Chapter 2

Measuring teacher regulating activities concerning student learning in secondary education classrooms: Reliability and validity of student perceptions

This chapter is based on:
Abstract

This article describes the use and validation of the Pedagogical Practices Inventory, which uses student perceptions arranged into five subscales to measure teacher activities concerning the regulation of student learning in secondary education. To determine the reliability and validity of the instrument, an inventory study (N = 2,128) and a study in which observational data (N = 11) and inventory data (N = 201) were combined, were carried out. Analysis of the inventory data showed internal subscale reliabilities between .83 and .90, indicating consistency of the PPI subscale scores. Correlations between inventory and observational data showed significant relations for three of the five subscales, indicating that the PPI is suitable to tap teacher regulating activities in classroom contexts.
Introduction

The role of the teacher is of major importance in education. Research has shown that between 7% and 15% of the variance in student outcomes is related to differences between schools, teachers and classes in education. Most of this variance is between teachers (Reynolds, 1995 in Den Brok, Brekelmans, & Wubbels, 2004). There are systematic relationships between the way teachers teach and the quality of their student learning. According to Hattie (2009), one of the aspects that is likely to have above average effects on student achievement is the use of particular teaching methods. Teachers can choose various ways to arrange the educational environment to facilitate student experiences of different kinds of learning (Bolhuis & Voeten, 2001).

In the current secondary education in the Netherlands and elsewhere, the development of student self-regulated learning skills is considered a major factor in developing life-long learning skills (Zimmerman, 2002). Hence, we are interested in the way that teachers stimulate and facilitate student self-regulated learning within their classroom practices, or more specifically, within their regulating activities in classroom contexts. There are different ways to gain insight into teacher regulating activities; however, they need to be measured in a reliable and valid way. This article, therefore, focuses on the reliability and validity of a student perceptions inventory to measure teacher regulating activities in secondary education classrooms.

Different ways to gain insight into teacher practices

There are different ways to gain insight into teacher classroom practices. Research in schools initially focused on the observable behaviours of teachers, but subsequently also began to use questionnaires to measure both teacher and student perceptions of teacher practices (Den Brok et al., 2004; Kunter & Baumert, 2006; Kunter et al., 2008). Below, some examples are presented and the advantages and disadvantages of research using classroom observations, teacher perception and student perception questionnaires are discussed.

One way to investigate teacher practices is through observations. Observations can provide a detailed description and may therefore be a good way to gain insight into teacher classroom practices. Bolhuis and Voeten (2001), for example, aimed to provide a detailed description of what teachers do to facilitate self-directed learning. Newmann, Marks, and Gamoran (1996) observed mathematics lessons to determine the extent to which they conformed to criteria of ‘authentic pedagogy’ (Newmann et al., 1996). Observing,
however, is a time-consuming and intensive way of gathering data, as is the analysis of the data. Therefore, observation studies often rely on only a small sample of schools and teachers as well as a small number of lessons per teacher. It can be concluded therefore, that observations are useful in constructing a detailed description of teacher practices, but because of the intensive method of data collection and analysis, this method will generally involve a small sample, meaning that the insights gained concern a non-representative sample of teachers.

A second way to investigate teacher practices is by using the perceptions of teachers themselves. Trigwell and Prosser (2004), for example, used the Approaches to Teaching Inventory (ATI) to measure the key aspects of variation in approaches to teaching at university. Wubbels, Brekelmans, and Hooymayers (1992) used the Questionnaire on Teacher Interaction (QTI), to gather data about interpersonal teacher behaviour. While the above-mentioned examples concern paper and pencil inventories, more recently, Meirink, Meijer, Verloop, and Bergen (2009) asked teachers to keep a digital log describing what was learned and how it was learned every six weeks, in order to examine their learning activities.

Using teacher perceptions implies measuring teacher self-perceptions. These self-perceptions are not necessarily in accordance with student perceptions or classroom observations, with discrepancies between teacher perceptions and their actual classroom practices possible. Kunter et al. (2008) actually found a low to moderate agreement between teacher and student ratings. Wubbels et al. (1992) investigated the relationship between teacher ideals, self-reports and student perceptions, and found that for most teachers the self-reported scores on ideal global interpersonal behaviour characteristics were higher than the student scores of the same teacher’s behaviour. In other words, most teachers considered their behaviour to be more like their ideal than did the students. As the study by Wubbels et al. (1992) only concerned interpersonal behaviour in the classroom and cognitions about that kind of behaviour, some care should be taken when interpreting the results. Nevertheless, we can conclude that teacher self-reports about their behaviours are partly shaped by their ideals and are therefore not necessarily actual representations of teacher classroom practices.

A third way to gain insight into teacher practices is the use of student perceptions. Pintrich, Roeser, and De Groot (1994), for example, expanded the self-report questionnaire Motivated Strategies for Learning Questionnaire (MSLQ), with items that asked students about class work, their teacher and the opportunities to work with other students in class.
An important reason to use student perceptions is that they construct their own knowledge and perceptions of teacher practices (Den Brok, Bergen, et al., 2004; Fraser, 1998). Student perceptions of the learning environment constitute a mental representation of learning activities and affect their conscious and unconscious choices in the classroom (Boekaerts & Cascallar, 2006). The way in which students perceive, interpret and process information in the instructional situation, including teacher practices, is an important determinant of what the student learns (Shuell, 1993). Nevertheless, it is the teacher who arranges the educational environment to allow the students to gain experience of different learning skills. Therefore, it is relevant to gain insight into teacher practices as perceived by students because of the influence of these perceptions on student learning (Opdenakker & Minnaert, 2011).

Several studies demonstrate that the perceptions of students provide valuable insight into aspects of teacher practices that may in turn affect student behaviour (Fraser, 1998; Marsh, 1982; Wubbels & Brekelmans, 2005), and that students are able to provide ratings of teacher practices that are sufficiently stable, reliable, valid and predictable for teacher evaluation and research purposes (Den Brok, Brekelmans, et al., 2004). The results of a study on the relationship between teacher practices and student outcomes showed that student perceptions mediate the influence of the learning environment on student outcomes (Den Brok, Brekelmans, et al., 2004; Trigwell & Prosser, 2004; Van Tartwijk, Brekelmans, & Wubbels, 1998).

There are also more practical reasons to use student perceptions of teacher practices. Firstly, student perceptions are relatively easy to obtain and it is a cheap and practical manner to gather information (Den Brok, Brekelmans, et al., 2004). In other words, it is much easier to carry out large-scale studies of teacher practices using student perceptions than using observation studies (Den Brok, Brekelmans, et al., 2004). Secondly, student perceptions combine many different individual perceptions in a classroom, which means that they provide a more complete overview of teacher practices than, for example, observations by one or two persons (Den Brok, Brekelmans, et al., 2004). Thirdly, student experiences are often based on a large number of lessons. Students often have experience of several situations and contexts with one teacher, which assists in developing a representation of teacher practices which is as differentiated as possible (Fraser, 1998). Thirdly, using student perceptions is a simple and efficient research method that allows different aspects of the learning environment to be assessed on the basis of the individual student, as well as at the classroom level (Ludtke, Trautwein, Kunter, & Baumert, 2006).
Although student perceptions have some advantages over teacher perceptions and classroom observations, we also realise that student perceptions are nothing more and nothing less than that: personal assessment and views of practices (Den Brok, Bergen, et al., 2004), which might for example be affected by students’ general study orientations (Parpala, Lindblom-Ylänne, Komulainen, & Entwistle, 2013). Furthermore, student perceptions do not inform us about actual intentions of teachers, the frequency, function or the effectiveness of teacher practices (Den Brok, Bergen, et al., 2004). It is therefore that, in addition to student perceptions, we used observational data to investigate teacher regulating activities, and also investigate the relationship between student perceptions and observational data.

Teacher regulating activities and student self-regulated learning

Taking into consideration the advantages and disadvantages of observations, teacher self-perceptions and student perceptions, in the present study we have chosen to develop and use a student perceptions inventory to measure teacher classroom practices – specifically, teacher regulating activities facilitating student self-regulated learning.

Self-regulated learning is of growing importance in Dutch educational policy and practice because the ability to self-regulate is viewed as a key to successful learning in school and beyond (Boekaerts, 1997, 1999; Bolhuis, 2003; Jossberger, Brand-Gruwel, Boshuizen, & van de Wiel, 2010; Kuo, 2010). Self-regulated learning is viewed as a process in which students actively and constructively monitor and control their motivation, cognition, and behaviour (Aldridge, Fraser, Bell, & Dorman, 2012; Järvela, Järvenoja, & Malmberg, 2012; Pintrich, 2004; Pintrich & de Groot, 1990). Research conducted by Zimmerman (2002) has shown 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. If students are actively involved in learning activities, then it is likely that learning will be more meaningful to them (Aldridge et al., 2012). The teacher, as part of the learners’ environment, can play an important role in stimulating students and helping them develop their capacity for self-regulated learning (Kuo, 2010; Reeve, 2009).

In secondary education, student self-regulated learning is important, enabling students to be more conscious and mature independently of any particular form of support. This capacity enables students to be better prepared for work, life and higher education. However,
secondary education students often find themselves in a turbulent period of life due to biological, cognitive and social changes, which can have a considerable impact on student thinking and behaviour (Wigfield, Byrnes, & Eccles, 2006). These student characteristics are often accompanied by a decline in competence and efficacy beliefs (Wigfield et al., 2006) and a concomitant decline in motivation during this period of schooling (Pintrich et al., 1994), and may thus provide a challenge to teachers, who need to intervene ‘in time’ in the students’ learning process. The challenging nature of this issue is the reason that we are interested in teacher regulating activities in secondary education aimed at stimulating and facilitate student self-regulated learning. Consequently, we hope to gain insight into teacher regulating activities oriented towards the development of student self-regulated learning by measuring teacher interventions in a reliable and valid way.

Developing self-regulated learning is like becoming your own teacher, gradually taking over regulatory activities initially carried out by a teacher or a tutor (Simons, 1987; Vermunt & Van Rijswijk, 1988). The interplay between teacher regulated activities and student activities is described by Boekaerts and Simons (1995), who mention three educational regimes in which cognitive, affective and metacognitive learning functions (Simons, 2000) must be carried out, either by the teacher and/or by the student. Learning functions in this context are seen as psychological functions, which have to be fulfilled during the learning process (Shuell, 1988). The educational regimes differ in the degree of regulation by teacher or student.

**External regulation:** Students who are dependent on others to get started or to complete a task need external regulation to direct their learning. In this educational regime, the teacher regulates all learning functions and leaves no room for learning functions to be regulated by the student.

**Shared regulation:** There is a shared division of tasks in regulating learning between the teacher and the students. The teacher stimulates students to learn actively. Through assignments, questions and study tasks, students are stimulated to comprehend, integrate and apply their learning actively.

**Internal regulation:** Students regulate their learning internally, specify their own learning goals and do not need instruction or guidelines from others in choosing a learning or problem-solving strategy (Boekaerts, 1999).

When considering the role a teacher can play in the development of student self-regulation skills, it may be asked which teacher regulating activities – related to the above-mentioned distinction in educational regimes – can be found in classroom practice.
Since not much is known about how teachers support and stimulate the development of self-regulation skills in general (Jossberger et al., 2010), it is important to gain insight into teacher regulating activities and, consequently, to measure them in a reliable and valid way.

This study investigated teacher regulating activities in secondary education classrooms by collecting student perception data using the Pedagogical Practices Inventory (PPI). Before developing the PPI, we analysed some existing student perception questionnaires which also assessed aspects of teacher practices such as instructional behaviour or monitoring.

These included the Constructivist-Oriented Learning Environment Survey (COLES) (Aldridge et al., 2012), the Teacher’s Instructional Behaviours Questionnaire (Kunter et al., 2008) and the Experiences in Teaching and Learning Questionnaire (ETLQ; Entwistle, McCune, & Hounsell, 2002). These questionnaires, however, do not specifically measure teacher regulating activities aimed at student self-regulated learning in secondary education. For this purpose, the Pedagogical Practices Inventory (PPI) was used and validated in this study.

**Research questions**

The aim of this article was to investigate whether teacher regulating activities could be measured in a reliable and valid way by means of a student perceptions inventory, the PPI. Because we are interested in the teacher activities, we do not want to analyse student perceptions at the level of individual students, but at the teacher level. Therefore, individual student perceptions were aggregated to scores for each teacher. In this way, we can appropriately deal with the nested data structure, taking into account both student and teacher level. The study of the reliability and validity of the PPI was guided by two research questions:

*What is the reliability of the PPI subscales, taken into account the nested data structure on student and teacher level, and what correlations can be found between these subscales?*

To examine the external validity of the inventory, we also investigated the relationship between student perceptions and data that were gathered through observations of a select group of teachers. This resulted in the sub-question:
What is the relationship between student perceptions and observational data on teacher regulating activities associated with the development of student self-regulated learning?

Method

The present study consists of a large scale inventory study (‘study 1’) and a study in which observational data and inventory data are combined (‘study 2’). The inventory that was used to obtain inventory data, the Pedagogical Practices Inventory (PPI), was developed in a small preparatory study based on two teachers. The results of the preparatory study are described under ‘Instruments’ within study 1. Within this study, aspects of reliability and validity of the PPI were examined by computing the internal consistency of the subscales and the correlations between the subscales. In study 2, a combination of observational data and inventory data are used to validate the PPI further, by investigating the relationship between student perceptions and observations of a group of teachers, selected from the dataset of study 1.

Study 1: Inventory study

Participants

The study was carried out in secondary vocational education. In this type of education, the diversity of students (concerning curricula, cognitive levels, learning difficulties and behavioural problems) puts great demands on teacher practices. Because we expect that all kinds of teacher regulating activities may occur in this educational context, it is an appropriate educational environment to validate the PPI. A grade eight student population, i.e. the second year of secondary education, was chosen because after their transfer from primary to secondary education the students would have had a year to become accustomed to the school and the teaching processes within the school. The choice of this grade also ensures that students have experienced the practices of different teachers, so they have a more developed perception of teacher practices than grade seven students. Finally, grade eight classes are still comprehensive, whereas grade nine students must choose a field of study, which might be based on preferences for the practices of particular teachers.
For this study, grade eight students from 11 schools completed the PPI between February and June 2010. In total 2,128 inventories were completed, 1,091 by boys and 1,035 by girls. On two inventories, the students did not disclose their gender. 18.2% of the inventories were filled out by 13-year olds, 60.1% by 14-year olds and 21.1% by 15-year olds, while .6% of the students did not specify their age. Per teacher, on average 16.6 students completed the inventory and the inventory data resulted in information about 128 teachers. Of the 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, technical studies and flower arrangement) and 11 teachers of both subject domains.

**Instrument**

**The Pedagogical Practices Inventory (PPI)**

The PPI was developed on the basis of two other student perceptions inventories: the Questionnaire on Lesson Activities (Den Brok, 2001) and the Questionnaire on Students’ Perceptions of Teacher Behaviour, which is a modified version of the Questionnaire on Beliefs about Teaching and Learning (Hoekstra, Brekelmans, Beijaard, & Korthagen, 2009; Meirink et al., 2009; Zwart, Wubbels, Bergen & Bolhuis, 2009). From the Questionnaire on Students’ Perceptions of Teacher Behaviour, six subscales with a total of 47 items were selected. From the Questionnaire on Lesson Activities, nine subscales with 49 items were selected. To develop an inventory that could be used for almost all subjects in secondary vocational education, we decided to omit six items due to their high level of subject specificity. In this way, 15 subscales were selected: subscales related to external (teacher) regulating activities, to shared regulation, and to teacher regulating activities in which teachers enable and stimulate students to regulate their own learning. The total of 90 items from both inventories were to be answered on a five-point Likert scale (1 = almost never, 5 = very often). In Table 2.1 the selected subscales and the number of items per subscale are presented.

Two teachers were selected for the preparatory study. One teacher was perceived by peers as well as their team leader and colleagues as a teacher who mainly executed regulatory activities herself, while the other was perceived as a teacher who stimulated student internal regulation activities during classroom practice. The perceptions of the practices of the two teachers were based on experiences of collaboration during lessons,
in team meetings and study days. In addition, the first author observed lessons taken by each teacher, which confirmed the characteristics of the teacher types. During the preparatory study, the teachers were told that their practices would be observed to find out exactly what they do in classroom practice. At the end of the preparatory study, they were informed in more detail about the study, with both teachers recognising themselves in the descriptions of the first author and the team leader, on which the selection was based.

Table 2.1  The selected subscales from the Questionnaire of Student Perceptions of Teacher Behaviour (Meirink et al., 2009) and the Questionnaire on Lesson Activities (Den Brok, 2001), the number of items of the selected subscales, and the total number of items

<table>
<thead>
<tr>
<th>Questionnaire on Student Perceptions of Teacher Behaviour</th>
<th>Questionnaire on Lesson Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale</td>
<td>Number of items</td>
</tr>
<tr>
<td>1. External Cognitive Regulation</td>
<td>8</td>
</tr>
<tr>
<td>2. External Affective Regulation</td>
<td>8</td>
</tr>
<tr>
<td>4. Internal Cognitive Regulation</td>
<td>8</td>
</tr>
<tr>
<td>5. Internal Affective Regulation</td>
<td>8</td>
</tr>
<tr>
<td>6. Construction</td>
<td>7</td>
</tr>
<tr>
<td>Uncoded item</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of items</td>
<td>47</td>
</tr>
</tbody>
</table>

A selection of 21 grade eight students was made ($Age_M = 13.9$ years; $SD = .73$) from two different classes, all of whom were taught by both teachers. To extend the population, 19 students from grade nine ($Age_M = 15.0$ years; $SD = .74$) were also selected for the preparatory study. The total of 40 students filled out both inventories (Questionnaire on Perceptions of Teacher Behaviour and Questionnaire on Lesson Activities) twice: once in relation to the mainly externally regulating teacher and once in relation to the teacher who stimulated more internal regulation.

To recognise patterns in the differences between the two teachers, the difference scores of the items were computed on the student level. Further analyses of the data from both inventories were performed separately because there were far more items than respondents. To find discriminatory clusters of items within both inventories, and therefore to explore the structure of the inventory data, a principal component analysis (with
Varimax rotation) was performed on the data on the student level from both inventories. The principal component analysis resulted in six components: four components in the data from the Questionnaire on Perceptions of Teacher Behaviour and two in the data from the Questionnaire on Lesson Activities. The six components explained 66% of the total common variance. The items with factor loadings of .40 and above were selected.

Based on expert\(^1\) conceptual interpretation of the selected items in which teacher regulating activities were the primary focus, five meaningful components were extracted: ‘Direct instructing’, ‘Instructing information processing’, ‘Supporting self-regulation activities’, ‘Probing self-regulation activities’ and ‘Allowing self-regulated learning’.

At the end of the preparatory study, some items were reformulated: firstly, as a result of student interviews,\(^2\) terms such as ‘matter’, for example, were replaced by ‘subject matter’ and ‘task’ by ‘assignment’. Secondly, to better align the items with the defined content of the subscales, some were rephrased. For example, the item ‘With this teacher, we discuss how we can study for a test’, was reformulated as ‘With this teacher, we think about how to study for a test ourselves’, because the latter better fitted into the subscale, ‘Allowing self-regulated learning’. In this way, the five components were operationalised in terms of five subscales.

**Procedure**

Data for study 1 were collected in November and later in the school year to ensure students had enough experience of their teacher’s practices to be able to complete the inventory. The inventory was administered during classroom lessons and students received detailed instruction about how to complete the inventory. In six of the 11 schools, the first author was assisted by four student teachers, who received detailed instructions about instructing the grade eight students. In order to obtain a more generalised picture of the teacher practices over classes, we collected student perceptions from at least two grade eight classes for each teacher. The students completed the PPI for two randomly assigned teachers (students in grade eight are taught by several different teachers). The randomisation was based on a schedule ensuring that at least 14 students from at least

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1 The experts were the authors of this article, who all have experience in education in their roles as professor, lecturer or teacher.

2 In two shifts, 11 grade eight students were individually interviewed by the first author after they had filled out both inventories. A couple of items were discussed with every student, ensuring that every item from both inventories was discussed with at least two different students.
two different classes completed the inventory on one teacher. All teachers were informed about the inventory study and all agreed to participate. Teachers who taught subjects such as music, physical education and religion were excluded from the study because several items on the inventory were not applicable to lessons in these fields. Furthermore, the selection of teachers ensured that students did not complete the inventory about a teacher who was also their mentor (the mentor is a permanent counsellor of a group of students). This was done because we thought that 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 three inventories about three different teachers.

Data analysis

Regarding the first research question (what is the reliability of the PPI subscales, taken into account the nested data structure on student and teacher level, and what correlations can be found between these subscales?), the overall group-mean subscale reliabilities at teacher level were analysed by means of multilevel analysis of the data from the inventory dataset, using MLwin (Rasbash, Browne, Healy, Cameron, & Charlton, 2011). In this way, subscale reliabilities of individual teacher ratings were estimated based on the student ratings. PPI subscale reliabilities are expressed as $\lambda_j$ (Snijders & Bosker, 1999). To examine the correlations between the subscales, Pearson’s correlations were computed.

Results

Given the nested structure of our data we checked by means of multilevel analyses the amount of variance in the teacher level. Results showed variance on the teacher level of between 23% (subscale ‘Allowing self-regulated learning’) and 36% (subscale ‘Instructing information processing’). Multilevel analysis of the inventory data showed internal reliabilities of the subscales between .83 and .90 (see Table 2.2). Since this is above the usually acceptable value of .70 (Bliese, 2000), we can conclude that the five subscales of the PPI appeared to have a good internal reliability. Table 2.2 shows example items of the five PPI subscales, the subscale means and standard deviations based on the inventory dataset.
To examine the correlations between the subscales, Pearson’s correlations were computed on the teacher level. Table 2.3 shows the correlations between the five PPI subscales.

Table 2.3  Correlations between the PPI subscales, based on the inventory dataset of study 1 (128 teachers)

<table>
<thead>
<tr>
<th>Subscale</th>
<th>‘Direct instructing’</th>
<th>‘Instructing information processing’</th>
<th>‘Supporting self-regulation activities’</th>
<th>‘Probing self-regulation activities’</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Instructing information processing’</td>
<td>.90**</td>
<td>.93**</td>
<td>.87**</td>
<td>.86**</td>
</tr>
<tr>
<td>‘Supporting self-regulation activities’</td>
<td>.93**</td>
<td>.87**</td>
<td>.98**</td>
<td>.92**</td>
</tr>
<tr>
<td>‘Probing self-regulation activities’</td>
<td>.93**</td>
<td>.87**</td>
<td>.98**</td>
<td>.87**</td>
</tr>
<tr>
<td>‘Allowing self-regulated learning’</td>
<td>.86**</td>
<td>.92**</td>
<td>.85**</td>
<td>.87**</td>
</tr>
</tbody>
</table>

** Correlation is significant at the .01 level (2-tailed).
Study 2: A combination of observational data and inventory data

Participants

Of the 128 teachers of study 1, 11 teachers were selected for study 2, which was carried out between November 2010 and April 2011. The selection of the teachers was based on the subscale means obtained by the inventory study: a representative distribution across the subscale means was pursued. Six of the 11 teachers taught a practical subject and five a theoretical subject. The 11 teachers taught at five different schools.

The observations took place seven to 13 months after the inventory study, and another comparable group of grade eight students was also selected for further data gathering on the 11 observed teachers using the PPI. This was carried out between November 2010 and April 2011. From 11 classes, in which the observations were carried out, 186 students (82 boys and 103 girls, one student did not specify gender) completed the PPI on their observed teacher. Two observers were involved in the observation study: Observer A had been a teacher in technology in secondary education for 6 years, and graduated at the teacher training program recently. Observer B had been teacher in physical education in secondary vocational education for 27 years, and teacher educator in educational studies for 11 years. Both observers had sufficient pedagogical background to understand teaching practice after instruction of the coding scheme.

Instrument

To collect observations of teacher practices, an observation instrument was submitted to observers to identify teacher regulating activities. The observation instrument was based on the five subscales of the PPI, and some keywords clarifying the content of the subscales, were also described in the observation instrument.

Procedure

The 11 teachers were videotaped during one complete lesson, ranging from 34 to 61 min. Two observers scored the videotaped teacher regulating activities on the five categories of the observation instrument every 10 min. using Likert scale scores (1 = almost never, 5 = very often). Students in the class where the lesson was videotaped completed the PPI.
for the observed teacher. The aim was to perform the observation and administration of the inventory on the same day. For 10 of the 11 teachers this was done successfully. In one case there was a time gap of nine days between observation and the completion of the inventory.

The observers received instructions from the first author about how to interpret the categories of the observation instrument, based on their observation of a videotaped lesson, which was not included in the final observation data. The observers did not know the teacher subscale scores based on student perceptions.

Data analysis

To answer the second research question (what is the relationship between student perceptions and observational data on teacher regulating activities associated with the development of student self-regulated learning), the means of the 10 min. observation scores on the five categories were computed. Firstly, interrater reliability between the two observers was computed with an intra-class correlation coefficient. Secondly, to investigate the relationship between observational data and inventory data, subscale means of the inventory data were compared with the observers’ subscale means using Kendall’s Tau correlations.

Results

From the data obtained from observations, observer agreement between the two raters was computed with an intra-class correlation coefficient (ICC), using an absolute agreement definition. This resulted in an ICC of .72 (average measures), which indicates strong agreement. To compare observational data with student perceptions as obtained in the inventory dataset, average scores of the two observers were used. Correlations between the subscale means of the inventory data and the observational data are shown in Table 2.4.

Kendall’s Tau showed significant relationships between the student perception data and the observations for three of the five subscales: ‘Instructing information processing’, ‘Supporting self-regulation activities’ and ‘Probing self-regulation activities’. Thus, there appears to be a relationship between student perceptions and observational data for these three subscales, which is not apparent for the subscales ‘Direct instructing’ and ‘Allowing self-regulated learning’. 
Conclusions and discussion

The main aim of this article was to investigate whether teacher regulating activities related to student learning can be measured reliably and validly by means of a student perceptions inventory. For this aim we drafted two research questions.

The first research question concerned the reliability of and relationships between the PPI subscales. The results of study 1 showed that the five PPI subscales appeared to have good internal reliability. A correlation analysis showed considerable overlap between the defined subscales. Students seem to perceive teacher practices as an all-in-one experience rather than separated into several features. This may be a result of the fact that student perceptions are based on experiences with the teacher over a large number of lessons in a variety of situations and contexts. In addition, perceptions of teacher practices in this study were collected using the perceptions of several students from at least two different classes. The perceptions therefore constitute an overview of many different individual perceptions. These factors make the use of student perceptions a valuable resource for investigating teacher practices. Despite the high correlations between the scales, it may be useful to distinguish the five different subscales at the conceptual level; for example, if one wants to give feedback to teachers on their lessons or to develop and execute more tailored interventions in teacher practices.

One of the advantages of student perceptions, as mentioned above, is that they constitute a collection of many different individual perceptions, in different classroom contexts, which means that they might offer a more complete overview of teacher practices than, for example, observations by one or two people (Den Brok, Brekelmans, et al., 2004). The results of study 1 show that the perceptions of students from more than one class are a reliable way to gain insight into teacher regulating activities. Students experience

<table>
<thead>
<tr>
<th>Subscales</th>
<th>Kendall’s Tau</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Direct instructing’</td>
<td>-.09</td>
</tr>
<tr>
<td>‘Instructing information processing’</td>
<td>.42 *</td>
</tr>
<tr>
<td>‘Supporting self-regulation activities’</td>
<td>.42 *</td>
</tr>
<tr>
<td>‘Probing self-regulation activities’</td>
<td>.45 *</td>
</tr>
<tr>
<td>‘Allowing self-regulated learning’</td>
<td>.24</td>
</tr>
</tbody>
</table>

* Correlation is significant at the .05 level (1-tailed).
several different situations and contexts with the teacher, and this allows a representation of teacher practices which is as nuanced as possible (Fraser, 1998). Furthermore, gaining insight into teacher regulating activities using student perceptions is a relatively easy and efficacious manner to retrieve information about teacher practices. This means that it is easier to carry out large-scale studies. An interesting topic for future research would be student perceptions based on experiences in individual lessons or even parts of lessons. It would be interesting to determine whether student perceptions reflect differences between the various aspects of teacher regulating activities or whether students are not able to distinguish between these aspects. Multilevel analyses showed considerable variance on the teacher level, which indicates that student perceptions gathered using the PPI reflect patterns in teacher classroom practices. Compared to other instruments the variance on the teacher level is rather high (e.g., Fraser, 1998).

The second research question concerned the correlations between student perceptions and observations by others. To answer this question, correlations between the inventory and observational data were investigated, with significant correlations found for three of the five subscales. Results also showed that for two subscales student perceptions and observations were not related. We do not have another explanation, than that it could be due to the unique value of the different methods. Results show that student perceptions and observations by others partly measure the same aspects, but shows also that each method also measures unique aspects of teacher practices.

Considering the fact that student perceptions appear to be a rather reliable way to gain insight into teacher regulating activities aimed at student learning, the use of student perceptions might be an appropriate manner to investigate such practices. Observational studies, however, are also useful in providing a detailed description of teacher practices. This leads us to the conclusion that both methods have their own value (Den Brok, Bergen, et al., 2004) in determining teacher regulating activities in classroom contexts. The student perceptions inventory (PPI) and the observational instrument can be considered complementary. Although both instruments are sufficiently reliable measurement instruments in themselves, a combination of these two research methods is a more valid way to gain insight into teacher practices. Wubbels et al. (1992) also consider that comparing student perceptions with observations might be useful. Other authors state that a mix of research methods is useful, firstly, because in this way the weaknesses of each research method can be compensated for (Uhlenbeck, Verloop, & Beijaard, 2002), and secondly, because the combination of different methods may more
adequately cover different aspects of teaching and therefore do justice to the enormous variability in classroom contexts (Dwyer, 1998; Uhlenbeck et al., 2002).

Future research investigating teacher practices in secondary education should focus on the further validation of the PPI at a more detailed level. Moreover, the present observational instrument only investigates fairly global features of teacher practices. It would be interesting to combine results from the inventory data with more detailed observational analyses to gain further insight into teacher regulating activities oriented towards stimulating student self-regulated learning. That is also interesting because several studies have clearly revealed how self-regulatory processes lead to success in school (Zimmerman, 2002), but not much is known about how teachers support and stimulate the development of student self-regulation skills (Jossberger et al., 2010). Therefore, gaining further insight into these teacher regulating activities would be very useful. While it is apparent that students are able to identify teacher practices, the extent to which the perceived teacher regulating activities actually stimulate student self-regulated learning activities remains to be determined.

Acknowledgements

We would like to thank all of the students and teachers who participated in this study. We would also like to thank the student teachers who assisted in the data collection, and our observers who helped code the data, for their work.
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