Chapter 6

Conclusions and discussion
Introduction

Several authors see self-regulated learning as key to successful learning in school and beyond (Pintrich, 2002; Winne, 1995; Zimmerman, 2002). Students who can regulate and adjust their learning behaviour learn more efficiently (Cazan, 2013) and achieve better academic results (Järvelä, Järvenoja, & Malmberg, 2012; Winne, 1995; Zimmerman, 2008). The teacher can play an important role in stimulating students and developing student self-regulated learning (Reeve & Halusic, 2009), for example by arranging educational environments in which students learn and gain experiences with different types of learning skills (Minnaert & Vermunt, 2006; Schunk & Zimmerman, 2007). Nevertheless, not much is known about exactly how secondary education teachers support and stimulate the development of student self-regulated skills within their classroom practice (Jossberger, Brand-Gruwel, Boshuizen, & Van de Wiel, 2010). This dissertation aimed to gain an understanding of teacher regulating activities related to student self-regulation.

To investigate teacher regulating activities, we first developed a student perceptions inventory, the Pedagogical Practices Inventory (PPI). Chapter 2 described several reasons for using student perceptions. One of these was that student perceptions can be obtained relatively easily (Den Brok, Brekelmans, & Wubbels, 2004), making them useful for and applicable to large-scale studies. Using the PPI enabled us to map the regulating activities of teachers from several secondary schools. We investigated the reliability and validity of the PPI by conducting an inventory study in combination with an observation study.

To gain an understanding of modes of regulation1 within teacher regulating activities, the student perceptions inventory dataset from the first study was supplemented by a cohort from a second inventory study. An observation study was carried out to investigate whether differences between teachers based on student perceptions were also visible for observers who watched videotaped lessons given by the teachers.

A more detailed understanding of teacher regulating activities related to student self-regulated learning was sought by observing such activities during classroom lessons. This study used a newly developed observation scheme, in which the components of self-regulated learning—metacognition, motivation and behaviour (Zimmerman, 2008)—were

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1 We use the term ‘modes of regulation’ to refer to external, shared and internal regulation as described in studies by Boekaerts (1999) and Vermunt & Verloop (1999).
combined with different teachers’ instructional modes\(^2\) – direct instruction, reasoned instruction and questioning – to regulate these components.

Finally, because several researchers (e.g., Den Brok, Brekelmans, et al., 2004; Hattie, 2009) state that the teacher has an important role in creating learning environments and interactions that stimulate students’ learning processes and develop students’ learning skills, we investigated the extent to which student perceptions of teacher regulating activities predicted self-reported student learning outcomes.

**Major findings**

*Measuring teacher regulating activities*

In order to learn more about teacher regulating activities, the first step was to construct an inventory that enabled us to measure these activities in a reliable and valid way. For this purpose, the Pedagogical Practices Inventory (PPI) was developed in a preparatory study, and then used and validated in a large-scale inventory study. Chapter 2 described how the PPI was based on two other student perceptions inventories and developed in a small study by investigating secondary education students’ perceptions of two of their teachers. After a principal component analysis of the data at student level, and gathering experts’ conceptual interpretations of the items, five meaningful components were extracted, thereby establishing the five PPI subscales.

The reliability of the PPI was investigated in a large-scale inventory study. The external validation of the PPI was examined by investigating the relationship between student perceptions inventory data and observational data. The results of the analyses showed that the five PPI subscales had good internal reliability, which means the PPI is a reliable instrument for measuring teacher regulating activities. Analyses of the external validity of the PPI showed a significant relationship between student perceptions and observations for three of the five subscales. The results showed that student perceptions and observations measure the same things to some extent, but they also encompass distinct features.

\(^2\) The term ‘instructional mode’ can be interpreted as a teacher’s method of instruction (how self-regulated learning components are regulated).
**Modes of teacher regulation and teaching practice**

Several studies (Boekaerts, 1999; Boekaerts & Simons, 1995; Vermunt & Verloop, 1999) make a distinction between different modes of teacher regulation: external, shared and internal regulation. What has been unknown until now is the extent to which the phases of regulation, related to a gradual transfer from teacher regulation to student self-regulation, can be observed in classroom practice. Based on the aforementioned studies, we expected that teachers would differ in the way in which they carried out various modes of regulation in their pedagogical practices.

Chapter 3 described how data from an inventory study, using the PPI, were used to investigate whether teachers differed in their pedagogical practices in terms of their mode of regulating student learning activities. Observational data were used to examine whether observers categorized teachers into similar groups to the categorization based on student inventory data. The inventory data consisted of 2,970 inventories divided over two datasets: the dataset described in the previous section, supplemented by a set from another five secondary education schools. Teachers for the second observational study were selected from the first dataset.

Principal component analyses performed separately on both inventory datasets showed that both datasets had a similar structure. Results further showed that for both datasets there was only one significant factor underlying the five scales, with the separate subscales having a nearly equal contribution. Student perceptions of teacher regulating activities appeared to be situated on one dimension, in which the different teacher regulating activities were combined.

To determine whether it was possible to define different groups of teachers, a cluster analysis was performed, using the factor scores which were computed on the basis of the PCA on the first dataset. The results revealed three teacher clusters that differed significantly in their factor score and thus in the degree of perceived teacher regulating activities on the combined five subscales. Teachers differed in the degree to which they show a combination of regulating activities – to a low, medium or high degree. The last group of teachers combined external regulating activities with shared and internal regulating activities, and executed all of these regulation modes to a high degree.

For the observational study 12 teachers, evenly distributed over the three categories, were videotaped during one complete lesson. Two independent observers scored the videotaped lessons using an observation scheme that incorporated five categories corresponding to the five subscales of the PPI. To investigate whether observers categorized
teachers into the same groups as those distinguished based on student perceptions, the observers also categorized teachers into one of the three categories after observing the videotaped classroom practices. The results showed that the observers placed teachers in the same categories as they had been categorized based on student perceptions.

**Teachers’ instructional modes and self-regulated learning components**

Based on student perceptions and global observational analyses as described in the previous section, the results so far revealed that teachers combined various regulation modes to stimulate student regulation of learning in secondary vocational education. To gain a better understanding of teacher regulating activities related to student self-regulated learning during classroom lessons, we investigated teacher activities by observing classroom practices. Eight teachers were videotaped in their own classroom, a natural setting.

Chapter 4 described the development of an observation scheme, including three components of self-regulated learning: metacognition, motivation and behaviour (Zimmerman, 2008), as well as modes in which teachers regulate these components: direct instruction, reasoned instruction and questioning. Both perspectives were combined in an observation scheme.

In the observational analyses, transcriptions of teachers’ regulating activities were combined with teachers’ verbal intonation in order to score 910 verbal units for the eight teachers. Based on results of the aforementioned studies in which teachers were grouped according to the degree in which they perform regulating activities, we also investigated whether the two most contrasting groups differed in what aspects of self-regulated learning they showed within their regulating activities and in how they showed the self-regulated learning components.

The results showed that the majority of the teacher regulating activities were directed towards the self-regulated learning component of behaviour. Fewer teacher regulating activities were directed towards motivation and metacognition. Most regulating activities were guided by direct instruction, which applied to all self-regulated learning components. All observed teachers showed regulating activities related to all behaviour categories (by direct instruction, reasoned instruction and questioning), and the category motivation by direct instruction. Only between one and five teachers showed regulating activities from the remaining categories: all metacognition categories (by direct instruction, reasoned instruction and questioning) and two motivation categories (by reasoned instruction and questioning).
Analyses of differences between teachers in the two most contrasting clusters showed significant differences in favour of cluster 3 teachers for the self-regulated learning component of motivation and for the category of motivation by direct instruction. As this category is part of the self-regulated learning component of motivation, the difference between the two groups of teachers might be caused by the category ‘motivation by direct instruction’. A more in-depth investigation of the scores, however, showed that nearly half of the scores in this category were for one and the same teacher, who can be considered a good representative of the group based on student perceptions of his regulating behaviour. Nevertheless, he differed from the other teachers in this group in the scores on the observation categories.

**Teacher regulating activities and student learning outcomes**

As part of the main aim of this dissertation – to find out more about teacher regulating activities related to student learning – we also examined the relationship between teacher regulating activities and student learning outcomes. Chapter 5 described how inventory data from the PPI (from the same data set in Chapters 2 and 3) were used to map the teacher regulating activities of 170 secondary vocational education teachers. In addition to the PPI, students answered questions about their learning outcomes, and about their liking for the teacher. Because teacher characteristics such as gender, age and years of teaching experience might influence self-reported learning outcomes, we also collected data on these teacher characteristics from the teachers themselves.

The results revealed that teacher regulating activities explained 78% of the variance in self-reported learning outcomes, of which two-thirds was a joint effect with the variable ‘liking the teacher’, and of which one third was a unique effect. The extent to which teachers performed regulating activities in classrooms did matter in terms of student self-reported learning outcomes. Teacher gender appeared to have no significant effect on learning outcomes. Teacher age and teaching experience were strongly correlated, of which the factor teacher age appeared to be significantly correlated to self-reported learning outcomes. This effect appeared to operate jointly with that of liking for the teacher, with the effect of liking on self-reported learning outcomes being much larger. Based on our results, it seemed that when teacher age, and thus also years of teaching experience, increased, students liked teachers less and reported lower learning outcomes.
Discussion

The general aim of this dissertation was to gain an understanding of teacher regulating activities related to student self-regulated learning within classroom practice in secondary education. The results not only yielded insights into teacher regulating activities, but also contributed to research on different methods for understanding teacher practice. We chose to use student perceptions first of all. In line with constructivist claims, it is a student’s perception that determines the effect of an instructional act on student learning (Den Brok, Bergen, Stahl, & Brekelmans, 2004; Shuell, 1993).

The use of teacher perceptions might have provided clues to teachers’ aims and underlying motives. However, as self-perceptions, teacher perceptions of their teaching behaviour are not necessarily an accurate representation of their classroom practices. The validity of teachers’ self-reports is often limited by self-serving biases or by a lack of reflective awareness (Kunter et al., 2008). Within the present dissertation, we therefore chose to use student perceptions to shed light on teacher regulating activities. We also used observational data, and partly combined these two methods.

The Pedagogical Practices Inventory (PPI) appeared to be a reliable and valid instrument to gain an understanding of teacher regulating activities. This is in line with other studies that showed that secondary education students can provide teacher behaviour ratings that are sufficiently stable, reliable and valid for teacher evaluation and research purposes (e.g., Den Brok, Bergen, et al., 2004; Fraser, 1998).

The combination of student perceptions and observations by others led us to conclude that both methods partly measure the same aspects, but that they also have their own value (Den Brok, Bergen, et al., 2004) and that a combination of different methods may more adequately cover different aspects of teaching (Dwyer, 1998; Uhlenbeck, Verloop, & Beijaard, 2002). Student perceptions enabled us to find out about the practices of many teachers distributed among several schools, and observations allowed us to zoom in on the practices of a selection of teachers and to observe teacher regulating activities aimed at student learning in a more detailed way.

With regard to teacher regulating activities related to student self-regulated learning, research distinguished different modes of regulation within teacher regulating activities: external, shared and internal regulating activities (Boekaerts & Simons, 1995; Vermunt & Verloop, 1999). Our results, however, revealed the teaching practice to be more integrated: one dimension appeared to underlie the student perceptions, in which the
combination of the various teacher regulating activities congregated. Our results showed that secondary education teachers combined direct instruction (external regulation), with stimulating, probing (shared regulation) and facilitating self-regulated learning (internal regulation). Apparently, the teaching practice revealed a combination of various types of regulating activities.

While research in the 1990s concluded that teachers were not yet equipped to turn students into self-regulated learners (e.g., Schunk, 1995; Zimmerman, 1995), our results suggest that today’s teachers have integrated activities allowing student self-regulated learning into their teacher regulating activities, and that they might therefore have a better conceptual understanding of student regulation. Within their teaching practice, however, teachers not only focused on stimulating and teaching students to regulate their learning, but they combined the different regulation modes.

This is in line with the views of Bolhuis and Voeten (2001), who state that student activating or process-oriented teaching cannot occur in isolation from more traditional approaches to teaching: ‘Instructional practices will be a mixture of lecture-format approaches, procedures to activate student learning, and techniques to guide and coach learning processes’ (p. 838). Activating students goes hand in hand with a classroom atmosphere in which students perceive their teachers as being cooperative, coupled with a sufficient degree of dominance (Brekelmans, Sleegers, & Fraser, 2000). To establish such a classroom atmosphere, whole-class teaching moments are also especially important (Van Tartwijk, Brekelmans, Wubbels, Fisher, & Fraser, 1998), with the teacher providing a clear lesson structure, for example.

Our results, emphasizing the occurrence of a combination of teacher regulating activities, question several theories in which different teacher regulation or control modes are defined (e.g., Biggs, 1996; Vermunt & Verloop, 1999). Bolhuis and Voeten (2001) also describe a gradual shift from teacher regulation to student regulation of learning, which goes from modelling, making learning visible, to activating students to participate, and having them practise on their own. However, instead of moving from one regulation mode to another, the results of the present research suggest a more integrated view of teaching practice than is to be found in the literature. In relation to the combination of the different regulation modes, our results showed that teachers differ in the degree to which they combine the different regulating activities – to a low, medium or high degree. To our knowledge, this finding has not been described in other research.
The results of the detailed observational study on teacher regulating activities in the classroom first of all showed that about 60% of these activities were related to the self-regulated learning components of metacognition, motivation and behaviour. This means that about 40% of the teacher regulating activities were directed towards classroom management issues, including discipline and student misbehaviour. We realize that the extent to which teacher regulating activities are expressed is only partly related to the time that teachers spend on such activities. Teachers across different countries (TALIS, in 34 countries) report spending 79% of their time on teaching and learning activities (OECD, 2014). The relatively low time spent on teaching and learning activities in our study might be a result of the context of secondary vocational education. Teachers in this type of education spend relatively more time on classroom management issues than in regular education (Onderwijsraad, 2010).

The results of the observational study further showed that the majority of teacher regulating activities were geared towards the self-regulated learning component of behaviour. This means that teachers showed little or no regulating activities oriented to motivation and metacognition. This is regrettable, because Zimmerman (2008) states that self-regulated learners are not only behaviourally but also metacognitively and motivationally active participants in their own learning process. Thus, the components metacognition, motivation and behaviour can all be considered essential components of self-regulated learning. An underlying assumption of self-regulated learning is that individuals are pro-active, self-regulating agents (Bidjerano & Yun Dai, 2007), and that they are active processors of information (Pintrich, Smith, Garcia, & McKeachie, 1993) and constructors of their knowledge (Den Brok, 2001).

The results of our research showed that most regulating activities were guided by direct instruction. Teachers mainly focused on directing the learning activities of students, instructing and telling students to execute learning activities, and how. This meant that teacher regulating activities were hardly ever accompanied by information about the relevance of the learning activity, nor did they occur in a questioning mode. This is unfortunate, because research has shown that students who believe that a task is interesting and important will engage in more metacognitive activity, more cognitive strategy use and more effective effort management. Questioning can also stimulate students so that their thinking is extended, and therefore also their learning and understanding (Rojas-Drummond, Torreblanca, Pedraza, Vélez, & Guzmán, 2013).

Several studies (e.g., Fraser, 1998; Wubbels & Brekelmans, 2005) state that aspects of teacher practices may affect student behaviour. The results of studies on the relationship
between teacher practices and student outcomes (e.g., Den Brok, Brekelmans, et al., 2004; Trigwell & Prosser, 2004) show that student perceptions mediate the influence of the learning environment on student outcomes. In line with these findings, we expected that there might be a relationship between teacher regulating activities and students’ perceived learning outcomes. The results of our study revealed that teacher regulating activities predicted 78% of student self-reported learning outcomes. Although further analyses suggested that two-thirds of the explained variance was linked to the effect of liking the teacher, the remaining one-third was the result of a unique effect. Apparently, the extent to which teachers perform regulating activities in classrooms matters in terms of student self-reported learning outcomes.

Our results also showed that the extent to which students perceive teacher regulating activities correlates with the level of student liking of the teacher. We might suggest that being liked as a teacher facilitates a positive effect of teacher regulating activities on learning outcomes. Teacher behaviour that promotes a cooperative relationship with students – such as listening, being supportive and being responsive – is associated with enhanced student engagement and performance (Davis, 2003; Martin & Dowson, 2009; Pianta & Hamre, 2009). This means that if teachers want to maximize the effect of their regulating activities, they should include the more ‘interpersonal’ aspects of teaching in their teaching activities. Teachers who want to stimulate and facilitate student learning can do so by creating a cooperative atmosphere in which they demonstrate their concern for students by being helpful, friendly and understanding (Den Brok, Brekelmans, et al., 2004). Such a classroom atmosphere, in which students perceive their teachers as being cooperative, combined with a sufficient degree of teacher dominance (Brekelmans, Sleegers, & Fraser, 2000), enables students to experiment with new tasks and use strategies that will help them to learn effectively (Davis, 2003).

**Practical implications**

Although several investigations have identified multiple aspects of self-regulated learning, these studies did not provide a detailed characterization of self-regulated learning in real contexts and in real time (Perry, VandeKamp, Mercer, & Nordby, 2002). The results of the present research first revealed that in practice teachers not only focus on stimulating and teaching students to regulate their learning, but they combine external, shared and internal regulating activities. In relation to the student perceptions inventory (Pedagogical
Practices Inventory, PPI) that we used in our research, this means that teachers combined regulating activities such as telling, instructing (‘This teacher indicates exactly how we can improve our schoolwork’), with supporting, stimulating (‘This teacher asks us what we already know about the subject’) and allowing students to self-regulate (‘With this teacher, we ourselves reflect on what we know about a new subject’).

Our results suggest a more integrated view of teaching practice than described in the model with different phases of teacher regulation. We suggest that instead of moving from one regulation mode to another, teachers and students would benefit more if teachers expanded their teaching repertoire and became proficient in handling all regulation modes. This suggestion is based on the assumption that it might be better for teachers to teach in a way that has already been observed in practice than to adopt completely new behaviour that has not yet been observed. Our suggestion is all the more plausible because we investigated the regulating activities of many teachers and found that all teachers performed a combination of regulating activities; no individual regimes were found.

The results of our study revealed that being liked as a teacher overlaps with a positive effect of teacher regulating activities on student learning outcomes. In other words, if teachers want their regulating activities to have an optimal effect, it is recommended to pay also attention to their relationship with students. Although teachers do not have complete control over the degree to which students like them, they can choose to carry out activities that are known to promote a cooperative relationship: being supportive, caring, helpful and friendly (Davis, 2003; Den Brok, Brekelmans, et al., 2004; Pianta & Hamre, 2009). In addition, teachers can demonstrate their concern for their students through their overall organization and class preparation, as well as through modelling and promoting students’ use of strategies (Davis, 2003).

Detailed investigations on teacher regulating activities related to the self-regulated learning components of metacognition, motivation and behaviour (Zimmerman, 2008) showed that few regulating activities were related to the components of metacognition and motivation. The results also revealed that teachers mainly regulate students’ learning activities by direct instruction, rarely accompanied by an explanation about the how and the why of the learning activities. Nor were students questioned about their learning activities. If the findings of this study were to be confirmed by more extensive research on this topic, it might imply that it is difficult for teachers to find tools for implementing self-regulated learning components in their lessons. Despite ample attention to student self-regulated learning skills in the research, there appears to be little focus on practical implementation.
It is recommended that both teacher education and professional development programmes pay more attention to the practical implications of theoretical insights into self-regulated learning. This is in line with the content of a recent call for educational research programmes (NRO call 2013–2020). The teacher’s role in the learning and development process of students is key in this call for professional development. The extent of teacher control and guidance is described as one of the dilemmas facing teachers. As a result of our research, we suggest further investigation of incumbent teachers who succeed in combining the various regulation modes to a high degree. These teachers could usefully serve as models for teachers who do not know how to apply theoretical insights in practice.

Further research

A strength of the present dissertation is that a mixed-methods design was used: both student perceptions and observational data were used and partly combined, in order to shed light on teacher regulating activities. By combining the two methods, we were able to utilize the advantages and unique value of each method. Nevertheless, there are some limitations within the present research. Suggestions for further research are based on both the limitations and results of the present dissertation.

The research revealed three newly developed instruments: the student perceptions inventory (PPI), an observation instrument based on the PPI, and an observation scheme that provided more details on regulating activities related to student self-regulated learning. Within the present research, the PPI was validated in an inventory study and an observation study. Nevertheless, we suggest that in further research, both the PPI and the observation instrument based on the PPI could be investigated in greater detail. Because the first observation instrument only investigates fairly global features of teacher regulating activities, further research might result in more detailed descriptions of the observation categories.

The results of both cohorts in the inventory study showed considerable overlap between the subscales of the PPI. Students seem to perceive teacher practices as an all-in-one experience rather than separated into several features. It would be interesting to investigate student perceptions based on experiences in individual lessons or even parts of lessons, to examine whether students are able to distinguish between the various aspects of teacher regulating activities.
Within the more detailed observational study, we analysed teacher regulating activities during 20 minutes of the middle part of each lesson. In order to obtain a more complete view of these activities, we recommend observing whole lessons, more lessons per teacher and the lessons of more teachers. We also suggest that our results be verified in a larger sample. This could include an investigation of whether there are differences between teacher activities in secondary vocational and general secondary education. Student characteristics in secondary vocational education may require other teacher regulating activities than in general secondary education.

As part of the study on the relationship between teacher regulating activities and student self-reported learning outcomes, learning outcomes were measured by asking students a question about their perceived learning outcomes with a particular teacher. To obtain a more complete view of student learning outcomes, this information could be complemented for example by student grades, collected from the teacher or by standardized testing on a specific topic.

Because our results suggest that an important part of the positive effect of teacher regulating activities is the degree to which the teacher is liked, it would be interesting to test in future models whether liking the teacher can actually be considered a mediating variable between teacher regulating activities and student self-reported learning outcomes. Further in-depth investigation into teachers’ expressed regulating activities and student learning outcomes could shed further light on the effectiveness of different activities.

In the present research we used student perceptions and observational data, but these methods do not provide information about the underlying motives of the teachers themselves. Because of the low occurrence of teacher regulating activities related to the self-regulated learning components of motivation and metacognition, for example, questioning teachers about their motives regarding their regulating activities could yield interesting insights. This could be studied by watching videotaped lessons with the teachers and interviewing them. If these sessions took place at regular intervals over an extended period, they could provide insight into the development of teachers’ thinking about regulating activities over time.

**General conclusion**

Because of the ever-changing conditions under which current students will be expected to work in the future, and the related requirements of their future employers we cannot
ignore the importance of self-regulated learning within the educational context. The present dissertation sheds light on teacher regulating activities related to student self-regulated learning in secondary vocational education. Teachers in our study not only focused on instructing students or stimulating student self-regulated learning, but they combined various regulating activities. This finding suggests that instead of moving from the one regulation mode to another, teachers should expand their repertoire of regulating activities.

The majority of teacher regulating activities in our study aimed to direct students to execute learning activities. In contrast, fewer teacher regulating activities related to students’ metacognition and motivation. In the context of teacher training and professional development programmes, teachers may be encouraged to know that the desired teaching repertoire partly consists of teaching tools that are already familiar. This is reassuring in their constantly challenging work of preparing students to be able to survive in an ever-changing society.
References


