

## Students' Learning Processes during School-Based Learning and Workplace Learning in Vocational Education: A Review

Harmen Schaap · Liesbeth Baartman ·  
Elly de Bruijn

Received: 1 June 2011 / Accepted: 2 November 2011 /

Published online: 19 November 2011

© The Author(s) 2011. This article is published with open access at Springerlink.com

**Abstract** Learning in vocational schools and workplaces are the two main components of vocational education. Students have to develop professional competences by building meaningful relations between knowledge, skills and attitudes. There are, however, some major concerns about the combination of learning in these two learning environments, since vocational schools are primarily based on the rationales of learning and theory, while workplaces are based on the rationales of working and practice. This study therefore aims to structure empirical insights into students' learning processes during the combination of school-based learning and workplace learning in vocational education. A review-study has been conducted in which ultimately 24 articles were analyzed thoroughly. The review shows that students' learning processes in vocational schools and workplaces are related to six main themes: students' expertise development, students' learning styles, students' integration of knowledge acquired in school and workplace, processes of knowledge development, students' motivations for learning and students' professional identity development. Our results show that students are novices who use specific and different learning styles and learning activities in vocational schools and workplaces. It is concluded that the enhancement of students' learning processes needs to be adaptive and differentiated in nature. Recommendations for further research are elaborated and suggestions for the enhancement of students' learning processes are discussed using insights from hybrid learning environments and boundary crossing via boundary objects.

---

H. Schaap (✉) · L. Baartman · E. de Bruijn  
HU University of Applied Sciences, Utrecht, Netherlands  
e-mail: h.schaap@uu.nl

L. Baartman  
e-mail: liesbeth.baartman@hu.nl

E. de Bruijn  
e-mail: elly.debruijn@hu.nl

H. Schaap · E. de Bruijn  
Utrecht University, Utrecht, Netherlands

**Keywords** Students' learning processes · Integration of knowledge · Skills and attitudes · School-based learning · Workplace learning · Vocational education · Review-study

## Students' Learning in Vocational Schools and Workplaces

Vocational education needs to deliver reflective practitioners who possess an adequate knowledge base that includes relevant domain-specific and general knowledge (Griffiths and Guile 2003). It is expected that those practitioners are able to solve complex problems and that they have the ability to acquire and develop new knowledge during their career. Students in vocational education need to integrate knowledge, skills and attitudes (Baartman and De Bruijn 2011), while they simultaneously need to develop a professional identity (Achtenhagen and Grubb 2001; Geijssel and Meijers 2005). To acquire and integrate these types of knowledge, skills and attitudes, vocational schools and workplaces are seen as the two most important learning environments, in which students learn in authentic learning environments (Gulikers et al. 2008) and direct their learning by themselves (Kicken et al. 2008).

A general aim of vocational curricula is that students build meaningful relations between knowledge, skills and attitudes acquired in both vocational schools and workplaces (Baartman and De Bruijn 2011). In vocational education two main learning pathways exist, namely school-based pathways and work-based pathways (OECD 2009). In the school-based pathway students learn in school and participate in different workplaces as part of their total vocational trajectory. In the workplace pathway students are employed in professional organizations for more than 60% of the time. However, in several countries, such as Sweden, France and The Netherlands, the school-based pathway is gradually changing into a pathway in which school-based learning is combined with an extensive part of workplace learning too (Nelen et al. 2010; OECD 2009). In contrast, a vocational system, such as in Germany, is organized primarily as an apprenticeship system, in which students work as professionals in an organization while they learn in school for 1 day a week (Achtenhagen and Grubb 2001; Rauner 2007).

However, some major concerns exist about students' learning processes in vocational schools and workplaces (Akkerman and Bakker 2011; Eraut 2004; Griffiths and Guile 2003; Rauner 2007). Students often experience difficulties in integrating knowledge, skills and attitudes, since it requires complex cognitive skills as well as critical reflection (Baartman and De Bruijn 2011) and because students need to be able to transfer what is learned in school to the workplace and vice versa (Van Merriënboer and Kirschner 2007; Van Oers 1998). This is mainly due to the different goals and rationales of the two environments (Hager 1998; Marsick and Watkins 1990). Where vocational schools are primarily focused on students' learning processes, reflection, meaningful peer interactions and theoretical insights, workplaces are mainly preoccupied with working, making profit or serving customers, effective innovations and efficient procedures (Resnick 1987). Consequently, different types of knowledge (e.g., theoretical models, concepts, methods, procedures), skills (e.g., social, cognitive, reflective and self-regulative) and attitudes

(e.g., being costumer friendly, keeping up with recent developments or taking safety not for granted) are dominant in the two environments (cf., Guile and Young 2003). Van Schaik et al. (2010) postulate that different types of knowledge need to be embedded in learning environments, both in- and outside vocational schools, to enhance students' internalization of knowledge. There is also a lack of consistent guidance that explicitly accounts for students' integration processes in both learning environments (De Bruijn and Leeman 2011; Nelen et al. 2010). As a consequence, student learning in workplaces is often unguided (Achtenhagen and Grubb 2001).

To enable adequate guidance by vocational educators in both learning environments and to ensure knowledge-rich learning environments in both schools and workplaces, a fundamental starting point is sufficient insight into students' learning processes when they strive for integration of knowledge, skills and attitudes gained in both learning environments. In fact, how such learning processes take place during school-based learning and workplace learning remains vague. The main research question of this study is therefore: "What do students' learning processes look like when they strive to integrate knowledge, skills and attitudes in the school and the workplace?" This study aims to structure empirical insights into students' learning processes during the connection of school-based learning and workplace learning in vocational education.

## Methods

A review-study was conducted including four phases. First, general keywords for the selection of literature were formulated. These general keywords were: vocational education, learning processes, competence development, workplace learning, informal learning, situated learning and learning in practice. These general keywords were intended to capture students' learning in vocational education in both school and workplace. The review was primary focused on empirical insights in vocational education, which foremost comprises the fourth and fifth qualification level of the European Qualification Framework (European Commission 2008). This level of education was chosen because it aims to deliver students to the labor market as well as to prepare and stimulate students to continue their educational career in higher education.

Second, a number of key publications were thoroughly analyzed to elaborate the general keywords. Additionally, synonyms for the keywords were formulated (e.g., via thesaurus of the ERIC-website). This resulted in four main components of the literature search, namely: learning processes, learning environments, the system of vocational education and development of competences (see Table 1).

Third, literature was searched in two databases: ERIC and Psycinfo. The literature was first selected per component (e.g., workplace learning OR work-related learning OR work-based learning). The search terms per component were combined (using Boolean AND) to search for literature about learning processes (component 1) in both vocational schools and workplaces (component 2), in senior secondary vocational education (component 3), which aims for students' competence development specifically (component 4). Articles that focus on learning environments that include less than approximately 20% of learning either in schools

**Table 1** Search terms per main component

Component 1. Learning processes	Component 2. Learning environments
- Informal learning and formal learning	- Workplace learning or work-related learning
- Participation and acquisition	- Work-based learning and school-based learning
- Cognitive processes	- Situated learning
- Information processing strategies	- Apprenticeship
- Surface learning and deep learning	- Learning in practice
- Learning styles	- Authentic problems
- Learning activities	- Complex problems
- Learning strategies	- Simulation or simulated environment
- Intentional learning	
- Incidental learning	
- Observational learning	
Component 3. Vocational education	Component 4. Competence development
- Vocational education	- Transfer (i.e., into the workplace or into actions)
- Post-compulsory or postsecondary education	- Integration of different types of knowledge
- Dual system	- Conceptual understanding
- Competence or competency-based education	- Problem-solving ability
- Powerful learning environment	- Professional skills
- Project-based learning	- Knowledge development
- Vocational training centers	- Occupational identity
	- Job performance

or workplaces were excluded from the review. This study does not focus on students' learning processes in either vocational schools or in workplaces, or on short internships in professional organizations which aim to enhance students' general vocational orientation. The premise of such a narrow orientation is to include only the relevant insights that can contribute to our understanding of how students combine different types of knowledge, skills and attitudes acquired in both learning environments. These publications were all published between 1990 and 2010. This led to 82 and 130 hits respectively ( $n=212$  articles in total).

Fourth, a more specific selection was made by using three exclusion criteria: 1) studies that did not explicitly focus on empirical research or sound conceptualization of new models, 2) studies that only focused on the design of learning environments or on instruction and 3) studies that only focused on learning in workplaces or on human resource development in organizations. The titles and abstracts from articles that were derived from ERIC and Psycinfo were thoroughly analyzed for their relevance for the research aims. A relatively large amount of literature that was excluded from the review focused on the use and effects of specific tools (e.g., ICT-tools) in vocational education. These articles were excluded from the review because they were mainly preoccupied with the implementation of such tools instead of their effects on students' learning. The reference lists of the selected articles were checked for additional relevant articles that were not already included. This process of four phases resulted in 24 relevant articles.

## Results

The results depict six main themes that are relevant for students' learning processes when they strive to integrate knowledge, skills and attitudes learned in vocational schools and workplaces. These main themes are: students' expertise development, students' learning styles, students' integration of knowledge acquired in school and workplace, processes of knowledge development, students' motivations for learning and students' professional identity development. The 24 articles are clustered per theme in Table 2.

The findings for each of these six themes are described below. In the description of all themes, we explicitly focus on the question what the literature in this theme contributes to our understanding of students' learning processes when they strive to integrate what is learned in school and the workplace. Due to our selection criteria the descriptions of some themes are based on only two or three articles, so the results of the review need to be interpreted with some caution.

### Students' Expertise Development

Two studies on expertise development during were selected. Both studies show that experts possess an integrated knowledge base including comprehensive relations between context-specific applications. Boshuizen (2003) shows that students' reasoning in vocational schools differs from students' reasoning in workplaces, because theoretical notions and abstract models which are learned in vocational schools can be directly used to solve a problem. This is not true for problems students encounter in workplaces, since these problems are more complex, dynamic and situational in nature. As a consequence, the theoretical notions and abstract models which are learned in vocational schools cannot directly be used to solve such problems. Moreover, students need to combine different theoretical notions, abstract models and practical insights in order to be able to adequately solve these problems. However, students did not report deep or critical reflection cycles during periods of workplace learning. Boshuizen concludes that students "*may well come to*

**Table 2** Sources per main theme

Main theme	Sources
Students' expertise development	Boshuizen (2003) and Daley (1999).
Students' learning styles	Slaats et al. (1999), Stavenga de Jong et al. (2006).
Students' integration of knowledge acquired in schools and workplaces	Aarkrog (2005), Fuller and Unwin (2003), Furstenau (2003), Lindberg (2003), Nickolaus et al. (2007), Tynjälä (2008) and Van Woerkom (2004).
Students' knowledge development	Eraut (2003), Illeris (2004); Miettinen and Peisa (2002), Nonaka et al. (1994), Nonaka et al. (1995), Poortman (2007) and Raelin (1997) and Van Oers (1998).
Students' motivations for learning	Billett (1994), Hodgkinson et al. (2008), Rozendaal et al. (2003).
Students' professional identity development	Colley et al. (2003) and Schaap, De Bruijn, Van der Schaaf and Kirschner (2009).

*conclusions about the good and less optimal aspects of their behavior and problem solutions, but they then fail to draw conclusions on how these could be improved, never draw up concrete action plans for future situations or, if they do, don't implement these concrete plans"* (p. 23). Boshuizen shows also that students' learning in workplaces often starts with conceptualizing and relating new information to their prior knowledge. Students prefer learning in a formal way, because participation in the workplace is often overwhelming. Important prerequisites for script formation are that students have the possibility to perform in different situations and contexts and that they actively reflect on differences and similarities between those situations.

Daley (1999) aims to investigate actual learning processes that take place in reflective practice, when students learn in one setting and transfer that information to their work environment. She shows that novices and experts perform and prefer different learning processes in the workplace. For the purpose of this review, the learning processes experienced by novices are the most relevant, as students in vocational education can be regarded as novices in the workplace. At the start of the learning process, novice learners entering the workplace for the first time during their vocational education have little experience with real situations and must rely on the rules they have learned in their preparatory education to function. When they gain more experience with different real situations, they begin to differentiate situations into meaningful components. This leads to an integrated and validated knowledge base that enables further professional development. During knowledge construction students relate new knowledge to prior knowledge through which knowledge from different domains or disciplines becomes interrelated. Their learning of novices focuses on concept formation, which encompasses mainly assimilation of knowledge into existing and familiar knowledge structures. Solving complex problems or performing tasks in the workplace is still a process in which students take deliberate actions and in which they separate the problem solving process into small and conscious sets of actions. Learning for novices is an uncertain process, in which they try to seek for confirmation and support for their ideas, conceptions or beliefs by asking experts in the workplace, look things up and attend to formal education. For learning in vocational education, this shows how students try to connect workplace learning and school-based learning: the uncertainties encountered in the workplace lead to the experienced need to ask questions and consult theories in school. It also shows that learning in workplaces is often overwhelming for students, which is mainly due to the large amount and comprehensiveness of new information. As a consequence, students are often not able to profit from learning situations or contexts. Like Boshuizen (2003), Daley postulates that students in this phase prefer formal learning in school, because they perceive this as a safe environment in which information is offered in a relatively structured way.

### Students' Learning Styles

Two empirical studies on students' learning styles during school-based learning and workplace learning in vocational education were selected: Slaats et al. (1999) and Stavenga de Jong et al. (2006). These authors follow Vermunt (2005) in the definition of learning style, namely as a more-or-less consistent whole of personal

information processing strategies, regulation activities, learning conceptions and motivation.

First, Slaats et al. (1999) found that students in vocational education use three information processing strategies and two regulation strategies. The three types of information processing are surface strategies, deep strategies and application of knowledge. A surface strategy refers to reproducing or literally using information by writing or imitating vocational educators, while a deep strategy entails understanding of information by seeking similarities and differences between situations. Application of knowledge is actively applying knowledge as well as relating theory to practice and vice versa. The two regulation strategies are internal and external regulation. Internal regulation refers to students who guide their learning whereas external regulation refers to learning that is primarily guided and structured by learning environments. Slaats, Lodewijks and Van der Sanden show that most students use a reproductive learning style (34,8% of 1,036 students in total), which refers to a combination of surface learning and external regulation of learning processes. A constructive learning style is used by 26% of the students, meaning that they use a deep strategy, that they regulate their learning themselves and that they are highly motivated. 24,6% of the students use a versatile learning style, which implies that they are highly motivated and that they use a combination of different learning activities. Finally, 14,6% of the students use a passive learning style. These students do not use a clear learning style, do not have a clear picture of their learning and are not highly motivated. Apart from that, differences were found between students in different educational programs. The reproductive learning style is mostly used by students in educational programs that qualify for administrative and financially oriented vocations, whereas the constructive learning style is often used by students in educational programs that qualify for technical vocations. In educational programs qualifying for social vocations the versatile learning style is often used, while the passive learning style is predominantly used by students in programs qualifying for agricultural vocations. Slaats, Lodewijks and Van der Sanden state that it is difficult to explain those relationships, due to the question of causality: it is possible that a certain vocation (e.g., different cultures or shared knowledge, norms and values) affects students' learning styles, while it is simultaneously possible that students with a particular learning style automatically choosing a specific vocation. Slaats, Lodewijks and Van der Sanden conclude that: *"probably a part of the students' learning process stems from a personal, habitual way of learning and another part is influenced by the actual learning context students are confronted with"* (p. 490).

Second, Stavenga de Jong et al. (2006) confirm the results of Slaats et al. (1999) that students in vocational education mainly use constructive, reproductive and versatile learning styles. However, these results only account for learning in vocational schools. For learning in workplaces they found three other learning styles: learning by doing, guided learning and reflective learning. Of the 407 participants in total, 29% preferred learning by doing, meaning that the students immerse in the complexity of workplaces, but that they often do not reflect on their experiences or combine theory with practice. Most of the students, namely 43%, use guided learning as their dominant learning style. Guided learning implies that students barely regulate their learning and show average scores on reflection and conceptualization. Reflective learning is used by 28% of the students, referring to



learning processes in which high levels of reflection, experimentation and self-regulation are dominant. Stavenga-De Jong et al. conclude that there is a weak relation between learning styles used in vocational schools and in workplaces. The most prevalent relations are passive learning combined with learning by doing, constructive learning combined with reflective learning and reproductive learning combined with guided learning.

### Students' Integration of Knowledge Acquired in School and Workplace

Seven empirical studies on students' integration of knowledge acquired in vocational schools and workplaces were selected in our review. These empirical studies show that students' knowledge acquisition processes differ between vocational schools and workplaces. Aarkrog (2005) shows that students in workplaces learn mostly by legitimate peripheral participation. They observe and listen to experienced colleagues and imitate their behavior. They gradually get more responsibility in fulfilling different tasks. Students perceive what they have learned in school as relevant when it is formal, technical knowledge that they can directly apply in their work. For example, they perceive school-based practicing how to deal with customers as irrelevant as they can more easily learn this in practice. In the workplace, vocational educators experience difficulties linking practice to theory (e.g., explaining why students have to act in a particular way) due to the impossibility to pause the regular work for explanations. In fact, Aarkrog concludes that legitimate peripheral participation requires full participation in vocational schools and workplaces, because some knowledge and skills can best be learned in vocational schools (e.g., knowledge of specific products or theoretical models) while other knowledge and skills can be learned more effectively in workplaces (e.g., dealing with angry customers or a high workload).

Fuller and Unwin (2003) distinguish expansive learning from restrictive learning. Expansive learning refers to active participation in different communities of practice encountered in different workplaces, in which students continuously reflect on the integration of acquired knowledge in these situations. Restrictive learning refers to learning in a limited number of workplaces in which only a small amount of tasks can be fulfilled and where there is little time for reflection. Fuller and Unwin conclude that learning is not automatically triggered during the performance of tasks, and they advise to let students participate in many different work settings to stimulate reflection on the similarities and differences.

Van Woerkom (2004) distinguishes eight activities that can foster critical reflective work behavior in which implicit knowledge can be made explicit, namely: reflection, learning from mistakes, critical thinking, asking for feedback, experimenting, sharing knowledge, group thinking and career awareness. Some of these activities are more suitable in workplaces (e.g., learning from mistakes or experimenting), whereas other activities can be better supported by learning in vocational schools (e.g., reflection, critical thinking or career awareness). Van Woerkom concluded that explicating implicit knowledge is an important prerequisite for learning of experiences, for example encountered in the workplace. Without such explication, it is hard for students to change and subsequently to receive feedback on their implicit knowledge or on its development.



An example of such explication can be found in the work of Furstenu (2003), who shows that observing and interviewing professionals about their expert or practical knowledge and experiences seem to be useful for enhancing students' conceptualization. Furstenu concluded that learning in both vocational schools and workplaces foster students' conceptualization, because students are better able to relate abstract knowledge to practical applications in workplaces. However, professionals appear to experience difficulties in explicating and communicating their knowledge, due to its abstract and implicit nature. Furstenu concludes that a combination of school-based learning and workplace learning is better than learning in school alone, but that transferring abstract knowledge requires specific learning environments such as simulations.

Moreover, Nickolaus et al. (2007) point out that knowledge in workplaces is often offered in a fragmented and unsystematic way. They show that there are no differences between a self-regulated learning environment and a structured and student-centered learning environment with regard to students' declarative and procedural knowledge development, ability to solve problems and motivation. Weaker students seem to take advantage of a structured and student-centered approach.

Lindberg (2003) shows that school tasks, simulated tasks and vocational tasks can be used to reduce fragmentation as Nickolaus et al. (2007) showed. She postulates that students need to learn how to read and understand school-based texts (e.g., assignments) and work-based texts (e.g., manuals) in order to combine and use different pieces of information. Students need support and guidance to learn how to interpret information and how to integrate theoretical knowledge into vocational practices.

### Students' Processes of Knowledge Development

Eight models and mechanisms of students' knowledge development in vocational education are conceptualized in the selected literature. Illeris (2004) and Poortman (2007) distinguish four types of knowledge development, namely accumulation, assimilation, accommodation and expansion. Accumulation refers to the construction of new, relatively simple schemes or patterns, where assimilation is the process of combining new information within existing schemes. Accommodation means that students reconstruct or reorder their existing schemes, while expansion entails a radical change or shift in a professional identity. Expansion implies a change in a cognitive, affective and social way. These four types of knowledge development are based on the assumption that learning entails information that needs to be processed and structured into mental models. The main feature of this process is that the cognitive and affective effort employed by students gradually increases, ranging from relatively low mental effort during accumulation to high mental effort during the process of expansion. The extent to which new information 'fits' with prior knowledge mainly determines which internal acquisition processes occur. Poortman shows that, besides expansive processes, accumulation, assimilation and accommodation take place during workplace learning, but that assimilation most frequently occurs. However, such processes of knowledge development do not automatically lead to intended

learning outcomes. Moreover, they can sometimes evoke non-learning or resistance, mainly occurring when students experience a conflict between their prior knowledge and the learning environment (e.g., when theories are too difficult for students or do not fit with their prior knowledge).

Eraut (2003) distinguishes five phases of knowledge development, referring to progressive re-contextualization stressing the dynamic and continuous nature of transfer. Eraut distinguishes: 1) extracting information from contexts in which it is originally learned and used, 2) understanding of new situations by informal and social learning, 3) recognizing which knowledge and skills are relevant for particular situations, 4) transforming the selected knowledge and skills to these situations and 5) integrating knowledge and skills with other knowledge and skills that are needed there. It appears that the second phase is foremost tacit in nature, which makes it difficult for students to explicate and articulate their understanding. Eraut shows that extracting information from contexts (i.e., phase 1) and recognizing relevant knowledge and skills (i.e., phase 3) mainly take place in vocational schools. He also shows that in vocational schools as well as in workplaces minimal attention is paid to transforming and integrating knowledge.

Nonaka et al. (1995) and Nonaka et al. (1994) distinguish four phases of knowledge development, namely: socialization, externalization, combination and internalization. Socialization means that implicit or tacit knowledge are shared during for example internships or vocational tasks. Externalization refers to the process of explicating and articulating implicit knowledge, whereas combination means that explicit knowledge is transformed and allocated into for example documents or procedures. Internalization entails an affective process in which explicit knowledge is personalized into implicit knowledge, mainly by learning-by-doing. The interrelated phases together form a cyclic-iterative process, in which knowledge development takes place in and between all phases.

Miettinen and Peisa (2002) have found that direct contact with relevant others (e.g., representatives of organizations, specialized teams or directors) is epistemologically and motivationally essential for learning. They state that vocational schools should support and guide students in maintaining mutually beneficial relationships with relevant others in order to connect the content and methods of studying and learning.

Finally, Raelin (1997) describes a comparable model in which workplace learning is defined for both individual and collective learning. This model consists of conceptualization, experimentation, reflection and experiencing, in which theory and practice as well as explicit and implicit knowledge are combined. Conceptualization is relating explicit knowledge (e.g., models or procedures) with professional behavior. This relation is especially important for describing and analyzing professional behavior in workplaces. Experimentation refers to the application of theoretical knowledge in a way that it becomes contextualized and in which espoused theories and theories-in-use become integrated. Experiencing entails learning-by-doing in which shared knowledge and common values, norms and beliefs become internalized. Reflection refers to the ability to explicate implicit thoughts and to critically analyze one's own behavior. Raelin shows that all types of learning are needed for effective learning.

## Students' Motivations for Learning

Three studies were selected in this theme. The three studies all show that motivational aspects of learning are especially important for students in vocational education. Hodkinson et al. (2008) argue that learning in vocational education goes beyond assimilation or accommodation. They postulate that learning entails a social process in which expectations, endurance and power constellations determine how and what is learned. Low motivation and passivity are problematic for learning because they can decrease students' self-efficacy, while they can simultaneously increase resistance regarding learning (Billett 1994). Billett shows also that resistance against learning is caused by different perceptions of learning outcomes as well as by a lack of self-efficacy. Moreover, he postulates that these factors cause large differences in students' learning. Some students are highly motivated and enthusiastic, while other students are less motivated and passive to learn. Poortman shows that such resistance to learning can also occur when students do not perceive the learning content as relevant, while prior knowledge determines how emotionally committed a student is. When students know that they lack prior knowledge, they can transform this awareness into a high motivation to learn. Other students possess sufficient prior knowledge but fail to learn in workplaces, which is often due to uncertainty and shyness. Students in lower-level educational trajectories often show little motivation to learn in school, which is often caused by earlier negative learning experiences. Billett and Poortman both conclude that motivational aspects are important for learning in vocational schools and workplaces and that they can have strong positive and negative effects on learning.

Rozendaal et al. (2003) distinguish four indicators of motivation, namely: interest, persistence, test anxiety and performance anxiety. They show that students with test anxiety use superficial learning strategies, while students with interest and persistence use superficial as well as deeper learning strategies. However, Slaats et al. (1999) show that intrinsic motivation (i.e., interest in the subject matter, curiosity about the course content and learning as much as possible about it) and extrinsic motivation (i.e., receiving a degree and creating chances for oneself on the job market) are heavily interrelated and most of the times play no explicit role in students' learning in vocational education. They conclude that motivation in vocational education is more general in nature (e.g., motivation for a specific vocation), meaning that the triggers of motivation (i.e., intrinsic or extrinsic) are inferior to the extent to which the student is motivated to become a professional in a specific vocational domain. For example, receiving a diploma or certificate in vocational education, which students in higher education perceive as an extrinsic orientation, "*is by definition a vocation-oriented event, which would explain the two blending into one motivational orientation*" (p. 482/483).

## Students' Professional Identity Development

Two articles were selected in the review that each addresses professional identity during school-based learning and workplace learning in a different way. Both articles conceive students' professional identity development as an important goal of

vocational education. First, Colley et al. (2003) describe professional identity development as a process of anticipatory socialization, meaning that the development of a professional identity already starts before students enter the labor market. During anticipatory socialization students grow into the shared knowledge and collective values, norms and beliefs of a certain vocational community, while they simultaneously accept the limited possibilities of their education on the labor market. This interaction between socialization and the often limited possibilities refers to the development of a vocational habitus. Vocational habitus combines personal traits with collective routines that are determined by gender, ethnicity and social class. This means that students learn to participate in the culture of a certain vocational community, but that particular student's better suit in specific jobs, due to their gender, ethnicity, social class and experiences. Colley et al. postulate that students need to be guided in influencing their vocational habitus in a way that fits within their horizons of actions.

Second, Schaap, De Bruijn, Van der Schaaf and Kirschner (2009) refer to professional identity development as internalization and socialization of knowledge into a personal professional theory. A personal professional theory is a personal knowledge base that serves as a frame of reference in the process of internalizing professional knowledge and beliefs. It is postulated that the development of personal professional theories means growing into a specific vocational community, through the internalization of shared knowledge and collective norms, values and beliefs of professionals. Knowledge derived from participating in different contexts and situations within a certain vocational community becomes internalized in a personal professional theory. Learning is not conceived here as a passive, unconscious process, by which students become immersed in a vocational community and internalize and adopt the thinking and reasoning that is typical for that particular vocational community. Rather, learning is conceived as an active process, in which students participate in vocational communities and in which students work together to obtain meaningful knowledge development.

## Conclusions and Discussion

The aim of this review was to structure insights from recent literature on students' learning processes during the combination of school-based learning and workplace learning. The main research question was: "What do students' learning processes look like when they strive to integrate knowledge, skills and attitudes in the school and the workplace?" Six main themes were distinguished to answer this question, namely: students' expertise development, students' learning styles, students' integration of knowledge acquired in school and workplace, processes of knowledge development, students' motivations for learning and students' professional identity development during learning in vocational schools and workplaces. The results show that learning in vocational education comprises a continuous interplay between cognitive, affective and social processes. Inherent to this interplay between cognitive, affective and social learning processes is that students actively reflect on experiences as well as on their processes of becoming a professional or developing a professional identity.

It is concluded that students in vocational education are novices who have specific learning features and needs, which especially accounts for students' expertise development, students' learning styles and students' motivational processes. The results concerning expertise development and the integration of knowledge show that students' learning often starts with conceptualizing and relating new information to their prior knowledge. Students prefer learning in a formal way, because participation in the workplace is often overwhelming. Important prerequisites for script formation are that students have the possibility to perform in different situations and contexts and that they actively reflect on differences and similarities between those situations. Furthermore, the amount of background, experiences and accompanied prior knowledge differs between students, while prior knowledge heavily influences the way students learn (Schaap, Van der Schaaf and De Bruijn 2011a). Students in vocational education use different learning styles and these learning styles highly differ when students learn or participate in vocational schools or in workplaces. Learning styles also differ between vocational domains. It seems that students' learning styles in vocational education are relatively context-dependent and that specific situations or contexts determine to a great extent which learning style or which combination of learning styles is used. In this view, learning styles are more dynamic and situational in nature, meaning that one student can possess different learning styles which can be used in different situations (Vermunt 2005; Vermunt and Endedijk 2011). Research shows ambiguous results concerning the relation between motivational processes, students' learning processes and learning outcomes. Motivation in vocational education needs to be conceived in a general way, meaning that students need to be motivated to learn to become a professional. A distinction between intrinsic and extrinsic motivated seems to be less relevant for learning during integrated school-based learning and workplace learning. Students are motivated for obtaining general occupational commitment. This commitment enhances learning but students highly differ in the way how their motivation is related to their learning.

Generally, our results confirm that contradictions between learning and working influence students' learning processes, since these contradictions cause difficulties in combining students' experiencing with practicing or in combining acquisition and participation in vocational schools and workplaces (Sfard 1998). We take this general conclusion as a starting point for discussing the implications for the guidance provided by vocational educators and by discussing the organization and structure of vocational education. We will postulate that vocational educators' guidance needs to be adaptive and differentiated in nature, while students' integration of knowledge, skills and attitudes can be enhanced in hybrid learning environments in which different boundaries can be crossed.

First, in our view, students' learning processes during school-based learning and workplace learning in vocational education need to be enhanced in an adaptive and differentiated way. Adaptive means that learning environments need to take students' current level of thinking and working into account during the different phases of their educational career. Differentiated learning refers to learning processes that differ between vocational schools or in workplaces, between different workplaces or between different vocations. Schaap, Van der Schaaf and De Bruijn (2011b) found for example that students' personal knowledge development and reflective processes

highly differ between students in the domain of Information- and Communication Technology and Pedagogical Work. Adaptive guidance of vocational educators therefore seems an important prerequisite for enhancing students' learning. Adaptive guidance refers to flexible and differentiated learning environments in which students' needs and preferences are challenged and encouraged (De Bruijn and Leeman 2011). The amount of support, on task- and guiding level, can be adapted to students' current thinking level of the students (Vygotsky 1978). Vocational educators have an important role in for example revealing students' prior knowledge, in enhancing integration of different types of knowledge and in enhancing students' reflection, because the results of our review show that some learning activities, such as accommodation and expansive learning, are difficult to accomplish. Vocational educators can make students aware of similarities and differences between different tasks and situations (De Bruijn and Leeman 2011). They can ask critical and reflective questions to evoke students' reflection and ultimately transfer of knowledge, skills and attitudes, also known as prompting via specific reflective prompts. Prompts are verbal or written stimuli that foster students to justify their decisions in the learning process, in analogy to thinking-aloud protocols, for example when students were asked to type short reasons for each decision (Krause and Stark 2010). Krause and Stark (2010) show that when such prompts are combined with elaborated feedback, deeper levels of reflection facilitate learning, which is *"especially promising for students with little prior knowledge, low confidence or low motivation concerning the respective field"* (p. 269). Moreover, students' reflection is a prerequisite for accommodation and expansive learning (Illeris 2004). Vocational educators need to guide students' structuring and interpreting processes, by for example interfering into the learning process when students are confronted with new or complex concepts or notions, since our results show that that students need time to reflect on their prior knowledge, to integrate new information and to give meaning to it. It is important to structure and integrate theoretical insights, since students are often overwhelmed by the comprehensive amount of knowledge which they need to process and internalize into a personal knowledge base (Kirschner et al. 2006).

Second, this raises the question how vocational schools and workplaces need to be organized and structured to enhance students' cognitive, affective and social learning processes. To provide some suggestions for this organization, we elaborate two different theoretical notions, namely the notion of connectivity and boundary crossing via boundary objects. Connectivity not only entails the combination of formal versus informal learning (i.e., the connection of codified, formal and objective knowledge with tacit, implicit knowledge). It also emphasizes horizontal versus vertical learning, which is the connection between conceptual understanding of students and the extent to which students can transfer knowledge into different situations (Griffiths and Guile 2003; Wesselink et al. 2010). Griffiths and Guile stated that connectivity can be realized through four practices, namely thinking (e.g., explicating knowledge and beliefs, argumentation, negotiation of meaning), dialogic inquiry (e.g., collaborative learning, learning from experts, access to shared knowledge and common values, norms and beliefs), boundary crossing (e.g., participation in different contexts and situations in which knowledge is applied and developed) and resituating competences (e.g., progressive re-contextualization). An



example of a learning environment based on connectivity is a hybrid learning environment (Huisman, De Bruijn, Baartman, Zitter, and Aalsma 2010; Zitter, De Bruijn, Simons, and Ten Cate 2011). A hybrid learning environment is a specific and unique learning environment which combines relevant and effective components of vocational schools and workplaces. Unique refers here to own aims, responsibilities, targets, markets and thus learning possibilities, since there is no physical distinction between a vocational school (i.e., learning) and an organization (i.e., working). Explicit attention can be paid to new theoretical concepts and insights that students need to learn. For example, work processes can be slowed down temporally through which time for deliberate and consciousness thinking and acting is created. On such moments, practical problems can be related to theoretical insights and vice versa. Rush et al. (2011) postulate that such a learning environment provides a safe environment for learning, offers the ability to manipulate training opportunities and offers possibilities for vocational educators to give immediate feedback to students. Vocational educators in a hybrid learning environment are both experts in their profession (e.g., modelling) as well as coaches (e.g., stimulating reflection) who enhance boundary crossing of students through which poly-contextual and connective skills are developed (Huisman et al. 2010; Zitter et al. 2011). We expect that hybrid learning environments can be fruitful for students' learning processes, since our results suggest that learning in vocational schools and workplaces can be conscious and goal-directed, but also incidental, unplanned or unaware. Our results also suggest that some types of formal and more general knowledge and skills can be better learned in vocational schools while other more context specific knowledge and skills can best be learned in workplaces. It is hypothesized that in hybrid learning environments, students internalize different types of knowledge into an own personal professional knowledge base, because they can apply their knowledge directly in different situations and contexts, while vocational educators can enhance reflection in- and on action and immediate feedback can be achieved (Schaap, Van der Schaaf, and De Bruijn 2011a).

Seen from the second theoretical perspective, students' learning in vocational schools and professional workplaces implies that students need to connect and mobilize themselves across different social, cultural and physical practices when they learn in both school and workplaces. Vocational schools and workplaces are different learning environments. From an organizational point of view, Engeström et al. (1995) postulate therefore that students need to cross different boundaries, in which they overcome socio-cultural differences. Boundary crossing refers to "*a person's transitions and interactions across different sites, where boundary objects refer to artifacts doing the crossing by fulfilling a bridging function*" (Akkerman and Bakker 2011, p. 133). Alsup (2006) showed that student' teachers experience discontinuities when they need to learn in different learning environments, due to role and perspective changing. Akkerman and Bakker (2011) state that boundary crossing is a cognitive process that entails four specific learning mechanisms: identification, coordination, reflection and transformation. Identification entails unraveling different components of different learning environments and how different types of knowledge, skills and attitudes are related. Coordination entails the creation of cooperative and stable exchanges between vocational schools and workplaces. Reflection is a deeper learning mechanism, referring to students'



elaboration of their perspectives on both learning environments. Transformation is about collaboration and co-development of (new) practices. When crossing boundaries, students need to reflect on their performances to gain understanding of their formal and informal learning in different contexts. Baartman and De Bruijn (2011) postulate that students not only need to perform tasks in a direct or routine-based way, but that students also need to reflect during their performance. This is important for learning in both vocational schools and workplaces. Students therefore need to learn how to reflect critically and analytically on themselves during and after their performances, comparable to reflection-in-action and reflection-on-action (Schön 1983). Van Woerkom and Croon (2008) call this critical reflective work behavior, referring to professionals' ability to reflect on crucial activities to explain successes and errors in one's own behavior to plan and improve future actions. Artifacts such as portfolios (e.g., in teacher education see Mansvelder-Longayroux et al. 2007) or concrete products and designs, can serve as boundary object to overcome the boundaries between vocational schools and workplaces.

Concluding, the results of our review show that vocational schools and workplaces entail different types of knowledge, skills and attitudes and that some of them can be learned in schools, while others can be learning in workplaces. It is still unclear how students need to combine and integrate those different knowledge, skills and attitudes into a coherent set of professional competences, since few empirical evidence is available concerning the content of what needs to be learning and how such content needs to be offered and enhanced. There is also little empirical evidence is available concerning how vocational educators can enhance students' awareness of their learning styles in different learning environments and how students can consciously switch between learning styles. More research is needed to explore how students integrate different types of knowledge and how the development of professional skills and attitudes is related to this integration (Baartman and De Bruijn 2011). In our view this is remarkably, since learning can only be optimized when the relation between the 'how' and the 'what' is thoroughly investigated. Further research is needed to pinpoint what and how students actually learn during learning in for example hybrid learning environments, which boundaries they need to cross and how boundary objects become meaningful for both vocational educators and students.

**Open Access** This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

## References

- Aarkrog, V. (2005). Learning in the workplace and the significance of school-based education: A study of learning in a Danish vocational education and training programme. *International Journal of Lifelong Education*, 24, 137–147.
- Achtenhagen, F., & Grubb, N. W. (2001). Vocational and occupational education: Pedagogical complexity, institutional diversity. In V. Richardson (Ed.), *Handbook of research on teaching* (pp. 604–639). Washington: American Educational Research Association.

- Akkerman, S. F., & Bakker, A. (2011). Boundary crossing and boundary objects. *Review of Educational Research, 81*, 132–169.
- Alsup, J. (2006). *Teacher identity discourses. Negotiating personal and professional spaces*. Mahwah: Erlbaum.
- Baartman, L. K. J., & De Bruijn, E. (2011). Integrating knowledge, skills and attitudes: Conceptualizing learning processes towards vocational competence. *Educational Research Review, 6*, 125–134.
- Billett, S. (1994). Situated learning—a workplace experience. *Australian Journal of Adult & Vocational Education, 34*, 112–130.
- Boshuizen, H. P. A. (2003). *Expertise development: The transition between school and work*. Inaugural address. Heerlen: Open Universiteit Nederland, The Netherlands.
- Colley, H., James, D., Tedder, M., & Diment, K. (2003). Learning as becoming in vocational education and training: Class, gender and the role of vocational habitus. *Journal of Vocational Education & Training, 55*, 471–498.
- Commission, E. (2008). *The European qualifications framework for lifelong learning*. Luxembourg: Office for Official Publications of the European Communities.
- Daley, B. J. (1999). Novice to expert: An exploration of how professional learn. *Adult Education Quarterly, 49*, 133–147.
- De Bruijn, E., & Leeman, Y. (2011). Authentic and self-directed learning in vocational education: Challenges to vocational educators. *Teaching and Teacher Education, 27*, 694–702.
- Engeström, Y., Engeström, R., & Kärkkäinen, M. (1995). Polycontextuality and boundary crossing in expert cognition: Learning and problem solving in complex work activities. *Learning and Instruction, 5*, 319–336.
- Eraut, M. (2003, January). *Transfer of knowledge between education and the workplace*. Paper presented at the in inaugural address of H. P. A. Boshuizen. Heerlen: Open Universiteit Nederland, The Netherlands.
- Eraut, M. (2004). Informal learning in the workplace. *Studies in Continuing Education, 26*, 173–247.
- Fuller, A., & Unwin, L. (2003). Learning as apprentices in the contemporary UK workplace: Creating and managing expansive and restrictive participation. *Journal of Education and Work, 16*, 407–426.
- Furstenau, B. (2003). Exploration of an industrial enterprise as a method of boundary-crossing in vocational education. In T. Tuomi-Gröhn & Y. Engeström (Eds.), *Between school and work: New perspectives on transfer and boundary crossing* (pp. 85–118). Amsterdam: Pergamon.
- Geijsel, F., & Meijers, F. (2005). Identity learning: The core process of educational change. *Educational Studies, 31*, 419–430.
- Griffiths, T., & Guile, D. (2003). A connective model of learning: The implications for work process knowledge. *European Educational Research Journal, 2*, 56–74.
- Guile, D., & Young, M. (2003). Transfer and transition in vocational education: Some theoretical perspectives. In T. Tuomi-Gröhn & Y. Engeström (Eds.), *School and work: New perspectives on transfer and boundary-crossing* (pp. 63–81). Amsterdam: Pergamon.
- Gulikers, J. T. M., Bastiaens, T. J., Kirschner, P. A., & Kester, L. (2008). Authenticity is in the eye of the beholder: Student and teacher perceptions of assessment. *Journal of Vocational Education and Training, 60*, 401–412.
- Hager, P. (1998). Understanding workplace learning: General perspectives. In D. Boud (Ed.), *Current issues and new agendas in workplace learning* (pp. 31–46). Springfield: Adelaide, National Centre for Vocational Education Research.
- Hodkinson, P., Biesta, G., & James, D. (2008). Understanding learning culturally: Overcoming the dualism between social and individual views of learning. *Vocations and Learning, 1*, 27–47.
- Huisman, J., De Bruijn, E., Baartman, L. K. J., Zitter, I. I., & Aalsma, E. (2010). *Leren in hybride leeromgevingen in het beroepsopleidings*. [Learning in hybrid learning environments in vocational education]. 's Hertogenbosch: ECBO.
- Illeris, K. (2004). Transformative learning in the perspective of a comprehensive learning theory. *Journal of Transformative Education, 2*, 79–89.
- Kicken, W., Brand-Gruwel, S., & Van Merriënboer, J. J. G. (2008). Scaffolding advice on task selection: A safe path toward self-directed learning in on-demand education. *Journal of Vocational Education and Training, 60*, 223–239.
- Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experimental, and inquiry-based teaching. *Educational Psychologist, 41*, 75–86.
- Krause, U. M., & Stark, R. (2010). Reflection in example- and problem-based learning: Effects of reflection prompts, feedback and cooperative learning. *Evaluation & Research in Education, 23*, 255–272.

- Lindberg, V. (2003). Learning practices in vocational education. *Scandinavian Journal of Educational Research*, 47, 157–179.
- Mansvelder-Longayroux, D. D., Beijaard, D., & Verloop, N. (2007). The portfolio as a tool for stimulating reflection by student teachers. *Teaching and Teacher Education*, 23, 47–62.
- Marsick, V. J., & Watkins, K. E. (1990). *Informal and incidental learning in the workplace*. London: Routledge.
- Miettinen, R., & Peisa, S. (2002). Integrating school-based learning with the study of change in working life. *The alternative enterprise method. Journal of Education and Work*, 13, 309–319.
- Nelen, A., Poortman, C. L., De Grip, A., Nieuwenhuis, L., & Kirschner, P. A. (2010). *Het rendement van combinaties van leren en werken. Een review studie uitgevoerd op verzoek van de PROO-NWO. [Effects of combinations of learning and working. A review study conducted as initiative from PROO-NWO]*. The Netherlands: Twente University.
- Nickolaus, R., Knoll, B., & Gschwendtner, T. (2007). Innovations in vocational education and difficulties in their empirical substantiation. *European Journal of Vocational Training*, 40, 22–37.
- Nonaka, I., Byosi re, P., Borucki, C. C., & Konno, N. (1994). Organizational knowledge creation theory: A first comprehensive test. *International Business Review*, 3, 337–351.
- Nonaka, I., Toyama, R., & Byosi re, P. (1995). A theory of organizational knowledge creation theory: Understanding the dynamic process of creating knowledge. In M. Dierkes, A. B. Antal, C. Child, & I. Nonaka (Eds.), *Handbook of organizational learning and knowledge* (pp. 491–517). Oxford: Oxford University Press.
- OECD. (2009). *Learning for jobs. OECD policy review of vocational education and training. Initial report*. Paris: CERI.
- Poortman, C. L. (2007). *Workplace learning in senior secondary vocational education*. (Unpublished doctoral dissertation). Dissertation. Twente University: The Netherlands.
- Raelin, J. A. (1997). A model of work-based learning. *Organization Science*, 8, 563–578.
- Rauner, F. (2007). Practical knowledge and occupational competence. *European Journal of Vocational Education and Training*, 40, 52–66.
- Resnick, L. B. (1987). Learning in school and out. *Educational Researcher*, 16, 13–20.
- Rozendaal, J. S., Minnaert, A., & Boekaerts, M. (2003). Motivation and self-regulated learning in secondary vocational education: Information-processing type and gender differences. *Learning and Individual Differences*, 13, 273–289.
- Rush, S., Acton, L., Tolley, K., Marks-Maran, D., & Burke, L. (2011). Using simulation in a vocational programme: Does the method support the theory? *Journal of Vocational Education and Training*, 62, 467–479.
- Schaap, H., De Bruijn, E., Van der Schaaf, M. F., & Kirschner, P. A. (2009). Students' personal professional theories in competence-based vocational education: the construction of personal knowledge through internalisation and socialisation. *Journal of Vocational Education and Training*, 61, 481–494.
- Schaap, H., Van der Schaaf, M. F., & De Bruijn, E. (2011a). Development of students' personal professional theories in senior secondary vocational education. *Evaluation & Research in Education*, 24, 81–103.
- Schaap, H., Van der Schaaf, M. F., & De Bruijn, E. (2011b, September). *Stimulating the development of students' personal professional theories through contingent modeling*. Paper presented at the European Conference of Educational Research (ECER), Berlin, Germany.
- Sch n, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.
- Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher*, 27, 4–13.
- Slaats, A., Lodewijks, H. G. L. C., & Van der Sanden, J. M. M. (1999). Learning styles in secondary vocational education: Disciplinary differences. *Learning and Instruction*, 9, 475–492.
- Stavenga de Jong, J. A., Wierstra, R. F. A., & Hermanussen, J. (2006). An exploration of the relationship between academic and experiential learning approached in vocational education. *British Journal of Educational Psychology*, 76, 155–169.
- Tynj l , P. (2008). Perspectives into learning at the workplace. *Educational Research Review*, 3, 130–154.
- Van Merri nboer, J. J. G., & Kirschner, P. A. (2007). *Ten steps to complex learning. A systematic approach to four-component instructional design*. New Jersey: Lawrence Erlbaum Associates Publishers.
- Van Oers, B. (1998). From context to contextualising. *Learning and Instruction*, 8, 473–488.
- Van Schaik, M., Van Oers, B., & Terwel, J. (2010). Learning in the school workplace: Knowledge acquisition and modeling in preparatory vocational secondary education. *Journal of Vocational Education and Training*, 62, 163–181.

- Van Woerkom, M. (2004). Kritisch reflectief werkgedrag: De verbinding tussen individueel leren en organisatielernen. [Critical reflective work behavior: The connection between individual learning and organizational learning]. *Tijdschrift voor HRM*, 7, 67–82.
- Van Woerkom, M., & Croon, M. (2008). Operationalising critically reflective work behaviour. *Personnel Review*, 37, 317–331.
- Vermunt, J. D. (2005). Relations between student learning patterns and personal and contextual factors and academic performance. *Higher Education*, 49, 205–234.
- Vermunt, J. D., & Endedijk, M. D. (2011). Patterns in teacher learning in different phases of the professional career. *Learning and Individual Differences*, 21, 294–302.
- Vygotsky, L. S. (1978). *Mind in society*. Cambridge: Harvard University Press.
- Wesselink, R., De Jong, C., & Biemans, H. J. A. (2010). Aspects of competence-based education as footholds to improve the connectivity between learning in school and in the workplace. *Vocations and Learning*, 3, 19–38.
- Zitter, I., de Bruijn, E., Simons, R. J., & Ten Cate, O. (2011). Adding a design perspective to study learning environments in higher professional education. *Higher Education*, 61, 371–386.

**Dr. Harmen Schaap** is assistant professor at the Faculty of Social and Behavioral Sciences, Utrecht University, The Netherlands. He also works as researcher at Utrecht University of Applied Sciences, also in The Netherlands. He recently finished his dissertation on students' personal knowledge development in vocational education. He currently works on research towards teacher' learning and professional development.

**Dr. Liesbeth Baartman** is researcher at Utrecht University of Applied Sciences, The Netherlands. She specializes in students' learning processes and accompanying learning environments in vocational education, and the quality of assessment in vocational education.

**Prof. dr. Elly de Bruijn** is a specialist in research on teaching and learning processes in the context of vocational education. Design research on innovative teaching practices and accompanying questions on student results and teacher professionalism are her special interests. She holds a professorship at both HU University of Applied Sciences and Utrecht University, Utrecht, The Netherlands.