational education and working life requirements. Practical examples of such courses are the ones that develop skills related to self-concept (social skills, conflict management; emotions, understanding different cultures; actions, explanations for success and failure).

At an institutional level, the findings of abovementioned studies provide educational institutions with strategies to improve vocational teacher education and authorities to further develop vocational education curriculum. For example, in the Finnish context, the research has supported the development of vocational teacher training seminars, instructional material and expert networks. The research also points to ways in which the quality and relevance of vocational outcomes can be enhanced by offering vocational education students opportunities to develop the attributes and characteristics associated with excellence.

References

Argyris, C., & Schön, D. A. (1974). *Theory in practice: Increasing professional effectiveness*. San Francisco: Jossey-Bass Publishers.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs: Prentice-Hall.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes, 50*, 248–287.

Bandura, A. (1997). *Self-efficacy. The exercise of control*. New York: W. H. Freeman and Company.

Billett, S. (2001). Knowing in practice: Re-conceptualising vocational expertise. *Learning and Instruction, 11*(6), 431–452.

Billett, S. (2011). Subjectivity, self and personal agency in learning through and for work. In M. Malloch, L. Cairns, K. Evans, & B. O'Connor (Eds.), *The SAGE handbook of workplace learning* (pp. 60–72). Thousand Oaks: SAGE Publications Inc.

Boekaerts, M. (1992). The adaptable learning process: Initiating and maintaining behavioral change. *Applied Psychology: An International Review, 41*(4), 377–397.

Boekaerts, M. (1995). The interface between intelligence and personality as determinants of classroom learning. In D. H. Saklofske & M. Zeidner (Eds.), *International handbook of personality and intelligence* (pp. 161–183). New York: Plenum Press.

Boekaerts, M. (1996a). Personality and the psychology of learning. *European Journal of Personality, 10*(5), 377–404.

Boekaerts, M. (1996b). Teaching students self-regulated learning: A major success in applied research. In J. Georgas, M. Manthouli, E. Besevegis, & A. Kokkevi (Eds.), *Contemporary psychology in europe: Theory, research, and applications* (pp. 245–259). Seattle: Hogrefe & Huber.

Borkowski, J. G. (1996). Metacognition: Theory or chapter heading? *Learning and Individual Differences, 8*(4), 391–402.

Borkowski, J. G., & Burke, J. E. (1996). Theories, models and measurements of executive functioning: An information processing perspective. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 235–261). Baltimore: Paul H. Brookes Publishing.

Borkowski, J. G., & Muthukrishna, N. (1992). Moving metacognition into the classroom: Working models and effective strategy teaching. In M. Pressley, K. R. Harris, & J. T. Guthrie (Eds.), *Promoting academic literacy: Cognitive research and instructional innovation* (pp. 477–501). Orlando: Academic.

Borkowski, J. G., Chan, L. K. S., & Muthukrishna, N. (2000). A process-oriented model of metacognition: Links between motivation and executive functioning. In G. Schraw & J. Impara (Eds.), *Issues in the measurement of metacognition* (pp. 1–42). Lincoln: Buros Institute of Mental Measurements, University of Nebraska.

Davis, D. F., Bagozzi, P. R., & Warshaw, R. P. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982–1000.

De Bruin, A. B., Thiede, K. W., & Camp, G. (2001). Generating keywords improves metacomprehension and self-regulation in elementary and middle school children. *Journal of Experimental Child Psychology, 109*(3), 294–310.

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology, 18*(1), 105–115.

Deci, E. L. (1975). *Intrinsic motivation*. New York: Plenum Press.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiment examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125*(6), 627–668.

Deci, E. L., Koestner, R., & Ryan, R. M. (2001). Extrinsic rewards and intrinsic motivation reconsidered once again. *Review of Educational Research, 71*(1), 1–51.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Press.

Dewey, J. (1916). *Democracy and education*. A Penn State Electronic Classics Series Publication 2001. University Park: Pennsylvania State University.

Dinsmore, D. L., Alexander, P. A., & Loughlin, S. M. (2008). Focusing the conceptual lens on metacognition, self-regulation, and self-regulated learning. *Educational Psychology Review, 20*, 391–409.

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest, 14*(1), 4–58.

Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki: Orienta-Konsultit.

Engeström, Y. (2008). *From teams to knots: Activity-theoretical studies of collaboration and learning at work*. Cambridge: Cambridge University Press.

Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work. *British Journal of Educational Psychology, 70*(1), 113–136.

Ericsson, K. A. (2006). The influence of experience and deliberate practice on the development of superior expert performance. In K. A. Ericsson, N. Charness, P. J. Feltovich, & R. R. Hoffman (Eds.), *The Cambridge handbook of expertise and expert performance* (pp. 683–703). Cambridge: Cambridge University Press.

Ericsson, K. A., Krampe, R., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*(3), 363–406.

Evans, K., Guile, D., & Harris, J. (2011). Rethinking work-based learning: For education professionals and professionals who educate. In M. Malloch, L. Cairns, K. Evans, & B. O'Connor (Eds.), *The SAGE handbook of workplace learning* (pp. 149–161). Thousand Oaks: SAGE Publications Inc.

Finavia. (2013). *Air traffic controller: Job description*. Helsinki: Finavia Inc.

Finnish National Board of Education. (2015). *Inspiring and strengthening the competence-based approach in all VET in Finland. Support material for implementation.* Publications 2015:2. Helsinki: Finnish National Board of Education.

Fuller, A., & Unwin, L. (2003). Learning as apprentices in the contemporary UK workplace. *Journal of Education and Work, 16*(4), 407–426.

Gagné, F. (2004). Transforming gifts into talents: The DMGT as a developmental theory. *High Ability Studies, 15*(2), 119–147.

Gagné, F. (2010). Motivation within the DMGT 2.0 framework. *High Ability Studies, 21*(2), 81–99.

Gardner, H. (1983). *Frames of mind*. New York: Basic Books.

Gardner, H. (1999). *Intelligence reframed: Multiple intelligences for the 21st century*. New York: Basic Books.

Hager, P. (2011). Theories of workplace learning. In M. Malloch, L. Cairns, K. Evans, & B. O'Connor (Eds.), *The SAGE handbook of workplace learning* (pp. 17–31). Thousand Oaks: SAGE Publications Inc.

Hanhinen, T. (2010). *Kvalifikaatiot ja työelämäosaaminen – Dynaamisen kvalifikaatioiden luokitusjärjestelmän konstruointi*. Acta Universitatis Tamperensis. Academic dissertation. Tampere: University of Tampere Press.

Harris, K. R., Friedlander, B. D., Saddler, B., Frizzelle, R., & Graham, S. (2005). Self-monitoring of attention versus self-monitoring of academic performance: Effects among students with ADHD in the general education classroom. *Journal of Special Education, 39*(3), 145–156.

Heckhausen, J. (2005). Competence and motivation in adulthood and old age: Making the most of changing capacities and resources. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 240–256). New York: The Guilford Press.

Järvelä, S., & Hadwin, A. (2013). New frontiers: Regulating learning in CSCL. *Educational Psychologist, 48*(1), 25–39.

Järvelä, S., & Järvenoja, H. (2011). Socially constructed self-regulated learning and motivation regulation in collaborative learning groups. *Teachers College Record, 113*(2), 350–374.

Kaisvuo, H. (2014). *The representation of self-efficacy experienced by an upper secondary school student*. Academic dissertation. Tampere: Juvenes Print – Finnish University Print Ltd.

Kanfer, R., & Ackerman, P. (2005). Work competence: A person-oriented perspective. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 336–353). New York: The Guilford Press.

Kaplan, A. (2008). Clarifying metacognition, self-regulation, and self-regulated learning: What's the purpose? *Educational Psychology Review, 20*, 477–484.

Kuhl, J. (1984). Volitional aspects of achievement motivation and learned helplessness: Toward a comprehensive theory of action-control. In B. A. Maher (Ed.), *Progress in experimental personality research* (Vol. 13, pp. 99–171). New York: Academic.

Kuhl, J. (1992). A theory of self-regulation: Action versus state orientation, self-discrimination, and some applications. *Applied Psychology: An International Review, 41*(2), 95–173.

Kuhl, J., & Fuhrmann, A. (1998). Decomposing self-regulation and self-control: The volitional components inventory. In J. Heckhausen & C. S. Dweck (Eds.), *Motivation and self-regulation across the life span* (pp. 15–49). Cambridge: Cambridge University Press.

Laitinen, E. (2014). *Ammattikorkeakoulujen opettajien kulttuurienvälinen kompetenssi ja sen mittaaminen*. Acta Universitatis Tamperensis. Academic dissertation. Tampere: University of Tampere Press.

Lave, J., & Wenger, E. (1990). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Le Deist, F. D., & Winterton, J. (2005). What is competence? *Human Resource Development International, 8*(1), 27–46.

Linnenbrink, E. A., & Pintrich, P. R. (2002). Motivation as an enabler for academic success. *School Psychology Review, 31*(3), 313–327.

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance*. Englewoods Cliffs: Prentice Hall.

Marsick, V. J., & Watkins, K. E. (1990). *Informal and incidental learning in the workplace*. New York: Routledge.

Mulder, M. (2014). Conceptions of professional competence. In S. Billett, C. Harteis, & H. Gruber (Eds.), *International handbook of research in professional and practice-based learning* (pp. 107–137). Dordrecht: Springer.

Nokelainen, P. (2008). *Modeling of professional growth and learning: Bayesian approach*. Acta Universitas Tamperensis. Tampere: Tampere University Press.

Nokelainen, P. (2016). *Modeling the characteristics of vocational excellence: A case study with Finnish WorldSkills Competitors*. Manuscript submitted for publication.

Nokelainen, P., Smith, H., Rahimi, M., Stasz, C. & James, S. (2012). *What contributes to vocational excellence? Characteristics and experiences of competitors and experts in WorldSkills London 2011*. Madrid: WorldSkills Foundation. Retrieved 20, Aug 2015, from http://www.worldskillsfoundation.org/downloads/WSF_MoVE_Global_report_WSC2011.pdf

Nokelainen, P., Stasz, C., & James, S. (2013). *What contributes to vocational excellence? A pilot study of the individual characteristics of the WorldSkills UK 2011 squad.* SKOPE Research Paper No. 118. Oxford: SKOPE Publications, University of Oxford.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*(4), 543–578.

Paloniemi, S. (2006). Experience, competence and workplace learning. *Journal of Workplace Learning, 18*(7–8), 439–450.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 452–502). San Diego: Academic.

Pintrich, P. R., & de Groot, E. W. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*, 33–40.

Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in education: Theory, research, and applications* (2nd ed.). Upper Saddle River: Merrill Prentice Hall.

Pintrich, P. R., & Zusho, A. (2002). The development of academic self-regulation: The role of cognitive and motivational factors. In A. Wigfield & J. Eccles (Eds.), *Development of achievement motivation* (pp. 249–284). San Diego: Academic.

Puustinen, M., & Pulkkinen, L. (2001). Models of self-regulated learning: A review. *Scandinavian Journal of Educational Research, 45*(3), 269–286.

Pylväs, L., Nokelainen, P., & Roisko, H. (2015). The role of natural abilities, intrinsic characteristics, and extrinsic conditions in air traffic controllers' vocational development. *Journal of Workplace Learning, 27*(3), 241–263.

Ruohotie, P. (2000). Conative constructs in learning. In P. R. Pintrich & P. Ruohotie (Eds.), *Conative constructs and self -regulated learning* (pp. 1–30). Hämeenlinna: RCVE.

Ruohotie, P. (2003). Self-regulatory abilities for professional learning. In B. Beairsto, M. Klein, & P. Ruohotie (Eds.), *Professional learning and leadership* (pp. 251–281). Hämeenlinna: Research Centre for Vocational Education, University of Tampere.

Ruohotie, P. (2005). Ammatillinen kompetenssi ja sen kehittäminen. *Ammattikasvatuksen aikakauskirja, 7*(3), 4–18.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78.

Schreier, M. (2014). Qualitative content analyses. In U. Flick (Ed.), *The Sage handbook of qualitative data analysis* (pp. 170–183). London: SAGE Publications Ltd.

Schunk, D. H. (1983). Progress self-monitoring: Effects on children's self-efficacy and achievement. *Journal of Experimental Education, 51*(2), 89–93.

Schunk, D. H. (1985). Self-efficacy and classroom learning. *Psychology in the Schools, 22*(2), 208–223.

Schunk, D. H., & Hanson, A. R. (1985). Peer models: Influence on children's self-efficacy and achievement. *Journal of Educational Psychology, 77*(3), 313–322.

Schunk, D. H., & Zimmerman, B. J. (1994). *Self-regulation of learning and performance: Issues and educational applications*. Hillsdale: Lawrence Erlbaum Associates.

Tucker, C. M., Zayco, R. A., & Herman, K. C. (2002). Teacher and child variables as predictors of academic engagement among low-income African American children. *Psychology in the Schools, 39*(4), 477–488.

Vygotsky, L. S. (1930/1978). *Mind in Society. Development of Higher Psychological Processes*. In M. Cole, V. John-Steiner, S. Scribner, & E. Souberman (Eds.). Cambridge, MA: Harvard University Press.

Warshaw, P., & Davis, F. (1985). Disentangling behavioral intention and behavioral expectation. *Journal of Experimental Social Psychology, 21*(3), 213–228.

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66*, 279–333.

Wickens, C. D., McGee, J. P., & Mavor, A. S. (1997). *Flight to the future: Human factors in air traffic control*. Washington, DC: National Academies Press.

Winne, P. H., & Hadwin, A. F. (1998). Studying as self-regulated learning. In D. J. Hacker & J. Dunlosky (Eds.), *Metacognition in educational theory and practice* (pp. 277–304). Mahwah: Erlbaum.

Winterton, J. (2009). Competence across Europe: Highest common factor or lowest common denominator? *Journal of European Industrial Training, 33*(8/9), 681–700.

Wolters, C. A. (2011). Regulation of motivation: Contextual and social aspects. *Teachers College Record, 113*(2), 265–283.

Zimmerman, B. J. (1994). Dimensions of academic self-regulation: A conceptual framework for education. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance: Issues and educational applications* (pp. 3–24). Hillsdale: Lawrence Erlbaum.

Zimmerman, B. J. (1995). Self-efficacy and educational development. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp. 202–231). New York: Cambridge University Press.

Zimmerman, B. J. (1998). Academic studying and the development of personal skill: A self-regulatory perspective. *Educational Psychologist, 33*(2/3), 73–86.

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). San Diego: Academic.

Zimmerman, B. J. (2001). Theories of self-regulated learning and academic achievement: A overview and analysis. In B. J. Zimmerman & D. H. Schunk (Eds.), *Self-regulated learning and academic achievement: Theoretical perspectives* (pp. 1–37). Mahwah: Lawrence Erlbaum Associates.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice, 41*(2), 64–72.

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal, 45*(1), 166–183.

Zimmerman, B. J. (2011). Motivational sources and outcomes of self-regulated learning and performance. In B. J. Zimmerman & D. H. Schunk (Eds.), *Handbook of self-regulation of learning and performance* (pp. 49–64). New York: Routledge.

Zimmerman, B. J., & Bandura, A. (1994). Impact of self-regulatory influences on writing course attainment. *American Educational Research Journal, 31*(4), 845–862.

Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal-setting. *American Educational Research Journal, 29*(3), 663–676.

Zimmerman, B. J., & Campillo, M. (2003). Motivating self-regulated problem solvers. In J. E. Davidson & R. Sternberg (Eds.), *The nature of problem solving* (pp. 233–262). New York: Cambridge University Press.

Zimmerman, B. J., & Cleary, T. J. (2009). Motives to self-regulate learning. A social cognitive account. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 247–264). New York: Routledge.

Zimmerman, B. J., & Moylan, A. R. (2009). Self-regulation: Where metacognition and motivation intersect. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Handbook of metacognition in education* (pp. 299–315). New York: Routledge.

Zimmerman, B. J., & Paulsen, A. S. (1995). Self-monitoring during collegiate studying: An invaluable tool for academic self-regulation. In P. Pintrich (Ed.), *New directions in college teaching and learning* (pp. 13–28). San Francisco: Jossey-Bass.

Zimmerman, B. J., & Schunk, D. H. (2008). Motivation: An essential dimension of self-regulated learning. In D. H. Schunk & B. J. Zimmerman (Eds.), *Motivation and self-regulated learning: Theory, research, and applications* (pp. 1–30). Mahwah: Erlbaum.