Teaching for student self-regulated learning
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Chapter 3

Teacher practice in secondary vocational education: Between teacher-regulated activities of student learning and student self-regulation

This chapter is based on:
Abstract

The interplay between teacher regulation and student self-regulation of learning is an important topic in contemporary theories of teaching and learning. This study used mixed methods, including a student perception inventory and observations, to investigate whether teachers differ in their regulation mode during lessons. The results of the student perception study showed that teachers combined external, shared and internal regulating activities. Three groups of teachers differed in the extent to which they combined regulating activities. The classroom observations confirmed the presence of these three groups. The results are discussed with respect to their implications for educational practice and theory.
Introduction

More than at any time in the past, life and work today require far more than simple thinking skills and content knowledge. The ability to navigate complex life and work environments in the globally competitive information age requires individuals to attend rigorously to the development of essential skills, such as initiative, critical thinking, and self-regulation (Partnership for 21st Century Skills, 2009). Education plays an important role in helping students develop these skills, for example, by making them jointly responsible with the teacher for their learning and actively involving them in learning activities. When students are actively involved in learning activities, it is more likely that learning will be meaningful (Aldridge, Fraser, Bell, & Dorman, 2012). Self-regulation is important not only as a life skill but also during the school career. Students who can regulate and adjust their learning behaviour learn more efficiently (Cazan, 2013) and achieve better academic results (Järvelä, Järvenoja, & Malmberg, 2012; Jossberger, Brand-Gruwel, Boshuizen, & Van de Wiel, 2010; Kuo, 2010; Pintrich, Roeser, & De Groot, 1994; Stewart, Cooper, & Moulding, 2007; Trainin & Swanson, 2005; Winne, 1995, 2005; Zimmerman, 2008). Self-regulated learning is therefore perceived as a key to successful learning in school and beyond (Kuo, 2010; Pintrich, 2002; Winne, 1995; Zimmerman, 2002).

The teacher, as a component of the learning environment, can play an important role in stimulating students and developing student self-regulated learning (Hattie, 2009; Kuo, 2010; Reeve, 2009). Teachers have the opportunity to arrange educational environments in order to facilitate students to gain experiences with and learn different types of learning skills (Minnaert & Vermunt, 2006; Schunk & Zimmerman, 2007; Zimmerman, 2002). Most research on teacher practices for student self-regulation focuses on general education, but self-regulation skills are also important for students in vocational education. Self-regulation enables students to study more consciously, helping them prepare for work, life and further education (Pintrich & De Groot, 1990). For teachers in secondary vocational education, the task of developing student self-regulation is a major challenge because of the diversity in curricula and cognitive levels, learning difficulties (e.g., dyslexia), students’ behavioural problems and the turbulent biological, cognitive and socially challenging life stage of these students (Wigfield, Byrnes, & Eccles, 2006). Student diversity places great demands on the pedagogical practices of teachers, and it is important to gain insight into these practices to stimulate student self-regulated learning.
Student regulation of learning

Self-regulation theory originates from the psychological tradition of theory and research on self-control (Schunk, 2005), from Bandura’s socio-cognitive theory of human functioning. An underlying assumption of Bandura’s theory is that individuals are proactive, self-regulating agents rather than being passively shaped by their surroundings (Bidjerano & Yun Dai, 2007). Consistent with this tradition, Zimmerman (1995) and Pintrich’s (1995) conceptualisations of self-regulated learning reflect a social cognitive perspective on self-regulation. Under the social cognitive framework, self-regulation in the academic setting has been viewed as a set of skills that can be developed rather than as unchangeable or genetically rooted. Although research has shown that self-regulation develops from early childhood to adolescence, training and intervention studies have supported the argument that self-regulation can be successfully taught to students at all grade levels (Bidjerano & Yun Dai, 2007). Pintrich (1995) posited that students could learn to self-regulate in academic settings through self-reflection and practice. Therefore, it is incumbent on teachers to cultivate self-regulated learning skills (Bidjerano & Yun Dai, 2007; Cazan, 2013). However, research on the development of self-regulated learning skills is not recent: the long history of international attention on research on self-regulated learning is described in the next paragraph.

Dewey wrote about ‘learning to think’ (De Jong, 1992) as early as 1910. In response to research on memory strategies, Flavell and Salatas coined the term ‘meta memory’ in 1971 (Salatas & Flavell, 1976), which Flavell further elaborated as ‘metacognition’ (Flavell, 1979). Flavell interpreted metacognition as ‘(...) one’s knowledge concerning one’s own cognitive processes and products or anything related to them, e.g., the learning-relevant properties of information or data (...)’ (Flavell, 1976, p. 232). However, according to Flavell, metacognition ‘refers, among other things, to the active monitoring and consequent regulation and orchestration of these processes in relation to the cognitive objects or data on which they bear, usually in the service of some concrete goal’ (Flavell, 1976, p. 232). Therefore, Flavell proposed the distinction between self-knowledge and self-regulation. In subsequent years, Brown and others have determined self-regulated learning to be a ‘...thinker’s knowledge, control and coordination of his own cognitions’ (Brown & DeLoache, 1978 as referred to in De Jong, 1992, p. 6).

More recently, three essential dimensions of self-regulation were introduced: knowledge of processes, cognitive and affective states; the ability to monitor the inquiry process;
and the willingness to regulate the inquiry process (Borkowski, Chan, & Muthukrishna, 2000; Pintrich, Wolters, & Baxter in Akyol & Garrison, 2011). Self-regulated learning is viewed as a process in which students actively and constructively monitor and control their motivation, cognition, and behaviour (Aldridge et al., 2012; Järvela, Järvenoja, & Malmberg, 2012; Pintrich, 2004; Pintrich & De Groot, 1990).

Research conducted by Zimmerman (2002) has observed that self-regulated learners take control of their own learning process by, for example, setting proximal, attainable goals; being learning-oriented; understanding that different learning tasks require different strategies; and tending to use the most appropriate learning strategies effectively. Self-regulating learners can adapt their learning strategies to the immediate requirements of each particular learning situation (Bidjerano & Yun Dai, 2007; De Jong, 1992; De Jong, Kollöffel, Van der Meijden, Kleine Staarman, & Janssen, 2005). Knowledge, skills and attitudes can be transferred from one learning context to another and from learning situations in which this information has been acquired to a leisure or work context (Boekaerts, 1999; Van Grinsven & Tillema, 2006).

Because peers, home and other rules, communities and cultures are involved, learning is more than a dualistic setting as subject-object, learner-knowledge or teacher-learner (Sannino, Daniels, & Gutiérrez, 2009). However, in this broader activity system of the learner as a component of the learner’s school activity system, the teacher can play an important role in encouraging self-regulated learning (Kuo, 2010; Reeve, 2009). In the next section, this topic is explored in depth.

**The teacher and self-regulated learning**

Developing self-regulated learning is similar to becoming one’s own teacher by gradually assuming control procedures that are initially performed by a teacher, coach, etc. (Simons, 1987; Vermunt & Van Rijswijk, 1988). In this process of learning to regulate, the importance of sharing cognitive experience is emphasised (Schraw & Dennison, 1994; White, Frederiksen, & Collins, 2009). Flavell (1987) wrote that metacognition must “communicate, explain, and justify” one’s thinking to the self and others. Other authors state that metacognition is facilitated through talking about and discussing metacognition (Brown, 1987; Hmelo-Silver, 2004; Larkin, 2009). Most studies show that students can be trained to extend their metacognitive knowledge base and increase its coherency (Boekaerts & Corno, 2005). To promote student self-regulation, teachers must
help students to engage flexibly and adaptively in their metacognitive activities (e.g., task analysis, strategy selection and self-monitoring). Teachers can help students in the process of becoming self-regulating learners in which they learn to regulate their behaviour to improve their academic learning and performance (Cazan, 2013).

A teaching model that facilitates and enhances self-regulated learning is referred to as process-oriented teaching (Vermunt, 1994). Process-oriented teaching implies that the external control of the learning process by teachers gradually shifts to an internal control over the learning process by the students themselves. Vermunt (2003) defined an external to internal dimension of self-regulated learning, in which regulation refers to the control of content, the course and outcomes of the learning process. The theories of Bereiter and Scardamalia (1989) and Biggs (1996) indicate that there are differences between the extent to which there is strong, shared or loose teacher control in the interplay between teacher- and student-regulated activities. Boekaerts and Simons (1995) distinguish practices by three educational regimes, in which learning functions must be performed either by the teacher and/or the student. Learning functions in this context are observed as psychological functions, which must be performed during the learning process (Shuell, 1988). The educational regimes differ in the regulation mode by the teacher or the student.

The educational regimes differ in the degree of regulation by the teacher or student:

- **External regulation:** In this educational regime, the teacher regulates all learning functions. The teacher determines the students’ learning processes by undertaking explicit educational activities himself or herself.

- **Shared regulation:** Teacher and students divide the regulation of tasks. The teacher stimulates students to learn actively. Through assignments, questions and study tasks, the students are stimulated to comprehend, integrate and apply actively.

- **Internal regulation:** In this regime, the students choose their own learning activities and carry out the main component of the learning functions. The students internally regulate their learning when they specify their own learning goals and do not need instructions or guidelines from others to choose a learning or problem-solving strategy (Boekaerts, 1999). The teacher stimulates the students to use their metacognitive knowledge and skills to regulate their own learning.
In each of these approaches, the contents of the poles on the continuum are obvious: strong teacher control, or external regulation in the description of the first educational regime, is connected with a teacher’s presence, as in direct instruction; loose teacher control, or internal regulation, is connected with teacher activity that allows student agency. However, the type of teacher activities involved in the shared control regime is far less obvious. Shared regulation, in the tradition of Vygotsky (in Tharp & Gallimore, 1988), is a matter of social interaction, which anticipates and is sensitive to the students’ instructional needs. Shared regulation guides students into maturation to a level at which they can regulate their own learning. When, during the learning process, guidance is tailored to the needs of the student and intends to help the student achieve his or her learning goals, it is often called ‘scaffolding’ (Sawyer, 2006; Van de Pol, Volman, & Beishuizen, 2010).

In the ‘shared regulation’ category, discrete phases can be distinguished in which there is a gradual transfer of regulation activities from the teacher (external regulation) to the learner (internal regulation). Initially, the teacher’s pedagogical practices are focused on information processing; he or she shows how to obtain information by explaining and explicitly demonstrating. In this initial stage, the teacher acts as a role model and can be viewed as “the more knowledgeable other” (Van de Pol et al., 2010). In the next stage, the teacher gradually fades away. The teacher refers to the learning activities as a model and stimulates and supports students to regulate themselves, helping them when necessary. To make students aware of their behaviour, motivation and cognition, there is much attention on diagnosing and monitoring the learning process, setting learning goals, choosing and executing learning activities, and evaluating learning results (Bolhuis & Voeten, 2001; Jossberger, 2011; Kuo, 2010). In the final stage of shared regulation, the students regulate their own learning as much as possible, and the teacher regulates by questioning, probing and discussing the chosen learning activities.

The various regulation approaches in the educational regimes are summarised in the following scheme, which describes the regulation modes and their relationship to teacher classroom practices (see Figure 3.1).

When theorising about the role a teacher can play in the learning process, the question may be to what extent the defined phases of regulation, related to a gradual transfer to student self-regulation, can be observed in classroom practice. In this study, this question will be addressed by collecting student perceptions in addition to classroom observations. Using this data collection method, the value of student perceptions will be discussed.
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Student perceptions of teacher practices

There are two main reasons to use student perceptions. First, they have an intrinsic meaning: they mediate the influence of the learning environment on student outcomes (Trigwell & Prosser, 2004; Van Tartwijk, Brekelmans, & Wubbels, 1998). The way in which learners perceive, interpret, and process information in an instructional situation (including content and social processes) is crucial in determining what the student learns (Opdenakker & Minnaert, 2011; Shuell, 1993). The second reason is that from the constructivist perspective, students acquire their own knowledge and perceptions and build a construction of teacher behaviour, affecting their conscious and unconscious choices in the classroom (Boekaerts & Cascallar, 2006). Furthermore, several studies demonstrate that student perceptions provide valuable insight into the behaviour of teachers, which is important to students’ behaviour (Fraser, 1998; Marsh, 1982; Wubbels & Brekelmans, 2005). Also, secondary students can provide teacher behaviour ratings that are sufficiently stable, reliable, and valid for teacher evaluation and research purposes (Den Brok, Bergen, Stahl, & Brekelmans, 2004).

There are also more ‘practical’ reasons to use student perceptions. First, student perceptions are relatively easy to obtain and therefore a less expensive manner by which to obtain information than observing teacher behaviour (Den Brok, Brekelmans, & Wubbels, 2004). Second, student perceptions constitute an overview of many individual perceptions in a classroom, which means that they are less subjective than observations by one or two individuals. Third, student experiences are based on many lessons. The students

<table>
<thead>
<tr>
<th>Modes of regulation</th>
<th>Teacher classroom practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>External regulation (The teacher activities are orientated at regulating student learning activities)</td>
<td>Teacher activities: instructing, telling, indicating, specifying</td>
</tr>
<tr>
<td>Shared regulation (The teacher activities are orientated at stimulating student learning activities)</td>
<td>Teacher activities: • modelling, explicating, demonstrating • stimulating, supporting • questioning, probing, discussing</td>
</tr>
<tr>
<td>Internal regulation (The teacher activities are orientated at allowing student self-regulation)</td>
<td>Teacher activities: to let students think, discuss, correct, reflect themselves</td>
</tr>
</tbody>
</table>

Figure 3.1 The three modes of regulation related to teacher activities in classroom practice.
have often experienced multiple situations and contexts with the same teacher, which is helpful for outlining a representation of teacher behaviour, that is as differentiated as possible (Fraser, 1998). Finally, using student perceptions is a simple and effective research method that allows different aspects of the learning environment to be assessed at the individual student and classroom levels (Lüdtke, Trautwein, Kunter, & Baumert, 2006). For the aforementioned reasons and the importance of how teacher handling is perceived by students, in this research student perceptions are regarded as highly important in the investigation of the pedagogical practices of teachers.

Research questions

This article focuses on whether teachers differ in their pedagogical practices in terms of the mode of regulating student learning activities. This question has been split into the following sub-questions:

*Do secondary education students perceive teachers differently in their mode of regulation?*

*If there are differences, and if teachers can be grouped accordingly, do observers categorise the teachers into similar groups?*

Two studies were conducted to answer these questions. The first study included a questionnaire recording students’ perceptions of teacher practices to determine the teachers’ pedagogical practices relative to regulation. In the second study, observation measures were used to examine whether differences amongst the teachers, based on student perceptions, were also detected by observers who watched videotaped lessons of the teachers. Based on the aforementioned theories, including that of Boekaerts and Simons (1995), in which a distinction has been made amongst external, shared and internal regulation, we expected that teachers would differ in the manner in which they carried out various modes of regulation in their pedagogical practices. In sections 2 and 3, the methods and results of the two studies are described and discussed in section 4.
Study 1: An inventory study of differences amongst teachers’ pedagogical practices

To ascertain whether there were differences among the pedagogical practices of teachers in terms of teacher regulation, an inventory study was performed in 16 secondary vocational schools, belonging to the Agricultural Educational Centres (AOC’s) in the Netherlands. The schools were chosen from schools collaborating with our Teacher Education programme, which provide opportunities for student teaching placement. Altogether, 28 schools were approached, and 16 agreed to participate.

Data for the inventory study were collected on two occasions: the first dataset in the northern and middle region (11 schools), and, with a one-year interval, the second set in the middle and southern region (five schools) of the Netherlands. On both occasions, data were collected in the second half of the school year, so that the students would have had sufficient experience with the pedagogical practices of the teachers to complete the questionnaire. Because of the intensive manner and large scale of the data collection, it was not possible to perform the inventory study at all schools within the same year. The second dataset was used to validate the first.

An eighth grade student population was chosen because they are accustomed to secondary education and the style of teaching within the school (it is the second year of secondary education). This criterion ensured that these students experienced the practices of several teachers, as they had a clearly outlined representation of teacher behaviour. Eighth grade remains comprehensive, whereas by ninth grade students have chosen a field of study that could be based on preferences for the pedagogical practices of particular teachers.

Method

Participants

For the initial data collection, eighth grade students of 11 secondary agricultural vocational schools completed the Pedagogical Practices Inventory (PPI) between March and June 2010. The participants in this study belonged to a homogeneous Dutch-speaking group. Agricultural vocational education schools have few students or teachers from ethnic
minority groups (Forum, institute for multicultural affairs, 2011; Council of Agricultural Education, 2011).

Altogether, 2,128 inventories were completed, including 1,091 by boys and 1,035 by girls. In two of the inventories, gender was not indicated. Overall, 18.2% of the inventories were completed by 13-year-old students; 60.1% by 14-year-olds; 21.1% by 15-year-olds; and in 0.6%, age was not specified. The inventory data provided information on 128 teachers: 70 teachers of theoretical subjects (general subjects such as mathematics, English and geography); 47 teachers of a practical subject (vocational courses such as animal husbandry and flower arranging); and 11 teachers of both.

Between April and June of the second year of the study, the PPI was completed by eighth grade students of five other secondary vocational schools, situated in the middle and southern regions of the Netherlands. Altogether, 842 inventories were completed: 394 by boys and 445 by girls. In three of the inventories, gender was not indicated. In this cohort, 20.3% of the inventories were completed by 13-year-old students; 60.6% by 14-year-olds; 19.0% by 15-year-olds; 0.1% did not specify age. The inventory data provided information on 42 teachers: 31 teachers of theoretical subjects; 9 teachers of a practical subject; and 2 teachers of both.

**Instrument**

The Pedagogical Practices Inventory (PPI) was developed and used in an earlier study (Van Beek, De Jong, Wubbels, & Minnaert, 2014). In this study, the five subscales of the PPI appeared to have sufficient to good internal reliability scores (see Table 3.1). The five subscales of the PPI include ‘Direct instructing’ (Sample item: This teacher indicates exactly how we can improve our schoolwork, item 21); ‘Instructing information processing’ (Sample Item: This teacher lets us search for information in a text, item 34); ‘Supporting self-regulation activities’ (Sample Item: With a new subject, this teacher asks us what we already know about the subject, item 35); ‘Probing self-regulation activities’ (Sample item: The teacher asks us how we think to address an assignment in a proper way, item 29); and ‘Allowing self-regulated learning’ (Sample item: With this teacher, as students, we reflect on what we know about a new subject, item 38). The 47 items of the inventory were measured on a five-point Likert scale (1 = almost never and 5 = very often).
**Procedure**

We collected student perceptions from at least two eighth grade classes of every teacher to obtain an overall picture of the teacher practices over more classes. The students completed the inventory for two randomly assigned teachers (the students in eighth grade were taught by several different teachers). Randomisation was based on a schedule ensuring that at least 14 students from at least two different classes completed the inventory for one teacher. Before the administration of the inventories, all teachers were informed about the aims and procedures of the inventory study, and all agreed to participate. The study followed the ethical research guidelines of the Netherlands association for educational research. Teachers who taught subjects such as music, physical education and religion were excluded from the study because the items on the inventory were not applicable to these topics. Furthermore, the selection of teachers ensured that students did not complete the inventory about a teacher who was also their mentor. This procedure was performed because it was thought that the students might have a different relationship with a teacher who was also their mentor. Approximately 95% of the students completed two inventories about two different teachers, and 5% of the students completed inventories about three different teachers. The inventory was administered during classroom lessons, with students receiving detailed instructions on how to complete it.

**Data analysis**

For the data analyses, the inventory data on the student level were aggregated to the teacher level; the five subscale means of every teacher were computed. To examine whether the five defined subscales of the PPI could be observed in the data of the inventory study, a principal component analysis (PCA) was performed. First, the PCA was performed separately on both datasets to determine whether the factor loadings of the samples were comparable. A PCA in which the factor scores of the teachers were saved was then performed on the first dataset. This PCA was performed on the first dataset because the classroom observations were related to this dataset. A cluster analysis was performed using the factor scores to determine whether it was possible to define different groups of teachers.
Results

A Principal Component Analysis (PCA) on the subscale means of the teachers showed that both cohort samples loaded on one underlying factor. The PCA provided factor loadings between .95 and .98 (see Table 3.1), and the total amount of explained variance was 91.7% in the first and 93.8% in the second dataset. For both datasets, there was only one significant factor, and each separate subscale had a nearly equal contribution. A LISREL analysis was performed on the variance-covariance matrices of the subscale means of both datasets to test for invariant matrices between the two datasets. The Goodness of Fit statistics showed that the matrices of both datasets were invariant ($\chi^2 = 13.55$, df = 15, $p = .56$; $p$-value for test of close fit RMSEA = .85; group RMR’s = .01–.02, GFI’s = .91–.99); the first dataset was therefore considered representative for use in further analyses.

The factor score of each of the 128 teachers was computed based on a PCA of the first dataset. A cluster analysis, using Ward’s Method with squared Euclidian distance measure, was performed on the factor scores to investigate distinctions within the group of 128 teachers, based on the underlying factor of the five original subscales. Based on the interpretation of the dendrogram and in order to construct distinct groups, a three-cluster solution fit best. The three teacher clusters (see Table 3.2) differed significantly on the factor score ($F(2,125) = 283$, $p = .000$). This factor score indicated the degree of perceived teacher regulating activities on the five subscales as a whole; for example, a high factor score indicated that all five subscale means were high.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Factor loadings dataset 1</th>
<th>Cronbach’s alpha dataset 1</th>
<th>Factor loadings dataset 2</th>
<th>Cronbach’s alpha dataset 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Direct instructing’ (7 items)</td>
<td>.97</td>
<td>.75</td>
<td>.98</td>
<td>.74</td>
</tr>
<tr>
<td>‘Instructing information processing’ (11 items)</td>
<td>.95</td>
<td>.88</td>
<td>.95</td>
<td>.88</td>
</tr>
<tr>
<td>‘Supporting self-regulation activities’ (8 items)</td>
<td>.96</td>
<td>.88</td>
<td>.97</td>
<td>.88</td>
</tr>
<tr>
<td>‘Probing self-regulation activities’ (10 items)</td>
<td>.97</td>
<td>.89</td>
<td>.97</td>
<td>.90</td>
</tr>
<tr>
<td>‘Allowing self-regulated learning’ (11 items)</td>
<td>.94</td>
<td>.82</td>
<td>.97</td>
<td>.84</td>
</tr>
</tbody>
</table>

Extraction method: principal component analysis.
Study 2: Observations of teacher practices

The results of the previous study show that student perceptions of teachers’ pedagogical practices were situated in one dimension, on which the teacher-regulated activities were combined. Three categories of teachers were distinguished that varied in the degree to which students perceived the combination of regulation activities: low (cluster 1); medium (cluster 2); or high (cluster 3). The observational study examined whether the observers grouped teachers into identical categories as they had been categorised, based on student perceptions. For this purpose, two observers classified 12 teachers into these three categories after observing one videotaped lesson per teacher.

Method

Participants

For the observational study, we selected 12 teachers, who were distributed over three categories in the first dataset, based on student perceptions (see Table 3.3). Four teachers belonged to category one, three to category two, and five to category three. Six of the twelve teachers selected taught a practical subject, and six taught a theoretical subject. The 12 teachers, who taught at five different schools, were asked to participate in the observational study. All teachers agreed to participate and completed an informed consent form.

Procedure and instrument

The 12 teachers were videotaped during one complete lesson; the lessons ranged from 34 to 61 minutes. Following individual school’s guidelines, the research coordinator of

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Number of teachers</th>
<th>Mean factor score</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>21</td>
<td>-1.69</td>
<td>.43</td>
</tr>
<tr>
<td>Medium</td>
<td>69</td>
<td>-.08</td>
<td>.45</td>
</tr>
<tr>
<td>High</td>
<td>38</td>
<td>1.07</td>
<td>.38</td>
</tr>
<tr>
<td>Total</td>
<td>128</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
each school sent a letter to the parents informing them about the observational study and offering the opportunity to withdraw their children from the study. There were no parental objections to videotaping the children in the classroom. Hence, the previously mentioned ethical guidelines for educational research were followed.

The pedagogical practices of the 12 teachers were scored by two independent observers. Observer A has been a teacher in technology in secondary education for six years; observer B has an MSc in cognitive psychology and works as a statistical analyst in teacher education research. The observers employed an observation scheme incorporating five categories corresponding to the five subscales of the PPI and three categories of the student inventory factor. In addition to scoring the teacher’s pedagogical practices on every subscale at ten minute intervals, the observers provided an overall category score after they observed the entire lesson, keeping in mind the scored teacher practices throughout the lesson. Only the latter scores were used for this study.

The observers received instructions from the first author about how to interpret the categories of the observation scheme. A videotaped lesson was used for the instruction, but was not included in the observations. Furthermore, the observers were informed about the interpretation of the three categories of teachers based on student perceptions. However, the observers were blind to the teacher category membership based on student perceptions.

Data analysis

The category scores used for these analyses were based on student perceptions and category scores as estimated by the observers. First, agreement between the two observers was computed with an intra-class correlation coefficient using an absolute agreement definition. For both observers, the category scores were compared with the categories based on student perceptions. This result was also expressed as an intra-class correlation coefficient.

Results

The inter-rater reliability between observer A and B, computed with an intra-class coefficient, was .73 (average measures). The category scores of both observers were compared with the categories based on student perceptions. The results showed strong
agreement between student perceptions and observer A (.88) and a moderate to strong agreement between student perceptions and observer B (.74).

Table 3.3  The teachers, schools, theoretical (T) or practical (P) subjects, factor scores, and categories based on student perceptions and according to observers A and B

<table>
<thead>
<tr>
<th>Teachers</th>
<th>Schools</th>
<th>Subjects</th>
<th>Factor scores</th>
<th>Category based on student perceptions</th>
<th>Category according to observer A</th>
<th>Category according to observer B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>T</td>
<td>-2.23</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>P</td>
<td>-2.00</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>T</td>
<td>-1.76</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>P</td>
<td>-1.35</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>P</td>
<td>-.72</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>4</td>
<td>P</td>
<td>-.70</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>G</td>
<td>4</td>
<td>T</td>
<td>.47</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>H</td>
<td>1</td>
<td>P</td>
<td>.79</td>
<td>3</td>
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<td>I</td>
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<td>T</td>
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<td>3</td>
<td>3</td>
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<tr>
<td>J</td>
<td>2</td>
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Conclusions and discussion

The first question in this study was whether there were differences amongst teachers, based on student perceptions, regarding the manner in which their pedagogical practices could be characterised as externally, shared or internally regulating. The results showed that, based on student perceptions, the teachers did not differ in the manner in which their pedagogical practices were regulated (external, shared or internal). The teaching practice revealed a combination of various types of regulating activities. The teachers combined direct instruction (external regulation) with stimulating, probing (shared regulation) and self-regulated learning activities (internal regulation) to regulate, stimulate and improve student learning activities. One dimension appeared to underlie the student perceptions, in which the combination of the various teacher regulation activities congregated. This underlying dimension illustrated the teachers’ combined pedagogical regulating activities.
Three categories of teachers were observed along this dimension based on the degree to which they showed a combination of regulating activities: Teachers who carried out a combination of pedagogical regulating activities to a low degree, to a medium degree, and a high degree. In contrast to the other two categories of teachers, the last group of teachers combined external regulation activities with shared and internal regulation activities and executed all of these activity modes to a high degree.

Our second question asked whether observers categorised teachers into the same groups as those distinguished based on the student perceptions. To answer this question, the observers categorised teachers into one of the three defined categories after observing videotaped classroom practices. Video has become a widely used tool in teacher education and teacher learning (Seidel, Stürmer, Blomberg, Kobarg, & Schwindt, 2011), most likely because observations can provide a detailed description of teacher behaviour and may therefore be a good method for gaining insight into teacher classroom practices. It appeared that the teachers were categorised based on the classroom observations, in the same categories as in the student perceptions. We concluded that teaching practices were the same combination of teacher regulation practices, and that teachers differed in the degree to which they showed this combination in their educational practice. It is plausible that the student perceptions were congruent with the observed classroom pedagogical practices and were therefore in this study a valid indication of teachers’ practices.

The above results agree with the theory of Bereiter and Scardamalia (1989), which states that all teacher activities can be placed on one dimension. However, rather than a dimension running from external to internal regulation, the results of this study indicated that a combination of these two regulation modes was common in teaching practice. Similarly, the conceptualisations of Vermunt and Verloop (1999) and Biggs (1996) were not supported by our results. These authors coined one dimension and singled out three teacher control positions on this dimension: strong, medium and loose. Based on student perceptions, the current study showed that we could not interpret differences between the teachers as mere differences in the amount of regulation activities, external, shared or internal. Instead, teachers might be categorised based on student perceptions of a particular combination of these regulation modes. Finally, the theory of Boekaerts and Simons (1995) distinguished rigorously between three educational regimes. This could imply thinking in teacher types, distinguishing amongst those who carry out external, shared or internal regulation activities within their pedagogical practices. Our results did not support such a distinction. However, Boekaerts and Simons (1995) stated that
the transfer of learning activities to the student must be combined with a deliberate stimulation of learning activities. Simons, Van der Linden and Duffy (2000) showed more of this combination in their six-step model of instruction for new learning, but distinguished between guided, experiential and action learning as three types of instruction, which the authors based on and deduced from the teaching models of Mellander and Dixon (in Simons et al., 2000).

The results of the present research suggest a more integrated view of the teaching practice than in the research cited: teachers do not teach in one way or another but seem to combine these different approaches. Bolhuis and Voeten (2001) also stated 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)”. The results of the current study substantiated Bolhuis and Voeten’s insight: the teachers in the present study could be characterised by the combination of different levels of regulation. Cazan (2013) argued that several studies provide evidence that self-regulation strategies might be embedded within instruction. Our result, indicating that teachers combined different regulation modes, might support the view that teachers are aware of Boekaerts’ assertion that under conditions of maximal external support, student self-regulatory skills will develop minimally and students with minimal self-regulatory skills will not experience the beneficial effect of these skills first hand (Boekaerts, 1999). We conclude that the theoretical approaches of Vermunt and Verloop (1999), Biggs (1996), Cazan (2013), Boekaerts and Simons (1995) and Simons, Van der Linden and Dufy (2000) were insufficiently explicit in revealing that teachers’ pedagogical practices occur over the entire breadth of the external to internal teacher regulating activities continuum by combining them rather than using one or another.

Teaching students to become more autonomous, strategic, and motivated in their learning (Paris & Winograd, 2001), places extremely high demands on the teacher (Nykiel-Herbert, 2004). In the nineties of the previous century, when the construct of self-regulated learning was researched in depth by many educational psychologists (e.g., Schunk, 1995; Zimmerman, 1995), it was concluded that most teachers are not yet equipped to turn students into self-regulated learners (Boekaerts, 1997). Like others, Bereiter and Scardamalia (1989), concluded that the main obstacle was that teachers and students have naive models of what self-regulated learning means. Taking into consideration our result, that teachers combine internal, shared and external regulating activities in their
teacher practice, might indicate that teachers nowadays have a better concept of student regulation. It might indicate an awareness of the importance of self-regulated learning among teachers and probably also in teacher education (Pierce & Kalkman, 2003). Paris and Winograd (2001) contend that the instruction in teacher education should shift more towards how to foster strategic and motivated student learning rather than only focussing on managing classroom behaviour.

From the previous research on self-regulated learning we referred to, it is known that self-regulation is an important factor in student learning. This fact might make teacher educators emphasise in their programmes teacher activities that engage students in self-regulated learning. However, in practice, we did not find teachers who stood out in only focussing on stimulating and teaching students to regulate their learning. Instead, we found that teachers who emphasised student self-regulated learning, combined internal, shared and external regulating activities. This makes us suggest that a proposed shift in teacher activity towards stimulating teachers to emphasise student self-regulated learning, should not only be a matter of shifting from handling as an external regulator towards fostering student regulation, but also a matter of combining various regulation modes. For teacher education purposes it is requested to teach teachers how to diagnose and be adaptive to various levels of student learning and to become proficient in handling various regulation modes instead of focussing only on how to handle a particular mode of regulation.

Gaining more in-depth insight into classroom regulating activities of teachers who combine the various regulating activities to a high degree, might help develop a better understanding of how to move on in teacher education programmes. Together with the question whether there is a relationship between the degree to which teachers combine regulating activities and students’ (perceived) learning outcome, this makes an important agenda for further research.

From a research perspective further validation of both instruments, used for measuring teaching and learning among school-wide groups and individual teachers, is important. In the current study, no distinction is made between teachers of theoretical versus practical subjects. Further research might reveal whether theoretical or practical subjects require different pedagogical approaches. Furthermore, the present study was carried out exclusively in agricultural vocational education. Although we do not expect differences with other types of vocational education, this study must be expanded to general education (e.g., senior general secondary education and pre-university education), to obtain a broader view of the pedagogical practices of teachers in all branches of secondary
education. This will provide a more general view of teacher practices and possible school stream-related influences on students’ perceived teacher regulation modes might appear in teachers’ pedagogical practices.

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