Toward Self-Regulated Learning in Vocational Education:
Difficulties and Opportunities

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Chapter 1
General introduction

Three vocational teachers, John, Harry and Sue, are sitting together having lunch. "I am getting too old for this job," moans Harry. "What's this all about, Harry?" asks Sue. "I feel totally exhausted after the workplace simulation with 40 kids all around me. You must be a jack-of-all-trades to manage everything. Independent and self-directed learning in vocational education? You must be kidding me." John looks surprised. "Come on, Harry, do you really think like that?" Harry nods "Yes, sometimes I do. You know I like the idea, but planning something behind the desk and realising it in practice are two different things." "I see what you mean," says Sue, "but don't you think that we have already accomplished a lot?" "I agree with you, Sue," adds John, "but we are not yet there. We need to improve continuously to optimise students' learning."

Education is constantly on the move to keep up with and anticipate to current developments in the labour market. During the 1990s policy makers in The Netherlands rethought the aims of modern education. What came to the fore was that students should become flexible and adaptive employees. This requires that students are well trained and acquire knowledge, skills, and competencies that enable them to work in globalised environments and take opportunities for lifelong learning (COLO, 2010; Education Council, 1998; Ministry of Education, Sciences, & Cultural Affairs, 2004). To prepare students adequately for the future, different educational innovations (e.g., pre-vocational secondary education, competency-based education) were initiated intended to improve the educational quality and to satisfy societal and economical needs.

Pre-vocational education exists since 1999; it is a branch of secondary education and the first stage of theoretical and practical training that prepares young people (12 – 16 years old) for advanced training in a profession. In an effort to offer students in vocational education a more attractive, inspiring and challenging learning environment that facilitates the transfer between school and future labour market, workplace simulations were introduced. Workplace simulations (WPS) are authentic learning environments at school, in which students practice realistic tasks to develop generic and domain-specific vocational competencies. The idea is that students work independently and self-direct their learning (Teurlings & Van der Sanden 1999; Vrieze, Van Kuijk, & Van Kessel 2001).

However, since the beginning pre-vocational secondary education has a bad imago and came under fire. Regularly, newspaper articles are published with headings like 'Alarming level of knowledge in vocational education' (NRC, 29.06.2006), 'Teachers would like to abolish the "cistern" of pre-vocational secondary education' (Trouw, 12.03.2007), and 'Vocational education needs standards' (Trouw, 13.10.2010). Although the innovation aimed at the better, it became clear that bringing an idea to practice is a challenging endeavour, various obstacles can block the innovative enthusiasm and alternative routes are taken that sometimes might end up in a blind alley. The example in the beginning of John, Harry, and Sue shows that teachers can face difficulties when trying to translate an innovation to educational practice. Therefore, it is important to investigate how an innovation is implemented in practice and what needs further improvement to realise the initial ideas and to optimise student learning.

What does independent and self-directed learning in WPS exactly mean and how well prepared and supported are vocational students to work independently and to self-direct their learning? Is it a feasible goal? Like Harry, there are probably many who have doubts, and research has shown that vocational students face difficulties when they should direct and regulate their learning (Kicken, Brand-Gruwel, Van Merriënboer, & Slot, 2009). Being aware of one's own processes and being able to regulate and direct one's learning are complex skills. Acquiring these

skills does not happen automatically but needs training, instructional support, and feedback of the teacher (e.g., Hattie & Timperley, 2007; Van den Boom, Paas, Van Merriënboer, & Van Gog, 2004; Winne & Butler, 1994; Zimmerman, Bonner, & Kovach, 1996). Therefore, it is utmost important that vocational teachers like Harry, John, and Sue know how they can contribute and support students in this learning process.

Learning in WPS forms the focus point of this thesis. The main aim is to gain understanding in the kind of difficulties and success factors students and teachers experience in WPS, identify and explore self-regulated actions, and to seek ways to support students' self-regulated learning skills in the instructional design of the learning environment and feedback given by teachers.

Overview of the dissertation

Chapter 2 introduces the theoretical framework for the empirical studies. The central aim of the first study was to develop an understanding of self-directed and self-regulated learning, the design of the learning environment, and the role of the teacher and to explore how these factors can shed light on workplace simulation learning in vocational education. As student learning takes place in an environment, in which students and teachers interact with each other, all three factors need to be taken into account to optimise learning. Based on a theoretical analysis and synthesis, characteristics of each factor that can influence good functioning in workplace simulations and foster students' learning are put forward resulting in a theoretical model of requirements.

Chapter 3 and Chapter 4 describe exploratory case studies. The aim of the study presented in Chapter 3 was to explore students' perceptions with regard to learning and working in workplace simulations as well as their preparedness to work and learn in a self-directing way. Forty students in pre-vocational secondary education participated. It was investigated what factors they perceive to be relevant for successful learning in workplace simulations with regard to the design of the learning environment, the student characteristics, and the role of the teacher. The study reported in Chapter 4 investigates the perceptions of twenty teachers. They play a crucial role in translating the innovation to educational practice and therefore teachers' points of view with regard to the design of the learning environment and the student and teacher characteristics relevant for successful learning in workplace simulations were examined.

Chapter 5 presents a multiple case study, in which self-regulated learning activities of eighteen well-performing students in upper secondary vocational education were investigated. The aim was to unravel self-regulated learning behaviours in workplace simulations and to discover micro processes of planning,

monitoring, and evaluating. In this observational and in-depth interview study, information was collected on the approaches students use while working on an authentic learning task, how they deal with problems and mistakes, and how they interact with peers and the teacher.

In Chapter 6, an educational design study is described. The aim was to investigate how students' self-regulated learning in pre-vocational secondary education can be improved by redesigning learning tasks and optimise feedback. Three teachers and 66 students participated. The study consisted of two design cycles: redesign of learning tasks and optimising teacher feedback. First, learning tasks were redesigned together with teachers to be more authentic and challenging, and in each task a clear goal, a planning, transparent assessment and performance criteria, and a reflection assignment were added to trigger self-regulated learning. In the second cycle feedback giving was attended. Teachers were instructed to give feedback on a process and self-regulation level to reduce the discrepancy between current understanding and performance of students, and to promote their self-regulated learning.

The final chapter of this dissertation contains the general discussion of the main findings. Theoretical and practical implications are considered and directions for future research will be described.

The chapters of this dissertation were written as independent articles; as a consequence, there is some overlap between them.

Chapter 2

The challenge of self-directed and self-regulated learning in vocational education: a theoretical analysis and synthesis of requirements[*]

Workplace simulations (WPS), authentic learning environments at school, are increasingly used in vocational education. This article provides a theoretical analysis and synthesis of requirements considering learner skills, characteristics of the learning environment and the role of the teacher that influence good functioning in WPS and foster students' learning. WPS appeal to students' self-directed learning (SDL) and self-regulated learning (SRL) skills, as students are required to work and learn independently in these settings. To achieve individual learning, the environments should be adaptive to the learners' needs. Furthermore, the teachers should support learners to become competent in the domain but also guide them to become self-directed learners. To do so the interaction between the student, the teacher and the environment is of importance. The proposed model depicts the different elements and their relations.

It is a pedagogical necessity to develop employees that are qualified and adapted to the needs of the workplace (Achtenhagen & Oldenbürger, 1996). However, the business community expressed little satisfaction concerning the quality and adaptation of knowledge, skills, and performance of young employees and postulated that school and work were not sufficiently linked to one another (Gruber, Harteis, & Rehrl, 2008; Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004; Van Zolingen, 2002). In The Netherlands, this situation was recognised in the beginning of the 1990s and has led to an extensive debate.

Policy development was given a boost and the Education Council and the Ministry of Education, Sciences and Cultural Affairs in The Netherlands introduced a national action plan, in which vocational competencies, learning competencies, and career and citizenship competencies got a central role in vocational education (Education Council, 1998). Furthermore, technological, economic, and social developments force the educational system to adapt continuously to new contents and requirements. The ministry saw competence-based education as a solution to both problems, that is, to reduce the gap between the dynamic labor market and education and to stimulate lifelong learning (Ministry of Education, Sciences, & Cultural Affairs, 2004). This trend toward competence-based education is also seen in the USA (US Department of Education, National Center for Educational Statistics 2002) and in various countries in Europe (Descy & Tessaring, 2001).

In The Netherlands, vocational educational programs had to be competence-based since the first of August 2010. As a consequence, the traditional out-of-context practical and theoretical lessons are more and more replaced by internships and workplace simulations (WPS). WPS are authentic learning environments at school, which should attract, inspire, and challenge students to acquire knowledge, (learning) skills, and attitudes relevant for a vocational profession. The idea is that students work independently and self-direct their learning (Teurlings & Van der Sanden 1999; Vrieze, Van Kuijk, & Van Kessel, 2001). Students are on average 14 years old when they start working in WPS in pre-vocational secondary education and they continue in upper secondary vocational education. Depending on the professional track, students are aged between 18 and 20 when they finish upper secondary vocational education.

Many vocational schools have implemented WPS, but the execution varies considerably as the pedagogical concept and approach is not yet sufficiently worked out. And while the innovations have a direct impact on teachers and students, the problems they might face in accomplishing their new tasks and roles have not been considered sufficiently in advance. This lack of knowledge bears the risk that the innovation is doomed to fail before the necessary pedagogical knowledge can be developed.

Difficulties arise when WPS do not function optimally. Teachers have the responsibility to adapt their teaching and acting rather autonomously (Ministry of

Education, Sciences, and Culture Affairs, 2004), but a lack of deeper insights into workplace simulation learning may lead to educational solutions that do not fit the new formats, as these solutions are rooted in beliefs, experiences and in a teaching skills repertoire developed in traditional environments. This problem, for instance, appeared very persistent in the context of a curriculum innovation in medicine (Dornan, Scherpbier, King, & Boshuizen, 2005; Dornan, Hadfield, Brown, Boshuizen, & Scherpbier, 2005). For vocational students, the implementation of WPS means that they are required to work independently; yet research has pointed out that especially students in vocational education face difficulties as they do not know what to do or have preferences for specific activities at the cost of key activities (Beckers, Jacobs, & Kerkhoffs, 2005; Rozema, Sniekers, Meijs, Van Son, & Kerkhoffs, 2004). Thus, it became clear that the policy developments introduced new problems in vocational education that require a solution. We propose that a solution needs to take into account characteristics of the learning environment, the teacher, and the student and should identify requirements to learn and work effectively in WPS. Research in other fields identified self-directed learning (SDL) and self-regulated learning (SRL) as key skills to keep on learning and to achieve high-quality performance (e.g., Knowles, 1975; Van de Wiel, Szegedi, & Weggeman, 2004; Zimmerman, 2006). These skills also seem relevant for students to engage actively in WPS learning to cope with individual independence and task demands (cf. Van Grinsven & Tillema, 2006). To foster the development of SDL and SRL skills in WPS, the learning environment and the guidance of the teacher play an important role and need to be designed accordingly, but so far not much is known about how the teacher can best support the development of these skills in vocational education. Previous empirical research on SRL and SDL has focused primarily on academic learning, but it appears important to explore the concepts also in the context of vocational education to help improve learning from practical experience and engage students in processes that are desirable in occupational settings (cf. Biemans et al. 2004; Kuipers & Meijers, 2009).

The central aim of the present study is to develop an understanding of SDL and SRL, the design of the learning environment, and the role of the teacher, and explore how these factors can shed light on WPS learning. A theoretical model of requirements is developed that identifies success factors related to learning in WPS. More specifically, we want to answer the following question: Which characteristics of the student, the learning environment, and the teacher influence good functioning in WPS and foster students' learning? To optimise student learning, it seems important to look further than the influence of isolated factors or the sum of parts. Student learning takes place in a social environment, in which students and teachers interact with each other in a learning environment.

First, we describe the role of SDL (a concept prevalent in adult education) and SRL (a concept prevalent in educational psychology) and their relationship to

determine the characteristics of skilful learners in WPS. Then, we focus on the design of the learning environment, the role of the teacher, and the interaction between the student and the teacher in the learning environment to develop new and effective teaching–learning processes in the direction of SDL within vocational education. These theoretical elaborations result in a model to foster successful learning in WPS in vocational education. Throughout the article, three personas – that is, constructed practical examples based on observations in a professional cooking training – are provided to illustrate studying behaviours, the design characteristics of the learning environment, and the role of the teacher. These personas, Lisa, Mike, and Kevin are used to enhance reality and show how a learner in vocational education might look like (Grudin, 2006).

Skills for Learning in Workplace Simulations

WPS put emphasis on independent learning. What and how students learn seems to depend on their own ability to create learning opportunities independently and actively. They should be able to identify and formulate their learning needs. Moreover, insight into their own learning processes is essential to plan, monitor, and evaluate their task performance, to choose an appropriate learning path and to focus on performance aspects that need improvement (Kicken, Brand-Gruwel, & Van Merriënboer, 2008; Ericsson, 2006). These processes are related to the concepts of SDL and SRL.

At first sight, SDL and SRL seem highly similar. The concepts are difficult to distinguish, as terminology is often used interchangeably or in a similar way in the literature (Bolhuis, 2003; Boekaerts & Corno, 2005; Dinsmore, Alexander, & Loughlin, 2008; Schreiber, 1998). The theoretical background and empirical methods, however, differ respectively (Schreiber, 1998) and we believe that the concepts should not simply be used synonymously. We propose a coherent perspective and link SDL and SRL, which has practical implications for vocational education. From our point of view, vocational students can and should acquire SDL and SRL skills to work and learn effectively in WPS and in future occupations, but we ascribe these skills to different levels. We suggest that SDL is situated at the macro level and basically refers to the planning of the learning trajectory, while SRL concerns the micro level that deals with the execution of a task. In the following subsections, we review previous research to develop an understanding of the concepts by describing them on a macro and micro level and explore how they can shed light on WPS learning.

Self-Directed Learning: The Macro Level

Knowles described *self-directed learning* as 'a process in which individuals take initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes' (Knowles, 1975, p. 18). Although the concept of SDL was introduced in adult education, Knowles pointed out that SDL does not exclusively apply to adults. Leith (2002), for instance, indicated that once a person starts seeing herself or himself as an adult, she/he has an expectation of being independent in decision-making. When students see themselves as adults who are responsible for their own future, they are more motivated and self-directed.

Knowles' definition of SDL is cited frequently but the concept is fraught with confusion. Both Candy (1991) and Brockett and Hiemstra (1991) stated that a clear distinction between SDL as an instructional process and SDL as a personality construct was needed. Brockett and Hiemstra developed a conceptual framework for understanding self-directed learning, called PRO – personality responsibility orientation – in which they differentiate between personal responsibility, self-directed learning, learner self-direction, and self-direction in learning. The idea was to cover the breadth of the construct within a single framework that includes personality characteristics and instructional method. In this framework *personal responsibility* is seen as a starting point and refers to the fact that individuals need to be owners of their thoughts and actions and they should have – or be willing to take – control over how to respond to a situation without ignoring the social context. The freedom of making choices, however, also indicates that learners need to be able to make good choices during their learning process (Brockett, 2006), and they have to be responsible for the consequences of their thoughts and actions. Personal responsibility is closely related to autonomy. *Self-directed learning* refers to an instructional method, which stresses a process orientation that focuses on the activities of planning, implementing, and evaluating learning. A close link between teaching and learning is required. This perspective was the point of departure of Knowles in 1975; however, understanding the personal characteristics of successful self-directed learners was stressed as well. *Learner self-direction* in the PRO model refers to this personal aspect of the learner, the personal characteristics an individual needs to possess to take primary responsibility for personal learning accomplishments (such as intellectual development, self-concept or creativity) (Brockett & Hiemstra, 1991). A proactive personality was also found to be highly predictive for self-directed learning (Raemdonck, 2006). According to Brockett and Hiemstra the vital link is *self-direction in learning*, which refers to both the external characteristics of an instructional process and the internal characteristics of the learner. These authors assume that there is a strong connection between self-directed learning and learner self-direction. External and internal characteristics

should match, so that the teaching–learning situation fits the needs and desires of the learner and the social context in which learning takes place (Brockett & Hiemstra, 1991). The external conditions of the learning environment, which we discuss in more details later, play an important role in allowing self-directed learning, as learners seem to need the freedom to choose their learning activities.

Different authors have described characteristics of a skilful self-directed learner, like initiative, intentions, choices, freedom, energy, responsibility (Tough in Levett-Jones, 2005), the ability to learn on one's own, personal responsibility for the internal cognitive and motivational aspects of learning (Garrison, 1997), independence, autonomy, and the ability to control own affairs (Candy, 1991). These descriptions highlight a key aspect of SDL, namely that the learner determines planning and execution of her/his learning trajectory on the long term. A learning trajectory in WPS includes several tasks that are selected by the students themselves.

From our point of view, self-directed learning is therefore situated at the macro level, which means that it concerns a learning trajectory as a whole; a self-directed learner is able to decide what needs to be learned next and how one's learning is best accomplished. A skilful self-directed learner is able to diagnose learning needs, formulate learning goals, identify and choose human and material resources for learning (cf. Knowles, 1975; Kicken, Brand-Gruwel, & Van Merriënboer, 2008). This indicates that a self-directed learner is able, ready and willing to prepare, execute, and complete learning independently (Van Hout-Wolters, Simons, & Volet, 2000). To illustrate this for WPS consider the following persona, Lisa.

Lisa is enrolled in a professional cooking training. She likes cooking a lot and in addition to cooking at school, she also prepares dinner regularly at home. So far, she sticks to the recipes in cookbooks and she is able to prepare the dish according to the recipe. But she feels that cooking is more than just following a recipe; it is a creative task that requires a lot of knowledge. She realises that she needs to learn more about menu principles and decides that she wants to focus on the composition of a menu taking into consideration various international influences. Lisa thinks that she has made a good decision for improving her cooking competencies without neglecting the training of the basic skills. Lisa asks the teacher about the possibilities and informs about useful reading material.

The example of Lisa shows that she takes the initiative to think about her learning needs and learning goals in order to improve her cooking competencies. To accomplish her learning goal, she needs to consider her learning trajectory, which includes a variety of tasks. Along the road, she will diagnose new learning needs and formulate new learning goals to determine the direction of her learning trajectory. This is

a complex and difficult process, and it is a misconception to believe that learners are automatically self-directed. One might even argue that it is not always necessary to be self-directed to become a successful learner (Brockett & Hiemstra, 1991). But if the goal of vocational education is to achieve self-direction in learning and give learners more freedom to choose their learning activities to suit individual needs (and we believe it is), then learners should learn to self-direct. We propose that a first step in learning to self-direct one's learning is the skill to self-regulate learning activities and task performances, because the quality of performed tasks and activities will be input for future learning.

Self-Regulated Learning: The Micro Level

SRL in educational psychology can provide a valuable contribution to our understanding of the underlying learning processes of SDL important in WPS. While SDL is situated at the macro level, we propose that SRL is the micro level, which concerns processes within task execution. We agree with Loyens and others (Loyens, Magda, & Rikers, 2008) that SDL includes SRL, but that the opposite does not hold. In other words, a self-directed learner is supposed to also self-regulate, but a self-regulated learner does not have to self-direct at all. From this point of view, SRL deals more with subsequent steps in the learning process (Loyens et al., 2008). However, providing students with opportunities for self-directed practice can help to improve their self-regulation. Students need to have opportunities (e.g., during homework or studying) to rehearse and practice in order to routinise their skills (Zimmerman, 1998; Schunk, 2004).

A variety of perspectives on SRL exist and researchers with different foci attempt to model how cognitive, meta-cognitive, motivational, and contextual factors influence the learning process (e.g., Boekaerts, 1997; Pintrich, 2003; Zimmerman, 2002). According to Zimmerman (1989, p. 329), 'students can be described as self-regulated to the degree that they are meta-cognitively, motivationally, and behaviourally active participants in their own learning process'. This definition is based on social cognitive theory. Within this perspective, human learning occurs in a social environment and is determined by the reciprocal interactions among personal, behavioural, and environmental influences (Bandura, 1986; Schunk, 2004).

Zimmerman (2000a, 2006) describes three phases and underlying sub-processes that involve behavioural, environmental, and covert self-regulation. Research has indicated quantitative and qualitative differences in regulation processes and activities between more and less skilful learners (De Jong, 1992; Schunk & Zimmerman, 1998).

Forethought phase. This first phase can be described as a preparation phase, in which the learner orientates on and plans the steps to be taken for a learning task.

Self-regulated learners analyse the learning task, set a clear goal, make a plan, and select strategies for achieving the goal. Task demands and personal resources must be considered before beginning a task so that potential obstacles can be identified (Ertmer & Newby, 1996; Zimmerman, 2000a, 2006). Self-motivational beliefs including self-efficacy, outcome expectations, task value, and goal orientation, underlie the efforts to self-regulate (Zimmerman, 2000a, 2006). The empirical research of Pintrich (1999) indicates that self-efficacy, task value, and mastery goal orientation are positively related to SRL. Especially self-efficacy turned out to be highly predictive for students' motivation and learning (Zimmerman, 2000b) and the desire to succeed is seen as an important factor for success (Zimmerman, 2000a, 2006). Motivational beliefs promote and sustain SRL because students are more likely to invest time and effort using various strategies (Zimmerman & Schunk, 2008). Research reveals that naive learners in the forethought phase start off with rather non-specific distal goals that focus on performance aspects, while skilful learners apply specific hierarchical goals that focus on learning. Skilful learners in contrast to naive learners perceive themselves to be more self-efficacious and they report significantly greater intrinsic interest in learning tasks (Pintrich, 1999; Zimmerman, 1998).

Performance phase. In this second phase, monitoring and adjusting are central activities during the learning process. Monitoring is essential, as learners should be constantly aware of what they are doing by looking back at the plan and looking forward at the steps that still need to be performed to achieve the goal in mind. When learners realise that things do not work out as planned, they need to adjust their approach. Strategies and techniques are applied, such as self-control and self-observation that help the learner focus on the task and improve performance. Self-control includes task strategies, imagery, self-instruction, time management, environmental structuring, and help seeking, whereas self-observation includes self-monitoring and self-recording. When learners gain experience with a task, self-regulation can become partly automatic (Zimmerman, 2000a, 2006). Skilful learners are able to concentrate and focus their attention on the learning task and their performance, they are more likely to use systematic guides or techniques, and monitor their process (Zimmerman, 1998). Therefore, they are more likely to detect discrepancies in learning and changes in their progress. As a consequence, the learner can adjust, adapt, fine-tune or abandon her/his learning strategy and identify, retrieve, and seek new information (Winne, 1995). Naive learners are easily distracted by internal or external factors, such as their thoughts or surroundings, and there is some evidence that they even tend to adopt self-handicapping strategies, such as deliberately exerting low effort to make failure attributable to circumstances instead of one's own ability (Garcia & Pintrich, 1994). Systematic monitoring of the learning progress is not carried out (Zimmerman, 1998).

Reflection phase. Assessing and evaluating are key activities in the third phase of the learning cycle and are comparable with the terms self-judgment en self-reaction that Zimmerman uses. Self-judgment includes self-evaluation and causal attribution and self-reaction includes self-satisfaction/affect and adaptive/defensive inferences as predominant processes. After having accomplished the task, it is essential that learners evaluate the effectiveness and efficiency of the plan and their strategy use (Ertmer & Newby, 1996; Zimmerman, 2000a, 2006). Evaluating their process and reflecting on experience can increase learning from actual experience and can eventually be used in the future (Ertmer & Newby, 1996; Fowler, 2008). Reflection is therefore critical for the link between previous learning experiences and future learning experiences because by reflecting a learner can draw on previous knowledge to gain new knowledge (Ertmer & Newby, 1996). During the reflection phase skilful learners seek opportunities to self-evaluate their learning progress and they strive to enhance their performance. A negative outcome is attributed to wrong strategies and these learners can systematically improve their performance based on the adaptive strategies used, which results in a positive approach in the next forethought phase. In contrast, naive learners have difficulties to self-evaluate their learning progress; they avoid opportunities to do so or judge their performance on the basis of normative comparisons. Naive learners tend to attribute a negative outcome to a lack of ability. Consequently, they are unsystematic in their methods of adaptations, which can lead to negative self-reactions (Zimmerman, 1998).

In Table 2.1 we illustrate, using the phases of Zimmerman (1989), the differences between learners by introducing the personas Mike and Kevin. We take a look at their approaches upon hearing that they need to prepare the appetisers for the graduate party the next evening.

When students use self-regulated learning skills and are able to assess their own performance, they can gather information about their level of understanding, evaluate their effort and use of strategies, take into account attributions and opinions of others, and check how they improved in relation to their goals and expectations (Hattie & Timperley, 2007). It might be easier to start with learning to apply self-regulation skills to a task first instead of learning to plan the learning trajectory at once, because it is closer to a specific goal. When learners are skilled enough to regulate their learning on task level, they have accomplished important skills that function as foundation, from which students can proceed to self-direct their learning.

Table 2.1. Comparison of a Naive and Skilful Self-Regulated Learner

	An example of two different learners	
SRL phases	Naive learner	Skilful learner
Forethought phase	When Kevin is told about the task to prepare the appetisers for the graduate party, he is slightly worried. What if people do not like his appetisers? He tries to come up with a couple of ideas and searches examples on the Internet. There is a huge variety and he finds it difficult to choose. Finally, he chooses ten appetisers that look interesting. He does not yet think about the exact number of appetisers, because in his opinion that will be seen along the way. In his mind he goes through the different steps, but he does not write anything down. Kevin hopes that everything works out fine and that he is able to prepare the appetisers.	Mike is immediately enthusiastic about the task, although he realises that it is a challenging task. But he likes challenges, because he sees them as an opportunity to learn. Mike decides to start off with gathering information about appetisers. He decides to prepare six different appetisers (two with fish, two with meat, and two veggies), ten of each kind. Everything needs to be well organised as time for preparing the appetisers is limited. Therefore, he writes down a time schedule so that he knows what needs to be done first. Mike is satisfied with his preparation and thinks he made a good selection of tasty appetisers.
Performance phase	Kevin goes to his kitchen unit and tries to remember the different steps. He decides to start with the preparation of one appetiser and fetches the things that he needs for it without considering the necessities for the other appetisers. Time passes by quickly and the teacher announces that everyone needs to be ready within 30 minutes. Kevin hurries, but he realises too late that he should have prepared the appetisers in a different order.	Mike goes to his kitchen unit and looks at his time schedule. He fetches everything he needs for all the six kinds of appetisers like ingredients, knives, and bowls. His planning tells him exactly what to do and he focuses on his performance. He pays close attention to how the appetisers look and how they taste. Mike realises that he has to stabilise some of the appetisers to prevent them from falling apart. He has enough time to solve the problem.
Reflection phase	When time is up, Kevin is glad that the task has come to an end. He is not very satisfied with his work and does not want to deal with the appetisers anymore. He is unsure on what aspects he needs to improve and concludes that he is just not handy enough. Moreover, Kevin thinks that time was too short for the preparation.	When time is up, Mike looks carefully at all his appetisers. Some look better than others and next time he wants to work on and improve the visual presentation. The time schedule helped him a lot in organising his work and he is convinced that such a planning will be useful in future tasks too.

Combining Self-Regulated and Self-Directed Learning for Learning in WPS

Students' SRL and SDL skills are regarded relevant to become successful in WPS. At the micro level, that is the task level, important self-regulatory processes are orienting and planning in the forethought phase, monitoring and adjusting in the performance phase, and assessing and evaluating in the reflection phase. Skilful learners direct the regulatory processes to the task, the self, and the context. Especially setting specific goals that focus on learning, planning the learning task, organising information and resources, and adjusting the process by reflecting and assessing strategy use appear to be important student activities at the micro level in WPS. In fact, SRL appears to be the foundation for SDL.

At the macro level, the scope is wider as it exceeds the task level by the planning of the own learning trajectory. SDL therefore encompasses SRL. Feeling responsible and taking initiative are relevant characteristics to self-direct one's learning but, at the same time, self-direction also indicates two prerequisites. We suggest that a first prerequisite is a will to learn, which refers to a desire to learn, openness and curiosity to try things out, and being alert and fully mindful to new influences and ideas. According to Van Eekelen, Vermunt, and Boshuizen (2006) teachers differ remarkably in how they approach their own learning and deal with experience. Some of them are eager to learn, others do not see a need to learn or they do not know how to learn. This might also be the case for students in WPS; willingness seems to be an important factor for successful learning. A second prerequisite for SDL is the possibility to choose (Brockett, 2006) and the degrees of control learners have (Loyens et al., 2008).

Research reported so far suggest that SRL and SDL skills can be useful in all learning situations – no matter if it concerns professional or academic settings – as they make individuals enter learning situations more purposefully. We claim, however, that in WPS, SRL and SDL may get an extra edge because these learning environments require students to learn from practical experiences and they need to seek information and opportunities for learning more actively in contrast to traditional practice rooms. Consequently, by being able to self-regulate and self-direct one's own learning students can create more structure to deal effectively with the independence, which can finally also help them on their road to becoming qualified and adaptive employees, as much of the learning is supposed to take place at the learner's own initiative and students who are self-directed should benefit more from their learning experiences (Mala-Maung, Abas, & Abdullah, 2007). Those who take initiative are likely to '(1) learn more, and learn better, than those who wait passively to be taught; (2) enter into learning more purposefully and with greater motivation, and (3) tend to retain and make use of what they learn better and longer than do the reactive learners' (Knowles, 1975, p. 14). Research showed that young people with relatively more self-initiative, flexibility, purposefulness, and agency have better vocational and life trajectories (Blustein, Phillips, Jobin-Davis,

Finkelberg, & Roarke, 1997; Blustein, Juntunen, & Worthington, 2000; Pinquart, Juang, & Silbereisen, 2003).

Furthermore, students ought to learn from experience through active involvement, solving problems, and working independently. Learning by doing is important in WPS but students also need to think and reflect on actions so that learning becomes more meaningful (cf. Mayer, 2004; Schön, 1983). Research on learning in academic settings suggests that learners need to make sense of 'the presented material by selecting relevant incoming information, organising it into a coherent structure, and integrating it with other organised knowledge' (Mayer 2004, p. 17), which seems also applicable to vocational education. Learners, who use appropriate learning strategies, are able to regulate and direct their learning and practice vocational skills deliberately, are expected to reach higher levels of performance as they gain better practical insights and skills. For learners poor in these skills, WPS are likely to pose difficulties because they do not know how to get the best out of learning possibilities. If it becomes too difficult or students do not know how to handle the challenge, they might lose track. As a consequence, it seems possible that students lose their interest and motivation so that they might eventually drop out.

To be successful in WPS, we expect learners to take responsibility for learning both at a micro and a macro level and are expected to approach a task independently and actively with intrinsic interest and a will to learn. They should seek assistance when needed and hold positive beliefs about own capabilities. SRL can help learners to develop both knowledge and skills more effectively, but using self-regulatory processes will not automatically produce high levels of performance. Both external support and self-directed practice is needed for optimal learning and a superior performance (Zimmerman, 2006).

Both concepts, SRL and SDL, do not concern a dichotomous condition of present or absent but rather regard a collection of processes and levels of control that may be present in varying degrees on continuums. By viewing the concepts as continuums, it is possible to help learners to achieve SDL and help them improve their skills to be self-regulating (Candy, 1991). A meta-analysis of Dignath, Buettner, and Langfeldt (2008) found that training interventions of self-regulated learning were most effective when they had a social cognitive foundation or were based on a combination of social cognitive and meta-cognitive theories. To foster the development of SRL and SDL skills in WPS, an adaptive learning environment and teacher support play an important role and need to be designed accordingly.

Design of Workplace Simulations for Self-Directed Learning

Imagine the following situation. You enter a school building and are welcomed at a reception desk, on your right you see the entrance to a restaurant and next to it there is a big kitchen. When you look inside the kitchen you can spot a cold-storage room, a dishwashing area, and several individual kitchen units. Each kitchen unit has a cooker, a baking oven, a compartment for pots and pans, a drawer for cooking utensils, and a working station. Teenagers in cooking uniforms are all around the place, looking up information in a cookbook, cutting vegetables, garnishing plates, roasting or frying something. Teachers help when necessary, explain, give instructions, guide students' learning processes, and finally evaluate the students' work attitude and their task performance.

This scenario is a description of a professional cooking training in vocational education, which implemented WPS. WPS are authentic and practical learning environments at school, in which the (future) work situation forms the basis (Hoogenberg & Teurlings, 2002); they differ from traditional practical learning settings as they go beyond mere practice. The traditional practical-learning setting is characterised by a teacher-directed approach, an emphasis on transmitting knowledge by lecturing. That means the teacher demonstrates the task first, while all students observe and then perform the task themselves. The traditional practical-learning environment does not resemble the future workplace setting and all students are dealing with identical study material (tasks out of context) at the same time, which leaves little room for the individual needs. In WPS, a student-centred approach, however, several new pedagogical principles are introduced to make learning more active including (1) authentic setting, (2) integration of theory and practice, and (3) adaptive learning (cf. Vrieze, et al., 2001). In the following subsections, these principles are described and it is elaborated on what they mean for the design of WPS.

The Principle of Authentic Setting

The concept of powerful learning environment is increasingly used to describe learning environments that aim at the development of complex skills, deep conceptual understanding, and meta-cognitive skills. These learning environments are based on a constructivist learning approach, in which learning is seen as an active and constructive process. Learning should be embedded in an authentic context that is problem-based and offers opportunities for social interaction through collaborative learning (e.g., Dochy, Segers, Gijbels, & Van den Bossche, 2002; Könings, Brand-Gruwel, & Van Merriënboer, 2005; Van Merriënboer & Paas, 2003; Vermunt, 2003). WPS can be described as powerful learning environments in which students learn with each other by practicing realistic everyday tasks of a work field. Simulat-

ed learning environments in comparison to a real work setting have the advantage that students can develop and improve skills by practicing with well-designed tasks in a safe and controlled environment (Van Merriënboer & Kirschner, 2007). Students can experiment actively with realistic problems and can experience essential elements of the workplace without being too afraid of making errors (Cairns, 1995; Ogg & Kollaard, 2001). Simulations are also expected to increase arousal, motivation, task-engagement, and the quality of problem-solving (Cairns, 1995).

The authentic nature of WPS brings the workplace situation into school. It is not only important that students learn the know-how of the subject; they should also get acquainted with the working situation, which includes a certain work attitude of students concerning aspects such as collaboration and communication (Vrieze et al., 2001). Although the level of authenticity and implementation may vary, the advantage of learning in these practical formats is that traditional vocational skills, generic skills, and domain knowledge are integrated. In WPS, students fulfil different roles (e.g., workplace assistant, dishwasher or chef cook) that comprise a variety of tasks. A workplace assistant, for instance, captures organisational or administrative tasks such as controlling the storage and stock or distributing foodstuffs and kitchen utensils, while a chef cook is responsible for activities in the kitchen such as timing and the visual presentation of dishes. The different roles make learning more authentic, because students encounter similar tasks and activities as professionals in the work field. Additionally, students are required to take over more responsibility from the teacher, for example dealing out learning material and checking multiple-choice assignments (Vrieze, et al., 2001). To realise the principle of authenticity, it is important to design the learning tasks accordingly.

Learning tasks should be complex, realistic, and challenging (Van Merriënboer & Paas, 2003) and should foster high-quality learning (Vermunt, 2003). WPS by their very nature should provide students with whole authentic tasks that are realistic in correspondence to the real world. Working with whole tasks is thought to be advantageous because learners immediately acquire a complete view of the whole skill and are confronted with all constituent skills. However, whole tasks can be rather complex and in order to simplify task performance, they can be organised from simple to complex (Van Merriënboer & Paas, 2003; Van Merriënboer & Kirschner, 2007). Take for example a menu that students need to prepare. A menu can have various different courses and it is easier to prepare a three-course menu than a five-course menu. Moreover, the preparation of the dish can be more or less complex; making a fruit salad is a less difficult dessert than making a pudding.

In WPS, a task usually starts with the description of a case such as 'In the restaurant you are working, the manager informs the kitchen that a group of regular guests has reserved a table for the next evening. Instead of choosing courses from the fixed menu, they would like to have a four-course seafood menu. The chef cook gives you and your colleague the task to compose the seafood menu and to think

about a dessert that nicely goes with it'. This fictive case can trigger students to think about several matters like planning, products, preparation, presentation, method, and expenses. Because of the similarity between simulation and real life, students can train general skills (such as collaborating and communicating in a team) and vocational skills (such as applying menu principles and preparing seafood).

The Principle of Integrating Theory and Practice

Integrating theory and practice seems especially relevant for vocational education. Ogg and Kollaard (2001) describe students in vocational education as 'do-learners', which suggests that learning of theories alone is insufficient for these students to connect and apply the theory to the context. Experiential learning plays an important role in WPS. Research in other fields (e.g., medical education) has also indicated that students perceive active involvement or learning by doing as a valuable learning process (Wagenaar, Scherpbier, Boshuizen, & Van der Vleuten, 2003). It seems essential that students have the opportunity to develop practical skills and gain experience with vocational practice. WPS can provide this opportunity because these learning environments offer students the possibility to apply knowledge and skills in an authentic practice-oriented context. In WPS, theory and practice are integrated as much as possible; students learn the theory so that they can accomplish the practical tasks. Through the experience, students can imagine the requirements of further education and for future work settings more easily (Ogg & Kollaard, 2001). The underlying idea is that students are more motivated when they see the link between theory and practice. Teachers indicate that students are more attentive and able to learn independently in WPS (Vrieze, et al., 2001). Although this is promising, Fowler points out that it is not just any experience that results in learning. Learning depends on a meaningful interaction between high-quality experience and reflection and this interaction should therefore be facilitated to enhance learning (Fowler, 2008; Ertmer & Newby, 1996; Schön,1983; Schunk & Zimmerman, 1998).

Departing from authentic learning tasks, supportive information is an important design aspect that should be considered when realising the principle of integrating theory and practice. The given information should provide a bridge between the theoretical knowledge of the students and the knowledge they need for performing the practical task (cf. Van Merriënboer & Kirschner, 2007). Complex learning involves the development of a rich, interconnected knowledge base in which knowledge, skills, and attitudes are integrated. The information provided for the learner is dependent on learners' prior knowledge and necessary knowledge about a certain domain (e.g., you can only 'compose a seafood menu' if you know enough about seafood considering preparation, season, menu and taste principles).

Supportive information can help learners to develop an understanding of a domain and a subject matter problem so that they are able to work successfully on the learning task (Van Merriënboer & Kirschner, 2007). In our example, supportive information might be a variety of textbooks and cookbooks with recipes, film material or websites with information about seasonal food. The theoretical information and knowledge should match the requirements of the practical task in WPS.

The Principle of Adaptive Learning

The idea behind adaptive learning, based on Vrieze, Van Kuijk, and Van Kessel (2001), is that independent and self-directed learning in WPS is supported. Learners are regarded active participants, but they vary in how much they have accomplished SRL and SDL skills in order to work and learn independently. Therefore, an adaptive approach seems appropriate to allow students to work at their own level and pace (cf. Vrieze et al., 2001). Worksheets are used to facilitate independent work of students in WPS; they integrate a theoretical task, a preparation task, and an executive task. This study material should direct and guide students' learning process of vocational skills (Vrieze et al., 2001), so that they can develop vocational competence. Consequently, it is important to assess competencies including traditional vocational skills, generic skills, domain knowledge, attitude, and learning skills that are relevant qualities for the labour market. Assessment should be used as a 'tool for learning'. The underlying argument is that assessments can drive and foster learning. There are many different ways to assess performance, such as formative (assessment for learning) and summative (assessment of learning) assessments that also serve various purposes (Segers & Dochy, 2006). Formative assessments, such as self-assessments, peer assessments, performance assessments, learning journals, and development portfolios, seem more suitable for WPS learning as they focus on the learning progress and the quality of performance rather than on pass/fail decisions like in summative assessments (Birenbaum, 2003; Segers, Dochy, & Cascallar, 2003). Although formative assessments are expected to improve learning they can occasionally fail if students do not know how to accomplish a task (Birenbaum, 2003).

Although learning tasks clarify what learners need to do, more support for the learning process can be provided by making performance and assessment criteria transparent, so that learning intentions and success becomes clear (see Table 2.2). But telling students what they need to learn is not enough; information on how learning looks like when it is successful can help learners in understanding the processes and strategies of getting to a certain answer (Hattie, 2009). Students need to be aware of their own strengths and weaknesses to be able to choose a learning task and plan their learning trajectory (Knowles, 1975). An integrated set of

performance objectives can provide detailed descriptions of what is expected as acceptable performance outcomes (Van Merriënboer & Paas, 2003; Van Merriënboer & Kirschner, 2007).

According to Kicken, Brand-Gruwel, and Van Merriënboer (2008) a development portfolio can be a useful tool for students to help them assess their learning process, diagnose learning needs, and formulate learning goals. Being able to self-assess prior knowledge and performance is a necessary SDL skill to determine the next steps to be taken in the learning process. In an optimal situation, the degree to which learners are self-directed is congruent to the possibility of being self-directed in the learning environment (Hill & Song, 2007). This indicates that learners should be able to choose from a pool of learning tasks. Students need to be familiar with the possibilities and need to know which sources they can select so that they can determine their own learning trajectory (cf. Hill & Song, 2007). Only if the learning environment is adaptive, it can account for student differences, allow students to make choices in order to become self-directed learners. Therefore, WPS need to be designed accordingly.

To realise the three basic principles of WPS, they need to be carefully designed so that they can take into account the prior knowledge and skills of the learners. It is necessary that the educational setting provides the external conditions that foster the development of vocational competencies and facilitate SDL. The interaction between student and learning environment will further define the activities and strategies of the student that influence learning (Hill & Song, 2007). Important components in WPS are well-designed learning tasks, supportive information, as well as assessment and performance criteria. A pool of authentic learning tasks can trigger active involvement and offers the opportunity to make decisions about the learning trajectory. Performance and assessment criteria that are clearly stated can make the learning process more visible and learning needs become more transparent which should enable optimal learning (Kicken, et al., 2008; Hattie, 2009; Sluijsmans, Brand-Gruwel, Van Merriënboer, & Martens, 2004). A well-designed learning environment functions as a tool, but it is important to use instructional methods that promote appropriate processing in learners, account for learner differences, and trigger SRL and SDL so that optimal learning can be achieved. Here, the teacher comes into play.

Table 2.2. An Example of Assessment and Performance Criteria.

Competency: Composition of a menu	Evaluation				Improvement points
1. Menu principles Knowledge of the products Knowledge of taste principles Process of composition Variation in the courses	0	-	+	++	

Creativity				
2. Budget	0	-	+	++
Use of seasonal products				
Cost and benefits analysis:				
Preparation time				
Workload				
3. Visual presentation	0	-	+	++

Note: Abbreviations stand for: 0 unsatisfactory, - moderate, + good, ++ very good.

The Role of the Teacher

Teachers have various tasks in preparing students for the labour market. On the one hand, teachers are expected to teach students vocational competencies and on the other hand, they need to support the development of SRL and SDL skills, because these skills are instrumental for vocational competencies. Helping students to become self-directed learners should therefore be seen in the light of developing vocational competence.

Some students struggle with their SDL skills or might not even have acquired them yet and therefore prefer to be instructed by a teacher. SDL can be difficult, because students have to perceive a learning need and estimate how much they already know and how much they want and need to learn. As SDL skills do not develop by chance, support by a teacher is needed to guide students in diagnosing learning needs, formulating goals, and planning their learning (Timmins, 2008). Whether and how much self-direction learners develop, therefore, depends on the assistance and support they get, which in turn should be adapted to the learner's level.

The teacher can take different roles when guiding students' learning. Based on the results of a synthesis of 800 meta-analyses, Hattie has a preference for teachers as activators rather than facilitators. An activator acts as a change agent, who engages in reciprocal teaching. The following characteristics of an activator have been identified to be effective: feedback, direct instruction, and teaching students meta-cognitive strategies (Hattie, 2009). In terms of SRL and SDL it is suggested to be advantageous to start off with an activating form of guidance in the beginning and to move to a more facilitating one when students are on their road of becoming self-directed learners, because then students will take over responsibility for their own learning and only need a teacher as facilitator who stimulates the learning progress. In the following subsections, we zoom in on teachers' role in supporting SRL and SDL skills by considering giving feedback, providing direct instruction in SRL, and increasing responsibility of learners to become self-directed.

The Strength of Feedback

Feedback has been identified to be the most powerful influence on learning and achievement (Hattie & Timperley, 2007). Feedback can be defined as 'information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding' (Hattie & Timperley, 2007, p. 81) and it is 'information with which a learner can confirm, add to, overwrite, tune, or restructure information in memory, whether that information is domain knowledge, metacognitive knowledge, beliefs about self and tasks, or cognitive tactics and strategies' (Winne & Butler, 1994, p. 5740).

Feedback aims to close the gap between the current level of performance/understanding and the desired one that needs to be reached. In order to reduce this discrepancy, three questions need to be addressed by effective feedback, including 'Where am I going?', 'How am I going?', and 'Where to next?' (Hattie & Timperley, 2007). The three questions work together and have the power to trigger learners to initiate further actions. According to Hattie and Timperley, the effectiveness of feedback depends on its focus, which can be distinguished into four levels. Feedback can concern the task level, the process level, the self-regulation level or the self level. Deep processing and mastery of tasks are especially promoted by feedback on process level and self-regulation level because this feedback is related to learning (Hattie &Timperley, 2007). The focus should be on the learning process, teaching students how to learn, setting learning goals, choosing and executing learning activities, diagnosing and monitoring the learning process, and evaluating learning results (Bolhuis & Voeten, 2001). It is important that students and teachers set and communicate appropriate, specific, and challenging goals. Challenge gets students engaged and teachers, who assist students with feedback to accomplish challenging goals, enhance students' commitment or increase their efforts. Feedback works powerfully when there is a lack of knowledge and when there is an incredible amount of challenge. But it should be clear that it is not simply the amount of feedback that matters. More important is the nature of feedback, the timing, and the way students receive and perceive the feedback (Hattie & Timperley, 2007). Research has indicated that students feel most involved and motivated when they get support from their teachers, including organisational, pedagogical, or affective feedback (Dornan et al., 2005a).

According to Zimmerman, Bonner, and Kovach (1996) teachers should implement a self-regulatory cycle, in which they assist and empower students to self-observe their effectiveness. Teachers should support and encourage students by providing specific, personalised feedback. Feedback, such as correcting content or learning and rewarding, is important and leads to ongoing revisions on executive and regulative elements (Bolhuis & Voeten, 2001). Self-regulated and self-directed learners are expected to know when and how to seek feedback from others and are willing to invest effort in looking for and working on feedback. However, when the cost–

benefit analysis, reveals negative effects, then students will withdraw from feed-back-seeking behaviour (Hattie & Timperley, 2007).

It seems important that WPS are a place, in which asking for feedback and receiving feedback becomes a daily practice in the interaction between teacher and student. Feedback can help students to get actively involved in the learning process and they can acquire learning competencies that prepare them for their future professional life.

Direct Instruction in Self-Regulated Learning

Different aspects of instruction and teacher behaviour have been identified in research that effect students self-regulated learning including clarity and pace of instruction, the amount of structure provided, autonomy granted, teacher enthusiasm, humour, fairness, and teacher expectations about students' capacity (Boekaerts & Cascallar, 2006). Teachers can provide information, assistance, and opportunities so that students become strategic, motivated, and independent learners, which can be achieved by reducing competition, clarifying appropriate strategies, helping during problem solving, and creating an atmosphere of collaboration (Paris & Newman, 1990; Paris & Paris, 2001).

Moreover, explicit training in self-regulatory techniques, including (1) self-evaluation and monitoring, (2) planning and goal setting, (3) strategy implementation and monitoring, (4) outcome monitoring and strategy refinement, can be effective if teachers use a systematic instructional approach. Concentrating on the learning process before attending to the learning outcome can encourage students to continue spending effort on the development of SRL and SDL skills (Zimmerman, et al., 1996).

Bielaczyc, Pirolli, and Brown (1995) found that performance largely improved when training included self-explanation strategies and self-regulation strategies ((1) monitoring comprehension and learning activities and (2) clarifying and addressing comprehension failures). Training improved students' study strategies, which in turn resulted in improved cognitive skill acquisition and performance. Bielaczyc and others concluded that several factors are responsible for the effectiveness of strategies including prior knowledge, quality of the content of an explanation, cohesiveness and clarity of the learning material and the state of one's evolving understanding.

Teachers can build a learning environment in which students develop self-regulation and error-detection skills (Hattie, Biggs, & Purdie, 1996). A supportive environment with a positive classroom climate should be created in which the teacher is aware of the emotional and social aspects of learning (Bolhuis & Voeten; 2001) and in which teachers provide clear instructions and stimulate the learner's development (Zimmerman, et al., 1996).

Moreover, practice turned out to be a crucial element for progress and the development of superior achievement. But mere practice is not enough to overcome weaknesses in performance. Improvement of performance is affected by both how much and how learners practice. Ericsson has called those practice activities that focus sequentially on improving one specified aspect of performance at a time 'deliberate practice'. These are structured goal-directed training activities, which are adapted to the learners' level to maximise improvement. Deliberate practice consists of well-designed tasks, informative feedback, and repetition. Self-reflection, motivation, and endurance are essential characteristics that help the learner to persevere with deliberate practice activities, which are often difficult, laborious, and not always pleasant (Ericsson, Krampe, & Tesch-Römer, 1993; Ericsson & Charness, 1994). These activities show high overlap with key elements of self-regulated learning (Van de Wiel, Szegedi, & Weggeman, 2004; Zimmerman, 2006). It became clear that performance level could be increased as a result of deliberate efforts to improve (Ericsson, 2005). For example, positive correlations between aspects of deliberate practice (self-study, study resources, planning, study style, and motivation) and study achievements were found in the studies of Moulaert and others (2004) and Ericsson (2005).

So far, however, training interventions for SRL have been mainly directed to academic skills such as reading and writing, cognitive engagement or self-assessment. Although these skills are also relevant for vocational education, there is an additional practical-experience component involved in WPS that needs to be considered. According to Paris and Paris (2001), children can acquire and improve their understanding of SRL in different ways, including indirect experience, direct instruction, and practice. We think that all three aspects are relevant for learning in WPS and should therefore be taken into account when promoting SRL and SDL skills in vocational education. It is the responsibility of the teacher to foster SRL skills in the light of acquiring vocational skills and at the same time supporting SDL skills by allowing students to take initiative for their learning trajectories.

Increasing the Responsibility of Learners to Become Self-Directed

In order to increase self-directed learning, responsibility should gradually be trans-ferred to the student (Vermunt, 2006; Zimmerman, et al., 1996). Gradual transfer can mean that teachers start with modelling, which includes explaining and demon-strating, and then move on to activating students to participate by asking questions, involving them in subject matter, listening to their ideas, and closely monitoring students' activities.

Moreover, teachers should support SDL by allowing students to take initiative and at the same time they should be proactive and comfortable with learners taking initiative in the learning process (Ricard, 2007). That means creating possibilities in

which learners make choices, as choice can promote motivation and learning. However, controversial findings concerning the effects of choice have been reported. In a review study, Katz and Assor (2007) addressed the controversy regarding the value of offering choices by taking a close look at when choice motivates and when it does not. They state that choice can either be need-frustrating or need-satisfying. They indicate that 'choosing' should not be confused with 'picking'. 'Choosing' refers to 'meaningful realization of individual's desires or preferences' while 'picking' is a type of choice that 'does not involve interests, values, or goals' and should therefore not affect learning or motivation (p. 432). Based on the self-determination theory (Ryan & Deci, 2000), Katz and Assor proposed an explanation for the conflicting outcomes stating that choice is motivating and can enhance learning when the three psychological needs of autonomy, competence, and relatedness are satisfied or at least not ignored. Teachers can support students' motivation and learning by offering choices, which meet these students' needs. Providing explicit choices can enhance intrinsic motivation. However, too many choices may lead to increased anxiety, so providing assistance at appropriate times is essential (Brockett, 2006; Katz & Assor, 2007).

For WPS learning this could mean that task selection is gradually transferred to the student, for instance by giving students the possibility to choose from a smaller pool of learning tasks first and provide them with criteria to select appropriate tasks (Kicken, et al., 2008). The teacher should also get students involved and shift responsibility to them by asking them to self-monitor, assisting them in analysing their own task performance, and helping them to choose strategies and set goals that are appropriate considering their prior knowledge and outcomes (Zimmerman, et al., 1996).

Feedback and explicit training in how to learn are important tasks of the teacher to foster the development of SRL skills, but that alone seems not enough when considering SDL skills. Additionally, the teacher needs to increase students' responsibility and allow them to make their own choices in their learning trajectories. Bearing in mind, however, that the teacher has also the responsibility to take into account students' capabilities and prior knowledge, and adapt the instruction to students' level, so that they can gradually acquire SRL and SDL skills. Consider Mike and Kevin again, who had to prepare appetisers for the graduate party. Mike approached the task with confidence and was able to plan his activities carefully, while Kevin thought about different steps but did not write down an organised plan. A strategic teacher could have intervened by asking Kevin how he is going and what he is exactly planning. That might have triggered Kevin to think about the different steps more clearly. If Kevin experienced difficulties with writing down his planning, the teacher could have helped with the first steps and explain why certain steps are important. In the case of Mike, the teacher should not intervene with the planning, because Mike was able to do it himself successfully.

Elaborated explanations about the planning would have less effect, because Mike had already enough knowledge. The example shows that the teacher needs to be thoughtful in his support to adapt to the learners' level and it becomes an instructional goal to gradually transfer regulation and direction of the learning process to the learner.

Synthesis of Requirements: The Model

The previous paragraphs revealed that a number of factors need to be taken into consideration when designing and implementing an effective WPS. Figure 2.1 illustrates the three main interacting factors identified in the theoretical framework, including the learning environment on the background, the teacher and the student. The key skills of the student, the main components of the WPS, and essential tasks of the teacher are put forward in the model in order to achieve the desirable aim of a high-level task performance and the development of SDL and SRL skills.
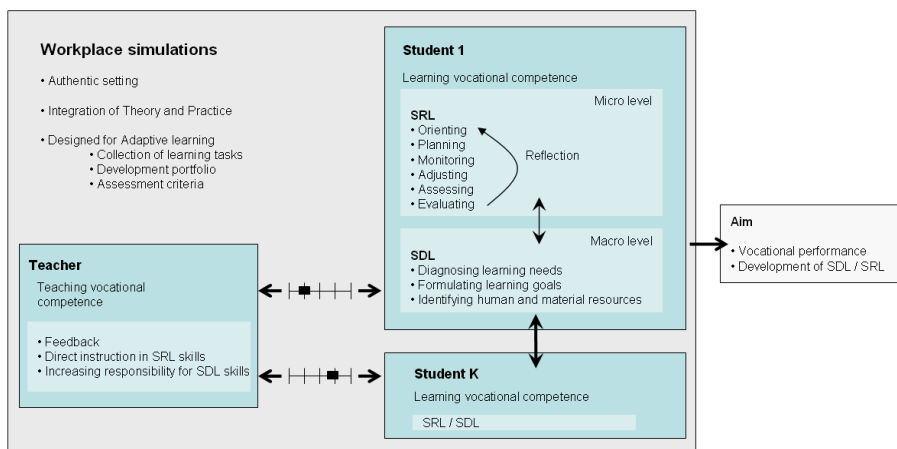

Figure 2.1. A framework for workplace simulation learning.

Students need to acquire vocational competence, and for this learning process SRL and SDL skills are instrumental. In Figure 2.1, Student 1 and Student K represent the learners in WPS. They interact with each other, which is shown by the two-headed arrow. The arrow between micro and macro level indicates that SRL is the foundation of SDL. SDL includes SRL, but the opposite does not hold and therefore learning to self-regulate should be the first step.

Three main principles have been identified as relevant requirements for WPS learning including (1) authentic setting, (2) integration of theory and practice, and (3) design for adaptive learning. Authentic and challenging learning tasks,

supportive information, a collection of learning tasks, a development portfolio, and clear assessment criteria are necessary design components to foster high-quality learning, active involvement, and SDL. The learning environment functions as a tool for the teacher.

To prepare students for the labour market within this environment, teachers should give feedback, provide explicit training in how to learn by explaining self-regulatory techniques, and gradually increase students' responsibility; these are regarded essential teacher strategies to assist the development of SRL and SDL skills.

The student interacts with the teacher in the learning environment. The interaction between teacher and student, which is shown by the ruler bar in Figure 1, is a crucial aspect for the development of vocational competence and of SDL and SRL skills. Teachers have the power to equip students with these necessary learning skills, but they need to know how to do it and have to have the right attitude to do so (cf. Hattie, 2009; Timmins, 2008). Especially in WPS learning, in which students are required to work more independently, it is important that sufficient support is provided by high consistency between learning tasks, supportive information, performance criteria, and teacher strategies. Support should be adaptive to the learners' level and through the interaction between student and teacher, opportunities for optimal learning can be created so that a higher performance level can be achieved.

Discussion and Conclusion

We investigated characteristics of and the interaction between the student, the learning environment, and the teacher that are expected to influence good functioning in WPS and foster students' learning. A theoretical framework was developed that identifies important requirements related to learning in WPS. As student learning takes place in a social environment, in which students and teachers interact with each other in a learning environment, all three factors need to be taken into account to optimise learning. Although the elements in the model are familiar topics in research, the combination of them in relation to WPS learning in vocational education and the focus on the interaction is new.

Moreover, a coherent perspective of SRL and SDL was developed by integrating the two concepts and we demonstrated that the concepts are clearly distinguished though related to each other. The concepts differ on important aspects and it was shown that SDL encompasses SRL, but that the opposite does not hold. By describing them on a micro and macro level, it was shown that SRL is the foundation of SDL and concerns the task level, while SDL aims at the planning of the whole learning trajectory. This distinction has consequences for the design of the learning

environment and the role of the teacher, because SDL has additional preconditions that need to be taken into account. When teachers want to foster SDL, they need to allow students to take control of their learning and provide them with choices, and, at the same time, students need to feel responsible and have a will to learn. We proposed that becoming a self-directed learner means acquiring SRL skills first.

Research on SRL and SDL in vocational education can help to reach the goal of developing employees that are qualified and adapted to the needs of the workplace. Those who are able to regulate and direct their learning and practice vocational skills deliberately are expected to reach higher levels of performance than individuals who are less skilled. Self-directed learners, who are able to self-regulate learning, can structure their own learning process and should therefore benefit in WPS.

However, learners vary and we believe that it is a risky starting point to assume that students are self-regulated or self-directed learners when they enter vocational education. The opposite is often the case. For students who are poor self-regulated and self-directed learners, WPS are likely to pose difficulties. These learning environments require initiative of the learner and responsibility for learning. Learning how to learn cannot be left to students; it must be taught so that 'co-regulation' can gradually be transformed into self-regulation. Therefore, the students need support when they learn vocational competence and develop SRL and SDL skills. The support needs to be provided by the learning environment as well as by the teacher. Students can reach higher levels of performance through the interaction with the teacher if the training tasks are structured appropriately and provide opportunities for repetition and error correction (Ericsson, Krampe, & Tesch-Römer, 1993). Effective improvement requires close monitoring of the attained performance by the teacher (Ericsson, 2006). It should be clear that the development of SRL and SDL skills takes time and demands a lot of effort from the student as well as from the teacher but we believe that this can be practiced and learned if support is adaptive to the wishes, needs, and skills of the learner.

From a theoretical and practical point of view, the depicted framework can help to explore the best ways to optimise students' learning processes and learning outcomes in vocational education by identifying discrepancies and opportunities in the interaction between student, WPS, and teacher. Future research needs to provide deeper insights into WPS learning in vocational education. It is essential to explore what is happening in WPS at different schools in practice and investigate perceptions and preparedness of students and teachers to work and learn in a self-directing way in these practical-learning environments. Important questions that need to be answered are: What kind of problems do students and teachers experience in workplace-simulation learning? Do WPS promote self-directed and self-regulated learning? Do students use SRL and SDL skills and can this be observed? And what are the best ways to support student learning and improve

vocational education? On the basis of the theoretical model developed in this study, empirical evidence needs to be gathered that would give an answer to the questions raised.

Multimethod studies and a combination of qualitative and quantitative approaches can provide us with wider and deeper insights into thoughts and behaviours involved in SDL and SRL. Likert-scale self-report instruments, for instance, cannot show what learners actually do, because people do not always do as they say (Dinsmore, Alexander, & Loughlin, 2008; Winne & Perry, 2000). Combining methods, however, seems advantageous because phenomena can be investigated from different angles.

To conclude, teachers need to be aware of their own actions and teaching behaviour and understand what is required from them to foster SRL and SDL in vocational education. Both, teachers and students, should not perceive the trend toward self-direction as a burden or an impossible goal in vocational education, but rather as a change for the better. The success, after all, depends on the dedication of teachers and students and therefore it is essential that they strive for the same goals. Moreover, theory has to be applicable to the situation in schools, hence, deeper insights into the processes and practices in WPS are needed to take the challenge of SRL and SDL in vocational learning.

Chapter 3

Students' Perceptions of Learning in Workplace Simulations in Vocational Education[*]

In vocational secondary education, workplace simulations (WPS) have been implemented to guarantee a better connection between the educational setting and the labour market. But little is known about how students learn in these WPS and what factors they perceive to be relevant for successful learning in WPS with regard to the design of the learning environment, the student characteristics, and the role of the teacher. In this case study, group interviews with 40 students were conducted to explore what is happening in WPS and to investigate perceptions and preparedness of students to work and learn in a self-directing way. Perceived success factors related to WPS learning and difficulties students face in these new learning environments are put forward and dilemmas are discussed. It is concluded that self-regulation and self-direction are learning processes that are not sufficiently promoted and supported in WPS.

There is a constant pressure on secondary vocational schools to innovate and improve their instructional formats to adapt to the changes in the labour market and society so that students acquire the necessary professional skills required for an occupation as well as for continuing professional development (Achtenhagen & Oldenbürger, 1996; Ministry of Education, Sciences, & Cultural Affairs, 2004). A means to acquire these skills and create optimal opportunities for vocational students to become adaptive employees are workplace simulations (WPS) (Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004; Vrieze, Van Kuijk, & Van Kessel, 2001). WPS are practiced-based settings at school that simulate a (future) work situation to realise an authentic, innovative, and inspiring learning environment. The simulation is a safe and controlled setting for students to acquire vocational skills, generic skills, and domain knowledge without having to be afraid of making errors.

New tasks and roles for students and teachers and different forms of interaction between students and teachers should go along with the introduction of these innovative learning environments (Van Grinsven & Tillema, 2006). One of the aims is to develop active and independent learners, who are to a certain extent responsible for their own learning. Students often work collaboratively with peers and practice job-related tasks, while the teacher should support and guide students' learning processes.

How this new pedagogical approach could be implemented best and what factors would guarantee success was not well studied in advance. Moreover, problems students might face in accomplishing their tasks and roles were not taken into consideration sufficiently. In addition, it is not yet known how students experience learning and working in WPS and whether this way of learning is congruent to their needs and wishes. It is of importance to have insight into students' perspective and appreciation concerning learning in WPS because these are related to the effectiveness of the learning environment (Cook-Sather, 2006; Elen & Lowyck, 1999; Entwistle, 1991; Entwistle & Tait, 1990; Könings, Brand-Gruwel, & Van Merriënboer, 2010). Furthermore, students' learning engagement depends on the feeling to be able to meet the challenges, the purpose and value of learning activities, and the feeling of safety and care (Roeser, Eccles, & Sameroff, 2000). The limited insight and the lack of knowledge bear the risk that the innovation might fail before the necessary pedagogical knowledge is developed.

The central aim of this study is to investigate students' perceptions on a) the design of the learning environment, b) the role of the student, and c) the role of the teacher and explore what characteristics students perceive to be relevant for successful learning in WPS. Previous research is briefly reviewed to put forward characteristics of the three interacting factors – the learning environment, the student, and the teacher - that can influence successful learning in WPS and then we focus on how we used group interviews to investigate students' perceptions.

The Learning Environment

Three new pedagogical principles are introduced in WPS to make vocational learning more active: 1) use of authentic setting, 2) integration of theory and practice and 3) adaptive learning (cf. Vrieze et al., 2001).

First, to realise the principle of authenticity whole authentic learning tasks that are complex, realistic, and challenging in relation to the real professional work field should be designed (Van Merriënboer & Paas, 2003) and they should foster high-quality learning (Vermunt, 2003). Students must perform all the defined constituent skills to successfully accomplish such an authentic task and they should also acquire the necessary domain specific knowledge (Van Merriënboer & Kirschner, 2007).

This brings us to the second principle. In the past, the theoretical domain-specific knowledge was often taught in theory classes and these classes were not tightly related to the practical lessons. In WPS the integration of theory and practice is realised by giving students the theory in relation to the learning tasks they need to perform. In the design of WPS an analysis should be made of the information and knowledge students have to construct in order to perform those practical learning tasks successfully. The provided information should span a bridge between the theoretical knowledge of the student and the task performance. By integrating theory and practice students develop an understanding of a domain and a subject matter problem so that they are able to work successfully on the learning task (Van Merriënboer & Kirschner, 2007). Moreover, students are expected to be more motivated when they recognise the link between theory and practice (Vrieze et al., 2001).

The third principle concerns adaptive learning. Adaptive learning means that students are able to follow their own learning trajectory. A well-designed WPS that allows adaptive learning can account for student differences. The adaptation can be provided by the system or the teacher who decides which learning tasks should be accomplished by a student to fulfil the learning needs by using different parameters such as past performance (Kicken, Brand-Gruwel, & van Merriënboer, 2008). But as the aim in WPS is to develop independent learners who are also able to learn on the job after leaving school, students should be able to make their own choices in selecting learning tasks. To facilitate students to function optimally in an adaptive learning environment, a portfolio can be used as a tool to make students' performance visible, to provide an overview of possible learning tasks that need to be accomplished, and to offer transparent performance and assessment criteria that help evaluate their own performance (Kicken et al., 2008). Learning tasks can provide metadata of the skills to be learned when working on the task. Offering opportunities for adaptive learning and providing supportive information helps students to become aware of their own strengths and weaknesses and they learn to

select learning tasks to fulfil their learning needs (Kicken, Brand-Gruwel, Van Merriënboer, & Slot, 2009).

The Student

As WPS put emphasis on independent and self-directed learning, students need to develop learning skills so that they are able to deal effectively with the appointed independence. Moreover, they should approach a task actively with intrinsic inter-est and a will to learn, hold positive beliefs about own capabilities, and know at what point in time they need to seek social assistance. Researchers have devoted considerable attention to developing and testing models of self-regulated learning (SRL) and self-directed learning (SDL) (e.g., Boekaerts, 1997; Brockett & Hiemstra, 1991; Knowles, 1975; Pintrich, 2003; Winne, 1995; Zimmerman, 2000a), skills that have been identified to play a central role in influencing learning and achievement. To date, these concepts have been theorised in many different ways in multiple disciplines with the result that SRL and SDL are often used interchangeable or in a similar way. Therefore, recent studies explored the links between these and related concepts and proposed to clearly distinguish them by pointing out similarities and differences (e.g., Dinsmore, Alexander, & Loughlin, 2008; Jossberger, Brand-Gruwel, Boshuizen, & Van de Wiel, 2010; Loyens, Magda, & Rikers, 2008; Pilling-Cormick & Garrison, 2007).

Based on the distinction of Jossberger and colleagues (2010), we suggest that to be successful in WPS, learners need to take responsibility for learning both at a micro and a macro level. From this point of view, SRL concerns the micro level that deals with the execution of a task, while SDL is situated at the macro level and basically refers to the planning of the whole learning trajectory. More explicitly, a skilled self-regulated learner is a cognitively, meta-cognitively, and motivationally active participant in the learning process at task level and s/he uses adaptive regulation strategies during task performance including orienting, planning, monitoring, assessing, evaluating, and reflecting (e.g., Zimmerman, 2000). When learners are skilled enough to regulate their learning on the task level, they have accomplished important skills that function as foundation, from which students can proceed to self-direct their learning. A skilled self-directed learner is able to decide what needs to be learned next and how one's learning is best accomplished by diagnosing learning needs, formulating learning goals, identifying and choosing human and material resources for learning (cf. Kicken et al., 2008; Knowles, 1975). This indicates that a self-directed learner is able, ready and willing to prepare, execute, and complete learning independently (Van Hout-Wolters, Simons, & Volet, 2000). Subsequently, that brings along two perquisites for SDL including a will to learn and the degree of learners' control to make choices.

The Teacher

To foster the development of SRL and SDL skills in WPS the support of the teacher plays an important role. Teachers have various tasks in preparing students for the labour market. On the one hand, teachers are expected to teach students vocational competencies and on the other hand, they need to support the development of SRL and SDL skills, because these skills are instrumental for vocational competencies. Whether and how self-directed learners develop depends also on the assistance and support they get, which in turn should be adapted to the learner's level. The teacher can be seen as an activator, a change agent, who engages in reciprocal teaching (Hattie, 2009). Teachers' role in supporting SRL and SDL skills includes giving feedback, providing direct instruction in SRL, and increasing the responsibility of learners to become self-directed (Bielaczyc, Pirolli, & Brown, 1995; Hattie & Timperley, 2007; Katz & Assor, 2007; Zimmerman, Bonner, & Kovach, 1996). In terms of SRL and SDL it is suggested to be advantageous to start off with an activating form of guidance in the beginning and to move to a more facilitating one when students are on their road of becoming self-directed learners, because then students will take over responsibility for their own learning and only need a teacher as facilitator who stimulates the learning progress.

Bringing these theoretical ideas into practice is no sinecure and therefore it is essential to explore what is actually happening in WPS at different schools and investigate perceptions and preparedness of students to work and learn in a self-directing way in these practical learning environments. Therefore, the following research questions are addressed: 1) What design characteristics of WPS do students perceive to be relevant for successful learning? 2) What learner characteristics do students perceive to be relevant for successful learning? 3) What characteristics of the teacher do students perceive to be relevant for successful learning?

Method

Educational Setting

The study took place in Dutch pre-vocational education. Its main aim is to prepare young students (aged between 12 and 16 years) for upper secondary vocational education and higher professional education. The duration is four years and consists of two parts. During the first two years, all students are offered the same broad set of subjects to acquire relevant general knowledge in mathematics, language, arts, natural sciences etc. At the end of the second year, students can choose out of four different sectors and four different learning pathways. Selecting a sector is a first

individual step to orientate towards further education and/or the labour market. The sectors are Agriculture, Engineering & Technology, Economics, and Care & Welfare, each including a specific set of subject matters. These sectors can be further subdivided into more specific units. A learning pathway is usually recommended by teachers on the basis of the students' achievement, capabilities, and preferences, so that a way of learning is chosen that suits them best. They can follow a theoretical, a combined, an advanced vocational, or a basic vocational learning pathway indicating a more theoretical to more practical approach. From the beginning of the third year, students start working in WPS. In these authentic learning environments students are actively involved in realistic practical tasks and processes. Depending on the learning pathway, students spend on average 4 to 12 hours in WPS (Ministry of Education, Culture, & Science, 2005).

Participants

Forty students from three different schools for pre-vocational secondary education located in the South of The Netherlands participated; eighteen females and 22 males from the sector Agriculture, Engineering & Technology, and Care & Welfare. Students were in their final year, fifteen or sixteen years old, and have worked in WPS since their third year in pre-vocational secondary education. All participated in an advanced vocational learning pathway. There were two reasons for including this group of students. First, students in the advanced vocational learning pathway spend more hours learning in WPS than students who take the theoretical or combined learning pathway. Second, these students are expected to be able to work more independently and to take more initiative and responsibility with regard to learning than students in the basic vocational pathway (Ogg & Kollaard, 2001).

Instrument

The group interviews focused on the three broad topics. Open questions were formulated concerning the design of the learning environment (WPS), the role of the student, and the role of the teacher. In the interviews, we used a predetermined list of questions, but the discussion was let to roam to themes that popped up during the sessions taking care that all important topics were covered (Fontana & Frey, 2005). Interviews started with questions about the learning environment such as 'Could you give an example of a good functioning WPS? What characterises a good WPS?' We have chosen to ask questions about the learning environment first in order to gradually proceed from a more general category to a more specific and more personal one. It was expected that questions about this topic facilitate the talk in the beginning of the interview. Then, questions about the role of students were asked concerning the way they work at tasks in WPS. Questions about the role of

teachers included their way of acting and guiding students. Participants were asked to illustrate their answers with examples.

A pilot was conducted to test if the questions of the interview were clear and understandable for the students. Furthermore, we wanted to see how they react in a group interview in order to determine the number of participants in a group. In the pilot three fourth year advanced vocational female students from the sector Care & Welfare were interviewed. Due to this pilot some questions were revised and it was decided to have five students per group to increase the discussion among participants (Fontana & Frey, 2005).

Procedure

Students were randomly selected by a teacher and were divided into several sepa-rate groups with a maximum of five students per group. Table 3.1 gives an overview of the distribution of the participants over the groups. Depending on the group size, the amount of information, and the speed of speaking, interviewing took between 45 to 90 minutes. Interviewing took place in meeting rooms at the schools. The interviews were recorded digitally with Audacity 1.2.6. software (Mazzoni, 2006) and transcribed verbally. As data were collected in Dutch, quotes used in the result section were translated into English.

Table 3.1. Distribution of students within sectors

Sectors	Agriculture	Engineering & Technology	Care & Welfare
Number of students	10	13	17
Groups of students	2 groups of 5 S	2 groups of 4 S and 1 group of 5 S	1 group of 3 S, 2 groups of 5 S, and 1 group of 4 S

Note. S indicates students.

Analysis

The aim was to derive insights from the group interview data in order to enhance understanding of students' perceptions with regard to workplace simulation learn-ing. Thematic analysis was used to identify theme in the data. This qualitative ap-proach provides a rich and detailed picture of actions and interactions in the learn-ing environment examined (Braun & Clarke, 2006; King, 2004).

First, two researchers read and reread the pilot transcript and systematically gathered the meaning of the text passages. This preliminary coding was a bottom-up approach in which material of relevance was highlighted. In an iterative process the key elements in the data were identified and each emerging theme was labelled and the meaning was explained (see Table 3.2). The different themes were grouped into categories and sub categories in order to reduce the number of units. The

categories were reviewed and critically discussed by all authors. Then two researchers coded individually approximately 20 percent of the interview data to calculate the inter-rater agreement. Cohen's kappa revealed a value of .73.

Table 3.2. Emerging themes with regard to the learning environment

Design characteristics	Abbreviated memo
Authenticity	The learning environment imitates reality. It feels very real for learners (e.g. cooking).
Structure	Learners are provided hold; they have to follow guidelines or a plan (e.g. the setup of the lessons, the task division, and roles).
Instruction	It concerns aspects of instruction like the description of a task and the way it is presented to students.
Learning tasks	The perceived difficulty and challenge of a learning task.
Assessment	All forms of assessments are described such as practical and theoretical assignments, work attitude, and written or oral tests.
Embedded reflection	Aspects that deal with reflective activities after task performance such as a reflection form that learners have to fill in.
Adaptation	The possibility to make choices concerning tasks and learning trajectory.
Collaborative learning	Learners work together in groups, either put together by the teacher or chosen by the students for a shorter or longer period of time. Furthermore, characteristics of successful and less successful collaboration are put forward.
Atmosphere	This code describes the climate in the class such as the working climate or the general climate such as chaos or calm.

Results

This section is divided into three main parts including students' perceptions on (1) the design of the learning environment, (2) the student characteristics, and (3) the role of the teacher that are perceived to be relevant for successful learning in WPS. In an effort to cogently articulate the findings and to provide a good overview, we have summarised the results in tables according to the main themes emerging in the data. Aspects that need further elaboration are described in more depth in the text. Citations of students are used as illustrations.

Students' Perceptions on the Design of WPS

In Table 3.3, the key themes of students' perceptions on the learning environmental characteristics are presented and for each category a citation is used as illustration.

Table 3.3. Summarised results of the learning environment

Design characteristics	Key aspects	Example
Authenticity	• Feeling of reality is highly valued • Picturing reality/job is easier	A2A: 'Practical lessons are good for your own development anyway, definitely if you do not know what you want to do. For example, a simulation of a hairdresser is simply nicer because then you get a bit of a foretaste.'
Structure	• Design of lesson provides guidelines, plan or task division e.g., timetable, overview, roles	A1S: 'Usually, everything is following a certain order, you cannot get confused actually, and therefore teachers can also see and check if you have done everything and in the right order. If you do not have a hallmark for your self-assessment then you are not supposed to start with your practical task.'
Instruction	• Theoretical and practical component is integrated • Explicit instruction of what and how to do are used • Clear and short formulations are desired	A2Ro: 'Well, I am a person, who needs quite a lot … yes how do you say that … I need clear instructions and when the task is formulated very vague, I simply do not understand.'
Learning tasks	• Students perceived task difficulty depends on prior knowledge • Challenge motivates	C3K: 'I think almost everything is rather easy here.' C3D: 'Yes, I also think that most tasks are easy. For example, reading to a doll.' C3K: 'That is really easy.' C3C: 'Or hot chocolate. C3B: 'Yes.' C3C: 'It was a lesson about making hot chocolate.' C3D: 'Within fifteen minutes you were ready.'
Assessment	• Difference in frequency and kind of outcome • Practical work and attitude are evaluated • No transparent assessment criteria	A1J: 'But actually students who have made a less good product but did invest good effort receive a better mark. Yes the mark for practical tasks depends very much on your effort.'
Embedded reflection	• Reflection is only partly integrated • Students do not like to reflect	C1M: 'Yes, to look at the process. How did you experience it yourself and how did you perform.'
Adaptation	• Making choice is limited • Picking rather than choosing	T2K: 'Yes, actually we can choose what we do, but at the end of the year all modules must be completed.'
Collaborative learning	• Working together is regarded important • Preference for working with friends	C3D: 'A good collaboration is very important, because you are doing the practical tasks together and you are also assessed on that.'
Atmosphere	• Good work climate is important as it influences well-being, motivation, and working attitude • Emphasis on sociability	A1S: 'Yes again sociability, in principle you work on your own and sometimes there is no sociability, but it is nice if it is pleasant then you realise that it is nice that day and everyone is working much better. If there is no good atmosphere, then it does not work out.'

Note. An abbreviation refers to a certain interview. The first letter indicates the sector. T stands for the sector Engineering & Technology, C stands for Care & Welfare, and A for the sector Agriculture. The number refers to the interview and the last letter corresponds to the name of a student.

Authenticity. Through authentic WPS students had the feeling that they gained a valuable impression of what a job contains and could imagine reality better. Students clearly distinguished between WPS that were authentic and those that were not. Learning tasks that triggered an unusual but real experience were perceived positively and most students reported that they valued internships because here they were confronted with real tasks and everyday complications.

Structure. In each WPS, one student was assigned the role of workplace assistant and in the Engineering & Technology sector a second student was responsible for the depot. In these roles students assisted the teacher and took over some of the teacher's responsibilities. Tasks included the distribution of learning materials and tools, keeping order, and checking assignments. However, students expressed a feeling of boredom and dissatisfaction when being assigned as workplace assistant, because most tasks were not perceived as challenging.

Learning tasks. Tasks varied in difficulty level and the perceived difficulty depended on students' prior knowledge and how seriously a task was executed. The students indicated to prefer challenging tasks in WPS. However, especially students in the Care & Welfare sector seemed to experience little challenge. It also happened that students worked faster and that no more tasks were available. As a consequence, students went to their teachers to ask for an extra task. Two students got a challenging task (*A1J: 'Well, we went to the teacher, to Mr. J., and then we said that we do not have anything to do. So he gave us the mowing-machine that was already broken for about one year and he said that we should unpick it and try to repair it. That is what we did and we managed.'*), while others were simply kept busy (*A1S: 'And then you go to Mr. P. and you get a task such as going for a walk with the ferret or when it is beautiful weather then they say that you can trim the hedge, so then you are busy.'*).

Embedded reflection. Schools and teachers differed in the way they implemented reflection moments. In some cases, reflection after accomplishing a task was integrated in WPS. For instance, the Care & Welfare sector of one school sometimes used a reflection form. Students did not like to reflect and they mentioned that it was rather difficult and inconvenient. If not obligated, they did not feel a need to follow the prescribed steps (*C2Hu: 'Yes, but it is also not compulsory or so.' C2T: 'No, she (teacher) also does not ask for it.' Interviewer: 'So if it is not compulsory, it is not done?' C2T: 'No.' C2StC: 'It is only extra work.' C2Hu: 'Yes, very stupid but no it is mostly not done.'*).

Adaptation. Students appreciated being allowed to make choices (*A1S: 'In the beginning you were allowed to choose yourself in which category you wanted to work … Thus that was much nicer. For example, if I was put to technology with mo-tors and stuff, well I do not feel anything for that, but I could choose and I decided to do kitchen and animals … and yes that was much more enjoyable.'*). However, students indicated that the possibility for students to make their own choices was

very limited. Choosing an extra subject students were interested in and wanted to learn more about seemed not possible. Choice mostly concerned picking rather than choosing (*C3C: 'The task says "choose a recipe" and finally it is not allowed, because it takes too much time or is too expensive or … so in the end you pick one of the meals that is on a working card.'*).

Collaborative learning. Working together was especially experienced as useful when students had to solve difficult tasks (*T1R: 'It also depends on the task. If I have to set the valves it is a difficult task and then I need my partner. But if I have to balance a tire, I could also do it alone.'*). A good collaboration was perceived as very important, because students' performance was also assessed. Working together was successful when students could communicate and confer easily with each other, tasks were fairly distributed, every group member was willing to work together and to help each other, understanding each other, and a good atmosphere was created.

Collaborating was perceived to be difficult, when group members were not willing to spend effort to the same amount. When students did not get along with each other in a group, the consequence was that they distributed tasks so that they could work more by themselves (*A2Ri: 'You have to work together, but if I do not like her then I do not have much contact with her and I do my own things.'*). Students also perceived problems when students from the basic and advanced vocational learning pathway had to work together. The participating schools varied in their approach, some schools mixed basic and advanced vocational students and in others they were separated and groups were more homogenous (*C3B: 'Basic vocational students are often more boisterous than advanced vocational students, more boisterous and they fall out faster and quarrel'*).

Students' Perceptions on Characteristics of a Successful Learner in WPS

This section is divided into personal and learning-related characteristics of students that are perceived to influence a successful approach and task performance in WPS.

Personal characteristics

Table 3.4 provides an overview of the personal characteristics that were mentioned by students.

Table 3.4. Summarised results of the personal student characteristics

Student characteristics	Key aspects	Example
Do-learner	• Strong preference for practice • Learning by doing easier to remember and more enjoyable	T3Jo: 'Practice is easier to remember.'
Deep learner	• Job-related knowledge • Applying knowledge correctly • Integration of theory and practice • Practicing activity regularly • In-depth learning if personal interest • Cheating does not help	T2K: 'The more often you do it, the better you know how you need to connect circuit and wire, so that it is good.'
Responsibility	• Own responsibility to work seriously • Being responsible triggers serious work attitude	C4L: 'It is also your responsibility to do all the tasks. Because sometimes they (students) say like "How does that work? We have not at all practice that." Even though, you should have practiced it. And then …"Oh, my folder is not complete." Well, then they have not kept it up to date every week. I think it is so much their own business.'
Independence	• Freedom to work on own pace is valued • Support to work independently is offered • Feeling left alone, difficulty to work independently	A1D: 'Teachers are not really present to give lessons in WPS. That is something you need to do yourself.'
Taking initiative	• Taking initiative to ask teacher • Passivity is not appreciated	C1S: 'There are also people that stand still all the time, they are not interested and think others will do the work.'
Motivation	• Interest for a topic • Ambition for future profession • Willingness to spend effort • Not motivated, not starting	C4B: 'Yes, if you find it very interesting it is self-evident that you also want to perform well and get the most, the best out of it. And if you do not feel like it, then you are happy if it is just sufficient.'
Job orientation	• Knowing future profession • Learning for aim • Confirmation of profession • Only insight into job relevant content	C3StK: 'If you know what you want, then you learn for your aim.'
Social skills	• Interaction with students and teachers • Communication • Mutual understanding • Work attitude • Empathy	A1R: 'Good communicating and being nice to the teachers otherwise you run against everything.'

Note. An abbreviation refers to a certain interview. The first letter indicates the sector. T stands for the sector Engineering & Technology, C stands for Care & Welfare, and A for the sector Agriculture. The number refers to the interview and the last letter corresponds to the name of a student.

Do-learner. Students mentioned that they were highly motivated in WPS and they had the feeling that they learned more by doing and were better able to remember the learning material when they were actively involved in a task (*A1D: 'He (teacher) can continue explaining how something works, but you learn best when you are doing it yourself, when you can work with your own hands. Then you learn the most.'*). Reading and learning theory from books was experienced as more difficult and less enjoyable (*C2T: 'I think learning from a book is very difficult, because I have a big problem concentrating and I am very quickly distracted by what is happening around me … '*), although some students also indicated that theory was important (*T3J: 'Practice is nice as you are working on electrical connections and so on. Yes, and theory is less, but it is part of it.'*). A few students mentioned that they would like to have more theory. Despite the preference for practice, students needed to accomplish the theoretical and practical parts of a task to perform successfully.

Deep learner. The integration between theory and practice was valued as effective for learning (*T1D: 'Actually, I think that what you learn in theory needs to be practiced in WPS afterwards.'*) as well as practicing regularly. Students indicated that they liked to learn in-depth about subjects they enjoyed and were interested in; they wanted to learn something new. However, there was also a risk that some students only focused on the subjects they liked and already knew a lot about, because that was easier (*T1T: 'If I was allowed to, I worked on my scooter every lesson, because I actually know everything about it.'*). Students from the Agriculture sector also mentioned that it was easy to cheat, which counteracts learning effectiveness. Cheating was possible as students had taken over tasks of the teachers and they still had difficulties with the responsibility that went along with it.

Independence. Students pointed out that they were expected to work independently in WPS (*T2D: 'You do need discipline to work on because you have a lot of freedom. There is nobody who pays attention and says that you have to finish that and you have to do it like that. If you are not in a mood, you can simply do nothing or foul around.'*). On the one hand, students indicated that they liked being more independent and having more freedom to work at their own pace, and that not everyone had to do exactly the same thing. Some students also mentioned that they had enough support to work independently (*C3B: 'But in the kitchen you have working cards and then everything follows automatically. Then you do not need any help.'*). On the other hand, however, students did find working independently difficult and could feel left alone (*T3Jo: 'With the theory you also usually have to figure it out yourself. And if you ask you receive the answer that it is in the book. But sometimes you cannot find it. So that is quite difficult.'*). The degree to which students were able to work independently varied considerably (*A1S: 'There are also students, who need a lot of attention. They need a lot of guidance. Yes and for them*

the teachers are also present. There are students who simply cannot work independently.').

Taking initiative. Some students indicated that they took initiative when they had completed a task and still had some time left (*T1T: 'Imagine he (peer) needs to know how he has to set the valves and he finds something on the Internet and actually he knows what he needs to set the valves, but not everything is standing on the website, then he keeps on looking until he has found everything.'*). However, for most students it seemed rather difficult to take initiative; they did not see or feel the need to do it. Moreover, students perceived some peers as passive during WPS, but they distinguished between those who were passive on a regular basis and those who were just not in the mood once in a while. Passive behaviour was experienced as annoying by fellow students (*T1T: 'He is really going too far, that is not normal anymore.' T1B: 'He actually made a drawing on someone's back or so.' T1R: 'He really does not get started. Even I start earlier.'*).

Social skills. Social skills were especially perceived important when students had to work collaboratively and communicate with each other and the teacher. Although a few students from the sector Engineering and Technology mentioned that it was important to have good communication, mutual understanding, and a good work attitude, social skills were more often stressed by students from the sectors Care & Welfare and Agriculture. Social skills that students found important were empathy, being nice and not short-tempered, having a good attitude, social manner, a feel, getting on well with the teacher, and knowing how far you can go. Especially, communication skills were highlighted. Students experienced good communication important for learning in WPS. Communicating well enabled pleasant contacts with fellow students and teachers, which again was perceived essential for a good atmosphere. Characteristics of good communication that were mentioned by students were listening carefully, being straightforward, honesty, patience, and politeness. Students did not appreciate to receive orders and perceived people who got angry quickly, were chagrined, quickly tempered, yelling, and affronting someone as poor communicators.

Learning-related characteristics

In Table 3.5 the learning-related characteristics are presented.

Table 3.5. Summarised results of the learning-related student characteristics

Student characteristics	Key aspects	Example
Learning task approach	• Characteristics of a successful approach • Characteristics of less successful approach	Successful: starting quickly, careful reading, good listening, not working too quickly, doing what is asked, keeping on working, seriously working, neatly working, asking questions, working independently, good work attitude, will to learn and work, spending effort, commitment, going for it, interest, discipline, being responsible, patience, perseverance, motivation Not successful: opposite is perceived detrimental for learning and working including attitude of indifference, failing to hold attention, and easily distracted
Planning	• Unstructured behaviour • Planning activities when collaborating	T1B: 'Normally, I just start and I'll see where I end up.'
Self-assessment	• No surplus value of self-assessment	C3K: 'But you cannot assess it yourself. We do not have checklists.'
Self-reflection	• Taking into account result and attitude • Knowing what is easy and difficult	T3J: 'I do know very well if I have done something good or bad. If I have completed a board then I first check if anything is wrong. For example, if it is not so precise, I first improve that. In the end, it is always good. But you have to check the measurements yourself.'
Problem solving	• Task-related problems • Interpersonal problems	T3J: 'In the beginning, I was in a fog. For example, when I opened the book and I had to make a task and start with the first things, I had absolutely no clue. I did not know how I had to do it.' Interviewer: 'How did you solve the problem?' T3J: 'I read more about the theory, and most of the time I asked and then everything went well.'
Help seeking	• Take initiative • Expect fast reaction • Waiting is difficult • Asking more than once is possible	T2J: 'When you need help, then you just need to mention it.' C4S: 'Yes, sometimes then I call her (teacher) and then she does not react and then I call her again and then she still does not react and then I start shouting.'
Asking peer	• Fast answer • Reputation is secured • Selection is made	C2C: 'You can always ask each other.'

Note. An abbreviation refers to a certain interview. The first letter indicates the sector. T stands for the sector Engineering & Technology, C stands for Care & Welfare, and A for the sector Agriculture. The number refers to the interview and the last letter corresponds to the name of a student.

Planning. When working collaboratively in small groups students stressed that it was especially important to distribute and plan the different tasks well and stick to appointments in order to achieve a good result (*C1C: 'In the beginning you really have to say what you are going to do, really make a plan … '*). Moreover, students knew that they had to watch the time in order to prevent finishing a task too late. Writing down a planning and using it during the process, however, was not done unless it was obligatory. Working plans, preparation plans or step-by-step plans were partly integrated in the tasks; however, some students indicated that making a planning was not necessary as all relevant information was already provided.

Self-assessment. Assessing one's own or a peer's performance was partly integrated in the participating schools, but the way students dealt with assessing was questionable. Students did not see the purpose or a surplus value of self-assessments, in which they needed to answer questions after reading about a certain topic. Moreover, they often did not know how to assess themselves or they indicated to have difficulties to take the assessment seriously (*C3C: 'We only have that (self-assessment) with 'assistance' when you, for example, have to learn the Heimlich manoeuvre. Then you are doing it with a peer and then you watch how s/he puts someone in the recovery position or so and then you check off. But you do check off anyway.' C3D: 'You do not say "no, you have not done that properly" or something like that.'*).

Self-reflection. Although students seemed to be able to self-reflect on their performance based on their results and attitudes, reflection seemed rather superficial as students did not go into details concerning their skill and possible improvements. Moreover, students also mentioned difficulties (*C3K: 'It is also possible that you learn something wrong. Last year we had a task and we filled everything in respectively, but we answered the question incorrectly. We did not realise that and so we also did that wrong in the exam.'*) and indicated that they did not judge their performance themselves, but waited for the teacher to tell them (*A2Ri: 'You see how you perform by the mark you receive or by the way a teacher treats you.'*) or (*T1D: 'I cannot tell if I did it well or wrong.' T1J: 'You do not know if you have done it well or wrong. The only thing the teacher does is to check the answers and sign off. But you cannot really say "I have done this, is that correct?" you would not get an answer.'*) or (*C4S: 'I do not judge my performance actually.'*).

Help seeking. Most students mentioned that they could ask the teacher for explanation or instruction even if it was more than once (*C2T: 'And what I also like is that well not all students do that here but a lot do … teacher explain it 10 times if you do not understand, she explains so long until you do understand, if necessary you go there after the lesson and then she still will explain it to you until you understand. That is something I really find important.'*), but other students also expressed difficulties (*T1D: 'If you ask something too often and if … imagine you have asked the same thing three times and damn you still do not get it. Then you ask*

again "Well, kid, do I have to explain it again?" You receive such an answer and that is so terrible' T1J (imitating the teacher): 'Even kids from primary school or kindergarten know that already.').

Asking peers*. Peers were perceived as easily approachable during the lesson and students indicated that they usually asked a peer for help first before they went to the teacher. Time was the most important reason for asking a peer first; it was much faster (*T2R: 'Yes, the teacher is also often busy with someone and if you have to wait for that you need additional thirty minutes.'*). One student also pointed out that asking a teacher too often was not good for your reputation. Students chose peers from whom they expected to know the correct answer (*C4StB: 'You have students in the class who do know something about cooking, they have also done it at home and then they can help you.'*) or (*T2D: 'Yes, usually you ask a student who will probably know the answer and if he does not know, you simple go to the teacher.' T2K: 'And not someone who is only busy with other things.'*).

Students' Perceptions on the Role of the Teacher in WPS

Teacher characteristics are divided into personal and teaching-related characteristics, but here only the teaching-related characteristics students perceived to be influential for a successful approach and task performance in WPS are presented. In Table 3.6 an overview of both, the personal and teaching-related characteristics, is provided.

Table 3.6. Summarised results of the teacher characteristics

Teacher characteristics	Key aspects	Example
1 Personal		
Calm	• Being calm and taking time is highly valued	C2V: 'We have one teacher; she really does a great job actually. She always stays calm and never tears into someone; she is always there and gives good compliments.'
Empathy	• Understanding thoughts and behaviour of students is important • Trust is created	A1S: 'In my opinion, our teachers mostly see quickly through the personality of the students and what they can say to them. They also see quickly if you have a bad day. They know how you are and they know immediately if something is wrong.'
2 Teaching-related		
Presence	• Necessity of presence • Complains about absence • Integrated dependency	A2A: 'Well, then it is saying "report to the teacher", yes and then you are standing there, but if the teacher is not present, you have a problem.'
Attention	• Faster students are allowed more • Matter of trust	T1T: 'Well, yes, the faster students are allowed more; they get … imagine there is

Teacher characteristics	Key aspects	Example
	• Personal attention is nice • Most attention to boisterous students	a car of a teacher that needs a check-up. Then a faster student gets the task.'
Direct support	• Clear and specific directions desired	C4N: 'Actually, the points of particular attention that you need to learn for example.'
Feedback	• Feedback on process and product is valued • Balance between positive and negative comments important • Stimulating/motivating	C4N: 'But she also only pays attention to mistakes that you make, not to the good things and that is simply no longer nice.'
Help	• Help on request of students • Passive behaviour of teacher is not desired	A2Ro: 'Some teachers do it really good and other absolutely not.'
Explaining	• Simple is valued • Visible is valued • Patient is valued	T3StJ: 'Yes, and by making a drawing or demonstrating something. That is what he (teacher) also does.'
Assessing	• Approving is valued • Ticking off is not valued	C3C: 'But you could also fill in whatever you like, because they do not really look at it. They look if you have written something and then they tick off.'
Maintaining order	• Being strict • Controlling aspects of behaviour • Controlling aspects of safety is important	T2D: 'Well, if it is really going too far, yes then he does something about it. But I have the impression that he rather talks about it. It depends who it is, some teachers are really a bit too mild, and they cannot really give a good punishment.'

Teaching-related characteristics

Presence. The teacher plays an important role in WPS and students expressed the need for presence of the teacher. Students expected the teacher to be there when they needed her/him and complained about the absence of the teacher, but they did distinguish between teachers that were more or less present. They got frustrated when the teacher was too busy and did not have enough time (*C1S: 'Sometimes when you ask something, she gives an answer, but when another student comes then she is quickly distracted and then she is away again and then you still do not know what to do.*'). Students also seemed to have difficulties to work seriously when the teacher was not present. The dependency on the teacher was also partly integrated in the tasks as students were obligated to show the product they were working on to the teacher at certain stages before moving on. The presence of the teacher was especially discussed in the groups of Care & Welfare and Agriculture as students were working in different workplaces at the same time.

Direct support. Students expressed a preference for clear directions rather than vague ones like "it is in the book" or "look it up on the computer". Direct support could concern personal advices by teachers to students concerning subject choices or it could refer to clear instructions during task performance (*A1J: 'I really need a teacher who tells me "do that and I stay with you until you have finished" and then I also succeed. And also someone who jumps in when something goes wrong.'*).

Feedback. Feedback was perceived as useful by students to judge their task performance better (*A1S: 'Do it once and then they watch how you are doing it and afterwards they point out what you did wrong and then you have to do it again. And then you actually just realise how little you know about … things of which you thought "oh yes, I know it". And then it is also nice to know how you have to handle a horse or a hamster or a mouse, yes, thus often you think that you already know and so you do it in a certain way and then mistakes are pointed out and you think "oh, yes, I did not know that" thus … '*). The balance between positive and negative comments was perceived important, but students expressed that some teachers focused too much on negative aspects. Students appreciated when teachers gave compliments or motivated them to perform better (*A2Ro: 'And he also says something like "you must not think that you cannot do it, because you sure can.'*).

Assessing. The teacher checked the performance of a task carefully (*A1R: 'Teacher J. assesses quite well, he always says when you ask him to approve your performance "Come here and now explain to me how all this stuff works". You must, you really must know what it is all about.'*). Some students indicated that assessing and approving performance was dependent on the teacher and how well you could get along with a teacher (*A1J: 'If you just had an argument with a teacher in advance and you have done your practical task perfectly, he still gives you a bad mark, because he is angry with you.'*). In contrast to assessing and approving, students also mentioned that teachers ticked off a task meaning that teachers only checked whether students had done a certain task. The content of the task then was not really approved by the teacher.

Discussion and Conclusion

In this exploratory study, we gained more understanding into the perceptions of students concerning the design of the learning environment, student and teacher characteristics that can make a difference in WPS. These three interacting factors need to match in order to fulfil expectations, wishes, and needs (Cook-Sather, 2006; Elen & Lowyck, 1999; Entwistle, 1991; Entwistle & Tait, 1990; Könings et al., 2010) and to foster the development of active and independent learners who should become adaptive employees in the future labour market (Achtenhagen & Oldenbürger, 1996; Ministry of Education, Sciences, and Cultural Affairs, 2004). Investigating

workplace simulation learning in this study by taking into account students' perspectives helped to identify success factors but also inherent problems and challenges in WPS that need to be solved and taken in order to support the development of effective learning strategies for the various types of learners and to realise the theoretical ambitions.

To answer the first research question 'What design characteristics of WPS do students perceive to be relevant for successful learning?', we go back to the theoretical starting point of WPS. The three pedagogical principles that were identified include authentic setting, integration of theory and practice, and adaptive learning (cf. Vrieze et al., 2001). Authenticity was highly valued by students and two major advantages were put forward. On the one hand, it increased students' motivation as the learning situation felt real including the complexity and challenges of everyday life and on the other hand, students could grasp and imagine reality better. It became clear that authenticity concerned the learning tasks as well as the physical arrangements of a WPS. Although research pointed out that learning tasks should be complex, realistic, and challenging in relation to the real professional work field (Van Merriënboer & Paas, 2003) and foster high-quality learning (Vermunt, 2003), students did not always perceive a learning task as useful, challenging, and authentic. As a result, students indicated that their motivation and engagement dropped (see e.g. also, Locke & Latham, 2002).

The second pedagogical principle of integrating theory and practice is realised by combining the theoretical domain specific information with a practical task and students indicated that this was a good way of learning as long as they could use the theoretical knowledge during the practical task performance. Students described themselves as do-learners with a clear preference for the practical part of the learning tasks. They experienced practice as easier and more enjoyable. According to students, the theoretical part should be as concise as possible and the instruction should be short and grammatically easy because they did not like reading and faced difficulties with long text passages. Only if they were interested in the subject matter and perceived the learning task as useful in light of a possible future profession, they were willing to spend effort on the theoretical part and wanted to learn more about a certain topic.

The third pedagogical principle of adaptive learning seemed not to be implemented according to the theoretical idea (Kicken et al., 2008; Vrieze et al., 2001). Adaptation and making choices to direct one's own learning pathway was limited to a predefined set of possibilities, which interferes with the idea of self-directed learning. Although students liked to make their own choices, the possible alternatives involved picking rather than choosing (e.g., Katz & Assor, 2008). Thus, being adaptive to learners' wishes (real choices) was not realised in the eyes of learners. Moreover, it became clear that performance and assessment criteria were not transparent for students, which made it more difficult to assess their task

performance. Likewise, reflection on task performance was only scarcely embedded in WPS and students did not perceive it as a useful activity.

In addition to these three principles, atmosphere was another learning environmental characteristic that students highlighted to be relevant in WPS for stimulating the learning and working processes and which was not mentioned explicitly in the theoretical background. Atmosphere was created by the WPS and by the interaction with peers and teachers. Students expressed a preference for a clean, calm, and cosy atmosphere to work and learn effectively. As collaborative learning was mostly used as method of working, the composition of the group also contributed to the atmosphere in WPS and students clearly preferred to choose themselves with whom to work. Peers were a part of the learning environment and they were a source for making learning enjoyable, but they could also seriously disturb the learning process and the atmosphere in WPS. Collaborating successfully required mutual understanding and the willingness to contribute and spend effort to the same extent.

The second research question focussed on the learner characteristics that students perceived to be important 'What learner characteristics do students perceive to be relevant for successful learning?'. Research has identified SRL and SDL skills to play a crucial role in learning and achievement (e.g., Boekaerts, 1997; Brockett & Hiemstra, 1991; Knowles, 1975; Pintrich, 2003; Winne, 1995; Zimmerman, 2000), and it was expected that these skills would help students to deal effectively with the appointed independence in WPS. Although students did not explicitly mention SRL and SDL they described closely related issues. Learner characteristics that were identified to be relevant for WPS learning could be divided into personal and learning-related qualities. Learners who were motivated, responsible, and socially competent, take initiative, work independently, and know what they wanted were perceived to be successful students in WPS as these students were likely to approach the learning task with interest, discipline, perseverance, and commitment. Motivation and interest were related to deep learning. These are characteristics that were also described to influence the learning process positively. For instance, being responsible for one's own learning was described as important starting point for self-directed learning (Brockett & Hiemstra, 1991). Motivation was identified as an essential dimension in SRL, because this made students more attentive, display greater progress, persist, experience greater satisfaction and positive affect (e.g., Pintrich, 2003; Zimmerman & Kitsantas, 1999; Zimmerman & Schunk, 2008). According to Zimmerman and Schunk "motivational processes play a vital role in initiating, guiding, and sustaining student efforts to self-regulate their learning" (2008, p. 3).

Peers who missed these qualities and attitudes frustrated (cooperation with and progress of) others and ruined the atmosphere. With regard to learning-related characteristics, students indicated a rather unstructured behaviour in the sense that

they would start and then see where they end up; no planning activities seemed involved. According to students, planning was often not required to perform a learning task. However, when working collaboratively, students indicated some planning such as distributing tasks to achieve a good result. Assessing one's own or a peer's performance was perceived as difficult for students, especially doing the self-assessment seriously. Assessment criteria and worked-out examples might help, but they were not available. Students indicated to self-reflect on their performance by taking into account their work attitude and their result, but their self-reflection seemed to remain superficial and students also mentioned difficulties evaluating and reflecting on their performance. Often students saw it as a task of the teacher to tell them how they performed and where they needed to improve. Supporting the development of self-regulated learning skills can help students to plan, self-assess, and self-reflect (Bielaczyc et al., 1995; Zimmerman et al., 1996). Moreover, tasks need to be complex enough so that students understand and see the surplus value of these skills (e.g., Lodewyk, Winne, & Jamieson-Noel, 2009). Although students liked working in WPS, this study also shows that the implementation of WPS has its inherent problems and challenges and that it might not be appropriate for all kind of learners if not enough support is offered. WPS can pose problems especially for students who are not motivated and who have difficulties concentrating, as they are disturbed by peers. Learning how to regulate their motivation should be a crucial aspect in teaching SRL (e.g., Zimmerman & Schunk, 2008).

This brings us to the third research question: 'What characteristics of the teacher do students perceive to be relevant for successful learning?'. Research on the role of the teacher says that s/he can play an important role in promoting and supporting the development of SRL and SDL skills (e.g., Bielaczyc et al., 1995; Hattie & Timperley, 2007; Zimmerman et al., 1996). Findings about the role of the teacher were divided into two parts distinguishing personal and teaching-related characteristics. Teachers who were calm and empathic were highly valued by students and these characteristics seemed to trigger trust and students' well-being, which in turn contributed to a good atmosphere. Derisive expressions were not liked. Although WPS aimed to be an autonomy-stimulating environment, students wanted the teacher to be present in space and time. Students seemed to be very dependent on the guidance, direction, and presence of the teacher to work and learn effectively. Students expected and enjoyed when teachers paid close attention to their work and really assessed and approved what they were doing as long as feedback was constructive. The balance between positive and negative feedback both in terms of self and of task performance was highly valued. Good assessment was a learning experience in itself and should be fair, not affected by appreciation of the person of the student, while ticking off tasks completed without assessment was not valued. Moreover, students expected teachers to maintain

order and safety. Good teachers differentiated between students, enriching the tasks of the good students and helping the ones who needed more explanations and support. But in practice, students also had the impression that teachers did not have enough time to pay close attention to all students. Especially the most boisterous students who faced problems with the appointed independence got the attention of the teacher.

This study shows that interviewing students can provide valuable insights into students' perceptions and their expectations, which can help understand their point of view and the difficulties they face as well as identify their needs and wishes. This research is an important move in gathering knowledge about what is happening in WPS and what needs to be improved. However, this qualitative approach also has limitations. Not all statements can be validated, because students were not systematically observed in practice. Students can explicate what characteristics are important, but that does not mean that they are able to act in an appropriate way and actually strive for the ideal situation they described verbally. It is much easier to say how a good student is working, than actually performing in that way. Thus, although students identified characteristics of successful students in WPS, it does not necessarily mean that they also know how to turn this knowledge into practice. Moreover, the interview data does not tell us if students' appraisal of their knowledge and skills is appropriate or if students under- or overestimate their competences. Nevertheless, students being aware of the differences between learners might be a first step in the sequence of changing anything.

Future research should explore whether students' perceptions do or do not correspond with those of teachers. As students and teachers are the most important actors in WPS, it seems useful that both parties know what the other one expects and which steps need to be taken in order to improve learning in WPS. Therefore, teachers' perceptions about success factors and difficulties also need to be investigated to see similarities and differences. Furthermore, examining how students act and perform in WPS by observing their actual behaviour also needs to be addressed in order to verify the interview data in practice.

To conclude, this study leaves us with several design dilemmas. On the one hand, students want authenticity and agency, challenging tasks, and some tailoring and differentiation concerning enrichment and support. But on the other hand, the environment should be well-structured and students prefer direct teaching and support. Moreover, students want fair and transparent assessments that trigger learning, but at the same time self-assessment and self-reflection are neither really valued or seen as learning experience nor taught. Last but not least, WPS demands self-direction and commitment, but essential metacognitive skills to learn in WPS are not (yet) in students' field of vision. From the student interviews, we conclude that self-regulation and self-direction are learning activities and processes that are not sufficiently promoted and supported in WPS, at least in the implementations we

investigated. Designing an effective and enjoyable WPS in which students' SRL and SDL skills are supported optimally requires a perfect match between learning environmental characteristics and teacher support that is adaptive to learners' level.

Teachers' Perceptions of Learning in Workplace Simulations in Vocational Education[*]

Due to top-down innovations, workplace simulations have been implemented in vocational education as authentic learning environments in which students should work independently and self-direct their learning. As teachers play a crucial role in translating the innovation to educational practice, this in-depth interview study investigated teachers' perceptions on the design of the learning environment and the student and teacher characteristics relevant for successful learning in workplace simulations. Results reveal that teachers face difficulties in designing appropriate learning environments as well as realising students' self-direction, and they experience a conflict of letting go and keeping control.

Innovations in vocational education aim to improve the quality of learning and instruction and are necessary in order to keep up with the challenges of economic and societal developments. Innovating successfully means that vocational qualifications need to match work requirements and adaptive life-long learners should be developed (Achtenhagen & Oldenbürger, 1996; Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004; Cedefop, 2004). To achieve these aims, workplace simulations (WPS) have been implemented in Dutch vocational secondary education. WPS are authentic and practice-oriented learning environments at school that simulate a (future) work situation, in which students are required to work independently. The simulation is a safe and controlled setting for students to acquire vocational skills, generic skills, and domain knowledge. Students work collaboratively and learn by practicing job-related everyday tasks (Vrieze, Van Kuijk, & Van Kessel, 2001).

The implementation of WPS involved drastic changes in the physical appearance of the learning environment. Many vocational secondary schools started huge renovation projects to make the learning environment authentic, attractive, and inspiring for learners. But for an educational innovation to be successful in practice, more is needed than the mere appearance of a learning environment. The pedagogical approach and the instructional material also need to be developed and specified in order to optimise students' learning and achieve competent and active learners. However, these steps were not carefully thought out in advance so that theory and practice are often inconsistent or insufficiently concrete and applicable. Research has shown that top down large-scale innovations are at risk to yield success and the execution in the schools often differed from the theoretical plans and goals (Fullan, 2000; Lagerweij & Lagerweij-Voogt, 2004; Struyven & De Meyst, 2010; Waslander, 2007). Changes in Dutch vocational education were rapid but not systematic (Nijhof & Van Esch, 2004).

For teachers, WPS are a renewal and that indicates that their tasks and roles change. According to Abbott-Chapman, Hughes, and Williamson (2001) teachers' professional roles become more complex and sophisticated as the required pedagogical content knowledge and pedagogical repertoires need to meet the societal needs. Teachers' beliefs and values influence the implementation of change and there is a risk that teachers do not or cannot fully implement the innovative design in teaching (Abbott-Chapman, et al., 2001; Könings, Brand-Gruwel, & Van Merriënboer, 2007; Miedema & Stam, 2008). Teachers in The Netherlands have the autonomy and responsibility to adapt their teaching accordingly (Ministry of Education, Sciences, and Culture Affairs, 2004; Nijhof & Van Esch, 2004). However, their learning process and competencies to realise the innovation are often not taken into account sufficiently (Lagerweij & Lagerweij-Voogt, 2004).

As teachers play a crucial role in the interpretation of an innovation and translation to educational practice, the central aim of this study is to investigate what teachers perceive to be relevant for successful learning in WPS with regard to

a) the design of the learning environment, b) the student characteristics, and c) their role as teacher. So far, little attention has been given to teachers' perceptions with regard to these topics in WPS.

Pedagogical Principles in WPS and Implications for Educational Design

Three pedagogical principles are introduced in WPS to make vocational learning more active and engaging: 1) use of authentic setting, 2) integration of theory and practice, and 3) adaptive learning (cf. Vrieze et al., 2001; Jossberger, Brand-Gruwel, Boshuizen, Van de Wiel, 2010).

To realise the first principle of authenticity whole authentic learning tasks that are complex, realistic, and challenging in relation to the professional work field should be designed (Van Merriënboer & Paas, 2003) to foster high-quality learning (Vermunt, 2003). Students must perform all the defined constituent skills to successfully accomplish such an authentic task while acquiring the necessary domain knowledge (Van Merriënboer & Kirschner, 2007).

To realise the second principle of integrating theory and practice the theoretical information should be linked to the practical learning tasks. Careful analysis in the design process of the learning tasks is necessary to identify what knowledge students need to acquire to match the theoretical information with practice and students' prior knowledge. Integrating theory and practice is expected to help students develop an understanding of a domain so that they are able to work successfully on learning tasks (Van Merriënboer & Kirschner, 2007).

To realise the third principle of adaptive learning, students should be able to follow their own learning trajectory and be aware of their own strengths and weaknesses (Knowles, 1975). A portfolio, for instance, can be used as a tool to provide an overview of possible learning tasks that need to be accomplished and metadata concerning the skills that can be learned. Offering transparent performance and assessment criteria helps students to evaluate their own performance as they know the requirements and their performance becomes visible. A portfolio can also assist students to define their learning needs, and select learning tasks to fulfil their needs (Kicken, Brand-Gruwel, & Van Merriënboer, 2008). A well-designed adaptive WPS can account for student differences and let students make choices in order to become independent and self-directed learners.

WPS and the Consequences for Student Learning

WPS put emphasis on independent and self-directed learning; therefore, students need to develop learning skills so that they are able to deal effectively with the appointed independence and to be able to learn on the job after leaving school. Moreover, they should approach a task actively with intrinsic interest and a will to learn, hold positive beliefs about own capabilities, and know at what point in time they need to seek social assistance. Researchers have devoted considerable attention to developing and testing models of self-regulated learning (SRL) and self-directed learning (SDL), skills that have been identified to play a central role in influencing learning and achievement (e.g., Boekaerts, 1997; Brockett & Hiemstra, 1991; Knowles, 1975; Pintrich, 2003; Winne, 1995; Zimmerman, 2000a). So far, these concepts have been theorised in many different ways in multiple disciplines with the result that SRL and SDL are often used interchangeable or in a similar way. Therefore, recent studies explored the links between these and related concepts and proposed to clearly distinguish them by pointing out similarities and differences (e.g., Dinsmore, Alexander, & Loughlin, 2008; Jossberger et al., 2010; Loyens, Magda, & Rikers, 2008; Pilling-Cormick & Garrison, 2007).

Based on the theoretical analysis of the concepts (Jossberger et al., 2010), we suggest that to be successful in WPS, learners need to take responsibility for learning both at a micro and a macro level. From this point of view, SRL concerns the micro level that deals with the execution of a task, while SDL is situated at the macro level indicating the planning of the whole learning trajectory. More explicitly, a skilled self-regulated learner is a cognitively, meta-cognitively, and motivationally active participant in the learning process at task level who uses adaptive regulation strategies during task performance including orienting, planning, monitoring, assessing, evaluating, and reflecting (e.g., Zimmerman, 2000a). When learners are skilled enough to regulate their learning on the task level, they have accomplished important skills that function as the foundation from which students can proceed to self-direct their learning. A skilled self-directed learner is able to decide what needs to be learned next and how one's learning is best accomplished by diagnosing learning needs, formulating learning goals, identifying and choosing human and material resources for learning (cf. Kicken et al., 2008; Knowles, 1975). This indicates that a self-directed learner is able, ready and willing to prepare, execute, and complete learning independently (Van Hout-Wolters, et al., 2000). Subsequently, that brings along two prerequisites for SDL including a will to learn and the degree of learners' control to make choices.

WPS and What It Means for the Role of the Teacher

To foster the development of SRL and SDL skills in WPS the support of the teacher is essential. Teachers have various tasks in preparing students for the labour market. On the one hand, teachers are expected to teach students vocational competencies and on the other hand, they need to support the development of SRL and SDL skills, because these skills are instrumental for vocational competencies. Whether and how self-directed learners develop depends also on the assistance and support they get, and how this is attuned to the learner's level. A study of Azevedo, Moos, Greene, Winters, and Cromley (2008) showed that conceptual understanding and declarative knowledge were enhanced when students' regulation was externally facilitated and effective strategies were encouraged by a human tutor. The teacher can be seen as an activator, a change agent, who engages in reciprocal teaching (Hattie, 2009). Teachers' role in supporting SRL and SDL skills includes giving feedback, providing direct instruction in SRL, and increasing the responsibility of learners to become self-directed (Azevedo et al., 2008; Bielaczyc, Pirolli, & Brown, 1995; Hattie & Timperley, 2007; Katz & Assor, 2007; Zimmerman, Bonner, & Kovach, 1996). Teachers can provide information and opportunity to help students become strategic, motivated, and independent learners, especially if the teacher creates a learning environment in which students experience challenge and take responsibility with regard to their accomplishments and progress (Paris & Paris, 2001).

The way from conceptualisation to actualising pedagogies is complex and teachers must be adequately equipped with how to bring theory into practice (cf. Agarwal, Epstein, Oppenheim, Oyler, & Sonu, 2010; Tillema & Kremer-Hayon, 2002; Young, 2010). Teachers might perceive a disconnection between the theoretical ideals and the real practice in WPS. They may come across hindrances and problems attributable to the complexity of their everyday teaching practice, but they also might come up with solutions. As educational innovations have no chance without the support of teachers, who are the most important actors in shaping the innovation (Dijsselbloem, 2008; Miedema & Stam, 2008), exploring teachers perceptions on WPS is crucial. Therefore, the following research questions are addressed: 1) What design characteristics of WPS do teachers perceive to be relevant for successful learning? 2) What learner characteristics do teachers perceive to be relevant for successful learning? 3) What characteristics of the teacher do teachers perceive to be relevant for successful learning?

Method

Educational Setting

Dutch pre-vocational secondary education takes four years and prepares young students (aged between 12 and 16 years) for upper secondary vocational education and higher professional education. At the end of the second year, students can choose one of the four different sectors namely Agriculture, Engineering & Technology, Economics, and Care & Welfare, each including a specific set of subject matter. These sectors are further subdivided into more specific units. From the beginning of the third year, students start working in WPS. In these authentic learning environments students are actively involved in realistic practical tasks and processes (Ministry of Education, Culture, and Science, 2005).

Participants

Twenty teachers from three different schools for pre-vocational secondary education located in the South of The Netherlands participated; nine females and eleven males from the sectors Agriculture, Engineering & Technology, and Care & Welfare. The majority in the Care & Welfare sector is female, while the Engineering & Technology sector is dominated by male teachers.

Instrument

A semi-structured group interview was constructed to explore teachers' perceptions, experiences, and dilemmas with regard to the aforementioned three topics: the design of the learning environment (WPS), the characteristics of the student, and the role of the teacher. In the in-depth group interviews, we used a predetermined list of open questions, but the discussion was let to roam to themes that popped up during the sessions taking care that all important topics were covered (Fontana & Frey, 2005). The topics were addressed in the following order.

First, questions about the design of the learning environment were raised in order to gradually proceed from a more general category to a more specific and personal one. It was expected that questions about this topic would facilitate the discussion in the beginning of the interview. Teachers were encouraged to describe the learning environment and express their thoughts about elements they value, dislike, wish for, and struggle with by explaining characteristics of a good functioning WPS. Second, questions about students' personal and learning-related characteristics were asked. For instance, teachers were requested to think about a successful and a less successful student and compare them with each other by taking into account students' strengths and weaknesses in their learning task

approach. Third, the role of the teacher was discussed and teachers elaborated on the way they act in WPS and guide students' learning process. Teachers were asked to describe interactions with students and to indicate how they perceive the student-teacher relation. During the interviews, participants were stimulated to illustrate their answers with examples.

Procedure

The teachers volunteered to participate in the study. Based on the sector and department, teachers were divided into six groups with a maximum of four teachers per group. Table 4.1 gives an overview of the distribution of the participants over the groups. Depending on the group size, the amount of information, and the speed of speaking, interviewing took between 57 to 110 minutes. Interviewing took place in meeting rooms at the schools. The interviews were recorded digitally with Audacity 1.2.6. software (Mazzoni, 2006) and transcribed verbatim. As data were collected in Dutch, quotes used in the result section were translated into English.

Table 4.1. Distribution of teachers within sectors

Sectors	Agriculture	Engineering & Technology	Care & Welfare
Number of teachers	4	6	10
Groups of teachers	1	2 groups of 3 T	2 groups of 3 T and 1 group of 4 T

Note. T indicates teachers.

Analysis

The aim was to derive insights from the group interview data in order to enhance understanding of teachers' perceptions with regard to workplace simulation learning. Thematic analysis was used to identify theme in the data. This qualitative approach provides a rich and detailed picture of actions and interactions in the learning environment examined (Braun & Clarke, 2006; King, 2004).

First, two researchers read and reread the one interview transcript and systematically gathered the meaning of the text passages. This preliminary coding was a bottom-up approach in which material of relevance was highlighted. In an iterative process the key elements in the data were identified and each emerging theme was labelled and the meaning was explained (see Table 4.2). The different themes were grouped into categories and sub categories in order to reduce the number of units. The categories were reviewed and critically discussed by all authors. Then two researchers coded individually approximately 20 percent of the interview data to calculate the inter-rater agreement. Cohen's kappa revealed a value of .73.

Table 4.2. Categories and abbreviated description for the learning environment

Design characteristics	Abbreviated description
Authenticity	The learning environment imitates reality. It feels very real for learners (e.g. cooking).
Structure	Learners are provided hold; they have to follow guidelines or a plan (e.g. the setup of the lessons, the task division, and roles).
Instruction	It concerns aspects of instruction like the description of a task and the way it is presented to students.
Embedded reflection	Aspects that deal with reflective activities after task performance such as a reflection form that learners have to fill in.
Assessment	All forms of assessments are described such as practical and theoretical assignments, work attitude, and written or oral tests.
Adaptation	The possibility to make choices concerning tasks and learning trajectory.
Collaborative learning	Learners work together in groups, either put together by the teacher or chosen by the students for a shorter or longer period of time. Furthermore, characteristics of successful and less successful collaboration are put forward.
Atmosphere	This code describes the climate in the class such as the working climate or the general climate such as chaos or calm.
Preconditions	This includes facilities, group size and staff, and organisational aspects.

Results

This section is divided into three main parts including teachers' perceptions on (1) the design of the learning environment, (2) the characteristics of successful students, and (3) the role of the teacher. In an effort to cogently articulate the findings and to provide an overview, we have summarised the results in tables according to the main themes emerging in the data. Aspects that need further elaboration are described in more depth in the text. Citations of teachers are used as illustrations.

Teachers' Perceptions on the Design of WPS

In Table 4.3, the key aspects of teachers' perceptions on the learning environmental characteristics are presented.

Table 4.3. Summarised results of the learning environment

Design characteristics	Key aspects	Example
Authenticity	• Near to reality is highly valued • Same requirements in tasks as in a future job needed • Authenticity can be improved	T2A: 'I think it is important that they get into contact with aspects they will also come across in the business world.'
Structure	• Clear procedure • Step-wise description of the task • Integrated monitoring and approval steps • Clear start and finish	A1A: 'Our students need a clear structure. That is very important. Therefore, I also call attention to a clear start and finish of a lesson.'
Instruction	• Theoretical and practical component are integrated • Explicit instruction of what and how to do with clear and short formulations • Visual material effective for students' understanding e.g. video	A1J: 'The tasks are the most important, if they are good, then the rest, the learning material, follows automatically.'
Embedded reflection	• Reflection is scarcely integrated • Care & Welfare sector most progressive	C1F: 'And at the end, they can see what went well and what not, and why that is, and that is what counts. And that can be done differently next time. Well, and I think that the advanced-vocational students do that well.'
Assessment	• Difference in frequency and kind of outcome • Practical work and attitude are evaluated • No transparent assessment criteria	A1A: 'We need assessment criteria. A technical piece of work for example needs to be assessed according to aspects like good filing, scrubbed, and designed at the correct angles and things like that. But you need other criteria when you assess jam. Think of colour, taste, smell, I do not know.'
Adaptation	• Possibilities to choose not explicitly mentioned • Making choice is limited • Picking rather than choosing	C1F: 'I direct … I structure in advance by limiting the offer and choice to prevent chaos and quarrels.'
Collaborative learning	• Random group composition • Development of group spirit • Risk of social loafing • Financial aspect	T1M: 'Well, why do we work with group and not individually? Simply because we do not have enough material, the surface area is too small, and so on. Thus when you have 24 students and you make groups of two, then you only need twelve workplaces and if you have less workplaces available you make groups of four for certain tasks.'
Atmosphere	• Good work climate important as it influences well-being, motivation, and working attitude • Active and busy • Risk of distraction • Emphasis on interpersonal interaction and sociability	T1H: 'When they pass by, they must push or kick or pull each other.' A1H: 'Yes, once in a while a laugh, a teardrop, and from time to time just being open with one another. Creating a nice atmosphere … '

Design characteristics	Key aspects	Example
Preconditions	• Good facilities • Surveyable WPS • Preference for smaller group size or more staff to improve supervision • Feeling left alone, restricted, and frustrated due to organisational or economic decisions and lack of support	C1G: 'And you realise that the work is planned and organised behind a desk. Thus, no people from practice, otherwise they would do a lot of things differently.' A1A: 'We received something with which it was impossible to work; consequently, we had to rewrite everything.'

Note. An abbreviation refers to a certain interview. The first letter indicates the sector. T stands for the sector Engineering & Technology, C stands for Care & Welfare, and A for the sector Agriculture. The number refers to the interview and the last letter corresponds to the name of a teacher.

Authenticity. Teachers expressed a need for authenticity; they mentioned that practical tasks in WPS should simulate the real-life setting as much as possible, so that students get in touch with tasks they could come across in their future profession. Although teachers thought that WPS offer a lot of authentic learning opportunities for students, they realise that tasks and settings could be improved. For example, in the Care & Welfare sector role-playing tasks are often used and teachers indicated that role-playing is difficult for students because they cannot imagine themselves in the situation if it does not feel real *(C2W: 'I think that we should reduce role-playing games and simulating. It has to become more authentic, still more authentic. Look, we are close to reality, taking the (WPS) houses we have into consideration. But there are still many more things that need to be improved. Especially, serious role-playing is very difficult for kids. For example, students need to practice with wheelchairs and rollators on our corridor. Well the wheelchairs are rather race carts when you see them.')*. According to teachers, most authentic learning experiences could be gained in internships.

Structure. Teachers emphasised that it is essential for students to have a clear structure. To provide students with structure all steps followed a certain procedure or ritual, so that the students knew what they had to do. Teachers had the impression that students got along well after familiarisation with WPS. During the process, control or tick-off moments are integrated, which help teachers to keep an eye on students' process as students are required to contact the teacher for approval before they are allowed to proceed. Moreover, assigning students the role of workplace assistant is perceived important to enhance structure and clarity, divide labour, and transfer responsibility to students. However, teachers indicated that some students have difficulties taking this responsibility *(T2J: 'For two years now it runs through the organisation like a continuous thread. I think that students know exactly what is expected. They know what their task is every day, but as teacher you still have to urge them. Therefore, we gave students the task of*

workplace assistant and it is the responsibility of the workplace assistant to make sure that a workplace is tidy at the end of the lesson.').

Instruction. According to teachers, tasks form the crucial starting point and should promote independent working, knowledge development, and motivation. Teachers experienced difficulties to design appropriate learning tasks when they started with WPS. They realised that students did not understand what they had to do as instructions were too complicated and not learner-centred, formulations were too abstract, and teachers were uncertain about the difficulty level of the tasks. As a consequence, instruction was simplified, text was reduced, and all process steps to perform a task were stated explicitly.

Embedded reflection. Reflection as structured process is scarcely integrated in WPS. The Care &Welfare sector seemed most progressive regarding embedded reflection; at one school teachers use a reflection form, and at another school teachers pointed out that they are in the process of developing and using competency lists, which should help students to reflect on their own competencies. These teachers pointed out that students are able to use the reflection form. The teachers from the Agriculture sector indicated that they should integrate reflection more as it makes students more critical and helps them to pay attention to aspects that need further improvement. It was striking that teachers from the Engineering & Technology sector mentioned no form of embedded reflection.

Assessment. Assessment is not well-grounded on clear assessment criteria. Consequences of this lack are especially apparent when several teachers work together in WPS at the same time, and teachers end up with a different conclusion. According to these teachers, students quickly realise the differences between teachers and approach the teacher who give better marks. Some teachers indicated that giving a mark was rather meaningless, because there is little variance in assessments. However, they thought that students like to receive a mark. For the majority of teachers the learning process and the effort spent are most important.

Collaborative learning. According to the teachers, the advantage of working together is that students learn to collaborate with each other. Although the teachers know that students preferred to work with friends, they argued that it is a good learning experience to put students randomly together as collaboration should not solemnly depend on personal preferences. Especially the Care & Welfare teachers put emphasis on collaboration in relation to a future profession in this field. From teachers' perspectives, collaboration offer students the possibility to solve tasks together; they need to make and stick to appointments, and develop a group spirit. Teachers have good experiences with students working together, but at the same time they indicated that they have to watch the group process carefully. When a group composition is not ideal, collaborating becomes difficult hampering communication, motivation, and learning of group members. Teachers indicated that they need to be aware of the group process in order to correct behaviour and

change the group composition when a group was not functioning *(C1A: 'A less good learner quickly starts social loafing. And there are certain students you keep an eye on immediately. And then you need to be careful that you do not always put this student together with the same good student. The good student can pull along the other one, but it is a burden for this child.')*.

Teachers' Perceptions on Characteristics of a Successful Learner in WPS

This section is divided into personal characteristics and learning-related characteristics of students that are perceived to influence a successful approach and task performance in WPS.

Personal characteristics.
Table 4.4 provides an overview of the personal characteristics of successful learners that were mentioned by teachers.

    Independence. Learning and working independently is a central aim in WPS and teachers pointed out that they want learners to be as independent as possible with regard to students' individual level. Teachers had the feeling that their students are getting more and more independent. They mentioned that students, who are perfectly able to work independent start straight away, look up necessary information, take decisions, and try finishing a task in time, while others cannot handle the freedom in WPS. Teachers thought that students who have difficulties with working independently might benefit more from direct instructions and following step by step. They stressed that independence starts and falls with the ability to read, because only when students read carefully, they know what to do.

    Cognitive capacity. Teachers indicated that the smarter students are better able to cope with WPS and the attributed independence. Additionally, teachers emphasised that the mastery of basic skills including writing, calculating, and comprehensive reading is required, but they experienced obstacles due to a lack of these basic skills. Especially, comprehensive reading is perceived as stumbling block, because students need to read and understand the tasks they should perform independently *(A1H: 'If students are able to read comprehensively, they have already accomplished a long way.')*.

Table 4.4. Summarised results of the personal student characteristics

Student characteristics	Key aspects	Example
Do-learner	• Strong preference for practice • Learning by doing more enjoyable for students	T1M: 'We should not forget that we are talking about students of pre-vocational secondary education. These are students who need a lot of practice and little theory.'
Independence	• Independence is expected and required • Big differences in how learners cope with independence • Reading is prerequisite	C2L: 'For example in the kitchen, well, they have a working card on which they have the instruction what and how to do and then I see that one child is already busy with peeling and cutting, getting pots and pans out of the cupboard whatever, while another child is sitting there and is wondering what to do.'
Cognitive capacity	• Intelligence • Basic skills • Attention • Feeling insufficiently prepared for increasing number of students with disorder (e.g., ADHD)	C1A: 'My conclusion is that the higher the level of a student, the easier it works in WPS. The lower the level, the more difficult it becomes.'
Responsibility	• Stimulating responsibility • Being responsible triggers serious work attitude •	C3M: 'But I think you also need to give children a bit of a sense of responsibility. If you as teacher are always right on the ball, then they think "oh the teacher knows what I am doing anyway" and they need to get responsible for themselves and as teacher you need to let go.'
Taking initiative	• Taking initiative is valued and represents good learners • Passivity is not appreciated	T1H: 'There are students, who are, if I may say so, who are lazy, they are simply lazy. Ten horses could not even get them moving.'
Motivation	• Interest for a topic • Ambition for future profession • Willingness to spend effort • Not motivated, not starting	T2J: 'Motivation, if they are motivated, then they really want to go for it.'
Social skills	• Interaction with students and teachers • Communication • Mutual understanding	A1H: 'Yes, accept someone as s/he is and respect that someone has a different opinion.'
Job orientation	• Knowing future profession • Learning for aim • Confirmation of profession • Assistance in goal setting	T1J: 'I think, a less good learner does not yet know what he wants, he is still searching and today he likes this and tomorrow that and he thinks "Why am I here?" and this other boy knows exactly what he wants.'

Note. An abbreviation refers to a certain interview. The first letter indicates the sector. T stands for the sector Engineering & Technology, C stands for Care & Welfare, and A for the sector Agriculture. The number refers to the interview and the last letter corresponds to the name of a teacher.

Responsibility. Teachers mentioned that they wish to foster students' feeling of responsibility, because being responsible is an important quality for the future profession and teachers want their students to be prepared. They indicated that some students can easily take responsibility, while others cannot. To stimulate the feeling of responsibility, teachers try to give students responsibilities such as practicing tasks without supervision, managing the depot, controlling cleaning up activities, and taking part in assessment. According to teachers, students have to learn that they are responsible for keeping an appointment, treating materials with respect, practicing and completing a task. Teachers found it difficult to find the balance between letting go and trying to control everything. Depending on the student, teachers transfer more or less responsibility.

Taking initiative*.* Teachers valued initiative of students as positive and they thought that WPS can stimulate a more self-directed instead of a 'wait and see' approach. Especially the good learners seem to profit in this aspect from WPS according to teachers as they do not wait to be urged, taught or told what to do. However, the teachers also expressed concerns about initiative and self-direction *(T2R: 'In principle, students must be self-directing, but well that is where they usually fall short.' T2J: 'At this moment, we do not have the type of student, who can really self-direct.')*. Furthermore, teachers also perceived some students as passive during WPS and it takes a lot of effort and frustration to deal with them. Teachers described these youngsters as weak students who are lazy and not willing to spend any effort.

Motivation. According to teachers, student motivation is a crucial factor for success. When students are motivated they really want to go for it and that is what makes teachers happy. Teachers indicated that motivation is related to interest and instruction should trigger the interest of wanting to know more. Moreover, teachers realised that students get motivated when they have achieved something to be proud of. However, teachers also experienced that students can lack motivation and those students can negatively influence the atmosphere in WPS by distracting others or passing on their attitude. Teachers mentioned that they face problems when they encounter students, who were not willing to work and learn and in some cases teachers said they are not able to change it and finally gave up *(C2L: 'And no matter how positive you are … It is really difficult to deal with such kids, you might be lucky in one lesson and in the next two lessons it does not work. They can be so negative, only negative.' C2W: 'And nowadays, I do no longer spill any energy.')*.

Social skills. Teachers put emphasis on social skills that are perceived relevant for collaboration and communication among students and teachers. Teachers stressed common decency, good communication, good (work) attitude, respect, being nice, and social manner. Having good manners is perceived especially important by teachers during WPS and they explicitly mentioned being honest and open with each other, listening to each other, and handling critiques. Teachers

indicated that some students need to learn how to communicate appropriately without yelling and using abusive language.

Job orientation. According to teachers, most students do not yet know what they want to become and their interest changes from day to day. Teachers perceived students who have a professional future vision as self-confident; they know their subject and are goal-driven. Teachers from the Care & Welfare sector explicitly mentioned that students may have an unrealistic impression of a future profession and that working in WPS helps students to get to know the different facets of a work field. This knowledge allows students to make better choices and teachers assist them in having realistic and achievable goals.

Learning-related characteristics
In Table 4.5 the learning-related student characteristics are presented.

Table 4.5. Summarised results of the learning-related student characteristics

Student characteristics	Key aspects	Example
Learning task approach	• Characteristics of a successful approach • Characteristics of less successful approach	Successful: starting quickly, careful reading, good listening, doing what is asked, keeping on working, seriously working, neatly working, working independently, good work attitude, will to learn and work, spending effort, commitment, going for it, interest, discipline, being responsible, patience, perseverance, motivation, critical thinking, self-confidence Not successful: opposite is perceived detrimental for learning and working including attitude of indifference, failing to hold attention, and easily distracted
Planning	• Planning is difficult • Lack sense of time • Unstructured behaviour	C1G: 'Yes, some kids think "oh, I write it down, but I do what I want anyway".'
Self-assessment	• Support • Risk of underestimation or overestimation	A1J: 'Students do indeed see if someone is working faster than someone else, and they do indeed also see if a bouquet is better. They can even do that better than we do.'
Self-reflection	• Taking into account result and approach of others • Knowing what is easy and difficult	T1J: 'When mistakes happen, I think it is important that the student knows what went wrong. That is the moment of learning. And by reflecting, the student knows how he can improve next time.'
Help seeking	• Students take initiative • Fast reaction is expected • Waiting is difficult • Just in time	C1A: 'There are also children who stand next to you and pull your sleeve every two minutes.'

Note. An abbreviation refers to a certain interview. The first letter indicates the sector. T stands for the sector Engineering & Technology, C stands for Care & Welfare, and A for the sector Agriculture. The number refers to the interview and the last letter corresponds to the name of a teacher.

Planning. Although a work preparation was sometimes integrated in the task as starting point, teachers mentioned that students find it difficult to plan. They said that many students still lack a sense of time *(A1H: 'I think the pity is that these kids cannot plan well. That is a long learning process. I mean time, a sense of time, is so vague for them. When a task states that it takes 135 minutes or another 195 minutes, they do not realise and do not take into account the duration of the lesson.')*. Moreover, teachers experienced that even though students make a plan in the beginning, they do not use it during the task. Some teachers also expressed doubts letting students plan their learning activities themselves for a longer period as they thought that students are not able to do so. Other teachers mentioned that they want to move toward more independent planning in the future, but stressed that they are not so far yet.

Self-assessment. When teachers assess students' performance, they indicated that they try to ask students to self-assess their work first. Teachers thought that students are able to estimate their performance especially when teachers ask direct questions and students can compare their products, while assessing a peer seems to be a difficult task for students. Moreover, teachers pointed out that students are prone to underestimate or overestimate they performance because their often do not have criteria to assess themselves *(C1F: 'Some children find it really difficult to know if a product is good, also because they have little practical experience.')*.

Self-reflection. Teachers indicated that they try to prompt their students to think critically about themselves by asking questions like 'What went wrong and why?' Some teachers thought that students are able to reflect on their performance and again comparing their own approach and result with other students' performance help them to do so. However, teachers also mentioned that students find it difficult to reflect and mostly do not do it spontaneously *(T2R: 'Well, and correcting oneself when it goes wrong that is something they cannot do.')*.

Help seeking. Teachers perceived clear differences in students' help seeking behaviour. According to them, some students work rather independently, while others depend very much on teachers' guidance and approval. Moreover, teachers indicated that most students have difficulties to wait; they expect to be helped immediately. However, teachers stressed that students can ask all sorts of questions anytime *(C3L: 'And what I also find very important in this system is that you can jump in on questions a kid has at a certain moment. That is a clear difference in comparison to the earlier frontal teaching style, when the teacher was passing on everything and youngsters had to listen. Nowadays, it is actually the other way around. Kids start working and they come with questions.')*.

Teachers' Perceptions on their Role in WPS

Teacher characteristics are divided into personal and teaching-related characteristics, but here only the teaching-related characteristics teachers perceived influential for a successful approach and task performance in WPS are presented. In Table 4.6 an overview of both, the personal and teaching-related characteristics, is provided.

Table 4.6. Summarised results of the teacher characteristics

Teacher characteristics	Key aspects	Example
1 Personal		
Calm	• Being calm and patient is advantageous, also for teachers' own well-being • Feel kept on the run and therefore less able to radiate calmness	C2L: 'One time you can handle and stand much more than another time and you radiate much more calmness, which influences the whole lesson.'
Empathy	• Create safe environment • Atmosphere of trust • Connection with student • Building up self-esteem, self-confidence, and trust in own capabilities	C1N: 'Having a secure feeling, I think it is very important that a kid feels secure.'
2 Teaching-related		
Presence	• Necessity of presence • Impossible to be everywhere at the same time	C1F: 'And once a student commented "You are never there." and I said "What do you mean?". Students thought I was gone, but as we are dealing with the topic facility service, students are busy cleaning everywhere in the building. I need to monitor them, so that is why I leave a certain location.'
Direct support	• Clear and specific directions and advices • Directing by questioning • Letting go is difficult	A1H: 'What I still always find difficult is to decide when to intervene. When something goes wrong and students might lose their motivation? Or when a mistake might happen and is not to repair? I find that difficult.'
Attention	• Adaptation to learners' needs not realised • Matter of priorities and taking time	A1J: 'You can be sent round the bend, which results in continuously missing. Thus, I think that you need to ask yourself "do I distribute my attention well enough". And I think we can conclude that this is not always the case.'
Feedback	• Feedback on process and product • Group and individual level • Stimulating/motivating	C3L: 'Well, yes, I do that regularly by telling someone "I think the technique is good, but you could improve that, try to think about how you could improve that", I am not the kind of person who give immediately the right answer.'

Teacher characteristics	Key aspects	Example
Explaining	• Simple • Visible • Patient	C1A: 'For example, a task where students learn how to move a patient from a bed to a chair. Then I tell a little story and ask them what might happen when a patient is too heavy. And then I show them a video about a lift or traverse. That works very well.'
Assessing	• Approving • Ticking off • Intuition • Fear to discourage	T2J: 'You know, it is also often a feeling … a game between teacher and student. And if, for instance, the work attitude is bad, you are fast with your assessment.'
Maintaining order	• Intervene only in situations of danger or disturbance • Correct aspects of behaviour, linguistic usage, and safety	T2A: 'I keep a close eye on students, also because they often have to work with machines that are rather dangerous.'

Note. An abbreviation refers to a certain interview. The first letter indicates the sector. T stands for the sector Engineering & Technology, C stands for Care & Welfare, and A for the sector Agriculture. The number refers to the interview and the last letter corresponds to the name of a teacher.

Teaching-related characteristics

Direct support. Teachers provided examples of active supervision dealing with directing and adjusting actions of students. They described themselves as coaches or supervisors who guide the learning process. They found that students should work as independently as possible, but they jump in to support the process whenever necessary. To direct students, teachers ask questions or suggest further steps without providing an immediate answer *(T2R: '"Have you already thought about how you are going to do it?" And then it is still independent working, they need to think themselves.')*. Teachers also advise students to (re)read the instruction carefully to figure out essential information, which they might have skipped initially. Another way in which they direct students is by limiting possible choices. Providing personal advices concerning subject choices or future professions is also pointed out as directing students toward a realistic goal. To improve independent working and responsibility of students, teachers indicated that they need to let go and retreat *(C2W: 'Look, it is of course very difficult when things go wrong and you need to let go. You always have the tendency to say "come here and I help you" and show them how they actually should do it.')*. However, teachers perceive difficulties in letting go and stressed that it should be a gradual process. Teachers try to support students who experienced difficulties or get stuck, but they sometimes do not exactly know at what point in time to intervene. Some teachers thought that they have to jump in too often because in their opinion students are not able to work independently.

Attention. Teachers indicated that they try to pay attention to all students – adapt to learners' needs – but at the same time they have the feeling that they do

not always manage to distribute their attention equally. They try to approach students on their own level, but they mentioned that they pay especially attention to the weaker students in WPS so that they do not lose track. Still, they thought that weaker students face the risk to be lost in the crowd and it is the role of the teacher to make priorities and take time. According to teachers, students who face few problems move along with the group. Ideally, these students should receive more possibilities to broaden their knowledge and skills by being offered enriching material, but this does not happen often. Good students are kept busy. As reason teachers put forward the lack of time *(T1M: 'Look, it is the group that determines if you act more like a policeman or as a teacher. Thus my cynical question: "Do good students get any guidance?" Unfortunately, it is like this at the moment.' T1J: 'You should give this student in-depth knowledge, but you do not manage. When a task is done properly, you are happy, well yes thank you.')*.

Feedback. Teachers mentioned that students find it important to hear what the teacher thinks about their performance. Feedback is provided during and after task performance and it can be on group or individual level. Teachers indicated that they give feedback when students asked for it or when they passed by. It seems to be often based on questioning *(A1J: 'On the workplace and when they receive a mark then they get to hear rather regularly that they are doing well. Lately, two students were busy with measuring a piece of cloth and I came along and asked what they were doing? And suddenly they came with a lot of questions such as "Sir, look what we have done." thus actually they asked "Are we doing it well?" If I had not come along, they probably had just gone on. Thus, I think that feedback is actually something you give continuously.')*. When teachers assess students' performance they also give feedback on the aspects that went well and those that could be improved and it seemed that some teachers perceive feedback as closely related to the assessment *(T2J: 'Very clear step by step: you can get points for that, you are not doing that well, boy, for your exam you have to pay attention to this then it will be fine. That is the way you have to do it here.')*. Although teachers emphasised that feedback is important, they again have the feeling that they often do not have enough time for each student.

Explaining. Teachers indicated that they provide hints and tips when students ask for help or when they realise that a student is struggling with a task. They adapt to the preference of do-learners by making use of examples when explaining, so that students can imagine a situation better. A teacher, for instance, is asked by a student whether he needs to start with zero or one when measuring with a ruler *(A1A: '"When you are cycling home, then you also start with zero not with one, because the first kilometre also counts," I said and I hope that he understood it in this way.')*. Teachers said that verbal examples can also be further supported with a video demonstration. Moreover, teachers pointed out that they show and model certain actions and they said that it is important for students to know why a task is

relevant. However, teachers also mentioned that they sometimes need to explain the same things over and over again and in order to minimise repetition, they take the group together and go back to a frontal approach.

Discussion

In this exploratory study, we gained more understanding into the teachers' perceptions of the WPS learning environment and of the student and teacher characteristics that can make a difference. As teachers play a crucial role in the interpretation of an innovation and translation to educational practice (Könings, et al., 2007), investigating WPS learning by taking into account teachers' perspectives was essential to identify success factors, inherent problems, and challenges teachers face in implementing the design of WPS in teaching and in supporting the development of effective learning strategies in various types of learners.

To answer the first research question 'How do teachers perceive the design of WPS?', we go back to the three pedagogical principles introduced in WPS including authentic setting, integration of theory and practice, and adaptive learning (cf. Vrieze et al., 2001). Regarding the first principle of authenticity, teachers stated that it was crucial for WPS to be 'near to reality', offering the best within the school limits. However, it became clear that in some respect WPS lack essential elements which can reduce the educational effects tremendously (e.g., the role playing). Moreover, collaborative learning is an essential element of WPS. The idea behind it is that in real workplaces collaboration with colleagues and bosses is also required. Though good in itself both in terms of process and outcome, collaborative learning has several drawbacks, which required that the teachers has thorough knowledge of the group dynamics and student qualities. Social loafing and too large differences between students need to be prevented. Such measures also contribute to a good atmosphere in the WPS, as does a sense of humour and empathy. Furthermore, order and tranquillity helps students concentrate.

With respect to the principle of integrating theory and practice, teachers stressed the importance of the learning tasks in supporting motivation, independent working, and knowledge acquisition. According to teachers, an authentic learning task in which the practical part exceeds the theoretical information, triggers students' motivation and learning most. The instruction should be short and easy as this increased students' understanding and chances for independent working. However, teachers realised that comprehensive reading is often a badly developed skill. As a consequence, teachers change instructions and learning material by reducing the amount of text and increasing the use of visual materials (e.g., figures or video instruction). In this way, teachers try to adapt the learning materials to the level and (practical) ways of students' learning.

The third principle of adaptive learning is insufficiently realised in WPS. Ideally, WPS allow for differentiation and self-selection both in terms of tasks and in the way the task is fulfilled. This should make the learning more appealing and more adapted to the learning needs (Katz & Assor, 2007). In practice, this is hardly ever fulfilled. Making choices is limited to a pre-determined list of possibilities and some teachers argued that this limitation guarantees order. According to teachers vocational students need structure, which is provided in several ways including a clear beginning and ending of the lesson, a step-wise description of the task to be fulfilled with integrated monitoring and approval steps. Reflection at these points is not routinely included but – if done at all – postponed to the end of the task. Assessment – the final step in a learning sequence – is not a strong element in WPS. Valid criteria are missing, and teachers vary a lot in how they finally evaluated students' performance. Taking a critical look at teachers' expectations with regard to their students, one might even wonder if teachers do expect enough since the effort spend is most important rather than striving for excellence.

The second research question focused on the learner characteristics that teachers perceived to be important 'When, according to teachers, are you successful in WPS?'. Research has identified SRL and SDL skills to play a crucial role in learning and achievement (e.g., Boekaerts, 1997; Brockett & Hiemstra, 1991; Knowles, 1975; Pintrich, 2003; Winne, 1995; Zimmerman, 2000a), and it was expected that these skills would help students to deal effectively with the appointed independence in WPS. Teachers indeed described issues closely related to SRL and SDL. The learner characteristics identified to be relevant for WPS learning are divided into personal and learning-related qualities. In general, students are characterised as do-learners, i.e., students who prefer to work with their hands and be actively involved in practice, which makes WPS fit for them.

To be successful in WPS, several personal characteristics of students is perceived advantageous. As independence is expected and required, those students who work independently, responsible, and take initiative profit in WPS and are better able to learn effectively. Teachers thought that the cognitive capacity of students was an important predictor for students being able to work independently. Moreover, motivation and social skills are identified as important success factors in this study as they help in collaboration both with peers and teachers. Motivated students, who go for it, contribute to a good atmosphere and make teachers feel happy and enthusiastic (e.g., see also Martin, 2006). Subsequently, teachers also try to pay attention to these students. According to teachers, students' motivation is related to their self-esteem and therefore it is essential that students become self-confident and trust their own capacities. These results are similar to previous research findings concerning self-efficacy (e.g., Zimmerman, 2000b). Moreover, research also found that motivational beliefs promote and sustain SRL because students are more likely to invest time and effort using various strategies (e.g.,

Pintrich, 1999; Zimmerman & Schunk, 2008). It is a virtuous circle of learning that stimulated new learning and the interplay between the students and teachers influences the atmosphere either positively or negatively. It helps when students have a clear and realistic idea of what they want to be, but WPS are also meant to help them develop a professional idea.

Regarding the learning-related student characteristics, it became clear that the support for developing SDL and SRL skills is not sufficiently embedded in the participating schools. Some teachers even doubt their students to be able to self-regulate or self-direct their learning at all. According to teachers, planning is difficult for students; they show a rather unstructured behaviour and still lack a sense of time. With support of teachers, students are able to self-assess their work, but they also face the risk to over- or underestimate their performance. By taking into account the work of peers and comparing product and process, students are able to reflect on their own performance. Remarkably, planning, self-assessment, and self-reflection are not integrated and regularly trained. Therefore, it is not surprising that students do not apply these metacognitive processes to a large extent. Research shows that teachers play an important role in supporting the development of SRL and SDL skills (Azevedo et al., 2008; Bielaczyc, Pirolli, & Brown, 1995; Hattie & Timperley, 2007; Katz & Assor, 2007; Zimmerman, Bonner, & Kovach, 1996), which brings us to the third research question.

The third research question dealt with the role of the teacher 'How do teachers perceive their role in WPS?'. Teachers found it important to keep their calm and create a safe environment. Similar to direct teaching situations, order – to be kept by the teacher – is a precondition for learning. Teachers' most important instruments in WPS are attention and adaptation to learners' needs, direct support and feedback. This requires that teachers are almost omnipresent in the learning environment. However, in practice they have to spread their attention over a whole group of students that may be scattered over several rooms. Nevertheless, teachers have the feeling that they can guide their students on a more individual level as students show active help seeking behaviour; but at the same time, teachers are afraid to lose weaker students in the crowd. And although teachers are aware of the advantage of adaptive teaching, they often do not manage to differentiate well enough between the good and poor learners.

Moreover, teachers seem to be in a conflicting situation of keeping control and letting go. On the one hand, they want students to work independently and, therefore, they try to give them freedom and let go. On the other hand, teachers also feel the need to control the situation in order to make sure that at the end of the term, students have gained enough knowledge and skills to be able to pass the national exams. Finding the balance is difficult and teachers saw that making mistakes is only a useful learning experience when students got to know what went wrong and reflect on their own learning process. It is the students own

responsibility in WPS to perform the task appropriately and mistakes can happen because teachers let go. The absence of the teacher could impact learning negatively, because students could acquire wrong knowledge by not reading carefully and this knowledge was difficult to change. Critical thinking is triggered by teachers questioning, but there is no structured and effective training that benefited students' metacognitive skills directly. Research has shown that teachers can provide information and opportunity to students to seek challenges, reflect on their progress, and take responsibility, so they may become strategic motivated and independent learners (Azevedo et al., 2008; Bielaczyc et al., 1995; Paris & Paris, 2001; Zimmerman et al., 1996).

Teachers stressed that many students in pre-vocational education face problematic social issues at home, which have a great impact on their learning, motivation, and social behaviours at school. Teachers need to invest more time and energy on students' problems, humanistic goals, and behaviour problems. These challenges increase the demands and intensify the work (Abbott-Chapman et al., 2001). Nevertheless, teachers enjoy working in WPS and their dedication to their students is mostly strong. A powerful collegial support strengthens their coping strategies during the innovative implementation of WPS.

This study can help teachers and us to understand their point of view and the difficulties they face in WPS. Interviewing provides valuable insights into teachers' perceptions and their expectations; interviews were active and enabled each teacher to refer to personal experiences, knowledge, and perspectives. Teachers' perceptions are related to their approaches to teaching (Könings et al., 2007), yet, this qualitative approach cannot tell us enough about how teachers translate their conceptions into actual WPS practice. Teachers articulated disconnections between theoretical ideas and practice and it is still challenging to investigate how they move from conceptualising to actualising pedagogies (cf. Abbot-Chapman et al., 2001; Agarwal et al., 2010; Young, 2010).

In future research, teachers' statements could be validated by observing their strategies and behaviours in WPS. Moreover, educational design research can be a promising approach to increase the relevance of research in WPS educational practice. It is typically carried out in a naturalistic setting and allows a close connection between theory and practice as teachers can actively participate in the design process and contribute their practical experiences (Kelly, Lesh, & Baek, 2008; Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). From theory to practice and back again indicates a cyclical process in which theory and practice nurture each other. Theoretical knowledge is input for practice, but the growth in practical pedagogical knowledge also enriches theoretical pedagogical knowledge. Solving a theory-practice dilemma also includes bridging an attitude-behaviour gap (Tillema & Kremer-Hayon, 2002).

To conclude, teachers experienced struggles in their daily WPS work and it became clear that teachers wished to be supported and guided during the implementation process so that they learn how to adapt their teaching. From the teacher interviews, we conclude that self-regulation and self-direction are learning activities and processes that are not sufficiently promoted and supported in WPS, at least in the implementations we investigated. Designing an effective and enjoyable WPS in which students' SRL and SDL skills are supported optimally requires a perfect match between learning environmental characteristics and teacher support that is adaptive to learners' level. Routines and spontaneous and immediate reactions determine much of teachers' behaviours and it is possible that they are not yet sufficiently prepared to help students develop metacognitive skills. Thus it seems important that teachers are also taught to be reflective about their own practices.

Chapter 5

Exploring students' self-regulated learning in vocational education[*]

The aim of this empirical study was to unravel self-regulated learning behaviours in workplace simulations and to investigate micro processes of planning, monitoring, and evaluating. Eighteen well performing students from upper secondary vocational education participated. Students were observed during a practical lesson and interviewed afterward to gain detailed insights into their behaviours, thoughts, and (inter)actions. Results reveal students' self-regulated activities. Students planned with regard to time and resources, but no elaborated plan was worked out. During task execution, they monitored their work carefully and made adjustments when necessary. In evaluating their performance, students focussed more on the work than their process. Motivation was the driving force during task performance and beyond.

Education is constantly moving and innovations should improve the learning environments and equip students for lifelong learning (Educational Council, 1998; Ministry of Education, Sciences and Cultural Affaires, 2004). Innovations in vocational education resulted in the implementation of workplace simulations (WPS). Ideally, WPS are authentic practice-based learning settings at school that are designed to encourage the development of vocational competences and promote independent and self-directed learning (Vrieze, Van Kuijk, & Van Kessel, 2001). But simply being in a workplace simulation does not automatically mean that students acquire the necessary vocational knowledge and (learning) skills and the question rises how students learn in these authentic learning environments. Being able to self-regulate learning is seen as route to deal with cognitive and affective processes in learning for the profession; it helps students to learn for themselves and master the appointed independence in vocational education effectively (Boekaerts & Cascallar, 2006; De Bruijn & Leeman, in press; Jossberger, Brand-Gruwel, Boshuizen, & Van de Wiel, 2010; Van Grinsven & Tillema, 2006).

We provide a brief theoretical overview and then focus on how we have used observations and in-depth interviews to enrich our understanding of vocational students' self-regulated learning behaviours.

The Self-Regulated Learner

Self-regulation describes a metacognitive process that requires students to explore their own thought processes to evaluate the results of their actions and plan alternative pathways to success when necessary. Successful learners organise their work, set goals, seek help when needed, use effective work strategies, and manage their time (Boekaerts & Cascallar, 2006; Zimmerman & Martinez-Pons, 1986; Zimmerman, 2006). Such students act as agents, proactively engaged in their own development. In other words, self-regulated learners orientate, plan, monitor, adjust, assess, and evaluate their learning and task execution processes.

Acquiring skills and being able to self-regulate one's learning has become a key topic in education (Boekaerts & Cascallar, 2006). The increasing emphasis on self-regulated learning (SRL) can be explained by the purposeful engagement in learning and the contribution to lifelong learning. We believe that SRL in vocational education is of great value for students as they have to learn from practical experiences and need to seek information and opportunities for learning actively. Students need to be aware of their learning process to choose an appropriate learning path and to focus on performance aspects that need improvement (Jossberger, et al., 2010; Kicken, Brand-Gruwel, & Van Merriënboer, 2008; Ericsson, 2006).

Learners differ in their task approach and it has been shown that skilful learners direct regulatory processes to the task, the self, and the context (De Jong, 1992; Ertmer & Newby, 1996; Pintrich, 1999; Garcia & Pintrich, 1994; Zimmerman & Schunk, 1998). The task in vocational education is mostly practice-based and learners gain experience by doing, but they also need to learn from their experience and that goes beyond doing.

We distinguish three different phases in the task performance: preparation, execution, and closing (cf. Zimmerman, 2000a). During these phases various processes and activities take place and students make different decisions to organise their learning process. The better activities in one phase are executed the better and smoother activities in the next phase take place. Zimmerman (2000a, 2006) found that this is exactly what self-regulated learners do.

They start off with orientating on the learning task and planning the steps that need to be taken to accomplish the task. They set specific goals that focus on learning and organise information and resources. Moreover, self-regulated learners initiate efforts to select or arrange the physical setting according to their own preferences for working and learning. By selecting an ideal place, a student is better able to work successfully on the task and is less distracted. Being able to concentrate better on task performance, will reduce the risk of making mistakes due to inattention. Pintrich (1999) found that skilful learners report significantly greater intrinsic interest than less skilful learners and also have greater self-efficacy.

During task execution, self-regulated learners monitor and are constantly aware of what they are doing by checking their plan and looking forward at the steps that still need to be performed to achieve the goal in mind. Monitoring helps them to detect mistakes or deviations from the plan. As a consequence, they adjust, adapt, fine-tune or abandon a strategy and identify, retrieve, and seek new information (Winne, 1995; Zimmerman, 1998). By monitoring their progress, students can also figure out when they need to seek help. Knowing when, where and how to find help or necessary information is a self-regulated learning skill. The inclusion of seeking social assistance may appear unusual at first, but SRL is by no means non-social (Newman, 2002; Zimmerman & Martinez-Pons, 1986; Zimmerman, 2006).

Moreover, self-regulated learners seek opportunities to self-evaluate their task performance, and by reflecting on the progress learners can use their actual experience to improve performance in a future task. They attribute a negative outcome to a wrong strategy use and strive for a more adaptive strategy next time without doubting their capabilities (Ertmer & Newby, 1996; Garcia & Pintrich, 1994; Zimmerman, 1998).

Students who use self-regulated learning skills and who are able to assess their own performance, can gather information about their level of understanding, evaluate their effort and use of strategies, take into account attributions and opinions of others and check how they improved in relation to their goals and

expectations (Hattie & Timperley, 2007). Describing the outcomes of research so far automatically generates the contours of the 'ideal' learner, an ideal that is desirable and strived for in vocational education and training as well.

However, research on self-regulated learning so far has primarily focussed on academic performance and very little is known about the way students learn and what strategies they use in vocational education and especially in WPS. The long tradition of privileging cognitions and perceptions as indicators for self-regulation - by relying on survey methods to assess students' self-reports of actions generalised across settings and situations - has failed to provide a detailed characterisation of SRL in a vocational context and real time. Therefore, many researchers have stressed the importance of more in-depth and on-line investigations of actions and behaviours (e.g., Ainley & Patrick, 2006; Dinsmore, Alexander, Loughlin, 2008; Perry, 2002; Perry, VandeKamp, Mercer, Nordby, 2002; Schunk, 2008; Winne, 2005).

The aim of this study is to unravel SRL behaviours in WPS in vocational education and to investigate micro processes of planning, monitoring, and evaluating. Studying SRL in WPS reveals what learners actually do, which allows us to elaborate understanding of particular facets of SRL. Given the fact that we want to explore self-regulation, we focussed our study on students who were supposed to be self-regulated learners and we wondered whether and in what way these vocational students self-regulate their practical task performance. The following research question is put forward: How do well performing students in vocational education regulate their learning and interact with peers and teachers during practical task performance?

Method

Participants

Eighteen students (9 females, 9 males) in the first year of upper secondary vocational education from the sectors Agriculture, Engineering & Technology, and Care & Welfare participated. Their mean age was 16,5 years (*SD* 0.86). In Table 5.1 an overview is provided of the educational programmes participants were enrolled in.

Table 5.1. Overview of educational programmes

N	Educational Programme	Performed task
5	Electro technology (IV, RD, BB, DE, RJ)	Electrical circuits, electricity measurement, programming
2	Automotive engineering (NZ, KT)	Cylinder leakage test, compression test, thermostat test
1	Airplane maintenance technology (JB)	Aluminium work
1	Carpentry (GA)	Making a table
1	Goldsmithery (DS)	Designing and making a silver pillbox

N	Educational Programme	Performed task
1	Laboratory technology (CH)	pH-measurement
2	Pharmacy assistance (AD, DH)	Filling capsules, making ointments
2	Medical reception (CO, NB)	Blood pressure, audiometry, bandages, syringe
1	Equine Management (AB)	Bandages, grooming, horseback riding
1	Cooking (FH)	Preparing main dish and dessert
1	Hairdressing (RK)	Permanent waving, blow-dry

Note. The two-letter abbreviation is a unique code representing a student.

All were well-performing students in WPS. They were selected by the teachers from four different pre-vocational secondary vocational schools, who had taught the students for two years. They were selected on their grades and on characteristics of successful learners including self-regulation, motivation, and deliberate practice (Jossberger, Brand-Gruwel, Boshuizen, & Van de Wiel, 2010) (see Table 5.2). The teachers did this by rating all students in their exam classes on these criteria.

Table 5.2. Selection criteria for students

Characteristics related to self-regulated learning
  Able to steer and direct one's learning
  Able to work independently
  Being responsible
  Shows active and adaptive help seeking behaviour
  Motivated and willing
  Able to regulate one's learning (planning, monitoring, adjusting, evaluating, and evaluating)
Characteristics related to deliberate practice
  Focuses on activities that need further improvement
  Willing to spend effort
  Seeking challenge
Professional knowledge
  Practical and theoretical insight
  Good marks

Instruments

Questionnaire. To investigate the way students think about themselves as learners, the Inventory Learning Style questionnaire (ILS, Slaats, 1997) was used. The ILS was specifically developed for students of upper secondary vocational education and consists of grammatically easy and comprehensible statements.

The questionnaire deals with four topics including a) general information processing, b) regulation activities, c) conceptions of learning, and d) motivation, which are divided into eight scales: 1) integrated processing, 2) unrestricted storage processing, 3) internal regulation, 4) external regulation, 5) learning as constructing, 6) learning as copying, 7) intrinsic motivation, and 8) extrinsic motivation.

Integrated processing refers to students who try to connect different pieces of information by finding links and integrating new information to prior knowledge, while unrestricted processing refers to students who try to remember as much as possible by memorising the learning material without elaboration. A statement that concerned integrated processing is 'When I am dealing with theory, I think of examples in practice', while an example of unrestricted storage processing is 'I learn definitions by heart'.

Internal regulation concerns student-initiated regulation of strategies and activities, such as taking responsibility for the learning progress, while external regulation describes students who rely and depend on an external source (e.g., the teacher) to regulate and control the learning process. A statement included in the internal regulation scale is 'I check myself whether I have performed a task correctly' and in the external regulation scale 'To know whether I have performed a task correctly, someone else needs to look at it'.

Learning as constructing refers to the active role of a student to build up a personal repertoire of knowledge and skills. It concerns a constructive process, while learning as copying refers to a reproductive process in which students copy the presented learning material without changing or transforming it. The scale learning as constructing included statements like 'Learning is linking concepts and understanding matters'. An example of learning as copying is 'Learning is to remember the subject matter precisely'.

Intrinsic motivation deals with students' personal interest in a subject and the enjoyment to develop competence, while extrinsic motivation refers to students who stress the instrumental value of their education rather than the content. The intrinsic motivation scale consisted of statements like 'I follow the educational track because I like it', while the extrinsic motivation scale had statements like 'I learn because it increases my chances on the labour market'.

Responses were given on a 5-point Likert scale ranging from 'This never applies to me' to 'This always applies to me' or 'I totally disagree' to 'I totally agree'. All scales revealed a reasonable to good reliability ranging from .68 to .90 (Slaats, 1997).

Observation. Observations can reflect what learners actually do versus what they recall or believe they do (Perry et al., 2002). Therefore each student was observed during a practical lesson to capture all actions and interactions during task performance. The observer was positioned closely to the student so that she could see everything clearly, but at the same time kept a safe distance to prevent that the observation disturbed the student. An observation form was used, in which the observer wrote down all emergent actions and interactions of the observed student that occurred (e.g., looking at the drawing, hammering, whispering). Moreover, general impressions concerning the surrounding were noted (e.g., noisy, radio). The observer marked critical incidents that indicated self-regulated processes (e.g.,

taking notes, looking up information, and noticing changes in the product) during the observation. The observational data was not analysed but the critical incidents were used as input for the interview.

Recordings. During the observed practical lessons students' interactions with peers and teacher were captured by using a digital voice recorder (Philips voice tracer LFH 0622). The voice recorder hung around the student's neck. All recordings were transcribed verbatim, which made it possible to analyse the students' interactions in detail.

Interview. A semi-structured and retrospective interview was linked to the observation to illuminate students' actions and interactions and to further explore the line of thoughts and processes behind their actions. The developed interview scheme consisted of three parts. In the first part, the observed task performance of the student was discussed on the basis of the observational notes. The critical incidents were used as cues for the student to explicate their thoughts and behaviours in order to unravel self-regulated processes. Questions concerning task performance for instance were: What were you doing? Why did you do it this way? What was happening at that moment? How did you solve the problem? Why did you consult the teacher at that moment? At the end of the first part, questions concerning students' motivation and self-efficacy were asked like 'Did you like the task?' and 'When you started, did you think that you could execute the task successfully?' The second part of the interview dealt with students' task approach in general, their way of problem solving, their help seeking behaviour, and their way of evaluating performance. Questions in this part were for instance: How do you know that you are performing well or that it is not going well? In which situations do you normally ask for help? Did you ever give up? In the third part of the interview, questions about students' motivation concerning their education and future professional vision were asked like 'Do you like your vocational training?', 'What are the most important aims you want to achieve with your vocational training?' and 'Are you involved in any other activities in your leisure time that contribute to your professional development? And with what aim do you do that?' The questions in the second and third part of the interview were the same for each student, while part one depended on the task students performed during the observations.

Procedure

First, each student was visited at home and was asked to fill in the ILS question-naire. This happened during the summer vacation and it was an opportunity to get acquainted with participants. From February to April, each student was observed individually and audio-recordings of the interactions were made during one practi-cal lesson. In order to prevent discomfort, students were informed that the observ-er would make notes to record all actions and interactions that occur and students

were encouraged to perform as usual. All actions and interactions were noted on an observation form. As we observed students only once, we also verified whether the observed lesson was representative.

Directly after the lesson, the researcher interviewed the students in a meeting room at school. They discussed the lesson in-depth based on the observational notes and students were asked to explicate their behaviour and thoughts. Information on the way they work on a task, how they deal with problems and why they interact with peers or the teacher was collected. Depending on the educational track and the class schedule observations took on average 2 hr 58 min (*SD* 67,39) and interviewing 58 min (*SD* 8,37). The interaction and the interview data were transcribed verbatim.

Analysis

The data of each student consisted of the questionnaire, the audio recordings of the interactions, the observation form, and the semi-structured interview. The observational notes were input for the first part of the interview, but were not part of the analysis.

The questionnaire was analysed with a one-sample t test to compare the means of the eight different scales. The value 3, the centre of the 5-point Likert scale, was used as test value to investigate whether the mean scores deviate significantly from the centre. It was expected that students score significantly higher on the scales integrated processing, internal regulation, learning as constructing, and intrinsic motivation. Therefore, we used a one-tailed test.

An inductive-deductive method was used to develop the coding scheme for analysing the interview data. Based on prior research (Jossberger, Brand-Gruwel, Boshuizen, & Van de Wiel, submitted a; Zimmerman & Martinez-Pons, 1986) categories of self-regulated learning and motivation were identified to analyse the interviews. The categories are presented in Table 5.3. The coding scheme was tested and re-adjusted in a few iterations.

Table 5.3. Analysis scheme of self-regulated learning

Categories	Definitions
Self-regulated learning processes	
• Orienting	Statements indicating student-initiated orientation on the task, e.g., "I started by checking where I stopped last time."
• Planning	Statements indicating student task-related planning activities, e.g., goal setting, sequencing, and timing.
• Monitoring	Statements indicating student-initiated efforts to keep a close eye on their task performance and controlling process and progress.
• Adjusting	Statements indicating a change in the approach, e.g., correcting a mistake or using different materials.
• Evaluating	Statements indicating student-initiated evaluations of the quality of

Categories	Definitions
	their task performance with regard to the product, e.g., "Then I take a step back and look at my performance."
• Reflecting	Statements indicating students' awareness of their process: strength and weaknesses, aspects they have to pay attention to, knowing what is useful, difficult or easy, e.g., "That is one of the most difficult exercises for me."
Strategies	
• Keeping records	Statements indicating student-initiated efforts to record events and to write down notes.
• Organising	Statements indicating student-initiated overt and covert (re)arrangements of strategies and approaches to improve task performance, e.g., "I work from left to right until the end."
• Learning	Statements indicating strategies students use to remember information easier and learn for a practical exam, e.g., "I am talking to myself, and then I can remember it better."
• Problem-solving	Statements indicating students' way to deal with problems e.g., "First, I try to solve it by myself."
Task-related self-organisation	
• Environmental structuring	Statements indicating student-initiated efforts to select or arrange the physical setting to make learning easier, e.g., "I choose a quiet place."
• Seeking and selecting information/material	Statements indicating student-initiated efforts to seek and select task-related information and material from non-social sources, e.g., "I can find the necessary information in the protocol."
Social interaction	
• Seeking social assistance	Statements indicating student-initiated efforts to seek, give or receive help from a) peers and b) teachers. This category was further divided into social interactions concerning material, content, performance and process matters.
• Help seeking choice	Statements indicating that students make choices in selecting a peer or teacher to ask for help.
• Help seeking emotion	Statements indicating students' feelings about seeking help, e.g., feeling comfortable or embarrassed to ask for help.
• Proactive help seeking	Statements indicating student-initiated efforts to receive the help they need.
Motivation	
• Appreciation	Statements indicating students' motivation and interests concerning their education and professional choice.
• Persistency	Statements indicating that students do not give up when facing difficulties during task performance; they exhibit resilience.
• Self-efficacy	Statements indicating students' judgments of personal capabilities to execute the task successfully and achieve their aims.
• Goals	Statements indicating students' professional goals they strive for e.g., "I want to become electrician."
• Professional development	Statements indicating professional development activities outside school, e.g., "Every Saturday, I am working in a hairdressing salon."
• Deliberate practice	Statements indicating student-initiated efforts to practice certain skills in order to improve.
• Work attitude	Statements indicating students' way of task approach and attitude toward work, e.g., "I work seriously."

Next, a cross-case analysis was done to identify similarities and differences across all students and to provide detailed insight into students' self-regulated learning activities. An elaborated matrix was developed that permitted a systematic comparison of the eighteen participants. This analysis helped us reconcile an individual student's uniqueness and gain a deep understanding of the generic processes that occurred across students (Miles & Huberman, 1994). Based on the cross-case analysis, we describe three participants to illustrate the variety among students. These students are described as portraits to enhance reality (see Appendix).

In addition to the interview data, the interaction data provided information on the social interaction during the task performance. Student-initiated efforts to seek help from peers and teachers and to give help to peers was coded as well as teacher-initiated and peer-initiated helping behaviour. This coding made it possible to gather knowledge on the direction of the interactions. Furthermore, the reason to interact was coded and a distinction was made between interactions that concerned material, content, performance, or process matters.

To establish the inter-rater reliability, the first and second author coded approximately 20% of the interviews and interactions. With a Cohen's kappa of .77 the inter-rater agreement was considered substantial.

Results

In this section, first the results of the ILS questionnaire are presented. Then we zoom in on students' self-regulated learning during practical task performance by organising the findings along the three phases we discriminated. Citations of students are used as illustrations and the different participants are indicated by a unique code.

The Inventory Learning Style Questionnaire

In Table 5.4, the results of students' self-reports on the ILS questionnaire are presented. The one-sample t tests revealed that the mean of five scales deviated significantly from the centre of the 5-point Likert scale. The results indicate that the participating students applied integrated processing ($t(17)$ = 5.39, p < .01), internal regulation ($t(17)$ = 2.05, p < .05), and learning as constructing ($t(17)$ = 7.87, p < .01). Moreover, they were both intrinsically ($t(17)$ = 16.74, p < .01) as well as extrinsically motivated ($t(17)$ = 8.77, p < .01).

Table 5.4. Results of the ILS questionnaire

Scales	M	SD	t	p
Information processing				
Integrated processing	3.60	0.47	5.39	.00**
Unrestricted storage processing	3.10	0.78	.56	.29
Regulation activity				
Internal regulation	3.27	0.56	2.05	.03*
External regulation	2.86	0.63	-.91	.19
Conceptions of learning				
Learning as constructing	3.75	0.41	7.87	.00**
Learning as copying	3.10	0.76	.59	.28
Motivation				
Intrinsic motivation	4.61	0.41	16.74	.00**
Extrinsic motivation	4.31	0.64	8.77	.00**

Note. * $p < .05$, one-tailed. ** $p < .01$, one-tailed.

Self-Regulated Learning during Task Performance

On the basis of the interview data, students' self-regulated learning is described along the preparation, execution, and closing phase.

Preparation Phase

    Orienting. Most students oriented on the task by reading the task description or studying a drawing carefully in the beginning, so that they knew what was expected of them, activated their prior knowledge, and checked if everything was clear enough (*AD: 'I read the whole task description first, because then I know what I need to do and what materials I need.'*).

    Planning. Preparing the task execution in terms of planning time and resources was visible in several ways. Regarding time one student explicitly mentioned that he had set a goal (*GA: 'I had the goal to finish something during the lesson and I managed.'*) and at least four students paid close attention to their working time (*RK: 'I checked my watch to see how much time I had left before we had to start cleaning up.'*). Another student negotiated the use of resources and made agreements with peers (*CH: 'We discussed the order in which to use the instruments.'*). Moreover, most students claimed that they knew the steps they had to take during their task performance. In practice, knowing the order of steps generated a rough overview rather than a detailed plan, which sometimes led to problems later on. For instance, the cook in training said that he had made a planning in his mind by going through the different steps beforehand. However, during his task performance he realised that his planning was not good enough (*FH: 'Before I started to cut the vegetables I wondered should I start with that or should I make the mushroom sauce first. Well, yes, that was actually the point in time when it went wrong. I should have started*

with the mushroom sauce but I decided to cut the vegetables first. I thought that cutting the vegetables would take longer and I forgot about the fact that the mushroom sauce had to be on the stove for 20 minutes … '). In contrast to the other educational tracks, cooking is a dynamic domain in which a solid planning is absolutely essential in order to succeed in the preparation of the food. In the other educational tracks, planning might enhance a strategic approach, but not planning carefully may have less devastating consequences. In this study, no student had worked out a written elaborated plan including goals, sequences, and timing for the practical task. Nine students explicitly indicated that they did not make a planning in advance, but decided on most of the steps during task performance (*NZ: 'I decide on the run most often. See if it works out and otherwise improvise.'*).

Environmental structuring. Fifteen students preferred a calm and quiet surrounding and ten of them explicitly mentioned and showed how they structure their environment according to their preferences by 'selecting a specific workplace', 'telling peers to wait a moment, to stop disturbing, to keep on working, to calm down, or to keep quiet', 'putting away disturbing objects', or 'working with a headset'. Nevertheless, some of the students were more consequent than others and succeeded better in their environmental structuring (*DS: 'We can choose where to sit ourselves and at first I was sitting next to Peter, but I got annoyed. So I decided to move to another table. And now it is fine, every table has its own people from totally crazy to concentrated.'* or *NB: 'It is always important that I am not sitting next to people I am having a too good time with, because I am very quickly sociable and easily distracted. Thus, I usually try to find a quite place.'*). Three students did not have an environmental preference, but indicated that they focused on their task and did not mind the surrounding.

Execution Phase

Monitoring. Task execution was a continuous process of doing, checking, and adapting (e.g., comparing a drawing of an electrical circuit with own performance). Participating students paid attention to their product under construction and they indicated to inspect and control the product constantly to check whether they were still doing well and to prevent mistakes. The following examples illustrate students monitoring activity (*IV: 'Mostly, I check to verify whether I have used the right codes because sometimes I am wrong. Some time ago, I wrote down 21 although it should have been 22, so I check the drawing to see if it is correct what I am doing.'* or *RD: 'I checked the different switches first to see if one is broken, because if you start without checking it, you will have a problem later on when you have programmed everything.'*).

Organising. Most of the students used strategies to organise their process during task performance and followed a sequence of steps. The number of strategies varied as well as the specificity of a pattern. One of the electro

technology students indicated that he used colour combinations, worked from left to right, finished one part first before proceeding to another, and usually worked from easy to difficult. The carpentry student numbered materials to know where they belonged to, marked the top of a wooden plank which he did not sandpaper, organised his toolbox, transformed his workplace by putting two tables together. The pharmacy assistants ticked off the performed actions to know where they were in the process. The hairdresser worked from left to right and from the front to the back and used wrappers of different colours. Three students did not mention strategies of organising their work.

Adjusting. Monitoring sometimes led to larger adjustments of strategies and performance. When students realised that the product was not yet according to their expectations, they improved it by using another tool, doing certain steps over again, changing and correcting parts of it or adjusting their own approach. Most students indicated that they tried to improve their task performance by themselves if they were not yet satisfied with their product. Some tasks and products also required a careful approach as materials and products were delicate and could easily break or burn. In those situations, students were very careful in adjusting in order to prevent making irreversible mistakes or timely repairs and adjustments (*RK: 'When I realise that a curling pin is too loose, I roll it out and then I roll it in again but tighter so that it is better fixated.'* or *GA: 'It was not totally straight, so I had to chop a bit more.'*).

Problem solving. Students indicated that they sometimes experience problems such as 'a lack of knowledge to continue', 'a mistake', 'collaborating with peers' or 'finding materials' and if they cannot solve the problem themselves they ask a peer or the teacher for advice (*IV: 'When I face problems then I go to the teacher and ask, but usually I first try to solve the problem myself. And if I discover a mistake, then I try to figure out where the mistake has happened. And if I really do not have any clue, then I ask the teacher what I have done wrong.'* or *BB: 'Once we had to do an installation for a house, a two-way switch as they called it. You had a switch for a lamp and you could switch it off and on here and over there. I wondered how I had to do the connection. It was a bit of a problem for me, so I asked for advice.'*).

Keeping records. Students used artefacts to support task execution and prevent errors. Seven students made notes during the observed practical task performance partly based on different motives. Three electro technology students made a drawing in order to visualise the electrical circuit and two of them made additional notes of the colours of the wires to know what needed to be connected. The two pharmacy assistants and the laboratory assistant labelled their different ingredients to keep order. Moreover, the laboratory assistant wrote down formulas that were explained by the teacher. These formulas were not clearly described in the textbook, and keeping records in her notebook allowed her to turn to the information during the task performance. One of the automotive engineering

students used a coloured marker to underline important parts in the text and he indicated that it functioned as preparation and for reference.

Seeking and selecting information/material. In addition to preparing the task, most of the students needed to seek and select information and material from non-social sources to be able to work independently during task performance. All students indicated that they knew where to find the necessary information they needed for their task (e.g., a drawing, a protocol, recipe, a computer programme, and task description) and they tried to solve a lack of knowledge by themselves first before seeking social assistance.

Seeking social assistance. Students sought social assistance when they did not know how to proceed, had doubts and needed confirmation concerning their process or product, and when they wanted more information (*NZ: 'I had a hunch but I was not completely sure if there were more possibilities.'* or *DS: 'Yes, that was with the cutting machine. I did not see the zero and I adjusted the machine incorrectly. I thought that could not be correct and so I decided to ask the teacher.'*). All students indicated that they initiated efforts to receive the help they needed because they 'want to know how everything works', 'to learn', 'to be able to proceed', 'to prevent mistakes', 'to perform well', 'wanting certainty', 'to receive a good explanation', 'to solve the problem and answer the question', and 'to understand well'. Every student knew whom to ask for receiving the desirable answer. Good personal contact and the expectation to receive a correct answer were the considerations when consulting a peer (*RJ: 'I consult someone who knows a lot, not someone who knows very little.'*). Reasons for not consulting peers were 'too boisterous', 'too much irrelevant information', 'those who do not know anything', 'little experience, knowledge, and interest', 'no serious work attitude', 'little contact', and 'personal dislike'. Students also indicated that asking a peer for help is usually faster as the teacher is often busy, but if the teacher is available they consulted the teacher directly.

On the basis of the *interaction data*, the direction and range of the social interaction during the practical task performance was collected and the results are presented in Table 5.5. Although the way of interacting differed across students, students' self-initiated efforts showed that they chose to consult a teacher more often than a peer and in many cases the reason for help seeking concerned material issues. When students approached teachers for help, it often happened that teachers provided additional help students did not initially asked for. Thus, taking initiative often resulted in teacher-initiated helping actions. Moreover, participating students helped peers rather often compared to the help they received from a peer.

Table 5.5. Direction and range of social interaction during task performance

Direction	Content	Feedback	Material	Process
Seek help from peer (*79*)	0–3 (*13*)	0	0–12 (*46*)	0–5 (*20*)
Seek help from teacher (*124*)	0–10 (*24*)	0–4 (*20*)	0–4 (*36*)	0–8 (*44*)
Give help to peer (*127*)	0–4 (*13*)	0–3 (*12*)	0–11 (*25*)	0–18 (*76*)
Receive help from peer (*15*)	0–1 (*2*)	0–2 (*4*)	0–4 (*5*)	0–2 (*4*)
Receive help from teacher (*182*)	0–18 (*50*)	0–7 (*25*)	0–3 (*15*)	0–24 (*92*)

Note. The number in brackets indicates the totals.

Sixteen students felt comfortable asking a teacher or a peer for help. They perceived help seeking as easy and did not experience any distress because they thought that asking questions is part of the learning process (*AB: 'I think you can better ask, because, I mean, you are at school to try to learn things.'* or *KT: 'It is something in me. Some say "well, I do never dare to ask" and then I think "Don't be a fool, just ask." That's it.'*). Some explained their comfort by self-confidence and having a nice class with a good atmosphere. Two students mentioned that they had experienced situations in which they felt not comfortable and the reason they put forward for this feeling was a bad relationship with the teacher; they could not get on well personally with a teacher and therefore did not like to ask for help.

Closing Phase

Evaluating. To evaluate their performance, students mentioned different sources of information. Some students made use of different sources to evaluate their performance, while others relied on one source only. Sixteen students said that their product revealed how they performed (*NZ: 'The motor ran better.'* or *GA: 'The corners were at right angles.'* or *BB: 'The electrical circuit was working correctly.'* or *FH: 'The sauce was a bit too salty.'*). Four electro technology students indicated that they evaluate by comparing their performance with given assessment criteria and the carpentry student mentioned that he compares his performance with the performance of a peer. Two students also took their process into account when evaluating (*CH: 'Everything went well and I did not experience any problems.'*). For eight students, the teacher was an important source in the evaluation process and one student mentioned the result of an exam as additional indicator (*KT: 'Teacher finds it good.'*). One medical receptionist student checked whether she had performed all steps in a procedure. However, this information might not necessarily tell her how well she performed the steps.

Reflecting. Students reflected on aspects they wanted to improve and most of them showed an awareness of their own weaknesses and indicated what they find easy or difficult. While many students mentioned very task specific and/or behavioural aspects they had to pay attention to or wanted to improve, some also focused on semi long term goals. For instance, the cook in training mentioned that

he wanted to improve his planning, to develop a sense of taste, and to improve his cutting techniques. One medical receptionist student indicated that she wanted to gain more in-depth knowledge of diseases to improve her skills in giving explanations to patients. The equine management student thought that she needed to get to know all kinds of petty facts about the equestrian sport and to dare to push the limits. Four students mentioned that they needed to improve continuously to bring their skills to perfection and named a variety of domain specific aspects. Three students did not mention any aspects of improvement in particular.

Learning. Students indicated to learn by practicing and performing a practical task in WPS. In addition, some of the educational tracks had regular practical exams to test students' knowledge and skills. Some of the students indicated that it was not possible to learn for a practical exam, because they did not have the materials and instruments at home. In those cases, the only way to be well prepared was to pay close attention, participate, and practice during the practical lessons. A few students said that it was not required to learn for a practical exam or that they did not need to learn (*JB: 'Practice is easy for me, I do not need to study. I practice at school and teachers say that I have technical insight.'*). The majority of students indicated that they learned the most from hands-on experiences, by practicing and doing it themselves made them remember. The approaches students took in studying for practical exams were 'reading', 'making notes and summaries of the most important aspects', 'rehearsing and testing one's knowledge by questioning', 'studying material (e.g., a drawing) and deciding on what to do and how to do it', 'learning necessary steps and procedures by heart', 'asking professionals for explanations', and 'practicing and preparing at home'.

Students' motivation and professional development

Appreciation. All students indicated that they were satisfied with their choice for the professional field and liked their educational track. In general, the vocational training was according to their expectations and students indicated that they had carefully thought about their choice in advance (e.g., by visiting the school on an informative open day). One student thought that the vocational training was less challenging than he had expected. Two students mentioned that they found the theoretical lessons boring and four students indicated that they disliked the organisation of the school with regard to changing timetables and too many cancellations of lessons.

Persistency. All students indicated that they did not give up easily and continue also when facing difficulties (*DE: '"Does not work", does not exist.'*). Nine students had already experienced a difficult situation, in which they had struggled with their task performance and had been close to giving up. In those situations, students took a break or asked for advice and then moved on in the current or next lesson (*NB: 'I*

am not practicing a hundred times in one go, because it will not work anyway. I stop and continue another time.'). The following two examples in which students failed in the first attempt show how they dealt with the task (*IV: 'Once I had a task and it was simply not working out. I started three times over again. And then I decided to walk around the class a bit and I did some tasks in the book. Then I looked in the book to find more information and I started reading and then I succeeded eventually.'* or *DS: 'Last semester a task did not work out as planned. It was a music ball. You had to make a sound box, which was a lot of work. I managed that and when everything was ready, I realised that I had forgotten to put the jingle bell inside. So I had to open the solder, but afterwards it was totally deformed and I had to start all over again. Now, I am doing it in the evening hours and I am having a hard time because I do not like it. But I am doing it over.'*).

Self-efficacy. With regard to self-efficacy, students' statements illustrated that they seemed rather convinced in achieving their aims (*RJ: 'Definitely.'* or *KT: 'I can do it.'* or *CO: 'I do think I have the commitment.'*). Five students used more careful formulations like 'I think so' and 'I hope so', but no student expressed serious doubts. Students were also convinced to perform well on their task. Only one student indicated that she was often afraid to make a mistake, but during the observed lesson she achieved the best result.

Goals. Talking about their long-term goals, fifteen students expressed that their first aim was to earn their degree and to finish vocational education successfully; goals that were rather extrinsically motivated. Furthermore, students elaborated on their professional future. Strikingly, almost all students had a professional vision from more general to more specific intrinsically motivated goals. A more general goal was to continue with higher professional education to further specialise in the domain of interest. A more specific goal was put forward by the student involved in the goldsmithery training. Her aim was to travel after graduation to explore art and different styles and to refine and develop her own style before starting her own business.

Professional development. Ten students indicated that they regularly engaged in professional activities and they expressed an intrinsic motivation, enjoyment, and drive to experiment, to investigate, to work, to create or to repair. For instance, the hairdressing student said that she colours and styles the hair of her mother and friends in her leisure time, because she enjoys experimenting with hair and styling people so that they feel beautiful. Three students from electro technology and one student from automotive engineering worked a lot together with their fathers who were employed in their field of interest. All ten students stressed that interest was the primary aim to engage in professional activities and for four of them it was also a way to earn money.

One student mentioned that he liked to watch documentaries to get a better understanding of how things work and he was planning to work in a company as an

electrician during the summer vacation to gain working experience in his professional field and earn some extra money. For five students the only practical experience outside school was an internship once a week in their professional field as part of their educational training (e.g., working at a general practitioner practice or in a pharmacy). Two students said not to be involved in any kind of professional activity outside school nor doing an internship.

Deliberate practice. Interest and motivation led students to engage in practice and rehearsal. These were regular activities in the professional field of interest. However, they did not explicitly say that they practiced to improve their skills. Only three students mentioned that they practiced skills in school and out to improve their performance (*CO: 'For example, I experience problems with applying a certain bandage. Actually it is a rather easy one, but I do not really master that one. You have to turn it and continue in the opposite direction and I simply do not get it. So I practiced it thousand times and at the end of the lesson I am able to do it, but I need to rehearse regularly otherwise I forget how it works.'*)

Work attitude. Most of the students showed a serious work attitude and they worked independently, calm, concentrated and persistently. In two cases, the working attitude was less good. KT had difficulties to get started and AB was not well prepared for the lesson. Although it was not seen during the observed lesson, three students indicated that they also have times when they did not feel like working or learning.

Conclusion and Discussion

In this study, we investigated whether and in what way well performing students in vocational education self-regulate their practical task performance. By conducting a triangulation of self-reports, observations, and semi-structured interviews it was possible to examine thoughts and behaviours of self-regulated learning in-depth in vocational education, which has not been done before. We gained understanding of what well performing students already do and what they can improve and develop further. The observational data and the information gained from the interviews provide evidence that the students who participated in this study self-regulated their learning at least to some extent. This knowledge can be used to support self-regulated learning in a systematic way, so that skilful as well as less skilful learners improve their competencies continuously.

The results reveal that certain activities are associated with different phases of learning task performance. Their extent and interrelations are depicted in Figure 5.1. Yet, the figure is merely a simplistic representation, in the sense that in practice, students do not follow a strict linear pathway but can move back and forth during task performance. Therefore, we have used dotted lines to illustrate the

transparency between the phases. The graphical representation in the figure corresponds with the result section.
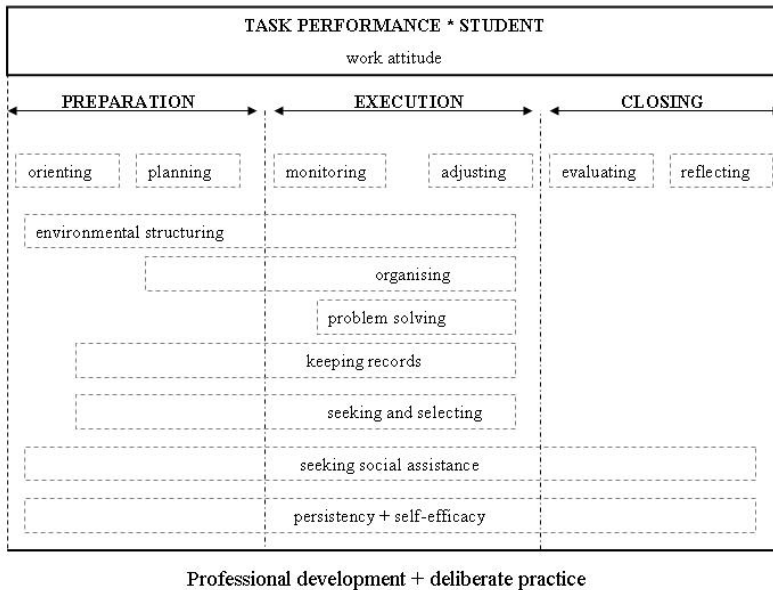

Figure 5.1. Graphical representation of the results

In general, students started straight away working on their practical task and they oriented themselves by checking what needed to be done. Students indicated that they knew the steps to be taken during task performance and we saw some planning with regard to time and resources. Students did not make an elaborated plan including goals, sequences, and timing. Research has shown that skilful learners set specific goals that focus on learning (Ertmer & Newby, 1996; Zimmerman, 2000a, 2006), but the students in our study hardly set explicit goals and if they did, it was about work rather than learning. However, they did explicitly practice in incidental occasions and in extracurricular activities. Another important preparatory action was that students tried actively to select an ideal workplace, suited to their own needs and personal preferences.

Monitoring appeared to be an activity that was regularly executed by keeping a close eye on the products students were working on. As students concentrated and focussed their attention on the task, they were able to detect (emerging) mistakes during the process. By going through the executed steps again, and again if necessary, and by making adjustments, they were often able to correct their own mistakes and improve their performance. The fact that students monitored carefully also helped them to determine at what point during task performance they needed to seek help; they knew where and how to find the necessary information. Only if

students had doubts and needed confirmation or when they wanted more information or materials, they consulted the teacher. A peer was consulted when they wanted to get a fast answer and thought that this peer had enough knowledge to help them out. In general, students experienced no distress in help seeking. They were proactive and considered teachers and peers as sources of social support in learning. It is important for students to take the initiative to get assistance when they face difficulties instead of being passive, giving up or persisting unsuccessfully. Previous research has shown that self-regulated learners show adaptive help seeking behaviours. Highly self-regulated learners see the beneficial value of external support and therefore seek help more readily than poorly self-regulated students (e.g., Newman, 2002; Zimmerman & Martinez-Pons, 1986).

For students' self-assessment of their performance, the product or their work was the most crucial. This certainly is not very surprising as the teachers' assessment is largely based on that result as well. Moreover, in most cases the product was a physical object - something they can see and touch – and thus it can also be easily tested and inspected. Students' own learning and working process was far less often taken into account in the evaluation process, that is, it was mentioned only a few times. Product and process are closely interconnected as the product is the result of the process. But evaluating one's own process goes beyond assessing the product. It is a meta-cognitive skill, which is especially important for students to deal in an efficient way with aspects of improvement and/or errors. Analysing error causes can help to prevent them in the future and making use of the mistakes from the past can evoke new insights for task performances still to come. Knowing what not to do in a certain situation has also been called negative knowledge. Negative knowledge is regarded beneficial for learning, but individuals have to identify suboptimal or incorrect actions first to prevent errors in the future and learn from their experiences (Gartmeier, Bauer, Gruber, & Heid, 2008; Harteis, Bauer, & Gruber, 2008). Taking process information from previous task performances into account to look ahead is a reflective process. The vocational students in this study reflected on aspects they wanted to improve, which shows that they have a certain awareness of their processes. Other research has also indicated that experts regulate their processes more often than novices in task performance (e.g., Brand-Gruwel, Wopereis, & Vermetten, 2005).

The driving force of students during task performance and beyond was their motivation. They were willing to work and to spend effort and did not easily give up when facing problems or difficulties. Some of the students strived for perfection and practiced deliberately to improve their skills. In most cases intrinsic motivation and in some cases also extrinsic motivation was the reason to engage actively in professional activities. Students reported extrinsic and intrinsic goals. The fact that most of the students mentioned the extrinsic goals first (e.g., receiving a certificate) shows that students consider their chances to enter the labour market successfully.

Moreover, they reported high self-efficacy concerning their task performance and achieving their future goals (cf. Pintrich, 1999). We cannot evaluate how realistic or optimistic their self-assessments are but it seems that students believe in their capacities and try to make their professional dreams come true.

Vocational education strives for independent and self-directed learners and self-regulated learning is a promising skill to accomplish this aim. Especially in WPS, self-regulated learning is regarded beneficial for learning from experience during practical tasks. This study reveals that well performing students self-regulated to some extent during task performance, but the results also show considerable room for skill improvement. Actively promoting students' use of specific processes and guiding their learning in systematic practice activities can further improve students' performance (Ericsson, 2006; Zimmerman, 2006). Cause for concern are weaker learners in WPS; they will probably require more assistance and support in accomplishing the appointed independence and developing self-regulated learning skills. Future research needs to address these issues and investigate how the instructional design and the teacher can support the development of self-regulated learning skills. We believe that vocational education should focus on excellence by challenging students and encouraging them to improve their skills continuously.

Appendix

Descriptions of three students as portraits.

> **Rose** is involved in the goldsmithery training and her task was to design a pill-box.
>
> The creative process of developing an idea preceded the observed lesson, but she explained that she had oriented herself on the task by making several drafts of her idea first. Rose preferred a calm working place and chose to sit at a table with seriously working peers. To protect herself from the busy surrounding and to concentrate, she worked with headsets and listened to music. She approached the task in a certain order of steps (from coarse to fine finishing) and paid attention to her working time. During task execution, she kept an eye on her product (e.g., the colour changed, straightness) and she paid close attention to her process by checking and testing the product regularly. She indicated that she wanted to perform well and prevent mistakes and therefore she made adjustments to improve her performance (e.g., filing, polishing, starting over again). To evaluate her performance, Rose indicated that she inspects her product. She reflected on those aspects that are still difficult for her and which she needs to improve further. When she experiences problems, she tries to solve it herself first before she consults a peer or the teacher.
>
> Rose is willing to spend effort and in her leisure time she engages in practice activities to improve her skills. She works on her own ideas during evenings and also has a variety of creative hobbies related to her professional field. She strives for perfection and takes challenges in her tasks. After graduation, she plans to travel around the world to develop her own style. In the future, she would like to open her own atelier and she expressed self-confidence to achieve her aims ('Where there is a will, there is a way.'). During the observed lesson, she was calm, concentrated, and worked persistently.

> **Joey** is involved in the automotive engineering training and his task was to do a thermostat and compression test.
>
> He indicated that he preferred a calm workplace, but he was less conse-quent in structuring his environment according to his wishes. After a slow start and the admonishing words of the teacher, he selected a task and orienting by looking up what needed to be done. Joey did not plan his steps but decided on the run what to do next. During task execution, he kept an eye on the product (e.g., the thermostat opened), but forgot to switch off the hot plate at the end. To evaluate his performance, he checked if nothing is lacking and awaited the

assessment of the teacher. Joey reflected on behavioural issues and indicated that he had to pay attention to his working attitude.

Joey was intrinsically and extrinsically motivated to engage in professional activities (e.g., fiddling with his scooter, repairing and checking cars for friends) and indicated that he does not easily give up. Joey's main goal was to gain a certificate and study further. He would like to work as car mechanic, specialised in gas and electric cars and later start his own business and earn a lot of money. He thought he had the capacity to achieve his goals, but indicated that sometimes he is willing and sometimes he is not.

During the observed lesson, he was rather talkative, but he finished his tasks in time.

Ted is involved in the electro technology training and his task was to make a micro electrical circuit.

He chose a calm workplace so that he was less distracted by peers. He had started with the task in a previous lesson and oriented by studying the drawing again to see how he needed to continue. Although he indicated that his approach was random, he started with the smallest components and ended with the biggest ones. During task execution, he kept an eye on the product and the tools (e.g., he detected that a tool was not working correctly) and he observed and tested his product by turning it upside down. Ted monitored his work in order to perform well and he improved his performance by making adjustments (e.g., added more solder to fill a gap, enlarged holes by drilling). He finished his task and tested his product by connecting it to a power source. To evaluate his performance, he filled in a given self-assessment form and compared the criteria with his product. Ted concluded that he had performed well. He indicated that he had a lot of prior knowledge and therefore experienced the task as easy. Moreover, he said that he was also motivated by the prospect of having a day off if he finishes the task earlier. Ted pointed out that he wants to pay attention to calm behaviour and neatness. When he experiences problems, he tries to solve it himself first before he consults a peer or the teacher.

Ted is intrinsically motivated to engage in professional activities (e.g., repairing electronics, or fiddling with his scooter). Receiving a certificate and finishing his education successfully was is main goal and he was thinking of continuing higher professional education after graduation and running the business of his father. Ted expressed self-confidence and is willing to go for challenging tasks.

During the observed lesson, he was calm, concentrated, and worked persistently.

Chapter 6

The quest for self-regulation: instructional redesign and teacher feedback[*]

This study investigates how vocational students' self-regulated learning in workplace simulations can be improved by redesigning learning tasks and optimising feedback. Three teachers and 66 students in pre-vocational secondary education participated. Together with the teachers learning tasks were redesigned to offer students an authentic context, clear learning goals, a work preparation, transparent assessment criteria, and reflection moments. Moreover, a workshop focusing on providing feedback on process and self-regulation level was given. Results reveal that teachers felt enabled to engage in constructive conversations with students and were more aware of providing feedback to trigger students' thinking about their processes during task performance. Students had significantly higher scores on internal regulation during the post-test while external regulation was not affected. Moreover, students showed an increase in reflecting on work/learning-related processes. Planning appeared to be difficult for students and was often neither realistic nor specific.

Innovations in education directly influence the teacher, the student, and the learning environment. Therefore, it seems self-evident that innovations will be especially successful, when they take into account the needs, capabilities, and wishes of both students and teachers (Könings, Brand-Gruwel, & van Merriënboer, 2010). One such innovation is the introduction of workplace simulations that have been developed to provide new ways in connecting school learning with the external vocational and professional world and to create a more inspiring, attractive, and challenging learning environment for vocational students (Vrieze, Van Kuijk, & Van Kessel, 2001).

Workplace simulations (WPS) are authentic learning environments at school, in which students work on realistic practical tasks to acquire vocational competencies. Smaller tasks are embedded in more extended ones that stimulate the development of competences that are nowadays required from vocational students to become adaptive employees in the labour market (cf. Achtenhagen & Oldenbürger, 1996; Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004). Vocational students have to acquire learning skills that help them continue learning and further develop their competencies so that they can react and anticipate adequately to changes in their professional work field (Biemans, et al., 2004; Education Council, 1998). Learning in WPS demands students to work independently and learn from practical experiences. To master the appointed independence and to learn effectively, self-regulated learning is regarded an essential quality in vocational education (De Bruijn & Leeman, in press; Jossberger, Brand-Gruwel, Boshuizen, & Van de Wiel, 2010; Van Grinsven & Tillema, 2006). Self-regulated learners engage actively in their own development by analysing and evaluating their process and performance and by reflecting on aspects that need further improvement. They are aware of their knowledge, beliefs, motivation, and cognitive processes and they can organise their work, set goals, seek help when needed, use effective work strategies, and manage their time (e.g., Boekaerts & Cascallar, 2006; Winne, 1995; Zimmerman, 2006).

However, most students have difficulties regulating their learning (e.g., Azevedo, Moos, Greene, Fielding, Cromley, 2008; Winne 1995). And experiences with the first implementations of WPS showed that adaptations are made that compensate for these problems (Miedema & Stam, 2008). Many of these adaptations appeared to run counter the intentions that accompanied the introduction of WPS, or instance by trading self-regulation by step-by-step instructions (Jossberger, Brand-Gruwel, Van de Wiel, & Boshuizen, submitted b). These developments ask for a partial redesign of WPS to offer practical solutions that support students' self-regulated learning. Providing guidelines for students and teachers can help to realise the theoretical ambition of self-regulated learning in vocational education. In this study, we focus on the design of learning tasks and direct feedback from the teacher in an effort to gain a better understanding of how to improve students' self-regulated learning in WPS. First, we briefly review previous research to identify relevant characteristics regarding the design of

learning tasks and feedback. Then we describe how we joined forces with vocational teachers to redesign learning tasks and feedback based on scientific insights in order to discover effective ways to promote self-regulated learning while at same time considering the practical constraints of WPS in prevocational schools.

The Power of Authentic Learning Tasks in Supporting Self-Regulated Learning

Learning tasks are the starting point in WPS to trigger students' interest and engage them in the learning process (Ames, 1992; Lodewyk & Winne, 2005; Lodewyk, Winne, & Jamieson-Noel, 2009). In WPS, students deal with practical authentic learning tasks (such as cooking, gardening or animal care) and primarily learn by doing. However, in an attempt to support students' self-regulated learning the context and features of a task should guide learners to think critically about their process and task performance. Being aware of what went well or less well during task performance can help students to identify points of improvement to exceed their current level of performance (Ericsson, 2006; Zimmerman, 2006).

As WPS simulate vocational settings, the use of authentic learning tasks is regarded important to stimulate active involvement. Students should perceive a meaningful reason to work on a variety of learning tasks, and novelty and diversity increase students' interest (Ames, 1992). Offering students complex, realistic, and challenging tasks can foster high-quality learning (Van Merriënboer & Paas, 2003; Van Merriënboer & Kirschner, 2007; Vermunt, 2003). However, it is important to prevent that a task is too complex and challenging for a student because in such a situation students likely withdraw from the task rather than engage constructively (Ames, 1992; Winne, 1995). During task performance supportive information should be available for students, because it can help them to integrate theoretical and practical knowledge and develop an understanding of a domain or subject matter problem (Van Merriënboer & Kirschner, 2007). Students need to feel capable to manage the task requirements and task structure can support this feeling. They reported more ease and value for well-structured tasks in comparison to ill-structured tasks (Lodewyk, et al., 2009) as well as higher self-efficacy for learning and performance (Lodewyk & Winne, 2005). Providing clear, specific, and short-term goals in tasks focus students' attention and provide information whether the task can be accomplished with reasonable effort (Ames, 1992).

Moreover, involving students in planning activities prior to and during task performance can make them more aware of time and guide them in organising and scheduling their steps in the process (Zimmerman, Bonner, & Kovach, 1996). Offering clear assessment criteria for evaluating the task performance makes the learning process more visible and learning needs become more transparent for

learners. After task completion, students should be triggered to reflect on their learning process and identify points of improvement to work on in future learning tasks (Kicken et al., 2008; Hattie, 2009; Sluijsmans, Brand-Gruwel, Van Merriënboer, & Martens, 2004; Zimmerman et al., 1996).

The Power of Feedback in Supporting Self-Regulated Learning

Feedback has been identified to be the most powerful influence on learning and achievement (Hattie & Timperley, 2007). According to Butler and Winne (1995) feedback is an 'inherent catalyst' for all self-regulated activities, and a prime determiner of processes that constitute self-regulated learning (p. 246). Feedback is a means to guide students toward more productive engagement in learning activities and trigger higher order thinking (Butler & Winne, 1995; Shute, 2008). Although research has generally found that students perform better when they receive external feedback (e.g., Azevedo, Moos, Greene, Winters, & Cromley, 2008; Van den Boom, Paas, Van Merriënboer, 2007), feedback does not always enhance learning (Hattie & Timperley, 2007; Shute, 2008). Effective feedback provides specific and strategically useful information on how a process or task performance can be improved (Butler & Winne, 1995; Shute, 2008). It is an interactive process in which the student her- or himself also plays an important role as feedback is only useful for students in cases they really need it, receive it in time, and are able and willing to use it (Shute, 2008).

The main aim of feedback is to increase students' knowledge, skills, and understanding. Feedback aims to close the gap between the current level of performance or understanding and the desired level. To reduce this discrepancy, three questions need to be addressed by effective feedback, including "Where am I going?" (What are the goals?), "How am I going?" (What progress is being made toward the goal?), and "Where to next?" (What activities need to be undertaken to make better progress?) (Hattie & Timperley, 2007, p. 88). The three questions work together and have the power to trigger learners to initiate further actions. According to Hattie and Timperley, the effectiveness of feedback depends on its focus, which can be distinguished at four levels. Feedback can concern the task level, the process level, the self-regulation level or the self level. Feedback on task level deals with how well a task is understood or performed, while feedback on the process level concerns the processes that are needed to understand or perform a task. When feedback focuses on the self-regulated level, students are encouraged to monitor, direct, and regulate their actions. Personal evaluations and affect about the learner are provided by feedback on the self-level. Deep processing and mastery of tasks are especially promoted by feedback on process level and self-regulation level, as this feedback is related to learning.

When teachers provide feedback they need to be aware of the fact that their feedback is contextualised by students' prior knowledge and beliefs. Providing feedback only on the outcome of a task can be difficult for students because this information provides little support for self-regulated learning and requires students' awareness of their processes during task performance (Butler & Winne, 1995).

To date, research on self-regulated learning has primarily focused on academic learning. However, the picture of the 'ideal learner' generated by these research outcomes is a desirable goal in vocational education as well. It is important that in WPS learning tasks are designed with care whilst asking for feedback and receiving feedback becomes a daily practice in the interaction between teacher and student. This combination can help students to become actively involved in their own learning process and acquire learning competencies that prepare them for their future professional life. Educational innovations such as WPS are meant to fulfil this role but present implementations appear to fall short. Therefore, the central aim of this study is to investigate whether and how students' self-regulated learning in pre-vocational secondary education can be improved by redesigning learning tasks and optimising feedback. This redesign was done in close collaboration with the teachers involved. More specifically, the following research questions are addressed: 1. How do teachers experience working with the redesigned learning tasks and providing feedback? 2. What is the effect of the redesign on students' self-reported self-regulated learning? 3. How do students self-regulate their learning during the intervention and does their regulation improve? and 4. How motivated are students while working on the redesigned learning tasks?

Method

School Setting

Pre-vocational secondary education prepares students (aged between 12 and 16 years) for upper secondary vocational education. The duration is four years. This study took place in the agriculture department of a Dutch pre-vocational secondary school located in the South of the Netherlands, which implemented WPS. From the beginning of the third year, the curriculum includes working in WPS, and students are actively involved in realistic practical tasks and processes. Pre-vocational secondary education includes four different learning pathways. Students can follow a theoretical, a combined, an advanced vocational, or a basic vocational learning pathway, which have different emphasis on theory and practice. A learning pathway is usually recommended by teachers on the basis of students' achievement, capabilities, and preferences, so that a way of learning is chosen that suits them best. De-

pending on the learning pathway, students spend on average 4 to 12 hours per week in WPS (Ministry of Education, Culture, & Science, 2005).

The WPS in the participating school consisted of several workplaces that were divided into five sections including processing of agrarian products, animal care, technology, flowers, and garden. Learning tasks guided students' learning process at each workplace and students rotated to gain experience in each section. For instance, to learn cooking and working with agrarian products (e.g., making croquettes) students worked in a professional kitchen. In another workplace, students learned to take care of and groom (pet) animals. The various technical workplaces offered possibilities to learn to work on and treat materials such as wood and metal (e.g. sawing, welding). Students could also work at individual workplaces equipped with a computer (e.g., designing a menu card with healthy dishes). Moreover, greenhouses and a flower shop provided workplaces for the care for plants and flowers (e.g., potting plants, making a bouquet, taking an order from a client). A huge garden with trees, flowerbeds, hedges, and a lawn provided diverse workplaces outside (e.g. mowing grass, pruning trees, trimming hedges).

Participants

Three teachers, who we call Ann (35 years old, 12 years of teaching experience), Ben (56 years old, 34 years of teaching experience), and Eric (59 years old, 30 years of teaching experience) participated and worked together in the WPS. They were responsible for 66 third-year students (38 females, 28 males) from three different classes. Their mean age was 15.02 years (*SD* 0.72). Class A consisted of 22 students (16 females, 6 males) from the advanced vocational pathway, who spent 12 hours a week in WPS. Class B consisted of 20 students (15 females, 5 males) and class C had 24 students (7 females, 17 males) both from the combined pathway, who spent 4 hours a week in WPS.

Materials

Intervention

Redesigned Tasks. Using the principles of co-design, together with the teachers each learning task (in total 30 tasks) was redesigned and improved, departing from the original content and structure so that all were authentic and challenging learning tasks, and interesting starting points to trigger students' motivation. To stimulate students' self-regulated learning the following task-specific elements were added in each learning task: 1) a clear description of a goal and specific learning goals, 2) a work preparation instruction, 3) clear assessment and performance criteria, and 4) a reflection.

The structure of the redesigned learning tasks is illustrated with the example 'Handling Chickens'. First, students read the task goal '*In this task you get to know the chickens and you learn how to handle, examine, and care for them correctly.*' Two specific learning goals were formulated: 1) After studying this task, you know the general characteristics of chickens such as behaviour, food, and reproduction and 2) you can handle and examine them correctly and observe their behaviour. To prepare their work, students could first watch a film about lifting up a chicken. Furthermore, they had to plan their work by answering the following questions: 1) How much time do you have for the practical tasks and how will you distribute your time? 2) What materials do you need for the task? 3) To what aspects do you need to pay attention to when dealing with the chickens? and 4) What do you need to do your work properly? The assessment and performance criteria aimed at guiding students' attention to aspects that were regarded important for the task including the chicken coop (e.g., clean, fresh water, food, shelter) as well as handling and examining the chicken (e.g., measuring length and weight). At the end of the task, students had to reflect on their performance.

Feedback. In addition to the redesigned tasks, a workshop was organised to inform the three teachers about the why and how of feedback giving. As starting point, the study of Hattie and Timperley (2007) was used. Special attention was given to the four different levels of feedback Hattie and Timperly distinguished. Emphasis was put on feedback concerning process and self-regulation level as these forms of feedback were identified as most effective with regard to learning and achievement. Clear and explicit examples were worked out to illustrate the differences between feedback on task, process, self-regulation, and self level. The researcher encouraged the teachers to pay close attention to their way of providing feedback to students. At the end of the workshop, it was discussed and summarised when and why feedback is effective. To help teachers' remember the information about giving feedback, they received a small, plasticised card – pocket feedback – with the summarised main aspects for interacting with students and providing feedback on it. They could easily carry the card with them in a pocket (see Figure 6.1)

Figure 6.1. Pocket Feedback

Measurements

Questionnaire. To investigate the way students think about themselves as learners, the two scales about regulation activities of the Inventory Learning Style questionnaire (ILS, Slaats, 1997) were used as pre- and post-test.

Items of the internal regulation scale (9 items) concern student-initiated regulation of strategies and activities, such as taking responsibility for the learning progress (e.g., 'I check myself whether I have performed a task correctly.'). The external regulation scale (9 items) describes students who rely and depend on an external source (e.g., the teacher) to regulate and control the learning process (e.g., 'To know whether I have performed a task correctly, someone else needs to look at it.').

Responses were given on a 5-point Likert scale ranging from 'This never applies to me' to 'This always applies to me'. The internal regulation scales revealed a reasonable reliability of .76 and the external regulation had a reliability of .68 (Slaats, 1997).

Student reflection. Three open reflection questions were included at the end of each task: 1) What went well during task performance and why? 2) What went less well during task performance and what did you do to it?, and 3) What would you like to pay attention to or do differently next time? These questions required short answers.

In addition, students were asked in the beginning of each task to indicate their agreement with the statement 'The goal of the task is clear to me.' The answer option ranged from "totally disagree" to "totally agree" on a 5-point Likert scale. At the end of each task, students had to answer the question 'Are you satisfied with your task performance?' with answer options ranging from "totally disagree" to

"totally agree" and the question 'How did you perceive the task?' with answer options ranging from "very difficult" to "very easy"; again a 5-point Likert scale was provided.

Student task motivation. In each task, students also had to answer four statements with regard to their motivation and self-efficacy: 1) I like to learn from the task, 2) I am confident to perform well on the task, 3) I am convinced to manage difficult situations in the task, and 4) I enjoyed working on the task. The first three statements were asked in the beginning of each task, while the last statement had to be answered at the end of a task. All statements were rated on a 5-point Likert scale and the answer options ranged from "totally disagree" to "totally agree".

Teacher reflections. After a WPS lesson, each teacher received an email with several questions and was asked to shortly reflect on the WPS lesson. During the first five weeks, the focus was on the learning tasks and teachers had to answer the following questions: 1) How did you experience the changes in the learning tasks during the practice in WPS? 2) What, according to you, went well for students and you as teacher with the redesigned learning tasks and why? and 3) What, according to you, went less well for students and you as teacher with the redesigned learning tasks and why? During the last four weeks, the questions focussed on teachers' feedback: 1) How did you give feedback? 2) What went well in giving feedback? 3) What went less well in giving feedback? 4) How did students react to your feedback? and 5) Did you spot anything else with regard to the adjusted learning tasks?

WPS observations. The first researcher was present during each WPS lesson and observed how students and teachers worked in WPS. The observer rotated between the different workplaces and made field notes to capture what was happening. During the observations, special attention was given to how students start working on the task, whether and how students prepare the practical task and make a planning, and whether and how students reflect on their task performance. Students' general work attitude and the atmosphere in WPS were also described. Furthermore, the communication and behaviour of teachers in interacting with students were taken into account and how teachers supported students' learning process and evaluated their performance.

Procedure

The data were collected over the course of three months and triangulation was used for cross verification. The three teachers were actively involved in the process and regular meetings were organised to evaluate the progress. Figure 6.2 presents an overview of the design and data collection of the study. Thirty learning tasks were redesigned in a joint endeavour of the first author and the teachers according to the task redesign principles described. Before the intervention started the ILS

questionnaire was distributed to all students. During the intervention students' task assignments including their task motivation, work preparations, and reflections from week 1, 3, 5, 7, and 9 were selected for the analysis. Moreover, after each WPS lesson teachers' reflections were collected by email. At the end of the intervention, the ILS questionnaire was distributed again to receive students' self-reports on the internal and external regulation scales.
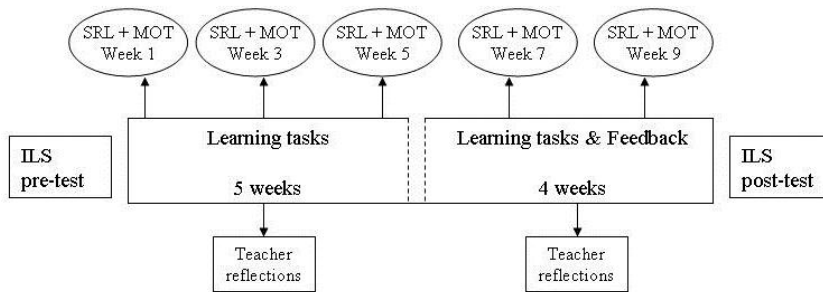
Figure 6.2. Graphical representation of the design and data collection of the study.

Analysis

Quantitative data. A repeated-measures ANOVA was used to analyse students' self-reported answers on the pre- and post-test. One student was excluded from the analyses as she did not fill in the post-test. For the reflection and motivation items in the tasks that were scored on a 5-point Likert scale, the mean scores and standard deviations were calculated. Additionally, repeated-measures ANOVA was used to compare students' answers, but this was only done to give some indications, because of missing values too many students were excluded from the data set.

Qualitative data. Content analysis was used to analyse the students' short-answer reflections as well as the teachers' reflections (e.g., Neuendorf, 2002).

Student reflections. The aim was to capture the aspects and the way students reflected on their task performance. Three main categories of reflection were identified in students' answers on the three open reflection questions at the end of each task. These were reflections on 1) task-specific processes, 2) work/learning-related processes, and 3) the self. Reflections on task-specific processes refer to aspects and actions that were part of the assignment and which students had to do to perform the task (e.g., lifting up the chicken went well). Reflections on the work/learning-related processes refer to aspects, in which students look at themselves as learners in the task performance process (e.g., "working more independently next time"). Reflections on the self dealt with students' emotional regulation (e.g., "to be more positive" or "more guts"). When students reflected

only superficially (e.g., "everything went well") their answers were scored as 'non-specific' and when they did not write down their reflection their answers were categorised as 'no reflection'. To calculate the inter-rater reliability, the first and second authors individually categorised the reflections of students from one class revealing a Cohen's kappa of .91. Moreover, the first and second reflection question consisted of two parts. In the first question, students had to reflect on the aspects that went well during task performance and additionally they were asked to indicate the reason. In the second question, students had to reflect on the aspect that went less well and additionally they were asked to indicate their solution. These answers were collected and grouped on the basis of the themes.

   Teacher reflections. The aim was to gain an understanding of the teachers' perceptions with regard to the redesigned tasks and feedback. Teachers' reflections were grouped into positive and negative (still to improve) comments to identify perceived effects on students and themselves as teachers. Teachers' reflections are reported in a narrative way to illustrate the progress.

Results

In an effort to cogently articulate the findings, we have organised this section in the following manner. First, the implementation process of the redesigned tasks and feedback method is described. Second, teachers' reflections on their experiences with working with the redesigned tasks and feedback giving are presented. Then the results of the students are reported: the ILS questionnaire outcomes and students' self-regulated learning during task performance, based on the field notes and the written task work. Finally, students' self-reported task motivation during task per-formance is presented.

Implementation Process

While implementing the redesigned tasks in WPS, it became clear that to realise the aims of the intervention certain preconditions regarding class management had to be fulfilled too. In the beginning of the intervention, the lesson start up in WPS was slow and perceived by teachers and researcher as rather messy and unstructured. In one occasion, it took almost one full hour before all students had started working on a task. Although a planner was already used before the redesign, students did no longer take that planning for granted. As a consequence, teachers had lost the over-view and given up on updating the planning.

   To guarantee a fast start in the morning, to smoothen the process in WPS, and to provide structure and clarity for both teachers and students, it was decided to reinstall the use of a planner, providing information on what task a student had to

do when. As from the third week of the intervention, students had to follow that planner and fill in their grades as soon as they had finished a task. Switching without a good reason was no longer tolerated. This planning made students' progress visible and assured the rotation across the diverse workplaces. Moreover, it allowed teachers a more organised approach with regard to planning as the availability of workplaces and the necessity of certain work activities could be taken into account more easily. For example, when bad weather was predicted, it was better not to plan in students for mowing grass and to have an alternative ready. This reduced problems during the WPS and additionally freed time for guiding students' learning process instead of solving problems due to a bad preparation.

Moreover, the researcher encouraged teachers to communicate clearly with each other and to agree upon strategies so that they prevent being inconsistent with one another in their communication to students.

Teachers' Reflections on the Redesign

Redesigned tasks. The reflections of the three teachers – Ann, Ben, and Eric – reveal how they perceived the redesigned tasks in WPS during the course of the intervention.

In the beginning of the intervention, Ben indicated that he had not yet experienced any differences. Ann saw that students needed time to get used to the structure of the tasks and remarked that the changes in the learning tasks were not introduced to students in advance. Ann also noticed that as a rule students' task performance was very automatic, most of the time they did not read carefully. The redesigned tasks made them more conscious of the structure in the task. In her role as teacher, Ann experienced advantages with regard to guiding and assessing students. She felt that she knew the content of the tasks better herself, which also helped when students asked questions; she could now instruct them to look up the required information in the task, because she was certain that students could find it. Moreover, Ann reported that assessment used to be difficult for her especially in cases when she had not seen students during the process, which happens regularly as teachers cannot stay at one workplace only. The assessment criteria embedded in the redesigned tasks facilitated the assessment process for her as they provided the necessary guidelines to check students' performance.

Eric indicated that the redesigned tasks lead to more structure and as the theoretical information was brought back to the essence with regard to the formulated goal and learning goals, it was more comprehensive for the students and facilitated independent work. According to the three teachers planning was difficult for students; they had to keep reminding them to make the work preparation and answer the reflection questions. Eric hesitated to pay close attention to the content of students' reflections. He also found that not reading and

not planning led to time pressure and not completing a task. The three teachers also remarked that the start up at the beginning of the WPS needs further improvement as a lot of time is lost.

As from the third week of the intervention, all three teachers had the impression that students asked fewer questions during task performance and worked more independently. The reasons the teachers put forward for these perceived changes were the improved quality of the tasks in general and the structure of the rede-signed tasks. The teachers indicated that these aspects enhanced clarity so that students knew better what was expected from them. Eric mentioned that the work preparation also reduced question asking with regard to the task and students were able to finish a task in the technological workplaces faster than in the past.

However, Ben indicated that students still have to get used to the assignments of planning and reflection and although students start writing more, all teachers have to keep reminding them. According to Ann, reflecting was difficult for students as they were not accustomed to think about why aspects went well or not and about describing it in their own words was even more complex. Students' willingness to read remained a difficult aspect during task performance, and all three teachers stressed that when students have to read longer passages they were likely to refuse to work. Ann also pointed out that some students need to be directed toward work and controlled by the teacher and she doubted that any task redesign could change this situation.

According to Ben and Ann, students were very positive about the tasks except for one task. In that specific task, students had to design a menu card with healthy dishes. Students indicated that they did not like the task because it was too theoretical and they missed a real practical activity. Therefore, it was decided to redesign the task again to offer students the possibility to prepare one of the dishes on their menu card and the teachers thought that students enjoyed the cooking aspect.

In line with Ann, Ben indicated that the work preparation in the redesigned tasks allowed him to point out mistakes to students regarding not planning carefully. However, Ben was concerned about his time management and he felt that the redesigned tasks required a lot of time of the teacher when he tried to look closely at all assignments. Ben indicated that the assessment criteria helped him to assess students' performance as they provided guidelines and forced him to take the time. But as a consequence, he had less time to walk around to check on workplaces resulting in feeling hurried and frustrated. Ben experienced an increase in work pressure. This was also true for Eric and he also pointed out that he faced difficulties to support and assess students in tasks that were not in his domain. In addition, Eric also indicated that time for guiding students was sometimes restricted by having to do other things in WPS as well, such as maintenance of tools and materials. Ann, on the contrary, had the feeling that she was getting more and more

used to working with the redesigned tasks and knew better what the tasks required and was therefore able to react faster and guide students better regarding questions and (un)desired behaviour.

Moreover, all teachers indicated that they liked working with the planner and positively evaluated that they had agreed upon no longer tolerating students to switch randomly. However, the teachers still experienced situations in which they had to correct students' behaviour when they did not follow the planning. Eric stressed that being consequent in the communication to students and correcting misbehaviour consistently makes students realise what is expected.

Feedback. In addition to the reflections on the redesigned tasks, Ann, Ben, and Eric also reflected on providing feedback during the second part of the course of the intervention.

All three teachers indicated that the feedback workshop made them more aware of the way they interacted with students. During WPS, they tried to pay attention to their feedback, but mentioned that they had to get used to it and remind themselves to take time. Breaking with certain routines was perceived as effortful.

Ben found it difficult to maintain providing good feedback; sometimes he came to realise that his feedback was not thought out well or that he had been too fast. He had to become aware of the fact that he provided feedback and the more mindful he was, the better it went. When he was mindful of his feedback, he experienced a feeling of satisfaction because in those situations the conversations with the students were more structured and he was better able to trigger students to think about their work by asking questions. As a result, Ben found that students started to think about their process, developed awareness, and even slowly changed their attitude. Ben experienced students' reactions as very positive and indicated that students became curious and could better evaluate themselves. Providing feedback became easier for Ben during the intervention because he managed to take the time to engage students in a constructive conversation in which he was able to ask questions and discuss points for improvement. However, in cases he lost his patience, he said that his feedback suffered.

Ann found it difficult to balance between instructing, providing feedback, and giving a direct answer to students questions, and sometimes she was unsure about the timing. She said that the pocket feedback helped her in mastering this process. Ann indicated that she felt more and more comfortable and tried to be more attentive to her conversation with students. She mentioned that she took her time for students and clearly communicated that others had to wait when she was in a conversation. However, she added that she had to learn to seclude herself from waiting students when they tried to get her immediate attention. Ann felt that students appreciated the time she took for them and the majority of students listened carefully, were enthusiastic, and actively engaged in the conversation about their learning process, while others still found it difficult to discuss their task

performance. It became clearer for Ann how to direct students and trigger them to reflect which also helped her in gaining an understanding of their performance. Ann became less inclined to give immediate answers but rather stimulated students to ask direct questions and explain the problem they faced. To get a better idea of students' task performance, Ann also mentioned that she tried to receive information about the performance early in the process.

Eric went through a process of serious doubts about himself as teacher and he was afraid not being able to perform well. He observed that this was only the second time in his long educational career that he felt intensively confronted with his own functioning; 'as if someone was holding a mirror', he said, 'I think I am doing it completely wrong, I never learned it. I am experiencing seriously self-doubts of whether I provide good feedback. My mistake is that I want to spell it all out for them.' He stated that he used the pocket feedback as a guideline and consulted the provided information regularly. He tried to give feedback, but indicated that he found it difficult to interact deeply with a student about the process. One explanation he put forward was that he had to do many things at the same time. Moreover, he came to realise that he did only scarcely provide feedback on process and self-regulation level and he found it difficult to create a moment of peace and quiet to do so. However, by giving more attention to feedback on students' process, he received positive reactions from students and Eric had the feeling that they were curious to hear more about their functioning. Eric also reported that he asked more open questions with regard to how students perceived a certain task and what they thought they had learned from the task leading to a conversation in some situations. He described the interaction as a moment of reflection for the students and for himself as a teacher.

Students' Self-Reported Regulation Activities

The means and standard deviations on the pre- and post-test for internal and external regulation (ILS) are presented in Table 6.1 It appears that the redesigned tasks and improved feedback had a positive effect on students' internal regulation as the results of the repeated measure analysis revealed a significant main effect here $F(1, 62) = 5.4$, $MSE = .231$, $p < .05$, $\eta^2 = .080$. There was no significant interaction effect between type of class and internal regulation. The fact that students scored significantly higher on the internal regulation scale of the ILS questionnaire in the post-test indicates that the intervention was effective. No significant results were found for external regulation $F(1, 62) = .72$, $MSE = .194$, $p > .05$, $\eta^2 = .011$.

Table 6.1. Means and standard deviations of the pre- and post-test for internal and external regulation.

	Internal regulation		External regulation	
	M	SD	M	SD

Pre-test	2.8	0.63	2.6	0.61
Post-test	3.0	0.57	2.7	0.60

Self-Regulated Learning during the Task Performance

Planning. The task redesign was aimed to trigger students' planning activities as they had to prepare the practical task before starting, by thinking about time, resources, and demands. In the beginning of the intervention, the majority of students did not prepare their work. Teachers kept reminding students to do so, but they often intervened too late, when students had already started with their practical task. It happened regularly that students filled in the work preparation at the end of the task rather than in the beginning. To illustrate students' reasoning with regard to planning, a situation that was observed in the first week is described. A student indicated that he had almost completed his work preparation before he had started with his practical task. When asked what he had not done in advance he said that he had not yet made a planning of the required steps and the timing. He further explained that his intention was to do this part after finishing the practical task, because only then he knew how long it took. This example indicates that the student was not aware of the purpose of a work preparation. He did not see planning as a useful activity but rather as an obligatory aspect unrelated to his practical task performance. The filled in work preparations show that when it comes to scheduling time and dividing work activities into a step-by-step plan students' planning mostly is neither specific nor realistic. Planning in advance seemed to be difficult for the majority of students; not planning carefully sometimes resulted in hectic and chaotic situations at the end, especially in the kitchen, or students did not finish a task in a reasonable time.

    Reflecting. In the beginning of the intervention, the majority of the students simply skipped the three open reflection questions at the end of each task. They did not use the questions to pause for a moment and think back of their task performance. The teachers kept reminding students to do so and to fill in the questions. The observations showed that it was difficult for both the teachers and students to get used to the structure and requirements in the redesigned tasks. Moreover, observations in the WPS revealed that there was no quiet moment created that would have offered students the possibility to take their time for reflecting. Certainly in the beginning, students reflected on the run most of the time and did not see an added value. One student, for example, mentioned that he did not like the questions and thought they were useless, because nobody would take a look at his answers anyway. In many cases, the reflections were very short, superficial or incomplete and the second part of question 1 (why did it go well) and question 2 (what did you do) were not always taken into consideration. Along the

run, however, students' reflections became more lengthy and comprehensive. Reasons students put forward for why certain aspects went well during task performance included perceived difficulty (e.g., 'Weeding went well, because it was easy.'), prior knowledge and experience (e.g., 'Cooking went well, because I have done it before.'), pleasure (e.g., 'Coming up with recipes went well, because I liked doing it.'), and instruction (e.g., 'Mowing grass went well, because it was well explained.'). Moreover, students considered their own approach (e.g., 'I worked seriously.'), how smoothly it went (e.g., 'It went quickly and I did not experience difficulties.') and they mentioned good collaboration with a peer as reason for why a certain aspect went well. Students involved in animal care tasks also referred to the behaviour of an animal as reason for why it went well (e.g., 'The hamster was calm and gentle.'). When reflecting on aspects that went less well during task performance students either asked a teacher or a peer for help or made adjustments regarding task specific processes (e.g., 'I looked for a better background for my menu card.' or 'I used nails in addition to the glue to put the wooden planks together.') or work/learning-related processes (e.g., 'I tried to concentrate better.' or 'I practiced.').

Table 6.2 provides an overview of the identified categories of reflection and the number of occurrences. Students' short-answers reveal that they mostly reflected on task-specific processes such as painting, finding recipes or drilling holes. Taking a look at their first week reflections, the number of occurrences for reflecting on work/learning-related processes shows that this was not often considered compared to task-specific processes. It is remarkable that the reflections on work/learning processes increased over the weeks of the invention; in particular, the third reflection question that deals with adjustments and changes in the future triggered students to reflect on work/learning related processes such as working more independently, asking more questions, reading and following the instruction more precisely. Students did not often reflect on their self with regard to emotional regulation. Non-specific reflections and not reflecting at all occurred frequent and did not decrease considerably across the weeks of the intervention. The number of occurrences for 'no reflection' indicates a trend toward decrease from week 1 to week 7; however, in week 9 the number increased. The observations suggest that this increase may be due to the fact that for one class it was the last WPS lesson before the summer vacation and additionally it was an extremely hot day. These circumstances could have influenced students' task performance. Nevertheless, it also shows that reflecting had not yet become a routine activity at the end of the task.

Table 6.2. Students' reflection during task performance.

		Week 1			Week 3			Week 5			Week 7			Week 9	
Reflection	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**

	Week 1			Week 3			Week 5			Week 7			Week 9		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
task-specific processes	28	22	20	41	40	19	44	43	15	40	36	24	42	35	15
work/learning-related processes	2	2	5	4	3	8	2	2	8	5	2	16	1	3	19
self	1	2					1	1	3	1	1			2	1
non-specific	1	2		8	1	7	8	2	4	9	5	2	4		5
no reflection	15	19	22	6	14	23	4	10	26	5	14	15	12	18	17

Note. **1** = What went well during task performance and why?; **2** = What went less well during task performance and what did you do?; **3** = What would you like to pay attention to or do differently next time?

Table 6.3. Mean score and standard deviation on reflection.

	Week 1			Week 3			Week 5			Week 7			Week 9		
	n	M	SD	n	M	SD	n	M	SD	n	M	SD	n	M	SD
1) The goal of the task is clear to me.	43	3.67	0.68	51	3.96	0.72	54	3.93	0.67	52	3.83	0.59	53	3.89	0.61
2) Are you satisfied with your task performance?	31	3.97	0.79	53	3.94	0.63	54	4.15	0.68	54	4.02	0.71	48	4.21	0.65
3) How did you perceive the task?	33	3.30	0.64	48	3.58	0.65	53	3.57	0.77	50	3.50	0.79	44	3.59	0.66

Table 6.3 and Figure 6.3 present the mean scores and standard deviations of students' self-reported reflection during task performance. The mean scores of the students who answered the questions were all above the neutral value of three on the 5-point Likert scale. That suggests that students perceived the task goals as clear, their own task performance as satisfactory, and the tasks as rather easy. The repeated-measures ANOVA revealed no significant differences.
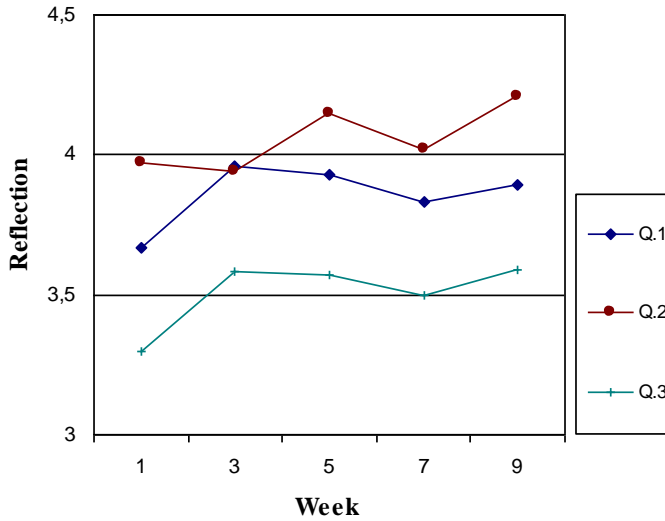
Figure 3. Mean score on reflection across the weeks of the intervention.
Note. **Q.1** = The goal of the task is clear to me; **Q.2** = Are you satisfied with your task performance?; **Q.3** = How did you perceive the task?

## Students' Motivation during Task Performance

The observations made clear that personal interest was the driving force for students' motivation and self-efficacy. At the beginning of each WPS lesson, a look at the planner revealed in which section students had to work and what task they had to do, and even without reading the task description, students were either enthusiastic or not. When students were enthusiastic about a task, they were more likely to start quickly. However, it also happened repeatedly that students complained and tried to switch when they had a preference for another section and task. In those cases, self-regulating their own motivation appeared to be difficult for the majority of students and usually a teacher had to encourage students to get started.

Table 6.4 and Figure 6.4 present the mean scores and standard deviations of students' self-reported motivation during task performance. The results reveal that students' motivation and self-efficacy remained constant during the intervention, no extreme ups and down are visible. Again repeated-measures ANOVA revealed no significant results. The average scores were all above 3,5 on a 5-point Likert scale indicating that students agreed with the statements and were motivated as well as self-efficacious with regard to their task performance. They liked to learn from the task, were confident to perform well and manage difficult situation during task performance, and they reported to have enjoyed working on the task.

Table 6.4. Mean score and standard deviation on task motivation.

	Week 1			Week 3			Week 5			Week 7			Week 9		
	n	M	SD	n	M	SD	n	M	SD	n	M	SD	n	M	SD
1) I like to learn from the task.	43	3.77	0.99	51	3.51	0.83	54	3.65	0.76	53	3.53	0.89	53	3.66	0.81
2) I am confident to perform well on the task.	43	3.77	1.12	50	3.96	0.57	54	3.85	0.68	53	3.75	0.65	53	3.87	0.62
3) I am convinced to manage difficult situations in the task.	43	3.67	0.97	50	3.76	0.66	54	3.81	0.70	53	3.66	0.68	53	3.77	0.72
4) I enjoyed working on the task.	33	3.94	0.93	53	3.79	0.79	55	3.91	0.95	54	4.02	0.94	48	3.94	0.78
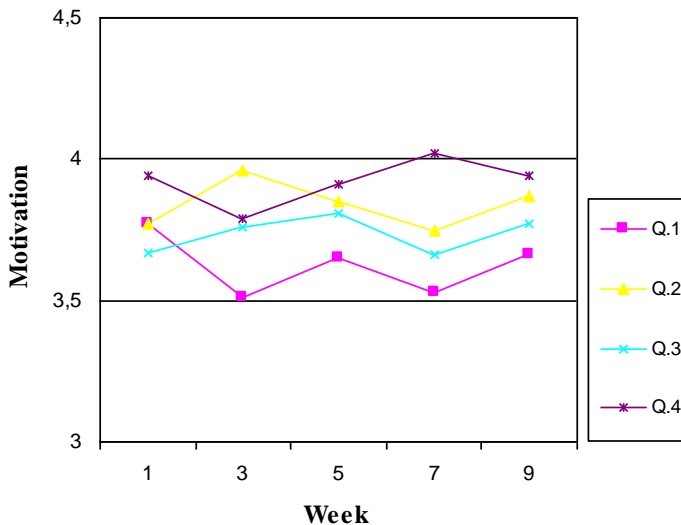
Figure 4. Mean score on task motivation across the weeks of the intervention.
Note. **Q.1** = I like to learn from the task; **Q.2** = I am confident to perform well on the task; **Q.3** = I am convinced to manage difficult situations in the task; **Q.4** = I enjoyed working on the task.

Discussion

The aim of this study was to improve self-regulated learning activities students in prevocational education display in WPS. In a joint effort with the vocational school teachers learning tasks were redesigned and feedback strategies were optimised. The research questions regarded the teachers' experience with the implementation of the redesigned parts of the curriculum, and the effects in students' self-regulated learning and motivation. In this discussion we will first focus on the redesign process itself and its implementation. Then the teachers' experiences are put forward and the findings with regard to students' self-regulated learning activities are discussed.

The first thing we found out in the first two weeks of the intervention was that the analysis of the problems so far had not been complete and that without a redesign of the class management routines no effect of the new tasks would be found. Strict class management was identified as an essential but disregarded condition in WPS practice. The teachers were aware of the 'messy' situation, but they did no longer organise it according to their individual wishes. To solve this problem, rules agreed upon were reinstated and tools such as class planners again became the leading thread for student work. Together with the redesigned tasks these elements were perceived supportive for a well-organised WPS practice and most important it freed time for the guidance of students. However, it took time to

achieve this more organised and structured approach in practice. Students were used to the unstructured semi-anarchistic practice before the intervention and some tried to break out whenever they saw an opportunity to do so. The teachers had to pay close attention and recognise this behaviour in order to prevent it in the future.

A great advantage in this study was that the teachers were a team and could easily communicate and discuss problems and solutions with each other. And although the teachers have their own teaching personality, they complemented one another and were willing to act in concert to improve students' learning. Regular meetings that offer the possibility to discuss and exchange various matters with regard to learning and working in WPS are considered advantageous to enhance awareness and facilitate action (e.g., Beijaard, Verloop, Wubbels, & Feiman-Nemser, 2000).

The first research question focused on teachers' perceptions and was formulated 'How do teachers experience working with the redesigned learning tasks and feedback?' The intervention as a whole raised teachers' consciousness and made them more aware of their own teaching practices. As a consequence, they felt empowered to direct students' learning processes. The redesigned learning tasks offered a clear structure and the teachers perceived advantages with regard to assessing and guiding students' task performance. It took time for the teachers and students to get used to the new requirements of the tasks and in the beginning the teachers experienced an increase in work pressure. According to the teachers, the redesigned tasks increased clarity for students, they gradually asked fewer questions, and eventually planned their task performance more often and reflected better on their processes.

Providing feedback was perceived to be effortful, because the teachers tried to be constantly aware of how they interact with students. Along the run, they experienced constructive conversations with students as they learned to take their time and trigger students' critical thinking about their processes. The positive reactions from students were motivating for the teachers and they indicated a feeling of satisfaction. Finding a good balance between instructing and providing feedback and timing it correctly was challenging and in some situations the teachers were irritated during an interaction and had no patience to give constructive feedback. The teachers experienced providing feedback as a learning process and moment of reflection. This learning process was sometimes also accompanied by (serious) doubts. Reflecting on their own performance made them aware of how they interacted with students and helped them to change their approach gradually. The findings showed that the teachers want students to become independent and self-regulated learners, but they are often unsure about how much and what kinds of support students need to attain it. The teachers' experiences highlight that there should be no end point in teachers' development as practitioners and

professionalising equips teachers with guidelines to improve students' learning. Moreover, these findings show that co-design with teachers is a good way to improve an on-going innovation, but that the implementation of a product teachers have ownership of is another effortful process (e.g. Breiting, 2008; Beijaard, Korthagen, & Verloop, 2007; Korthagen, 2007; Van den Berg & Geurts, 2007).

The second research question focused on students' self-reports on regulation activities and was formulated: 'What is the effect of the redesign on students' self-reported self-regulated learning?' The results showed that students scored significantly higher on internal regulation items in the post-test compared to the pre-test, while external regulation was unaffected. This may indicate that the intervention was effective and triggered students' awareness. The magnitude of the scores revealed that there is room for further improvement. Given the short time period of the intervention it is nevertheless remarkable that students scored significantly higher on the internal regulation scale. Moreover, this result is also supported by clear changes in students' reflections.

The third research question 'How do students self-regulate their learning during the intervention and does their regulation improve?' focused on students' self-regulated learning during task performance. Prior research on self-regulated learning found that self-regulated learners are aware of their knowledge, beliefs, motivation, and cognitive processes and they can organise their work, set goals, seek help when needed, use effective work strategies, and manage their time (e.g., Boekaerts & Cascallar, 2006; Winne, 1995; Zimmerman, 2006). The findings of this study revealed that vocational students still have a long way to go in order to become skilful self-regulated learners. Planning and managing time improved but remained difficult for students. Although students prepared their work more often before getting started with the practical task, the task performance revealed that their timing and scheduling of steps were often neither realistic nor specific, nor did they seem to use their planning during practical task performance. With regard to students' reflections, interesting changes were discovered. Students' reflections became lengthier as they elaborated more on why certain elements went well and what they did in case things went less well. Furthermore, they reflected more on work/learning-related processes by taking themselves as learners in the process into account; this awareness is considered crucial for self-regulated learning. The improvements in students' reflective activities are promising.

The fourth research question focused on students' motivation 'How motivated are students while working on the redesigned learning tasks?'. Students reported to be motivated and self-efficacious during task performance and the teachers also indicated that students' reactions regarding the redesigned tasks were positive in general. Their personal interest in a topic made them engage enthusiastically. When they did not like the task, they often had difficulties to regulate their motivation. Motivation appeared a prime determiner for students' engagement and is an

essential dimension of self-regulated learning. However, the motivational energy can either trigger students to engage in the learning process or underpin their performance (Martin, 2006; Pintrich, 1999; Zimmerman, 2008; Zimmerman & Schunk, 2008). As research shows that motivated students are more attentive to their learning process, put forth increased effort, are more likely to persist, and experience greater satisfaction and positive affect (Zimmerman & Schunk, 2008) it seems important that students learn to regulate their motivation more effectively to overcome deficient processes. The teachers reported enjoyment when students were motivated. This relationship between teachers' perceptions of student motivation and teachers' enjoyment was also found in the study of Martin (2006).

The quest for self-regulated learning in vocational education has just started and we came across difficulties as well as opportunities. The fact that we carried out this study in the naturalistic setting of WPS and co-designed the learning tasks together with vocational teachers allowed us to connect theory and practice increasing the relevance of this research (cf. Kelly, Lesh, & Baek, 2008; Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). However, although the data was collected over the course of three months, it is still greatly limited in time taking the goal of the manipulation into account. Developing self-regulated learning skills is not something that can be done quickly and easily. This study shows that teachers and students were still learning to operate effectively in this new format. Enough time needs to be allocated for reflection and self-regulated learning activities need to be integrated into the instructional design to create opportunities to engage in the learning process. Moreover, explicit training in self-regulated learning was found to be effective (e.g., Bielaczyc, Pirolli, & Brown, 1995; Hattie, Biggs, & Purdie, 1996; Zimmerman et al., 1996). Despite the limitations, this study gives hope for what a study of larger magnitude and of lengthier time frame might yield.

Chapter 7
General discussion

Self-regulated learning has become a key concept in education. Research done mainly in the academic domains has generated a generally agreed upon picture of an 'ideal learner', who likely is self-regulating. Self-regulating learners can be described as active agents in the learning process, who control, steer, and direct cognitive and motivational processes to achieve a learning goal. They organise their work, set goals, seek help when needed, use effective work strategies, manage their time, evaluate the result, and plan alternative pathways to success when necessary (Boekaerts & Cascallar, 2006; Ertmer & Newby, 1996; Pintrich, 1999; Winne & Butler, 1995; Zimmerman, 2006). Vocational education also embraces these student qualities as a desirable goal to strive for. Apart from acquiring vocational competencies, vocational students should be equipped with learning skills to become adaptive employees (Achtenhagen & Oldenbürger, 1996; Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004). To prepare these learners adequately for their professional future, innovative learning environments – workplace simulations (WPS) – have been introduced in vocational education to engage students in authentic practical tasks and trigger them to work and learn independently.

In this dissertation, the focus is on learning in workplace simulations and the quest toward self-regulation in vocational education. The main aim was to gain understanding in the kind of difficulties and success factors students and teachers experience in workplace simulations, identify and explore self-regulated actions, and to seek ways to support students' self-regulated learning skills in the instructional design and feedback.

Main findings

The theoretical framework presented in Chapter 2 was developed to identify important requirements related to learning in WPS by focusing on the interaction between student, teacher, and learning environment. Three main pedagogical principles have been identified as relevant requirements for WPS learning including 1) authentic setting, 2) integration of theory and practice, and 3) design for adaptive learning. Important design components are authentic and challenging learning tasks, supportive information, a development portfolio, and clear assessment criteria. Teachers can support students' learning by providing feedback, giving direct instruction in self-regulated learning, and increasing responsibility for self-directed learning. Effective learning in WPS would require a perfect match between the design of the learning environment and teacher support that is adaptive to learners' level. This framework was the basis for the empirical studies in this dissertation.

The case studies in Chapter 3 and Chapter 4 present data from an interview study that explored students' and teachers' perceptions. Students and teachers perceived similar difficulties and success factors with regard to WPS learning. Both

students and teachers emphasised the importance of authenticity with regard to learning tasks and physical arrangement of WPS, but indicated that authenticity was not always sufficiently realised. Students and teachers valued authenticity and its effect on students' motivation and learning, who both groups described as do-learners.

Students dislike reading and lack comprehensive reading skills. According to teachers this leads to lack of understanding and makes working independently difficult. As a consequence, teachers reported to adjust the learning material by reducing text and providing detailed step-by-step instructions.

Planning and reflection were hardly included in the tasks. Students found planning unnecessary as everything was spelt out literally, while teachers thought that students could not plan and lack a sense of time. Assessment appeared a weak point. Assessment criteria were not transparent for students and teachers stated that they often valued the effort spent most. Moreover, students' task performance was not always carefully approved by teachers and teachers as well as students experienced that as disadvantage. Clear assessment criteria are considered helpful for students and teachers in the evaluation process. Students and teachers mentioned almost the same student characteristics that they found relevant for WPS learning including being motivated, willing, interested, responsible, committed, socially competent, having discipline, and able to take initiative. These characteristics are closely related to self-regulated learning and it is promising that students and teachers agree on these characteristics.

With regard to the teacher, students stressed being empathic and calm as relevant personal characteristics of the teachers; they also stated that the teachers should be available in space and time. Teachers found WPS aims to be autonomy-stimulating, but they often had the feeling that students are very dependent on their guidance. This dependency appeared to be partly evoked as students were obligated to ask for approval of subtasks before being allowed to continue. Teachers experienced a conflict between controlling students' learning process and letting go. Some teachers expressed doubts whether vocational students are capable to regulate and direct their learning at all. Students, however, indicated that they appreciate to be challenged, which from their point of view was not always the case. This raises the question whether students tend to overestimate their performance, while teachers tend to underestimate students' capabilities. The findings from these two studies indicate that the match between the design of the learning environment and teacher guidance in supporting students' self-regulated learning is not yet realised in the WPS practices investigated; opportunities for self-directed learning were even nonexistent.

The Multiple case study reported in Chapter 5 showed that well performing vocational students do and are able to self-regulate their learning to some extent. Students oriented themselves on the task. They structured their environment

according to their needs and preferences by selecting an ideal workplace. Regarding planning students indicated that they knew the steps required to accomplish the task, implicating that no further planning was needed. No student had worked out an elaborated plan with detailed information on scheduling and timing. Only some planning with regard to time and resources was visible.

Students monitored their performance carefully during task performance, and adjusted their process when necessary. In cases they had doubts or needed more information or material they consulted a peer or the teacher proactively. Help seeking was easy and an integrated part of their learning process. To assess their performance, students examined and tested their product. Only a few students mentioned that they also take their process into account when evaluating their performance. Although the quality of a product is associated with the process, evaluating one's own process is more complex as it requires meta-cognitive awareness. However, though process evaluations were mostly absent, most students reflected on aspects they needed to improve further. The driving force was their motivation; they enjoyed engaging in extracurricular activities related to their professional field. Besides intrinsic goals, they also reported extrinsic goals.

Building on the knowledge gained from the previous studies, an educational design study was set up, which is described in Chapter 6. Together with vocational teachers, learning tasks were redesigned and feedback was optimised. It was investigated whether this improved students' self-regulated learning. The study revealed that the intervention had this impact. Results show that students had significantly higher scores on internal regulation. Moreover, they started to reflect more on learning/work-related processes. Planning, however, remained difficult for students, though some improvement was observed here as well.

Set up as a design experiment this study revealed that without dedicated class management well-designed WPS tasks do not have the intended effect. Clear rules and a planner provided a leading thread for student work and freed teachers' time for the guidance of students. Both, the teachers and students, needed time to get used to the new requirements in the tasks. After an initial increase in work pressure in the beginning of the intervention, teachers found out that by the end they were better able to engage in constructive conversations that triggered students' critical thinking.

Theoretical and Practical Implications

The findings of this thesis contribute to the conceptual understanding of self-regulated and self-directed learning. A coherent perspective of these concepts was developed providing clarity in the sea of similar terminology and conceptualisations (see also Boekarts & Corno, 2005; Dinsmore, Alexander, & Loughlin, 2008;

Schreiber, 1998). This framework provides a starting point to further investigate the relation between self-regulated and self-directed learning and test the validity of the theoretical model (e.g., Bijker, Van der Klink, & Boshuizen, 2010). The integrated focus on learner characteristics, learning environment and the role of the teacher makes it possible to take the complexity into account when optimising learning. Although the elements in the theoretical framework are familiar topics in research, the combination of them in relation to workplace simulation learning and the focus on the interaction is new. It seems important that research focuses on the interconnected forces between the main actors in learning, because they form the perfect match to foster learning.

Self-regulating and self-directing one's own learning involves complex processes and it is a misconception to believe that learners are automatically self-regulating and self-directing their learning in an effective way. The question might rise to what extent vocational students need to be self-regulated learners. It can even be argued that vocational students do not need to be self-directed at all to become skilled workers as long as they can follow orders and execute the professional task. However, if the aim of vocational education is to achieve self-direction in learning (and we believe it is), then learners should learn to self-direct. An additional argument is that these young adults should actively develop their careers rather than simply enter them (Biemans et al., 2004; Education Council,1998). From a lifelong learning perspective, continuous learning is integral to their working lives and increases their chances to reach more of their potential.

However, to think that this goal can be achieved easily and in short time is an indication of a naïve optimism. Nevertheless, educators should not perceive the trend toward self-direction as a burden or an impossible goal in vocational education, but rather as a change for the better. The success, after all, depends to a large extent on their dedication to optimise students' learning. The findings of the studies reported in this dissertation can be of considerable interest for teachers and policy makers and can contribute to pedagogical and curriculum development to design effective and enjoyable WPS.

However, a pitfall lies in the fact that the implementation of WPS in vocational education can be characterised as a top down large-scale innovation and previous research revealed that these types of innovations are a risk to yield success and the execution differed from the theoretical plans and goals (e.g., Fullan, 2000; Miedema & Stam, 2008; Struyven & De Meyst, 2010). This can be confirmed by results presented in this thesis. Teachers experienced difficulties to fully implement the innovative design in teaching and were not well enough prepared to support self-regulated and self-directed learning. Two practical implications are put forward to improve WPS practice and optimise students' learning.

First of all, teachers need to know what is considered self-regulated learning and self-directed learning. To support self-regulated learning in WPS, authentic and challenging learning tasks need to be designed that trigger students' motivation and engage them in critical thinking about their learning process by integrating planning and reflection. Planning and reflection need to be designed in such a way that students recognise the surplus value of engaging in these activities. Planning, for instance, does not mean pinning over a step-by-step instruction but rather thinking about timing and scheduling and holding on to it during task performance. For self-directed learning to occur, teachers need to allow students to take control of their own learning trajectory by offering choices and gradually transfer responsibility to learners.

Moreover, teachers need to be aware of their own practice and learn how they can support self-regulated and self-directed learning. Autonomy-stimulating learning environments like WPS do not imply that students' learning process needs no guidance. Feedback has been identified to be the most powerful influence on learning and achievement (e.g., Butler & Winne, 1995; Hattie & Timperley, 2007; Shute, 2008). Good feedback encourages dialogues between teacher and student and provides opportunities to challenge students to think about their own learning process. Feedback focusing on process and self-regulation level is most effective in enhancing self-regulated learning (Hattie & Timperley, 2007), but also direct strategy trainings had a positive impact (e.g., Bielaczyc, Pirolli, & Brown, 1995; Zimmerman, Bonner, & Kovach, 1996).

To conclude, self-regulated learning needs to be completely integrated in the instructional design and teacher feedback. Reflective practices for students and teachers are crucial to identify points for improvement to attain excellence. Moreover, the findings in this thesis show that co-design with teachers is a good way to improve an on-going innovation and helps to bridge the gap between research and practice. Continuously professionalising and exchanging ideas and experiences with colleagues are considered useful activities to enhance awareness and facilitate actions with regard to learning and working in WPS.

Future Research

We gained an understanding of difficulties and opportunities on our quest toward self-regulated learning in WPS in vocational education, but also new questions for future research rise to the surface.

An intriguing area of future research is to systematically examine students' motivation and especially their motivational regulation. In all studies, motivation was the driving force to engage in learning. Learning should be effective as well as enjoyable, but what seems to be an interesting learning task from educators' point

of view, is not necessarily perceived in the same way by students (e.g., Könings, Brand-Gruwel, & Van Merriënboer, 2010). In redesigning the learning tasks together with teachers, students' perspectives regarding needs, and wishes were considered and in general students perceived the tasks as positive. However, for most of the students their personal interest in a topic determined their engagement in the learning task. Not liking the task, decreased their motivation and often hampered their engagement. Investigating effective strategies students can use in regulating their motivation and providing guidelines teachers can use to support motivational regulation are considered interesting research areas. There is also need to investigate how differently designed learning tasks influence students' motivation (Lodewyk, Winne, & Jamieson-Noel, 2009).

Adopting a more integrative view by attending to the interaction between student, teacher, and learning environment was found supportive for improving self-regulated learning. However, more longitudinal research in close collaboration with teachers is required to gain a better understanding in the development of self-regulated and self-directed learning skills over time. In addition, quasi-experimental research in WPS practice can evaluate new ways of stimulating self-regulated learning in vocational education.

Moreover, we have not considered the social environment of students outside school. Teachers in our studies and previous research findings have stressed the impact of the social environment on students' learning (e.g., Wentzel, 1998; Zimmerman, Bonner, Kovach, 1996). Future research should incorporate social environmental factors because students learning is either supported or impaired by these factors (such as peers and parents). More insight in whether and how education can compensate for problematic social influences is desirable.

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Summary

Learning in workplace simulations (WPS) in vocational education is the topic of interest of this thesis. The main aim of the studies was to gain understanding in the kind of difficulties and success factors students and teachers experience in workplace simulations, identify and explore self-regulated actions, and to seek ways to support students' learning skills in the design of the learning environment and feedback given by teachers.

In the first study, reported in Chapter 2, the theoretical framework was developed to gain an understanding of the relation between students' self-directed and self-regulated learning skills, the design of a learning environment, and the role of the teacher. Furthermore, it was explored how these factors can shed light on WPS learning in vocational education. As student learning takes place in an environment, in which students and teachers interact with each other, all three factors need to be taken into account to optimise learning. Based on a theoretical analysis and synthesis, characteristics of each factor that can influence good functioning in WPS and foster students' learning are presented in a theoretical model of requirements.

In the framework a coherent perspective of self-regulated and self-directed learning is described. The two concepts differ on important aspects. By describing them on micro and macro level, it was shown that self-regulated learning is the foundation of self-directed learning and concerns the task level, while self-directed learning aims at the planning of the whole learning trajectory. This distinction has consequences for the design of the learning environment and the role of the teacher, because self-directed learning requires additional preconditions (such as allowing students to take control and providing choices). Three main pedagogical principles have been identified as relevant requirements for WPS learning including 1) authentic setting, 2) integration of theory and practice, and 3) design for adaptive learning. Important design components are authentic and challenging learning tasks, supportive information, a development portfolio, and clear assessment criteria. Teachers can support students' learning by providing feedback, giving direct instruction in self-regulated learning, and increasing responsibility for self-directed learning. Effective learning in WPS requires a perfect match between the design of the learning environment and teacher support that is adaptive to learners' level. This framework was the basis for the empirical studies in this dissertation.

Chapter 3 and Chapter 4 describe exploratory case studies. The aim of the study presented in Chapter 3 was to explore students' perceptions with regard to learning and working in WPS as well as their preparedness to work and learn in a self-directing way. Forty students in pre-vocational secondary education participated. It

was investigated what factors they perceive to be relevant for successful learning in WPS with regard to the design of the learning environment, the student characteristics, and the role of the teacher. The study reported in Chapter 4 investigates the perceptions of twenty teachers. They play a crucial role in translating the innovation to educational practice and therefore teachers' points of view with regard to the design of the learning environment and the student and teacher characteristics relevant for successful learning in WPS were examined.

Students and teachers perceived similar difficulties and success factors with regard to WPS learning. Both students and teachers emphasised the importance of authenticity with regard to learning tasks and physical arrangement of WPS, but indicated that authenticity was not always sufficiently realised. Planning and reflection were hardly included in the tasks and assessment appeared a weak point. Student characteristics that were considered relevant for WPS learning were closely related to self-regulated learning. With regard to the teacher, students stressed being empathic and calm as relevant personal characteristics of the teachers; and the availability of the teacher in space and time was considered important. The results of these two studies reveal that the match between the design of the learning environment and teacher guidance in supporting students' self-regulated learning is not yet realised in the WPS practices investigated; opportunities for self-directed learning were even nonexistent.

Chapter 5 presents a multiple case study, in which self-regulated learning activities of eighteen well-performing students in upper secondary vocational education were investigated. The aim was to unravel self-regulated learning behaviours in WPS and to discover micro processes of planning, monitoring, and evaluating. In this observational and in-depth interview study, information was collected on the approaches students use while working on an authentic learning task, how they deal with problems and mistakes, and how they interact with peers and the teacher. The results reveal that these students actually self-regulated during their task performance. They planned with regard to time and resources, but did not make use of an elaborated plan. During task execution, they monitored their work carefully and made adjustments when necessary. Help seeking was experienced as easy and as an integrated part of their learning process. In evaluating their performance, students focussed more on the work than their process. Motivation was the driving force during task performance and beyond.

In Chapter 6, an educational design study is described. The aim was to investigate how students' self-regulated learning in pre-vocational secondary education can be improved. Three teachers and 66 students of a school for vocational education participated. The study consisted of two design cycles: 1) redesigning learning tasks and 2) optimising teacher feedback. First, learning tasks were redesigned to be authentic and challenging, and in each task a clear goal, a planning, transparent assessment criteria, and a reflection assignment were added to trigger self-

regulated learning. In the second cycle feedback giving was attended. Teachers were instructed to give feedback on a process and self-regulation level to reduce the discrepancy between current understanding and performance of students, and to promote their self-regulated learning. Results reveal that the intervention had an effect on improving students' self-regulated learning. Students had significantly higher scores on internal regulation during the post-test while external regulation was not affected. Moreover, students showed an increase in reflecting on work/learning-related processes. Planning appeared to be difficult for students and was often neither realistic nor specific. The teachers felt enabled to engage in constructive conversations with students and were more aware of providing feedback to trigger students' thinking about their processes during task performance.

In chapter 7 the main findings and conclusions of the studies reported in this dissertation are summarised and discussed. Theoretical and practical implications are put forward and directions for future research are highlighted.

Samenvatting

Leren in werkplekkenstructuren (WPS) in het beroepsonderwijs is het onderzoeksthema van dit proefschrift. De centrale doelstelling van de studies was om inzicht te krijgen in de problemen en succesfactoren die leerlingen en leraren ervaren tijdens het leren en onderwijzen in werkplekkenstructuren, zelfregulerende activiteiten te identificeren en exploreren, en te zoeken naar wegen om het leren van leerlingen in WPS te ondersteunen door het ontwerpen van taken met specifieke designkenmerken en te focussen op het geven van feedback door docenten.

In de eerste studie, gerapporteerd in Hoofdstuk 2, is het theoretische raamwerk ontwikkeld om inzicht te krijgen in de relatie tussen zelfgestuurd en zelfgereguleerd leren van leerlingen, het ontwerp van de leeromgeving en de rol van de leraar. Er is onderzocht in hoeverre deze factoren licht kunnen werpen op het leren in WPS in het beroepsonderwijs. Aangezien leerlingen leren in een omgeving waarin leerlingen en leraren met elkaar in interactie treden, is het van belang alle drie factoren mee te nemen om het leren te optimaliseren. Op basis van deze theoretische analyse en synthese zijn kenmerken van elke factor geïdentificeerd die het goed functioneren in WPS beïnvloeden en het leren van leerlingen bevorderen. Dit resulteerde in een model van vereisten.

Het theoretisch raamwerk beschrijft een coherent geheel van aspecten die van belang zijn bij zelfgereguleerd en zelfgestuurd leren in WPS. De concepten zelfgereguleerd en zelfgestuurd leren verschillen op een aantal belangrijke aspecten van elkaar. Door ze zowel op macro- als op microniveau te beschrijven wordt duidelijk dat zelfgereguleerd leren ten grondslag ligt aan zelfgestuurd leren en het taakniveau betreft, terwijl zelfgestuurd leren betrekking heeft op het plannen van het hele leertraject. Dit onderscheid heeft consequenties voor het ontwerp van de leeromgeving en de rol van de leerkracht omdat zelfgestuurd leren bijkomende voorwaarden vereist (zoals leerlingen toestaan zelfcontrole uit te oefenen en keuzes te maken). Daarbij zijn drie didactische principes vereisten voor het leren in WPS: 1) authentieke omgeving, 2) integratie van theorie en praktijk, 3) ontwerp voor adaptief leren. Belangrijke ontwerpcomponenten zijn authentieke en uitdagende leertaken, ondersteunende informatie, een ontwikkelingsportfolio en duidelijke beoordelingscriteria. Leraren kunnen het leren van leerlingen ondersteunen en bevorderen door feedback te geven, directe instructie in zelfgereguleerd leren te verzorgen, en de verantwoordelijkheid van de leerling voor zelfgestuurd leren te verhogen. Effectief leren in WPS behoeft een goed samenspel tussen het ontwerp van de leeromgeving en de begeleiding door de leerkracht gegeven. Deze

begeleiding dient adaptief te zijn en rekening te houden met het niveau van de leerling. Dit theoretisch raamwerk was het uitgangspunt voor de empirische studies in dit proefschrift.

De hoofdstukken 3 en 4 beschrijven twee verkennende casusstudies. De studie die in Hoofdstuk 3 wordt beschreven had ten doel te onderzoeken hoe leerlingen aankijken tegen leren en werken in WPS en hoe voorbereid ze zijn om in WPS zelfgestuurd te leren en te werken. Veertig leerlingen in het voorbereidende middelbaar beroepsonderwijs (VMBO) namen deel. Onderzocht werd welke factoren met betrekking tot het ontwerp van de leeromgeving, kenmerken van de leerling en de rol van de leerkracht zij als relevant ervaren voor succesvol leren in WPS. De studie gerapporteerd in Hoofdstuk 4 onderzocht de percepties op dezelfde aspecten van twintig leraren. Leraren spelen een belangrijke rol bij het vertalen van een innovatie naar de onderwijspraktijk en daarom is het van belang hun visie op het ontwerp van de leeromgeving en de relevante kenmerken van leerlingen en de leraar voor succesvol leren in WPS te onderzoeken.

Leerlingen en leraren ervaren vergelijkbare problemen en succesfactoren met betrekking tot het leren in WPS. Beiden, leerlingen en leraren, benadrukten het belang van authenticiteit van de leertaken en de fysieke omgeving van WPS, maar zij gaven ook aan dat authenticiteit niet altijd voldoende gerealiseerd is. Belangrijke fases in zelfgestuurd leren, plannen en reflectie, waren nauwelijks in de leertaken geïntegreerd en het beoordelen bleek een zwak punt. Leerling-kenmerken die als relevant werden beschouwd waren nauw gerelateerd aan zelfgereguleerd leren. Leerlingen benadrukten dat het van belang is dat leraren zich kunnen inleven en rust uitstralen. Bovendien werd de aanwezigheid van de leerkracht in ruimte en tijd als belangrijk ervaren. De resultaten van deze twee studies laten zien dat de afstemming tussen het ontwerp van de leeromgeving en de begeleiding door de leraar, met name waar het de ondersteuning van zelfgereguleerd leren betreft, nog niet voldoende in de praktijk van WPS is gerealiseerd; in feite wordt er geen gelegenheid voor zelfgestuurd leren geboden.

Hoofdstuk 5 presenteert een meervoudige casusstudie, waarin de zelfregulerende activiteiten van achttien goede studenten in het middelbaar beroepsonderwijs (MBO) werden onderzocht. Het doel was zelfregulerend gedrag in WPS te ontrafelen en microprocessen van plannen, monitoren en evalueren te beschrijven. In deze observatie- en interviewstudie is informatie verzameld over de aanpak van leerlingen tijdens het werken met authentieke leertaken, hoe zij omgaan met problemen en fouten en op welke manier zij interacteren met medeleerlingen en de leraar. De resultaten laten zien dat deze leerlingen zichzelf reguleren tijdens de taakuitvoering. Zij plannen tijd en middelen, maar zij maken geen gebruik van een uitgewerkt stappenplan. Tijdens de taakuitvoering monitoren zij hun werk aandachtig en doen zo nodig aanpassingen. Het zoeken van hulp gedurende de taakuitvoering wordt als gemakkelijk ervaren en als een geïntegreerd deel van hun proces. Verder bleken deze leerlingen allen zeer gemotiveerd. Motivatie was de drijfveer tijdens de taakuitvoering en daarbuiten.

In Hoofdstuk 6 wordt een ontwerpstudie beschreven. Het doel was te onderzoeken hoe zelfgereguleerd leren bij leerlingen in het VMBO verbeterd kan

worden. Drie leerkrachten en 66 leerlingen in het beroepsonderwijs namen deel. De studie bestond uit twee ontwerpcycli: 1) het herontwerpen van leertaken en 2) het optimaliseren van leraar feedback. Ten eerste werden de leertaken samen met de leraren herontworpen zodat deze authentiek en uitdagend zouden zijn. Verder werd bij elke taak een duidelijke doelstelling, een planning, transparante beoordelingscriteria en een reflectieopdracht toegevoegd om zelfgereguleerd leren te bevorderen. In de tweede ontwerpcyclus ging het om de feedback van leraren. De leerkrachten werden geïnstrueerd feedback op proces- en zelfregulatieniveau te geven om leerlingen meer inzicht te geven in het leerproces en waar deze kan worden verbeterd en om zelfgereguleerd leren te bevorderen. De resultaten laten zien dat de interventie een positief effect had op zelfgereguleerd leren van leerlingen. Leerlingen scoorden significant hoger op interne regulatie tijdens de nameting terwijl externe regulatie niet beïnvloed werd. Bovendien lieten leerlingen een verbetering zien in het reflecteren op werk/leergerelateerde processen. Plannen bleek en bleef moeilijk voor leerlingen en was vaak niet realistisch noch specifiek. De leerkrachten voelden zich beter in staat constructieve leergesprekken met leerlingen te voeren en zij waren zich meer bewust van het geven van feedback die leerlingen stimuleerde tot nadenken over hun eigen proces tijdens de taakuitvoering.

In Hoofdstuk 7 worden de hoofdbevindingen en conclusies ten aanzien van de studies in dit proefschrift samengevat en bediscussieerd. Theoretische en praktische implicaties worden voorgesteld en directies voor toekomstig onderzoek worden gepresenteerd.

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