



# Engaging students: The role of teacher beliefs and interpersonal teacher behavior in fostering student engagement in vocational education



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## HIGHLIGHTS

- Teachers' beliefs and behaviors were examined in relation to student engagement.
- The context of the study was pre-vocational and vocational education.
- Perceived interpersonal teacher behavior was related to all types of engagement.
- The effect of teacher beliefs faded out when interpersonal behavior was included.
- Students' age was a negligible predictor of their engagement.

## ARTICLE INFO

### Article history:

Received 9 February 2013

Received in revised form

25 August 2013

Accepted 28 August 2013

### Keywords:

Student engagement  
Interpersonal teacher behavior  
Teacher knowledge  
Self-efficacy  
Teacher–student relationship  
Beliefs

## ABSTRACT

Student engagement is an important precursor for learning. In this study we used teacher ( $N = 200$ ) and student ( $N = 2288$ ) questionnaires to investigate whether perceived interpersonal teacher behavior and teacher beliefs concerning motives for being a teacher, attitudes toward teacher knowledge domains and self-efficacy for teaching are related to self-reported student engagement. Three components of engagement were distinguished: behavioral, emotional and cognitive engagement. The strongest relations were found between the two dimensions of interpersonal teacher behavior and the three components of student engagement. Remarkably, there was a relation of almost zero (0.01) between students' age and their engagement.

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## 1. Introduction

Student engagement is an important precursor for learning. Engagement has been shown to be related to better achievement at school, while disengagement has been shown to be related to school dropout (Archambault, Janosz, Fallu, & Pagani, 2009; Fredricks, Blumenfeld, & Paris, 2004; Reschly & Christenson, 2006; Zimmer-Gembeck, Chipuer, Hanisch, Creed, & McGregor, 2006). In fact, disengagement is even included in the definition of the dropout process. From a pedagogical perspective, dropout is defined as the outcome of a long-term process of withdrawal and

disengagement of the student from school. This process of disengagement begins during the early school years and can ultimately lead to the student's dropping out in high school or vocational education (Bradshaw, O'Brennan, & McNeely, 2008; Dunn, Chambers, & Rabren, 2004; Finn, 1993; Rumberger, 1995). Most dropouts in the Netherlands have abandoned pre-vocational or vocational study (Dutch Ministry of Education, Culture and Sciences, 2011a). It is therefore potentially of great importance to investigate how student engagement can be fostered, especially in pre-vocational and vocational education.

We know from the literature that a number of factors influence student engagement. At the school level, the size of the school and the teacher–student ratio matter (Fredricks et al., 2004). Within the classroom, a positive relationship with the teacher contributes to student engagement (Anderson, Christenson, Sinclair, & Lehr,

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2004; Klem & Connell, 2004; Muller, 2001; Roorda, Koomen, Spilt, & Oort, 2011), as do structure and clear teacher expectations. Student engagement is fostered in learning environments in which student autonomy is supported and where there is no punishment (Fredricks et al., 2004), although Elffers (2011) concluded that too much autonomy results in lower levels of student engagement. Furthermore, peers also influence the engagement of individual students (Fredricks et al., 2004). Finally, engagement usually decreases as students get older, particularly during high school (Fredricks et al., 2004; Klem & Connell, 2004).

This study focuses on the teacher. We are interested in the extent to which student engagement can be seen to be related to specific teacher behavior and beliefs. Teachers' beliefs influence their behavior in the classroom, and could affect the way they teach and the kinds of learning environments they create (Guskey, 2002; Palak & Walls, 2009). Pajares (1992) argued that there should be more focus on teacher beliefs in educational research. It may be that beliefs lie at the very heart of teaching (Kagan, 1992, p. 85). The aim of this study is therefore to explore whether and to what extent teachers' motives for being a teacher, attitudes toward teacher knowledge domains, and self-efficacy beliefs, and students' perceptions of their teacher's interpersonal behavior are related to student engagement.

## 2. Theoretical framework

This study aims to investigate teacher beliefs and interpersonal teacher behavior that could influence student engagement. Fredricks et al. (2004) stated that teacher support, positive teacher–student relationships, classroom structure, autonomy support and authentic and challenging tasks have been associated with student engagement at the classroom level. Clearly, the teacher has a role in creating those supportive conditions. However, whether teachers try to create them and how they go about trying to do so is likely to depend on their beliefs about teaching and about being a teacher.

### 2.1. The concept of engagement

According to Appleton, Christenson, and Furlong (2008), the concept of student engagement was introduced about 29 years ago. In early work related to engagement, Tinto (1975) and Finn (1989) each developed a model explaining dropout as the consequence of student withdrawal or disengagement from school. In Tinto's (1975) mediation model for dropout in higher education, students' interactions with the academic and social system produce a certain degree of social and academic integration. Finn's (1989) participation-identification model explicitly introduced the concept of engagement, which is defined as participation in and identification with school.

Research interest in student engagement has grown over the years. Fredricks et al. (2004) reviewed the literature on engagement and proposed using engagement as a meta-construct to bring together different lines of research. However, they also concluded that there are inconsistencies in the use of the different concepts and terminology associated with the multidimensional construct of engagement. For the purposes of our study, we distinguish among three types of engagement that have been proposed by different researchers (e.g. Appleton et al., 2008; Fredricks et al., 2004; Moreira, Vaz, Dias, & Petracchi, 2009; Sciarra & Seirup, 2008).

- Students are *behaviorally* engaged when they participate in the lessons, are on time, concentrate on the assignments given, and put effort into those assignments.

- Students are *emotionally* engaged when they are enthusiastic about a class, are interested in going to the class, and demonstrate a positive learning attitude.
- Students are *cognitively* engaged when they understand the importance of their education and the specific subjects and assignments, are able to formulate their own learning goals, make use of their self-regulating capabilities, and want to achieve academically.

Although we distinguish three different aspects of engagement, this does not mean that these aspects are mutually exclusive and independent of each other. For example, to be able to establish some kind of emotional engagement with school, the student needs to show at least some behavioral engagement, i.e., the student has to attend school (Archambault et al., 2009; Fredricks et al., 2004). Along with the multidimensionality of engagement, we can also distinguish two levels at which engagement can occur. A student can be engaged within a specific classroom and/or with the larger school community. Fredricks et al. (2004) state that it is important to differentiate between the two levels, because they are likely to have different antecedents and outcomes. Because our study focuses on the role of the teacher in fostering engagement, we use the concept of engagement as occurring at the classroom level.

### 2.2. Teacher–student relationships and interpersonal teacher behavior

A positive relationship between student and teacher has been shown to be important for student engagement and achievement (Roorda et al., 2011). According to Muller (2001), students who are trying to do their best are more likely to build a positive relationship with their teachers than are students who do not show interest in school. This means that the already disengaged students, those who are most in need of positive relationships with their teachers, are also less apt to be liked by their teachers (Jennings & Greenberg, 2008). Interested and caring teachers who try to establish positive relationships with their students could make the difference for students at risk (Jennings & Greenberg, 2008; Pianta & Allen, 2008).

Wubbels, Créton, and Hoymayers (1985) developed a circumplex Model for Interpersonal Teacher Behavior (MITB) that can account for teachers' interactions with their students. The MITB includes two dimensions: influence (along a continuum from low influence or Submission to high influence or Dominance) and proximity (along a continuum from low proximity or Opposition to

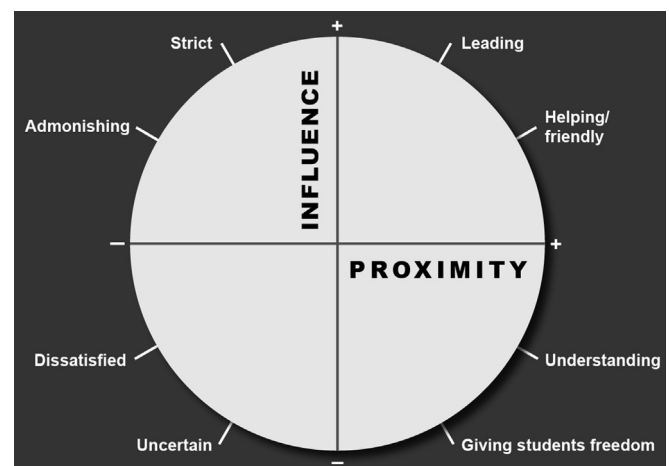


Fig. 1. Model of interpersonal teacher behavior (based on Mainhard, 2009, p. 9).

high proximity or Cooperation). The two dimensions generate eight types of teacher behavior: leading (DC), helping/friendly (CD), understanding (CS), freedom (SC), uncertain (SO), dissatisfied (OS), admonishing (OD) and strict (DO) (see Fig. 1). Furthermore, eight teacher profiles can be distinguished: directive, authoritative, tolerant/authoritative, tolerant, uncertain/tolerant, uncertain/aggressive, drudging and repressive.

The Questionnaire on Teacher Interaction (QTI) was developed to evaluate this model, and can be used to assess both student and teacher perceptions of interpersonal teacher behavior (Wubbels, Brekelmans, den Brok, & van Tartwijk, 2006; Wubbels et al., 1985). This instrument has been tested in different countries, including Brunei (den Brok, Fisher, & Scott, 2005), China (Yu & Zhu, 2011), Cyprus (Kokkinos, Charalambous, & Davazoglou, 2009), Indonesia (Maulana, Opdenakker, den Brok, & Bosker, 2011), Turkey (Telli, den Brok, & Cakiroglu, 2007) and the USA (Wubbels & Levy, 1991).

In terms of the dimensions of the MITB, teachers describe the ideal teacher as a teacher with a tolerant-authoritative interpersonal style (Wubbels & Brekelmans, 2005; Wubbels et al., 2006). This style scores very high on both proximity and influence, that is, at the Dominance and Cooperation ends of the scales (Wei, den Brok, & Zhou, 2009; Wubbels & Brekelmans, 2005; Wubbels et al., 2006). Studies also show a positive relation between high scores on both dimensions and positive cognitive and affective student outcomes (e.g. den Brok, Brekelmans, & Wubbels, 2004, 2006; van Petegem, Aelterman, van Keer, & Rosseel, 2008; Wubbels et al., 2006). In this study, we extend relevant student outcomes to include engagement, and consider cognitive, affective, and emotional types of engagement. Furthermore, most studies of the MITB have been conducted within secondary education, but they do not include secondary vocational education (Wubbels & Brekelmans, 2005; Wubbels et al., 2006). In this study we focus specifically on pre-vocational and vocational education.

### 2.3. Teacher beliefs: motives, knowledge domains and self-efficacy

Besides interpersonal teacher *behavior* we expect that teacher *beliefs* could also be related to student engagement. Therefore, this study also aims to identify the influence on engagement of teachers' motives for being a teacher, their beliefs about the specific teacher knowledge domains, and their self-efficacy for teaching.

Most teachers have an altruistic motive for choosing to become a teacher (Pop & Turner, 2009), although additional motives for choosing a teaching career have also been identified (Richardson & Watt, 2005, 2006; Yong, 1995):

- Teachers are *altruistically* motivated when they want to be a teacher to be able to contribute to the development of young people and society as a whole.
- Teachers are *intrinsically* motivated when they choose to be a teacher because they have a passion for teaching and seek opportunities to grow professionally.
- Teachers are *extrinsically* motivated when they choose to be a teacher based on external factors, such as salary, professional security, and status.

At the start of their careers, novice teachers are typically highly motivated to become a teacher. However, this initial high motivation could be affected by their later experiences during their careers, both within and outside of school (Kelchtermans, 1993). In this study, we address motives for being a teacher, rather than for becoming a teacher, and investigate whether there is a relation between these three types of teacher motives and levels of student engagement.

Another important area of teacher beliefs is their beliefs about what teachers should know. It is likely that particular teachers may consider specific domains of teacher knowledge to be more important than others. Three different types of teacher knowledge have been distinguished: subject-matter knowledge, or knowledge of the content and educational goals; pedagogical knowledge or knowledge about student development and about teaching; and didactic knowledge, or knowledge about how to present teaching materials/lessons (Beijaard, Verloop, & Vermunt, 2000; Borko, 2004; Bransford, Darling-Hammond, & LePage, 2005; Darling-Hammond, 2006; Verloop, van Driel, & Meijer, 2001). According to Beijaard et al. (2000) these three knowledge domains help to shape a teacher's identity. Teachers' classroom practice will be affected by what they know and by their view of the importance of that knowledge. Their students then experience that classroom practice. In this study we are interested in whether teacher attitudes toward the specific teacher knowledge domains relate to the reported engagement of their students. Thus, we are asking about the extent to which beliefs about teacher knowledge could be related to student engagement.

Whether teachers enact specific behaviors or apply specific knowledge also depends on their feelings of self-efficacy. Self-efficacy stems from the conviction someone has about his or her own capabilities to reach a certain goal. If a person thinks that he or she is not capable of influencing a certain outcome, he or she will probably not invest effort in reaching that outcome (Bandura, 1997; Knoblauch & Woolfolk Hoy, 2008; Tschannen-Moran & Woolfolk Hoy, 2001, 2007; Woolfolk Hoy & Burke Spero, 2005; Yeo, Ang, & Chong, 2008). The constructs of general self-efficacy as well as self-efficacy for teaching have been tested in multiple countries, and proved to be universal (Klassen et al., 2009; Schulz, Doña, Sud, & Schwarzer, 2002).

Many studies have shown the importance of teachers' self-efficacy beliefs in relation to other education-related attributes and outcomes. For example, self-efficacy has been associated with teachers' attitudes toward instructional innovations (Guskey, 1988) and their instructional management (Martin, Sass, & Schmitt, 2012), and with student achievement (Caprara, Barbaranelli, Steca, & Malone, 2006) and students' expectancies for success and perceptions of performance and difficulty (Midgley, Feldlaufer, & Eccles, 1989). Based on those studies, we expect that teachers' self-efficacy beliefs also matter for student engagement. We expect teachers who feel more self-efficacious to have more engaged students.

### 2.4. Research question

From the literature, we know that perceived interpersonal teacher behavior is related to cognitive and affective student outcomes. We would like to test whether there is also a relation between perceived interpersonal teacher behavior and student engagement, especially in the context of pre-vocational and vocational education. Furthermore, we would like to investigate whether student engagement can be explained by specific teacher beliefs. Therefore, we will examine the extent to which teacher beliefs (motives for being a teacher, attitudes toward teacher knowledge domains, and self-efficacy beliefs) and perceived interpersonal teacher behavior are able to predict self-reported student engagement in the form of behavioral, emotional, and cognitive engagement.

The recommendation has been made that educational research should pay greater attention to teacher beliefs (Pajares, 1992). In this study we investigate whether knowing about certain teacher beliefs can help us understand student engagement, or whether we also need to know about teacher behaviors in order to be able to

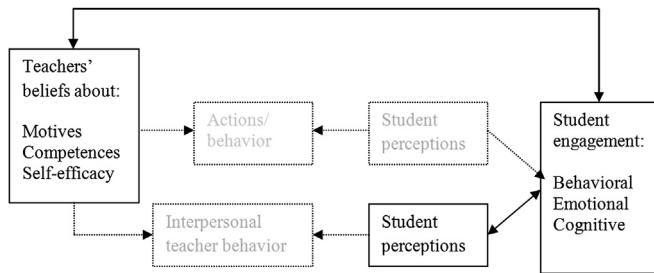


Fig. 2. Model of study.

explain student engagement. Fig. 1 represents the relations modeled in the study, with a distinction between interpersonal behavior as experienced by students and the set of specific teacher beliefs. Because interpersonal teacher behavior is what students directly experience, we expect perceived interpersonal teacher behavior to be the strongest predictor of student engagement.

Based on these considerations, we formulated the following research question: *To what extent do teacher beliefs and perceived teacher interpersonal behavior matter in relation to behavioral, emotional and cognitive student engagement in pre-vocational and vocational education?* The teacher beliefs are limited to teacher motives for being a teacher, their values for teacher knowledge domains and their self-efficacy for teaching.

In this study we are testing the relations indicated by the black boxes and solid lines in Fig. 2.

### 3. Method

Questionnaires were administered to measure the independent variables of teachers' motives, their attitudes toward teacher knowledge domains, self-efficacy, and perceived interpersonal teacher behavior, and the dependent variables of the three types of student engagement, in order to enable us to identify the relations between these independent and dependent variables.

#### 3.1. Respondents

Teachers from schools in The Netherlands providing pre-vocational and vocational education were invited to participate in the survey. In The Netherlands, after primary education, students can go on to either general lower secondary education or pre-vocational education. The majority (55%) of students in secondary education attend pre-vocational education (Dutch Ministry of Education, Culture and Science, 2011b). The pre-vocational track takes four years, and most students start at the age of 12 and finish at the age of 16, at which point they can move on to secondary vocational education. Programs in economics, health and social care, engineering and agriculture are offered at all levels of secondary vocational education, and students completing the highest level of secondary vocational education can move on to an applied university.

We contacted teams in our own school and schools in our network with the request to respond to our questionnaire. Because schools get many requests to participate in surveys and other studies, we asked schools to participate with a limited number of five to ten teachers. The request was sent to 52 schools (26 schools for pre-vocational education and 26 schools for vocational education). We received a positive answer from fifteen schools for vocational education and eight schools for pre-vocational education. The lower response rate from schools for pre-vocational education could be because we have better contacts in vocational

education, as we are working at an institute for vocational education. We also visited some schools of vocational education to explain our request.

The schools that reacted positively received an invitation for their participating teachers. In this invitation, we asked teachers to participate together with at least ten of their students. There were about 330 teachers invited, 200 of whom began filling in the questionnaire; 195 teachers completed the entire questionnaire. Students from 178 teachers responded to the student questionnaire. The number of participating teachers per school ranged from 1 to 40.

A total of 118 male teachers and 82 female teachers decided to participate. Their average age was 44.7 years old ( $SD = 10.64$ ). In 2010, the average age of teachers teaching in vocational education in the Netherlands was about 49, and about 45% of them were female (Dutch Ministry of Education, Culture and Sciences, 2011b). The participating teachers had on average 14.61 years of working experience, ranging from less than a year to forty years of experience. The majority (130 teachers) were working in vocational education, while 59 teachers taught students in pre-vocational education. The results showed that 87.6% of the teachers were mentoring a group of students.

Many of the teachers also asked their students to participate. A total of 2288 students responded to the student questionnaire. Their average age was 17.10 years old ( $SD = 3.26$ ). The majority (54.5%) of the participants were male. The student respondents included 824 pre-vocational students, 1459 students registered at an institution for vocational education, and five students identified as 'other'. The majority of the students (75.9%) were asked to respond to the questionnaire by their mentor teacher. The mentor teacher in the Netherlands provide additional support in the learning process, but also supports career orientation. If a student experiences problems at school, the mentor is the first one to be contacted.

#### 3.2. Instruments and data collection

To be able to measure students' engagement and their perceptions of teacher interpersonal behavior, as well as teacher motives, attitudes toward teacher knowledge domains and self-efficacy, two digital questionnaires were developed. We developed a student questionnaire to measure student engagement and interpersonal teacher behavior as observed by the students. A teacher questionnaire was developed to measure teachers' motives for being a teacher, the knowledge domains they value and their self-efficacy beliefs. Both questionnaires started with some questions about background variables such as gender, age, school level, but also about the subject taught by a specific teacher or whether the teacher was also the mentor of the group.

Teachers and students often differ in their perceptions of the learning environment (Fraser, 1998). We expect that students' perceptions of interpersonal teacher behavior are likely to be more closely related to students' engagement than teachers' perceptions of their own behavior would be. In this study we are interested in what influences student engagement. Therefore we chose to measure students' perceptions of interpersonal teacher behavior in order to capture the influence of teacher behaviors on student engagement. The other teacher attributes we are interested in are teacher beliefs. These beliefs could be compared with parts of the *professional self* and the *subjective educational theory* (Kelchtermans, 1993, 2009). Teachers themselves know best what beliefs they have. Therefore we decided to use teacher self-perceptions in measuring their motives, attitudes about knowledge domains, and self-efficacy.

To measure interpersonal teacher behavior, we used the 32-item version of the Questionnaire on Teacher Interaction (Wubbels et al., 1985). The response format we used was a five-point Likert scale ranging from 1 (*never*) to 5 (*always*). The reliability of this questionnaire has been proven to be satisfactory in several studies. The internal consistencies are lowest for teachers' self-perceptions, but almost never lower than 0.65 (Wubbels et al., 2006).

Measuring student engagement was more difficult, because there is no widely accepted questionnaire measuring this multidimensional construct. We based our final instrument on the questionnaires used by Appleton, Christenson, Kim, and Reschly (2006), Archambault et al. (2009) and Reschly and Christenson (2006). In these questionnaires, engagement is measured at the school level. However, in this study we are trying to link engagement to teacher characteristics, so we decided to reformulate the statements to be able to connect the engagement with a specific teacher. This meant we asked students to report about their engagement on the classroom level. We distinguished behavioral engagement (6 items), emotional engagement (11 items) and cognitive engagement (8 items). Emotional engagement consisted of six items addressing the subject taught and five items addressing the teacher. We used these items to form two scales for emotional engagement: emotional engagement – teacher and emotional engagement – subject. The response format for engagement items was a four-point Likert scale ranging from 1 (*totally disagree*) to 4 (*fully agree*).

We based our questionnaire measuring teacher motives on the one used by Hargreaves et al. (2007). They used three scales of four items each to measure teacher motives in their study. The response format was a four-point Likert scale ranging from *totally disagree* (1) to *fully agree* (4). We used the questionnaire developed by Beijaard et al. (2000) for the measurement of attitudes toward teacher knowledge domains (17 items). The response format here was also a four-point Likert scale ranging from 1 (*totally disagree*) to 4 (*fully agree*). Finally, we based our questionnaire measuring teaching self-efficacy on Bandura (2006). Self-efficacy (14 items) was measured using a ten-point Likert scale response format, ranging from 1 (*no influence at all*) to 10 (*could be totally influenced*).

We conducted a factor analysis and tested the reliability of the different scales during a pilot study with 92 teachers and 98 students. Based on the outcomes of the factor analysis, we decided not to include items about future aspirations and goals (cognitive engagement) that had been used in the study by Appleton et al. (2006). The reliabilities of the different scales from the pilot are reported in Appendix 1. After the pilot phase we also changed two items in the scale for behavioral engagement.

Data collection for the final study took place from May 2010 till March 2011. To be able to link the teacher questionnaire to the student questionnaire, we asked teachers and students to fill in a code at the start of the questionnaire. To guarantee anonymity each teacher created his or her own code; that teacher's students used the same code. Teachers could not open the student questionnaires.

### 3.3. Analyses

After final data collection was complete, we tested the reliability of our measures once again, using Guttman's lambda-2. We chose to calculate Guttman's lambda because this statistic yields a better estimation of reliability than Cronbach's alpha (Sijtsma, 2009). The critical values for Cronbach's alpha also apply to Guttman's lambda. The dimension scores for the QTI were calculated by transforming the scores to proportional scores, and adding or subtracting scores based on the position of the items on the circumplex (Mainhard, Brekelmans, Wubbels, & den Brok, 2008; Wubbels et al., 2006). The overall scores on the dimensions of the QTI can be positive or negative. Table 1 gives Guttman's lambda for the scales from the

**Table 1**  
Scales from the teacher questionnaire.

Scale	N	N items	$\lambda$	Example
Motive – altruistic	195	4	0.74	To give students the best possible start in life
Motive – extrinsic	195	4	0.73	The earning potential of the job
Motive – intrinsic	195	4	0.68	Having a challenging job
Pedagogical knowledge	195	6	0.79	As a teacher, I serve as a model for the way students mix with each other
Didactic knowledge	195	6	0.71	In my lessons, I pay a lot of attention to varied learning activities
Subject matter knowledge	195	5 <sup>a</sup>	0.74	I find it important to discuss subject-matter with colleagues
Self-efficacy	180	14	0.90	How much can you do to keep students on task on difficult assignments

<sup>a</sup> The item 'I choose to become a teacher based on the subject I studied.' was omitted to improve Guttman's Lambda.

teacher questionnaire. Table 2 presents the same information for the scales from the student questionnaire. Although three scales are just below 0.70, we decided to continue the analyses with these scales. For research purposes, reliability as low as 0.60 is still acceptable (Suhr & Shay, 2009). The lower reliability of two of the three scales (behavioral engagement and intrinsic motives) could be explained by the small number of items in the scale. The influence dimension, the third scale with lower reliability, is essential when measuring interpersonal behavior and other studies have shown the validity of this construct (Wubbels et al., 2006).

To determine the relations among the different variables we conducted multilevel analyses. Our aim was to learn which teacher characteristics matter for student engagement measured at the classroom level. We assumed that students taught by the same teacher would score more similarly on engagement as measured at the classroom level than students taught by different teachers. We tested this assumption by replacing the fixed intercept with a random intercept. A group consisted of students taught by the same teacher. All intercepts showed significant variance across groups:

- Behavioral engagement  $\text{var}(\mu_{0j}) = 0.02$ ,  $\chi^2(1) = 55.14$ ,  $p < .01$ ; the group explains 9.69% of the variance in behavioral engagement.
- Emotional engagement directed at the teacher  $\text{var}(\mu_{0j}) = 0.06$ ,  $\chi^2(1) = 244.80$ ,  $p < .01$ ; the group explains 19.70% of the variance in emotional engagement–teacher.

**Table 2**  
Scales from the student questionnaire.

Scale	N	N items	$\lambda$	Example
Behavioral engagement	2284	6	0.68	I am often late for this class
Emotional engagement – teacher	2275	6	0.92	This teacher treats me fairly
Emotional engagement – subject	2275	5	0.86	I like this class
Cognitive engagement	2270	8	0.85	When I do well at school it is because I work hard
Influence	2288	32	0.68	This teacher has authority
Proximity	2288	32	0.92	This teacher trusts students

- Emotional engagement directed at the subject taught  $\text{var}(\mu_{0j}) = 0.08$ ,  $\chi^2(1) = 292.06$ ,  $p < .01$ ; the group explains 22.22% of the variance in emotional engagement–subject taught.
- Cognitive engagement  $\text{var}(\mu_{0j}) = 0.03$ ,  $\chi^2(1) = 133.66$ ,  $p < .01$ ; the group explains 13.64% of the variance in cognitive engagement.

Based on these results, we concluded that there are differences among the groups of students; we therefore decided to conduct a multilevel analysis.

In building the models we created the following blocks of independent variables: student background variables, teacher background variables, the significant teacher beliefs and finally, perceived interpersonal teacher behavior. We tested whether the amount of variance explained by the model for each type of engagement increased from adding each block of variables, based on the  $-2 \log$  likelihood. We tested a model for each of the three types of engagement. We added the two blocks of background variables to every model. For the third block we first tested which beliefs significantly contributed to the model, then the significant beliefs were all added together. Finally we added both dimensions of perceived interpersonal teacher behavior. We expected the relation between perceived interpersonal behavior and engagement to be stronger than the relation between the other variables and engagement. To be able to detect the contribution of teacher beliefs to engagement, we decided to add beliefs first, before adding both dimensions of interpersonal teacher behavior.

**4. Results**

We considered three types of self-reported student engagement as our dependent variables: behavioral engagement, emotional engagement and cognitive engagement. Furthermore, we subdivided emotional engagement into engagement directed at the subject taught and directed at the teacher. We conducted four separate multilevel analyses to investigate which teacher characteristics predict the different types of student engagement.

*4.1. Descriptives*

The teacher results (see Table 3) show that teachers most often tend to report an altruistic motive for being a teacher ( $M = 3.48$ ,  $SD = 0.49$ ). Pedagogical knowledge has the highest importance rating from teachers ( $M = 3.52$ ,  $SD = 0.43$ ) and didactic knowledge is seen as least important ( $M = 3.00$ ,  $SD = 0.43$ ).

The student results (see Table 3) show the lowest level of engagement for emotional engagement with regard to the subject taught ( $M = 2.91$ ,  $SD = 0.60$ ). Furthermore, students report experiencing more proximity ( $M = 0.47$ ,  $SD = 0.34$ ) from their teachers than influence ( $M = 0.21$ ,  $SD = 0.18$ ).

*4.2. Behavioral engagement*

We tested whether teacher beliefs and perceived interpersonal behavior are related to behavioral student engagement. Table 4 shows the outcomes. Besides the age of the student (negligible contribution), only the two dimensions of interpersonal teacher behavior are significant predictors in the final model, with influence being slightly stronger than proximity. In our zero-model without any variables, the covariance is 0.179 at the individual level and 0.017 at the group level. In our final model the covariance is 0.158 at the individual level and 0.012 at the group level. This means that the final model explains about

**Table 3**  
Descriptives from the teacher and student questionnaires.

Scale – teachers	N	M	SD	Scale – students	N	M	SD
Motive – altruistic	195	3.48	0.49	Behavioral engagement	2284	3.16	0.44
Motive – extrinsic	195	1.92	0.67	Emotional engagement – teacher	2275	3.17	0.57
Motive – intrinsic	195	2.81	0.64	Emotional engagement – subject	2275	2.91	0.60
Pedagogical knowledge	195	3.52	0.43	Cognitive engagement	2270	2.96	0.47
Didactic knowledge	195	3.00	0.47	Influence	2288	0.21	0.18
Subject matter knowledge	195	3.14	0.51	Proximity	2288	0.47	0.34
Self-efficacy	180	7.24	0.96				

Note. We used a five-point Likert scale for all scales except the self-efficacy scale (ten-point Likert scale) and the dimension scores for interpersonal teacher behavior (scores were transformed to a score between 0 and 1 and yield a negative or positive score on both dimensions).

13% of the total variance, 12% at the individual level and 29% at the group level.

*4.3. Emotional engagement directed at the teacher*

We similarly tested whether teacher beliefs and perceived interpersonal behavior are related to emotional engagement directed at the teacher. The results in Table 5 for model 1 show that age and gender of the students do not contribute to their emotional engagement directed at the teacher. In models 2 and 3 we found that being the mentor, importance of subject matter knowledge and level of self-efficacy predict emotional engagement directed at the teacher, but these variables do not make an independent contribution when both dimensions of perceived interpersonal teacher behavior are added in model 4. Here, proximity appears to make a much larger contribution than influence. The final model explains 47.27% of the variance in emotional engagement related to the teacher. This model explains 37.04% of the variance at the individual level and 93.33% of the variance at the group level. This percentage seems improbably high, but the covariance on the group level is only 0.06 in our zero-model and diminished to just 0.004 in model 4. In our zero-model without any variables, the covariance at the individual level is 0.27, while in model 4 the covariance at the individual level is 0.17.

**Table 4**  
Multilevel analysis of behavioral engagement.

	Model 1		Model 2		Model 3	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Intercept	2.92	0.07	2.93	0.09	2.65	0.09
Student-level						
Student gender	–0.00	0.02	0.02	0.02	–0.00	0.02
Student age	0.01***	0.00	0.01**	0.00	0.01***	0.00
Group-level						
Mentor teacher			0.03	0.03	0.00	0.03
Subject T/P <sup>a</sup>			0.03	0.03	0.02	0.03
Teacher gender			–0.03	0.03	–0.01	0.03
Teacher age			–0.00	0.00	0.00	0.00
Interpersonal behavior						
Proximity					0.31***	0.03
Influence					0.39***	0.06
Number of parameters	5 ( $df = 2$ )		9		11	
$\chi^2$	22.50***		498.58***		154.70***	

Note. \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$ .

<sup>a</sup> A teacher teaching a more theoretical subject (0) or a more practical subject (1).

**Table 5**  
Multilevel analysis of emotional engagement directed at the Teacher.

	Model 1		Model 2		Model 3		Model 4	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Intercept	3.03	0.09	3.23	0.13	2.83	0.29	2.54	0.16
Student-level								
Student gender	0.03	0.03	0.04	0.03	0.04	0.03	−0.02	0.02
Student age	0.01	0.00	0.00	0.01	0.00	0.01	−0.00	0.00
Group-level								
Mentor teacher			0.10**	0.04	0.10**	0.04	0.02	0.02
Subject T/P <sup>a</sup>			0.04	0.05	0.06	0.05	−0.00	0.02
Teacher gender			−0.02	0.05	−0.01	0.05	0.04	0.02
Teacher age			−0.00	0.00	0.00	0.00	0.00	0.00
Teacher beliefs								
Subject matter know					−0.013**	0.05	−0.02	0.02
Self-efficacy					0.09**	0.03	0.01	0.01
Interpersonal behavior								
Proximity							1.09***	0.03
Influence							0.44***	0.06
Number of parameters	5 ( <i>df</i> = 2)		9		11		13	
$\chi^2$	7.22*		652.31***		13.71**		917.98***	

Note. \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$ .

<sup>a</sup> A teacher teaching a more theoretical subject (0) or a more practical subject (1).

#### 4.4. Emotional engagement directed at subject taught

The multilevel analysis for emotional engagement directed at the subject taught (see Table 6) shows that there are five variables that contribute to the final model: the age of the student, teacher gender, proximity, influence and teachers' extrinsic motives for being a teacher. Gender is a dummy variable, where 0 = male and 1 = female, so the negative coefficient for gender means that students taught by women score lower on emotional engagement directed at the subject. Having a teacher who expresses an extrinsic motive for being a teacher, retained in the final model, contributes negatively as well. Positive contributions are made by both dimensions of perceived interpersonal teacher behavior and students' age (negligible). The scores on proximity contribute most to the model.

In our zero-model without any variables, the covariance at the individual level is 0.29 and at the group level it is 0.08. In our final model the covariance is 0.22 at the individual level and 0.02 at the group level. This means that the model explains about 35% of the total variance in emotional engagement directed at the

subject taught, 24% at the individual level and 75% at the group level.

#### 4.5. Cognitive engagement

The multilevel analysis for cognitive engagement shows that the age of the student (negligible contribution) and both dimensions of perceived interpersonal teacher behavior contribute significantly to the final model (see Table 7). Both dimensions behave similarly. Before adding the dimensions of perceived interpersonal teacher behavior, we also found a significant negative contribution from teachers' extrinsic motives and a positive contribution from self-efficacy.

In our zero-model without any variables, the covariance is 0.19 at the individual level and 0.03 at the group level. In our final model the covariance at the individual level is 0.17 and at the group level it is 0.02. Therefore, the final model (Table 7) explains about 14% of the total variance, 11% of the variance at the individual level and about 33% of the variance at the group level.

**Table 6**  
Multilevel analysis of emotional engagement directed at the subject taught.

	Model 1		Model 2		Model 3		Model 4	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Intercept	2.62	0.10	2.82	0.14	2.24	0.29	2.06	0.22
Student-level								
Student gender	0.01	0.03	0.04	0.03	0.04	0.03	−0.01	0.03
Student age	0.01**	0.00	0.01	0.01	0.01*	0.01	0.01*	0.00
Group-level								
Mentor teacher			0.11**	0.04	0.10**	0.04	0.03	0.03
Subject T/P <sup>a</sup>			0.08	0.05	0.09	0.05	0.05	0.04
Teacher gender			−0.14*	0.05	−0.14**	0.05	−0.10*	0.03
Teacher age			−0.00	0.00	−0.00	0.00	0.00	0.00
Beliefs								
Extrinsic motive					−0.11**	0.04	−0.06*	0.03
Self-efficacy					0.10**	0.03	0.04	0.02
Interpersonal behavior								
Proximity							0.86***	0.04
Influence							0.35***	0.07
Number of parameters	5 ( <i>df</i> = 2)		9		11		13	
$\chi^2$	14.75***		740.28***		17.46***		478.24***	

Note. \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$ .

<sup>a</sup> A teacher teaching a more theoretical subject (0) or a more practical subject (1).

**Table 7**  
Multilevel analysis of cognitive engagement.

	Model 1		Model 2		Model 3		Model 4	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Intercept	2.57	0.07	2.59	0.10	2.32	0.21	2.27	0.21
Student-level								
Student gender	0.03	0.02	0.04	0.02	0.05	0.02	0.02	0.02
Student age	0.02***	0.00	0.02***	0.00	0.02***	0.00	0.02***	0.00
Group-level								
Mentor teacher			0.02	0.03	0.01	0.03	−0.01	0.03
Subject T/P <sup>a</sup>			0.02	0.04			0.00	0.03
Teacher gender			−0.06	0.04	−0.06	0.03	−0.04	0.03
Teacher age			0.00	0.00	0.00	0.00	0.00	0.00
Beliefs								
Extrinsic motive					−0.07**	0.03	−0.05	0.02
Self-efficacy					0.04*	0.02	0.01	0.02
Interpersonal behavior								
Proximity							0.42***	0.04
Influence							0.36***	0.06
Number of parameters	5 ( <i>df</i> = 2)		9		11		13	
$\chi^2$	33.41***		468.11***		10.22*		195.78***	

Note. \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$ .

<sup>a</sup> A teacher teaching a more theoretical subject (0) or a more practical subject (1).

## 5. Discussion

### 5.1. Summary

The results show that perceived interpersonal teacher behavior is by far the most important predictor of all types of student engagement in the different models. As shown in the model used in the current study (Fig. 2), teacher beliefs (motives, attitudes toward teacher knowledge domains and self-efficacy) are assumed to have a more indirect relation with student engagement. We were also interested in what specific teacher beliefs could tell us about student engagement. We assumed that based on their beliefs, teachers will show specific interpersonal behavior or employ specific actions in the classroom and could thereby influence student engagement.

Besides the influence of interpersonal teacher behavior, we also found a negative relation between higher teacher scores on extrinsic motives and students' emotional engagement directed at the subject taught. Furthermore, female teachers are less able to establish emotional engagement directed at their subject matter than their male colleagues are.

Without adding teachers' interpersonal behavior, we found that being the mentor of the student, valuing of subject-matter knowledge and teacher self-efficacy beliefs matter in fostering engagement directed at the teacher. Furthermore, teacher self-efficacy and extrinsic motives for being a teacher also explain variance in students' cognitive engagement. Thus, we found a weak relation between beliefs and student engagement, and can conclude that student engagement is better captured by interpersonal teacher behavior.

Finally, we note that there is a significant but negligible positive relation between student's age and engagement for all forms of engagement except emotional engagement directed at the teacher.

### 5.2. Interpersonal teacher behavior and the differences between behavioral, emotional and cognitive engagement

The results show that higher scores on both dimensions of interpersonal teacher behavior positively contribute to student engagement in pre-vocational and vocational education. These results are in accordance with results from studies conducted in general secondary education. Those studies have shown a relation between higher scores on both dimensions and cognitive and

affective learning outcomes (e.g. den Brok et al., 2004, 2006; van Petegem et al., 2008; Wubbels et al., 2006).

When comparing the different types of engagement, we found the least variance and lowest variance explained for behavioral engagement. Besides the differences in explained variance, we also found differences in the dimension of interpersonal teacher behavior that contributes more to each type of engagement. Influence contributes more to behavioral engagement, whereas proximity contributes much more to both types of emotional engagement than influence. Proximity also carries slightly more weight than influence in relation to cognitive engagement, but the difference between their contributions is only 0.06.

The outcomes for behavioral engagement differ from those for the other types of engagement. We found differences in the variance explained and in the contribution of the two dimensions of interpersonal teacher behavior. Various explanations for this difference can be provided.

One possible explanation could involve the scale we used to measure behavioral engagement. This scale was among the less reliable of all the scales used. Is it possible that some students gave more socially desirable answers about this type of student engagement? The items are about overt behavior and often about misbehavior such as skipping classes or being late. In most schools, students are punished when they do this. Although it was emphasized that filling in the questionnaire happened anonymously, students could be reluctant to admit that they do not always act as expected. As a student, saying that you do not like a class could feel safer than saying you skipped classes during the past four weeks.

Another explanation could lie in possible relations among the three types of engagement. We measured them separately, but to what extent are these different types of engagement related to one another? Archambault et al. (2009) showed that emotional engagement predicted both behavioral and cognitive engagement. In their model, behavioral engagement was ultimately related to dropout.

A third explanation could be that teachers influence feelings of emotional and cognitive engagement, but that there are other factors influencing behavioral engagement. For example, risk factors associated with dropout could also influence behavioral engagement, such as problems at home (Battin-Pearson et al., 2000; Jimerson, Egeland, Sroufe, & Carlson, 2000; Walker &



Sprague, 1999), peers (Macdonald & Marsh, 2004; Rumberger, 1995), and drug use or criminal activities (Battin-Pearson et al., 2000), which could make it difficult for a student to come to school (on time) or to concentrate on the assignments given. Elffers (2011) concluded that behavioral engagement does not change very much when students change schools or type of studies, but that emotional engagement differs between school contexts. This conclusion could suggest that the context influences emotional engagement but not behavioral engagement. This could imply that teachers should focus on fostering emotional and cognitive engagement.

We found the largest proportions of explained variance for both categories of self-reported emotional engagement. For emotional engagement aimed at the teacher this is probably not very remarkable. Interpersonal teacher behavior is the most important predictor; this behavior evokes emotions from students, most immediately students' feelings toward their teacher. Interpersonal teacher behavior is also an important factor in fostering engagement with a specific subject. den Brok et al. (2005) found earlier that higher scores on both dimensions of perceived interpersonal teacher behavior positively influenced students' attitudes toward science education. In our study we found that these findings apply for other subjects and classes as well.

The results show that it is important to have high scores on both dimensions of interpersonal teacher behavior. Based on our findings, we conclude that proximity is more important for engagement (especially emotional engagement) than influence. Therefore helping/friendly behavior supported by leadership would be the best combination to foster cognitive and emotional student engagement as a teacher (see Fig. 1). Thijs and Verkuyten (2009) examined the influence of authoritarian, authoritative and permissive teaching styles on situational engagement. They found the highest levels of reported intended academic effort with an authoritative teaching style and the highest levels of reported enjoyment with an authoritative or permissive style. Based on their description, the authoritarian style could be compared with the repressive style of the MITB, the authoritative with the tolerant/authoritative style of the MITB and the permissive style with the tolerant style. The authoritative, tolerant/authoritative and tolerant teaching styles all score high on proximity. Teachers with a tolerant authoritative style show the most cooperation. The tolerant/authoritative and the authoritative teaching style both score high on influence. The tolerant teaching style scores lower on influence. Proximity is very important in relation to emotional and cognitive engagement, but influence contributes to cognitive engagement as well. Based on our findings, we would therefore promote an authoritative or tolerant/authoritative style. This is in accordance with previous studies in which they promote an authoritative style in relation to cognitive and affective student outcomes (Thijs & Verkuyten, 2009; Wubbels & Brekelmans, 2005; Wubbels et al., 2006).

### 5.3. Beliefs in action?

We have already concluded that interpersonal teacher behavior matters when fostering student engagement. This behavior is part of students' experiences during a particular class. We did not measure other experiences, other perceptions of students related to the learning environment; instead, we measured teacher motives, their attitudes toward teacher knowledge domains and their self-efficacy beliefs. We expected teacher beliefs to be at least to some degree consistent with their actions in the classroom. Thus, these beliefs should ultimately influence student engagement.

Without knowing students' perceptions of the teacher's interpersonal behavior, we would have found certain types of

engagement to be positively related to teacher self-efficacy and importance of subject-matter knowledge, and negatively related to extrinsic motives. In a previous study in which we assessed only teachers' perceptions, we found relations between teachers' valuing of didactic and pedagogical knowledge and teachers' perceptions of students' emotional and behavioral engagement. Teachers placing higher values on those two knowledge domains perceived their students as more engaged (van Uden, Ritzen, & Pieters, 2003).

In this study, we measured whether beliefs directly related to self-reported student engagement; we did not assess the kind of learning environment that was created, other than students' perceptions of interpersonal teacher behavior. Therefore we do not know whether those teacher beliefs resulted in the creation of specific types of learning environments. The theory of planned behavior (Ajzen, 1991) suggests that behavioral intentions can be predicted by attitudes toward the behavior, subjective norms about the behavior (the beliefs one has about the norms or expectations of significant others) and perceived behavioral control. In our study we measured what is most likely one aspect of the final desired behavior (perceptions of interpersonal teacher behavior) and some beliefs. We should conduct further research to investigate which other behaviors are necessary to promote engagement and are therefore desirable when creating an engaging learning environment. We could ask students about other aspects of the learning environment in relation to their engagement, such as peers, or didactic aspects such as differentiation and the use of specific materials and assignments (Fraser, 1998).

Furthermore, it would be interesting to investigate the extent to which teachers feel confident to perform these different behaviors, as well as examining which attitudes toward the behavior and beliefs about the subjective norm are related to the desired behaviors. This information could help to create a specific profile and observation formats for teachers teaching in pre-vocational and vocational education.

### 5.4. Female teachers and emotional engagement aimed at the subject taught

We were surprised by the finding of the influence of gender on emotional engagement aimed at the subject taught. Most studies on the influence of the teacher's gender have not shown significant differences between male and female teachers with regard to students' achievement (Carrington, Tymms & Merrell, 2008; Feldman, 1992) or students' appreciation of their teachers (Feldman, 1992; Lahelma, 2000; Skelton et al., 2009). Feldman's review (1992) found only three studies in which interaction effects between teacher and student gender were significant. Sometimes students say that they prefer a male or female teacher, but if asked why, they mention skills that are not gender specific. It is competence that is most important (Lahelma, 2000; Skelton et al., 2009). Dee (2007) found that female and male teachers have different effects on student outcomes. Female teachers have a positive effect on girls' achievement and they have more positive perceptions of girls' behavior. Dee's results were more negative for boys. For example, boys look forward less to subjects taught by a female teacher. On the other hand, Carrington et al. (2008) found that students taught by female teachers showed more positive attitudes toward school. They did not find any differences between male and female teachers when measuring students' attitudes toward a specific subject, as we did in our study. It is difficult to explain our finding based on the literature about the influence of teachers' gender on student outcomes. Because of the somewhat mixed finding about the effect of gender on student outcomes, it would be good to

replicate this study to test whether this outcome also applies in other samples, and if that is the case, to explore this outcome in more depth.

##### 5.5. No contribution of age to engagement

We found a significant but negligible positive contribution (0.01) of age in explaining variance in engagement. This would mean that age essentially does not matter in relation to engagement for the students in our sample, and this is remarkable. In the literature, engagement has been found to decrease during the school years, especially during high school (Fredricks et al., 2004; Klem & Connell, 2004). A possible explanation for this finding could be the context of vocational education. The majority of the students in our study (63.77%) are from vocational education; they are also the older students in our study. In vocational education, students have chosen a course of study that prepares them for a specific job. In the Netherlands, we teach those students in authentic vocational settings related to the profession. This could contribute to higher levels of engagement. It is clear to students what the purpose of their study is, and it is probably even more clear in vocational education that the lessons and activities are necessary for their future profession. This could elicit positive feelings about a class.

Another explanation could be that puberty influences engagement. With an average age of 17.10, we also have a large group of students in this sample who have started to leave the phase of puberty. Recently, much research attention has been paid to the development of the brain during adolescence and corresponding changes in cognitive processes and social behavior. Cognitive control abilities improve during adolescence and also influence students' behavioral control (Crone & Dahl, 2012). These developmental characteristics could explain the almost neutral effect of age for cognitive and behavioral engagement. During adolescence students also undergo social-affective changes (Crone & Dahl, 2012) that could explain the almost neutral effect of age for emotional engagement in this study.

##### 5.6. Practical implications

We have some recommendations for improving student engagement based on our findings. First of all, it is important for teachers to invest in improving their interpersonal teacher behavior, so that students perceive them as more cooperative, but also dominant to a certain extent. Learning about the influence of interpersonal teacher behavior should be a very important part of teacher education, especially when preparing student–teachers to teach in pre-vocational and vocational education. Student–teachers should become aware of their interpersonal teacher behavior and of how it might be perceived by students. They should observe each other's behavior, and discuss it with each other. They should learn how different behaviors can influence different outcomes. For example, if student teachers would like to foster the emotional engagement of their students, they should invest more in behaving cooperatively, but if they would like to foster the behavioral engagement of their students they need to apply more dominant behaviors.

It would be good to enhance teachers' feelings of self-efficacy. Although the contribution of self-efficacy on engagement disappears when perceived interpersonal teacher behavior is taken into account, self-efficacy could influence interpersonal teacher behavior itself. As Ajzen (1991) wrote, perceived behavioral control could predict, among other things, behavior. If teachers are convinced that they themselves can foster student engagement, the chances increase that they will really try to improve their students'

engagement. It is not easy to improve self-efficacy. Self-efficacy could grow when someone experiences success. But it could also help to see someone else carrying out a certain activity with the desired outcome (Bandura, 1997). In addition, Bandura suggests that a pep-talk or good feedback could help to enhance self-efficacy. Experience and feedback could be combined using direct coaching. For example, a teacher is filmed during his or her class and he or she wears an earphone. A teacher–trainer watches this teacher's class in a separate room. This trainer gives immediate feedback or suggestions to the teacher wearing the earphone. The teacher could immediately apply these suggestions and experience what happens. If this 'intervention' has the desired effect, the self-efficacy of the teacher could grow. This intervention could influence not only the teacher's self-efficacy but also the (interpersonal) behavior of the teacher in the classroom.

A final recommendation addresses the application process for becoming a teacher. Our results show that it is difficult to predict the extent to which teachers are able to foster student engagement, based on their beliefs. In interviews we can ask teachers about their beliefs and experiences. Of course, a person is also judged on how he or she behaves and interacts during the interview. But if a school finds it important to hire teachers who are able to foster student engagement, an interview is not sufficient. It would be better to ask teachers to build a portfolio in which they include evidence about how students perceive their interpersonal teacher behavior. Some types of evidence could be videos of classes, students' evaluations, or students' answers on questionnaires about their interpersonal teacher behavior. Some teachers participating in this research asked for their students' responses on interpersonal teacher behavior in order to use that information for their portfolio. It would be even better to observe a teacher conducting some classes during the application phase. Interpersonal teacher behavior is relatively stable during a school year and difficult to change when teaching the same students (Mainhard, 2009).

##### 5.7. Limitations of the study and future research

We have already mentioned some limitations of this study and recommendations for future research in the domain of pre-vocational and vocational education. One limitation is that we measured teacher beliefs and student perceptions, but for different constructs. This makes it difficult to conclude which of these constructs best predicts self-reported student engagement. In future research, it would be better to ask teachers specifically about their beliefs regarding a good learning environment. Motives and beliefs about the knowledge domains could be included, but we could also ask, for example, what kinds of lessons contribute to an engaging learning environment. In the student questionnaire we could insert questions about how they perceive the learning environment and the classes taught by the specific teacher.

In conducting this study, we examined whether the different teacher beliefs and perceived interpersonal teacher behavior could explain self-reported student engagement. But could student engagement explain teacher behavior or teacher beliefs as well? That is, do teachers change their beliefs based on perceived student engagement or do they alter their interpersonal teacher behavior? In other words, we assumed that teacher beliefs influenced their behavior and finally student engagement, but it could also be the other way around, or even be bidirectional.

We did not find strong relations between teacher beliefs and students' self-reports of engagement. Does this mean that beliefs are not as important as Pajares (1992) suggested? Or are there other beliefs that could better explain variance in student engagement? We could only capture a limited set of beliefs in our study using an online survey. In future research we could explore whether there

are other teacher beliefs that could explain student engagement, such as perhaps more global beliefs about society or the development of youth. We asked about teacher knowledge domains, but we could ask about what a teacher would describe as a powerful learning environment or about the role of education in society.

A fourth limitation is that participation in this study was voluntary. The subject and goal of the questionnaire were explained in the invitation. It is possible that participating teachers were those who felt confident about fostering student engagement, which could influence the outcomes. Three contact persons for the participating teams reported that in their opinion, only their best-achieving teachers participated.

Another limitation is that we did not include school-level factors. Future research could include school-level factors such as teacher–student ratio, school size, student mobility and turnover and dropout rates. Furthermore, it would be interesting to include the influence of peers on student engagement.

A final limitation is the lower reliability of the scales measuring behavioral engagement and influence. This could have influenced the results. For future research, we would recommend examining how these scales could be improved for studies in pre-vocational and vocational education.

Finally, we recommend investigating what teachers actually do in their classrooms to foster student engagement and what they think they can do to promote student engagement. A more qualitative design could be used to pursue the results of this questionnaire in greater depth in the authentic settings in which teachers work.

## Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.tate.2013.08.005>.

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