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ABSTRACT

Given the importance of student engagement for students' current and future success, it is essential to explore how teachers can foster student engagement within lessons. This study relied on classroom observations to describe how teachers applied Self-Determination Theory (SDT) related (de)motivating teaching behaviours to foster students' engagement. Results from 120 observed lessons of 43 teachers indicated there were distinct relations between motivating teaching behaviours and student engagement. Most striking regarding the use of motivating teaching behaviours were the higher levels of relatedness support and guidance during activities in lessons in which students showed the highest levels of engagement. Conversely, in lessons where students were least engaged, teachers showed higher levels of chaotic teaching behaviours. Analyses of behaviours within lowly and highly engaging lessons showed that teachers in highly engaging lessons were observed to start with high levels of enthusiasm and after about ten to fifteen minutes focused on activating their students by offering room for experimenting and support while students worked on assignments. In contrast, teachers in lowly engaging lessons seemed to have a tendency to employ demotivating teaching behaviour at the start of the lesson. Implications and directions for future research are discussed.

It is the students who do the learning and if they resist or minimise their investment, attention or effort, not much will be accomplished (Good and Brophy 1987, 305).

Introduction

Research shows that student engagement constitutes a crucial precondition for optimal and deep-level learning (Barkoukis et al. 2014; Skinner 2016; Skinner, Zimmer-Gembeck, and Connell 1998). In addition, student engagement is associated with students'

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motivation to learn (Aelterman et al. 2012), and their persistence to complete school (Archambault et al. 2009; Rumberger and Lim 2008; Wang and Fredricks 2014). Moreover, students who are engaged at school show better long-term vocational opportunities (Abbott-Chapman et al. 2014).

As many teachers will recognise, students vary considerably in their engagement during lessons (Biggs 2012; Wang and Peck 2013). Some students are highly engaged (i.e. paying attention or putting in effort in assignments), while others do not engage in learning activities at all (Biggs 2012). Considering the importance of student engagement for students' current and future success, fostering student engagement is essential (Quin 2017) and how teachers interact with students on a day-to-day basis could be of influence (Jang, Kim, and Reeve 2016; Nguyen, Cannata, and Miller 2018; Quin 2017). Engaging students, however, while simultaneously teaching a subject and maintaining classroom management, is a complex and challenging task, to say the least.

In the current study, we relied on self-determination theory (SDT, Ryan and Deci 2000), to describe the classroom dynamics related to observed student engagement and (de)motivating teaching behaviours within lessons. Our main aim was to explore which specific motivating teaching behaviours were associated with high levels of student engagement and which demotivating teacher behaviours were associated with low levels of student engagement. Studying how these (de)motivating teaching behaviours are applied in the everyday practice of teaching could provide support for teachers and teacher educators to further explore and create ways to foster the engagement of students.

This study was specifically conducted among students in senior secondary vocational education (VET). There are indications that VET students start their first year with particularly low levels of motivation (Dubeau, Plante, and Frenay 2017; Vugteveen et al. 2016), and predominantly go to school because they feel pressured (Cents-Boonstra et al. 2018; Drechsel, Prenzel, and Kramer 2002). Within VET a significant number of students seem to experience challenges with their motivation for learning (Cents-Boonstra et al. 2018; Dubeau, Plante, and Frenay 2017; Elffers 2011; Vugteveen et al. 2016). Students' motivational challenges may be reflected in their actions in terms of low student engagement or even disengagement in lessons, demanding quite some motivational skills from their teachers.

Student engagement

Student engagement is defined and operationalised in many ways (Skinner 2016; Wigfield et al. 2015). Student engagement includes very generic behaviours like attending school or participating in different school activities. However, when observing student engagement within lessons, a more situational focus related to the specific engagement of students within a particular lesson is taken. In general, three aspects of engagement are distinguished: emotional; behavioural; and cognitive engagement.

Emotional engagement is defined as students' affective reactions to classroom activities, such as the expression of positive affect (i.e. students are enjoying the lessons; Van Uden, Ritzen, and Pieters 2014). Students are considered *behaviourally* engaged when they are involved in observable behaviour directly related to the learning process (Skinner 2016). Nguyen, Cannata, and Miller (2018) have divided behavioural engagement into passive behavioural engagement (e.g. paying attention in class) and active

behavioural engagement (e.g. asking questions, putting effort into assignments). Active behavioural engagement aligns with the concept of agentic engagement, which has been examined as a fourth dimension of student engagement in recent SDT-based work (Reeve and Tseng 2011). *Cognitively* engaged students understand the importance of their education (i.e. formulate their own learning goals; Van Uden, Ritzen, and Pieters 2014). Distinguishing these different aspects of student engagement does not mean, however, that they are independent or exclusive (Van Uden, Ritzen, and Pieters 2014). For students to enjoy the lesson (emotional engagement), they also have to pay attention (behavioural engagement).

Although student engagement is a multidimensional concept, observational studies to date have commonly used aggregated measures as indicators of student engagement (Jang, Reeve, and Deci 2010; Reeve et al. 2004; Van den Berghe et al. 2016). However, lumping different indicators of student engagement together, ignores the fact that student engagement is a multidimensional concept and may neglect important distinctions in the different indicators of student engagement (e.g. active versus passive). To develop a more detailed understanding of how students engage themselves within different lessons, the current study aimed at investigating a range of indicators of student engagement separately across a rich sample of lessons.

(De)motivating teaching behaviour

According to SDT, student engagement is fostered when teachers manage to support students' three basic psychological needs, while the thwarting of these needs is likely to result in student disengagement (Van den Berghe et al. 2016). Specifically, the need for autonomy refers to experiencing a sense of psychological freedom and volition to be yourself, the need for competence refers to feeling able to achieve success, and relatedness refers to experiencing a close bond.

Even though in the end it is the students themselves that (un)consciously decide to engage or disengage within lessons, teachers can certainly exert a significant influence on their students' engagement (Quin, Hemphill, and Heerde 2017; Shernoff et al. 2016). Within SDT, it is assumed that student engagement is fostered when teachers support students' autonomy, provide structure and are involved in warm interactions (relatedness support) with their students, and students thus experience greater need satisfaction (Jang, Reeve, and Halusic 2016; Niemiec and Ryan 2009; Reeve 2002). But what are the concrete teaching behaviours that are indicative of supporting these basic needs?

To experience a sense of autonomy, it is important that students experience their engagement in learning as a self-chosen act that reflects their own interests, preferences and values (Stroet, Opdenakker, and Minnaert 2013). To foster this need, teachers can invite students to provide input about the content of a lesson (e.g. reserve time in the lessons for substantive questions or students' interest), allow students to take the initiative and to explore (Haerens et al. 2013), offer a minimal amount of meaningful choices (Mouratidis et al. 2011; Niemiec and Ryan 2009), and provide meaningful rationales (Vansteenkiste et al. 2018).

Structure has been defined as the provision of desired information and guidance such that students can successfully achieve various outcomes (Grolnick and Pomerantz 2009; Skinner and Belmont 1993). When observed, structure was found to consist of two

dimensions: structure in the lesson plan and instructions (i.e. structure before activity; Haerens et al. 2013); and offering guidance during learning activities (i.e. structure during activity; Haerens et al. 2013). When providing structure before the activity, teachers communicate clear guidelines, give an overview and objectives for the lesson and share their expectations (Jang, Reeve, and Deci 2010; Sierens et al. 2009; Vansteenkiste et al. 2012). This can also be defined as a clarifying approach (Aelterman et al. 2019). Structure during activities entails the guidance that a teacher offers to students by providing new guidelines and help during exercises, using students as positive role models (Haerens et al. 2013), and providing constructive, informational feedback (Aelterman et al. 2019; Jang, Reeve, and Deci 2010).

According to SDT, relatedness support refers to an open, honest and caring attitude that leads to the development of a mutually positive relationship between student and teachers. In practice, relatedness support, for example, translates into individualised teacher–student conversations (e.g. about students' daily life), the promotion of cooperation and teamwork (e.g. helping a classmate) and the display of a responsive attitude (e.g. when a student is upset). This requires teachers to put energy and enthusiasm into the lessons, care for their students, pay attention to what students are saying, ensuring students feel personally accepted (Haerens et al. 2013; Korpershoek et al. 2019; Sparks et al. 2016).

Besides knowing what is effective to foster student engagement, it is equally important to understand the teaching behaviours that likely lead to low engagement or even disengagement and can best be avoided. Demotivating teaching behaviours are also described as the 'dark side' of SDT and have only recently emerged on researchers' agenda (Haerens et al. 2015). Within SDT, demotivating teaching behaviours, each thwarting a specific basic need, have been distinguished as: control (autonomy); chaos (competence); and cold teaching (relatedness).

Controlling teaching behaviour consists of tactics to pressure students to act, think or feel in specific ways, thereby exerting either external control by threatening with sanctions, yelling, intimidating and offering contingent rewards, or internal control by inducing feelings of guilt, shame and anxiety (De Meyer et al. 2014). *Chaotic* teaching behaviour involves an awaiting or abandoning stance (Aelterman et al. 2019), characterised by the absence of clear goals and a lack of information on how to achieve goals if they are provided (Jang, Reeve, and Deci 2010; Van den Berghe et al. 2013). Finally, *cold* teaching behaviour entails being unfriendly or even rejecting or excluding students (Skinner and Belmont 1993), being distant or distracted, and paying little attention to students in general (Van den Berghe et al. 2013).

Fostering student engagement with (de)motivating teaching behaviour in practice

Although ample studies have demonstrated that motivating teaching behaviour relates to higher student engagement (Quin 2017), most of this research has been conducted using questionnaires tapping into students' perceptions of the teacher's teaching style (Jang et al. 2016; Molinari and Mameli 2018), often combined with teacher self-reports (Quin 2017; Van den Berghe et al. 2015). There are only a small number of available observational studies (e.g. Haerens et al. 2013; Jang, Reeve, and Deci 2010; Reeve et al. 2004; Van den Berghe et al. 2013, 2016) and only three of these studies observed teaching behaviours that were related to observable students'

engagement (i.e., Jang, Reeve, and Deci 2010; Reeve et al. 2004; Van den Berghe et al. 2016), usually using aggregated scores over a lesson.

In general, these studies indicate that observed motivating teaching behaviour (Reeve et al. 2004) is positively related to student engagement (Jang, Reeve, and Deci 2010; Reeve et al. 2004; Van den Berghe et al. 2016). In addition, Reeve et al. (2004) showed in an observational study that students responded to teachers with higher levels of motivating teaching, with greater engagement. Furthermore, Jang, Reeve, and Deci (2010) specifically observed teachers' autonomy support and structure and found that a combination of both was positively related to students' behavioural engagement. Moreover, observational research showed that demotivating teaching behaviour, although low in occurrence, had a substantial negative impact on student engagement (De Meyer et al. 2014; Van den Berghe et al. 2013).

In sum, there is accumulating research supporting the link between (de)motivating teaching behaviour and student engagement. Much less is known, however, on the multiple ways in which teachers apply these different behaviours in practice (Stroet, Opdenakker, and Minnaert 2015a). So far, prior research has indicated that within lessons teachers use different (de)motivating behaviours simultaneously (Aelterman et al. 2019; Haerens et al. 2018; Vansteenkiste et al. 2012), triggered by teacher factors as well as student factors. On the one hand teachers' (de)motivating behaviour is influenced by trait-like teacher factors, such as teachers' own motivational orientation (Van den Berghe et al. 2013), beliefs (Hornstra et al. 2015) and a preferred teaching style (Aelterman et al. 2014; Reeve 2009). On the other hand, teachers' (de)motivating behaviour is also largely triggered by situational factors. Examples of which are: the lesson subject; students' behaviours (Matos et al. 2018; Van den Berghe et al. 2016); heavy workloads; feeling pressured (Pelletier, Seguin-Levesque, and Legault 2002; Pelletier and Sharp 2009; Ryan and Deci 2016); and negative perceptions of students' abilities or motivation (Hornstra et al. 2015). In other words, teachers' adoption of motivating and demotivating teaching behaviours may differ from lesson to lesson (Hornstra et al. 2018; Krijgsman et al. 2019; Reeve 2016; Van den Berghe et al. 2013). Moreover, there might be specific patterns during lessons of teachers' and students' behaviours that can be identified to understand how the interplay between teacher behaviour and student engagement develops within the course of lessons. Van den Berghe et al. (2016), for example, found positive associations between motivating teaching and observed student engagement within the first 15 minutes of lessons.

The present study

A limitation of these earlier studies is that often (de)motivating teaching behaviours were investigated in general and student engagement was most often defined as an aggregated measure throwing all dimensions together in a single scale. Looking at averages of student engagement and all (de)motivating teaching behaviours across a sample of lessons neglects possible situational differences in these behaviours. In addition, this approach provides quite broad recommendations for teachers for fostering students' engagement. From an extensive SDT literature review Haerens et al. (2013) and Van den Berghe et al. (2013) developed an observational tool that describes about 40 different concrete (de)motivating teaching behaviours.

Our aim was to extend prior observational work in this field by providing a more fine-grained approach, i.e. to describe the use of these concrete (de)motivating teaching behaviours and their specific associations with different aspects of student engagement. In addition, the present study describes the differences in the use of (de)motivating teaching behaviours between contrasting lessons with either high or low student engagement. Illustrating the differences between the use of (de)motivating teaching behaviours in extremely contrasting lessons in terms of students' engagement could lead to more specific recommendations for fostering student engagement for teachers. Specifically, the following research questions were addressed:

(1) *What is the occurrence of motivating teaching behaviours and indicators of student behaviour within lessons?*
(2) *How are (de)motivating teaching behaviours associated with different indicators of student engagement?*
(3) [a] *What are the differences in the use of (de)motivating teaching behaviours between lessons with high student engagement versus lessons with low student engagement?* [b] *How do teachers apply (de)motivating teaching behaviours during the course of lessons with either high or low student engagement?*

Method

Participants

Almost half of the students in the Netherlands (41%) continue their post-secondary education within VET from the age of 16, usually after finishing lower secondary vocational education. The primary purpose of VET is to prepare students for a vocation (e.g. child-care worker, nurse, baker, or mechanic). For this study, we took a convenience sample of teachers from one VET-college that wanted to explore effective ways to foster student classroom engagement. After discussing the study, the managers of four teams providing tracks in Basic Care & Welfare (level 2[1]), Social Cultural Work or Pedagogical Work (level 4) indicated that they would like to participate in the study.

From these four teams two teachers did not want to participate due to personal circumstances and were not included. In total, 53 teachers and their first-year students participated in this study. After careful review of the data, one lesson of a student-teacher was removed from further analyses because it showed disproportionally high levels of chaotic teaching behaviour and of students giving up. Thus, in total the lessons of 52 teachers were analysed in this study. The mean age of the participating teachers was 42.7 ($SD = 11.47$), ranging from 23 to 64, and 75.5% ($n = 40$) were female. Participants had on average 12.77 years of teaching experience ($SD = 9.44$, ranging between 0 and 38 years), and 8.58 years of experience specifically within VET ($SD = 7.19$, ranging between 0 and 35 years).[2] The observed lessons included a wide variety of lessons: 36 lessons in general subjects (e.g. Dutch or English); 10 lessons in creative subjects (e.g. drama, music); 61 lessons in vocational subjects (e.g. developmental psychology, pedagogics, coaching or providing activities for kids); and 13 lessons related to a form of counselling (e.g. discussing students' development and results or guiding their internships).

Procedure

This study was conducted in the second semester of the first year. All teachers who taught first-year students in the participating tracks received an invitation to participate in the study and were asked to provide active consent. Teachers were assured that their data would be handled anonymously and that they had the right to withdraw permission at any time. As classroom observations were used, all students taught by these teachers received an invitation to participate in the study and were asked to inform us if they did not want to participate. When students were under the age of 18, their parents received the same information. No students or parents withheld their consent for participation. This study was approved by the ethics committee of the faculty of Social Sciences of Radboud University (ECSW2015-1901-285).

Prior to the classroom observations, teachers were asked to fill out a short online survey on their background characteristics using Google Drive. After teachers had filled in the survey, they received a preliminary schedule for the classroom observations. Lesson recordings were planned from the teachers' lesson schedule and per availability of the camera equipment. The suggestions for recording dates and times were sent to the teacher and upon agreement the recordings were scheduled. When there were unexpected changes in the time schedule, for instance because teachers were absent on the predetermined date (e.g. due to illness), a new date and time were scheduled.

We intended to record three lessons per participating teacher to minimise the influence of random factors (e.g. having a bad day) and reduce the camera effects. Due to practical constraints, this was not possible for all teachers, resulting in a mean of 2.75 (SD = 0.55) recorded lessons per teacher. The focus was on recording lessons given to the same class of students and preferably on the same subject. This was done to keep conditions across lessons as similar as possible and to minimise effects on teachers' behaviour that are related to teaching a certain subject or teaching to a certain group of students.

In total, we recorded 144 lessons of 52 teachers between February 2015 and June 2015. For nine of these teachers there was no way of knowing which students attended the recorded lessons as they did not work with fixed classes of students. Therefore, we did not include these lessons in the analyses. In total, we analysed 120 recordings with known teacher−class combinations in which 43 teachers provided lessons to 14 different classes of students. Teachers from the same team provided lessons for multiple classes of first-year students and we recorded them in the class that most conveniently fitted the recording schedule. The number of recorded teachers per class varied from one teacher, who was the only teacher recorded teaching one lesson to a certain class, to nine teachers, who were recorded providing 25 lessons to the same first-year class. Only one teacher was recorded teaching three different classes, all other teachers were recorded teaching the same classes in all of their recorded lessons. In the case of 12 teachers we did not manage to record all the lessons in the same subject, so they were recorded teaching different subjects to the same class, as in previous recordings.

Lesson recordings were not equally spaced in time nor consecutive within the teachers' course, primarily due to pragmatic reasons (e.g. scheduling and availability of the equipment). For some teachers, the recorded lessons were two weeks apart, while for others there was a month, or even two months in between. The standard lesson duration was 45 minutes, although some lessons ended earlier; the shortest lesson was 25 minutes.

For the recordings two cameras were used: one facing the teacher and the other facing the students. There were instances where there was only one camera available. In that case, the camera was placed in the most optimal position facing teacher and students. The cameras were attached to a computer that put both recordings next to each other in one video file. This shared view enabled coders to code teacher and student behaviour at the same time.

Observation instruments

Student engagement

Collective student engagement was observed with five items from an observational instrument developed by Reeve et al. (2004), and adjusted and translated by Aelterman et al. (2012). This observational instrument combines different aspects of students' engagement, such as their attention, effort, verbal participation, persistence and positive emotion.

The five items within this observational instrument appeared to refer to different aspects of student engagement in different degrees from passive to active. For example: emotional engagement ('students are having fun and enjoy the lesson'); passive behavioural engagement ('students pay attention'); and active behavioural engagement ('students ask questions'). Cognitive engagement was not part of this study, as this type of engagement is difficult to assess through observations. The original item 'students don't give up easily during a task' was changed to 'students give up easily' because this was much clearer to observe in class.

Motivating teaching behaviour

Motivating teaching behaviours were observed with an instrument developed by Haerens et al. (2013). First, we measured the use of behaviours related to autonomy support (3 items, for example 'The teacher offers choice to all students'). Items related to structure were divided into two different aspects of structure: structure before activity (5 items, for example 'The teacher provides clear and concise instructions'); and structure during activities (7 items, for example 'The teacher gives positive feedback (e.g.: "Okay, keep going", "Good work")'. Lastly, we measured the use of teaching behaviours related to relatedness support (5 items, for example 'The teacher is close to the students, physically close').

Since this instrument was originally designed for the context of physical education, the wording of the items required slight adaptations to fit lessons for all types of subjects. Two items were added to assess autonomy support: 'The teacher uses inviting language ("may", etc.)' and 'The teacher provides room for students to contribute to the content of the lessons'. In total, 23 motivating teaching behaviours were coded in the present study.

Demotivating teaching behaviour

Demotivating teaching behaviours were observed with an instrument developed by Van den Berghe et al. (2013). The instrument includes behaviours related to controlling teaching (7 items, for example 'The teacher exercises power, interrupts students, and claims respect'), chaotic teaching (4 items, for example 'The teacher loses time with reorganizing groups, material, moving tables') and cold teaching (5 items, for example 'The teacher pays little attention to the students'). This instrument also was originally

designed for the context of physical education, thus wordings were changed where necessary. In total, 16 demotivating teaching behaviours were coded in the present study.

Coding observations

Two undergraduate and three graduate social science students coded the videos under supervision of the first author and after having received a training. In the first training session, coders were introduced to SDT and by means of one example lesson all codes were introduced. Subsequently, all coders were asked to code the same two test videos. Differences in coding were discussed to reach agreement. This procedure was repeated until an acceptable level of inter-rater agreement was reached (ICC = .73). The coding manual was refined after each training session.

For every five-minute interval of a recorded lesson, indicators for students' collective engagement and (de)motivating teaching were coded. We coded a maximum of 45 minutes (9 intervals) per lesson, as this was the maximum duration for one lesson at the VET college. For each item, coders assigned a score from 0 ((almost) never observed) to 1 (sometimes observed), to 2 (observed often), to 3 ((almost) always observed) for each five-minute interval. To compute the inter-rater reliability, 13% of the videos were double-coded. Intraclass correlation (ICC) estimates were calculated based on a mean-rating ($k = 4$), consistency, 2-way mixed-effects model. The inter-rater reliability for the combination of the three observational instruments was moderate to good (ICC = .75).

Plan of analysis

To answer the first research question, descriptive statistics and correlations were performed for all study variables across all recorded lessons ($n = 120$). In addition, we made a distinction between lessons with high student engagement versus lessons with low student engagement. This distinction was based on the mean level of student engagement calculated per lesson on four items of student engagement (without the indicator: giving up easily). Based on the means of student engagement and motivating teaching behaviour, all lessons were visually depicted in a graph to be able to describe the differences in lessons in terms of student engagement and motivating teaching behaviour.

Based on the mean of student engagement, the 10% most engaging and 10% least engaging lessons were selected. Mean levels, standard deviations and ranges were calculated for the most and least engaging lessons to explore the differences in the use of (de) motivating teaching behaviours. Furthermore, to explore the differences in the specific use of (de)motivating teaching behaviour within lessons in more detail, the teaching behaviours with the strongest associations per SDT dimension were selected. For these teaching behaviours the mean levels of observed behaviour were calculated per interval, to investigate whether teaching behaviours were used more in the beginning, middle or towards the end of the lesson.

Results

Descriptive statistics regarding the occurrence of motivating teaching behaviours and indicators of student behaviour within lessons

With regards to teaching behaviours, teachers scored highest on relatedness support while behaviours related to providing structure before and during activities were far less frequently observed. Additionally, demotivating teaching behaviours were hardly ever observed during lessons. Inspection of the means of the student engagement items, aggregated across all lessons (see Table 1), showed that the scores for paying attention (passive behavioural engagement) and enjoyment (emotional engagement) were above the mid-range of the scale (0 – 3). Students were hardly ever observed to give up during lessons. But they were far less frequently observed asking questions or putting effort into the class (active behavioural engagement). These scores were below the mid-range of the scale.

Associations between (de)motivating teaching behaviours and indicators of student engagement

Most of the associations between the study variables were low to moderate. There were some quite positive associations between motivating teaching behaviour and indicators of student engagement. Teachers' autonomy support (e.g. asking for students' participation, using inviting language), structure during activity (e.g. providing positive feedback, addressing students by their first name) and all items of relatedness support were positively associated with students' attention and enjoyment (passive student engagement).

With regards to indicators of active student engagement, the same dimensions but slightly different motivating teaching behaviour seemed to be of importance. Autonomy support (e.g. offering choice and room to experiment), structure during activity (e.g. offering new tips and support during exercises) and relatedness support (e.g. teachers' enthusiasm, empathy and attention) showed positive associations with students asking questions and putting effort into the lesson. Unexpectedly, we also found a negative association between teachers' provision of structure before activity (e.g. offering a rationale and clear verbal instructions) and students' effort within lessons.

Regarding the use of demotivating teaching behaviours, items of controlling (e.g. exercise power, irritation) and chaotic teaching behaviours (e.g. allowing chaos, using an illogical structure) were specifically negatively associated with indicators of passive and active student engagement. In addition, the use of destructive criticism was the only teaching behaviour that was positively associated with students giving up easily.

Differences in motivating teaching behaviour between lessons with either high or low student engagement

Overall, there seemed to be quite some differences between lessons regarding the levels of student engagement and motivating teaching (see Figure 1). Lessons in the upper-right corner are the lessons that have high levels of student engagement and high levels of motivating teaching and in the lower-left corner are the lessons with low student engagement and relatively low levels of motivating teaching. Interestingly, when looking at the lower-right corner there seemed to be a number of lessons with low levels of

Table 1. Means, standard deviations among all study variables and correlations with student engagement for all recorded lessons.

	M	SD	1a	1b	1c	1d	1e
Student engagement							
1a pay attention	2.15	0.44					
1b put in effort	1.17	0.77					
1 c ask questions	1.19	0.64					
1d give up easily	0.04	0.10					
1e enjoyment	2.03	0.43					
Autonomy support							
Asks for participation in the lesson content	0.30	0.51	.38**	.04	−.19*	−.05	.36**
Offers choice to all students	0.19	0.29	.08	.21*	.22*	−.09	.03
Gives the opportunity to experiment	0.65	0.74	−.18	.43**	.08	−.05	.03
Uses differentiation	0.04	0.18	.04	.13	.09	−.04	.08
Uses inviting language	0.98	0.54	.32**	.03	.18	−.11	.24**
Structure before activity							
Offers the students a rationale	0.44	0.43	−.04	−.32**	−.01	−.04	−.13
Gives an overview of the lesson	0.25	0.27	−.04	−.15	.20*	.01	−.12
Gives clear (verbal) instructions	0.91	0.59	.02	−.37**	.14	.01	−.11
Provides variation	0.08	0.19	−.10	−.06	−.03	−.01	−.06
Demonstrates, is a 'model' for the students	0.13	0.34	−.14	−.16	−.10	.03	−.06
Structure during activities							
Offers students a rationale	0.37	0.43	−.04	−.17	.21*	−.03	−.03
Monitors if students live up to instructions	0.62	0.52	−.06	.21**	.07	.10	−.08
Offers students new guidelines, tips and advice	0.55	0.63	.10	.56**	.46**	.07	.07
Provides positive feedback	0.46	0.45	.19*	.29**	.27**	−.06	.27**
Uses students as positive role models	0.06	0.13	.18	.12	.20*	.16	.20**
Offers help during exercises	0.66	0.70	.09	.65**	.10	.08	.10
Addresses students by their first name	1.02	0.69	.24**	.03	.20*	.04	.20*
Relatedness support							
Is physically nearby the students	2.00	0.45	.26**	.17	.11	.03	.25**
Is enthusiastic and eager	1.69	0.53	.46**	.20*	.35**	.01	.52**
Puts effort and energy into the lesson	2.00	0.51	.43**	.11	.11	.08	.48**
Takes the perspective of students, is empathic	1.91	0.64	.45**	.22*	.42**	−.01	.40**
Pays attention to what the students are saying	2.19	0.55	.43**	.21*	.27**	.13	.42**
Control							
Exercises power over the students	0.05	0.13	−.18*	−.18*	−.09	−.11	−.27**
Commands students, uses controlling language	0.40	0.43	−.16	.10	.26**	.18	−.23**
Is irritated, loses his/her patience	0.07	0.17	−.31**	−.19*	−.04	>.01	−.44**
Yells at the students	>0.01	0.02	−.02	−.20*	.01	−.08	−.15
Pressures the students by appealing to their self-confidence or induces guilt	0.03	0.08	.08	.10	.01	.12	−.03
Uses destructive criticism	0.03	0.09	−.02	.06	.07	.38**	−.14
Does not allow input from the students	0.02	0.06	−.11	−.11	.05	.09	−.19*
Chaos							
Loses time with the reorganisation of groups, equipment	0.06	0.12	−.16	−.19*	−.17	−.06	−.10
Doesn't know the students' names	0.01	0.03	−.01	.02	.08	−.06	.04
Allows chaos, leaves the students to it	0.13	0.24	−.33**	−.21*	−.23**	.05	−.44**
Uses an illogical and inconsistent structure	0.02	0.08	−.26**	−.19*	−.15	.09	−.25**
Cold							
Does not pay attention to the students	0.04	0.11	−.03	.10	−.12	.09	−.06
Is acting unfriendly and cold	0.03	0.13	−.12	−.08	.06	−.03	−.19*
Keeps distance from the students	0.03	0.12	−.07	.12	−.02	.26**	−.13
Is distracted	0.07	0.19	−.02	.09	−.11	.09	−.02
Is acting inconvenient and annoying	0.01	0.06	−.13	−.13	.12	−.03	−.21*

Note. *p <.05, **p <.01.

student engagement despite relatively high levels of motivating teaching. In addition, also in contrast with SDT, the left corner above the x-axis shows some lessons with moderate levels of student engagement despite relatively low levels of motivating teaching.
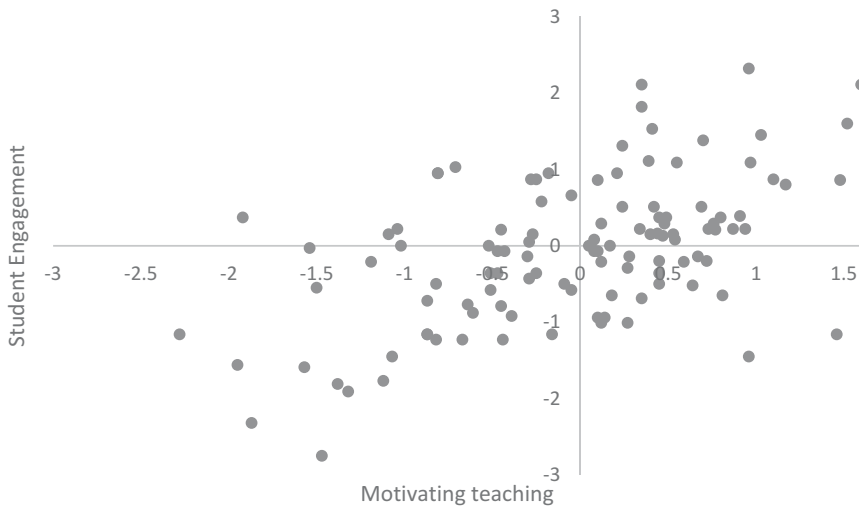
Figure 1. An overview of z-scores of all recorded lessons on levels of student engagement and motivating teaching behaviours.

The most engaging lessons were all part of the upper-right quadrant of Figure 1. From the 12 most engaging lessons, five lessons included creative subjects (i.e. drama, music and visual arts); four lessons were related to students' future vocation as a care aid or pedagogical worker (i.e. social skills, parenting, aesthetics and project management); and three lessons were on general subjects (i.e. Dutch). Most creative classes were taught in specific classrooms for music or drama lessons, with open space in which to perform; visual arts was usually taught in a large room with work benches or in a traditional classroom in small groups. Most vocational and general subjects were taught in traditional classroom settings, although one Dutch lesson was given in a computer room as students needed to perform assignments on the computer. The highly engaging lessons were recorded in six out of the 14 participating classes so there were a couple of classes that appeared multiple times. The maximum was four recordings with the same class. In total, there were three teachers with two lessons who scored among the most engaging lessons.

All lessons with low levels of student engagement were in the lower-left quadrant of Figure 1. From the 12 least engaging lessons, six subjects were related to students' vocation as a social worker, care aid or pedagogical worker (i.e. project management, first aid, aesthetics, client types and light and sound technique for performances such as children's activities); five lessons had a general subject (i.e. calculus, career and citizenship, English); and one lesson was study counselling. Regarding the subjects of the highly and lowly engaging lessons, there appeared to be some distinct differences. In the highly engaging lessons almost half of the lessons had a creative subject whilst none of the lowly engaging lessons had a creative subject. In addition, regarding the general subjects, lessons in Dutch were found to be among the most engaging lessons whilst lessons in calculus and career and citizenship were among the least engaging lessons.

Almost all lessons were taught in traditional classroom settings except for light and sound technique, which has a specific classroom with all the necessary equipment. The

lessons were recorded in eight out of 14 recorded classes and a couple of these classes occurred multiple times within the demotivating lessons. The maximum was three recordings with the same class with two different teachers. Thus, one of these teachers taught two lessons that were scored as lowly engaging.

Overall, with regards to the recorded classes of students, some of the same classes of students were recorded showing a high level of engagement (most engaging lessons) in one class and very low levels in the other (least engaging lessons). Regarding differences in teachers between highly and lowly engaging lessons, five teachers provided multiple lessons within the highly engaging lessons; the same was true with the lowly engaging lesson in which five different teachers taught multiple lessons. Two teachers were observed teaching at both ends of the continuum, thus teaching very contrasting lessons regarding students' engagement.

There were quite some differences in the minimum and maximum levels of the use of (de)motivating teaching behaviours, even within highly or lowly engaging lessons (see Table 2). Teachers in the most engaging lessons were observed using higher levels of inviting language (autonomy support), new tips, support, positive feedback, using students as positive role models and addressing students with their first name (structure during activity). Furthermore, teachers in the most engaging lessons showed much higher levels of relatedness support (i.e. teachers' enthusiasm, energy, empathy and attention). In contrast, the least engaging lessons were characterised by more chaotic teaching behaviours (allowing chaos and the use of illogical structure).

Teachers' use of (de-)motivating teaching during the course of lessons with either high or low student engagement

Regarding the use of motivating teaching behaviours over the course of the lesson, teachers seemed to use giving room to experiment (autonomy support; see Figure 2(a)) and offering help during exercises (structure during activity; see Figure 2(b)) more after the first two or three intervals of the lessons. While this seemed to be similar in terms of the timing for teachers within the most and least engaging lessons, there was quite a difference in the level in which they used these behaviours. Teachers in most engaging lessons seemed to provide students with more room for experimenting and support during assignments than teachers in the least engaging lessons. For relatedness support (see Figure 2(c)) teachers' enthusiasm did not seem to vary much within lessons, although teachers in engaging lessons seemed to show the highest level of enthusiasm around the second interval of the lesson. Compared to teachers in the most engaging lessons, teachers in the least engaging lessons were observed to be less enthusiastic. In addition, it seemed that teachers in the most engaging lessons became slightly less enthusiastic towards the end of the lesson, whereas teachers in least engaging lessons seemed to be most enthusiastic towards the end of the lesson. The highest levels of verbal instructions were observed at the beginning of the lessons in both types of lessons (structure before activity; see Figure 2(d)). Teachers within most engaging lessons seemed to use slightly more verbal instructions than teachers in the least engaging lessons.

For the demotivating teaching behaviours, it seemed as though most of these behaviours were used mostly at the start of the lessons, within the first two intervals.

Table 2. Differences in lessons with high levels of student engagement compared to lessons with low student engagement per study variable (means, standard deviations and range).

	Most engaging lessons			Least engaging lessons		
	M (SD)	Min	Max	M (SD)	Min	Max
Student engagement						
Pay attention	2.71 (.21)	2.33	3.00	1.64 (.38)	0.86	2.33
Put in effort	2.20 (.34)	1.40	2.67	0.22 (.33)	0.00	1.00
Ask questions	1.87 (.55)	0.63	2.44	0.58 (.57)	0.00	1.56
Give up easily	0.02 (.06)	0.00	0.22	0.03 (.07)	0.00	0.22
Enjoy the class	2.46 (.32)	2.00	3.00	1.43 (.70)	0.00	2.22
Autonomy support						
Asks for participation in the lesson content	0.29 (.52)	0.00	1.89	0.07 (.18)	0.00	0.56
Offers choice to all students	0.40 (.51)	0.00	1.89	0.16 (.22)	0.00	0.67
Gives the opportunity to experiment	0.62 (.82)	0.00	2.67	0.33 (.47)	0.00	1.33
Uses differentiation	0.08 (.16)	0.00	0.44	0.00 (.00)	0.00	0.00
Uses inviting language	1.32 (.41)	0.63	2.22	0.54 (.51)	0.00	1.67
Structure before activity						
Offers the pupils a rationale	0.35 (.32)	0.11	1.25	0.53 (.54)	0.00	1.78
Gives an overview of the lesson	0.23 (.17)	0.00	0.50	0.28 (.18)	0.00	0.67
Gives clear (verbal) instructions	0.83 (.49)	0.22	1.63	0.82 (.61)	0.11	1.86
Provides variation	0.08 (.14)	0.00	0.44	0.14 (.27)	0.00	0.89
Demonstrates, is a 'model' for the students	0.10 (.29)	0.00	1.00	0.33 (.53)	0.00	1.67
Structure during activity						
Offers students a rationale	0.41 (.56)	0.00	2.00	0.20 (.29)	0.00	0.78
Monitors if students live up to instructions	0.82 (.65)	0.11	2.44	0.47 (.41)	0.00	1.29
Offers students new guidelines, tips and advice	1.08 (.77)	0.00	2.22	0.17 (.29)	0.00	1.00
Provides positive feedback	0.86 (.50)	0.33	1.89	0.19 (.29)	0.00	1.00
Uses students as positive role models	0.05 (.08)	0.00	0.22	0.00 (.00)	0.00	0.00
Offers help during exercises	1.34 (.89)	0.00	2.56	0.13 (.21)	0.00	0.63
Addresses students by their first name	1.19 (.79)	0.22	2.80	0.44 (.54)	0.00	1.89
Relatedness support						
Is physically nearby the pupils	2.28 (.42)	1.38	2.67	1.86 (.50)	1.17	2.78
Is enthusiastic and eager	2.14 (.37)	1.67	2.89	0.93 (.55)	0.14	1.89
Puts effort and energy into the lesson	2.25 (.32)	1.78	2.78	1.43 (.58)	0.14	2.22
Takes the perspective of students, is empathic	2.47 (.45)	1.56	3.00	1.21 (.52)	0.11	2.11
Pays attention to what the students are saying	2.72 (.30)	2.22	3.00	1.67 (.71)	0.22	2.78
Control						
Exercises power over the students	0.00 (.00)	0.00	0.00	0.08 (.17)	0.00	0.57
Commands students, uses controlling language	0.28 (.30)	0.00	0.89	0.30 (.48)	0.00	1.71
Is irritated, loses his patience	0.01 (.06)	0.00	0.22	0.20 (.45)	0.00	1.43
Yells at the students	0.00 (.00)	0.00	0.00	0.00 (.00)	0.00	0.00
Pressures the students by appealing to their self-confidence or induces guilt	0.03 (.06)	0.00	0.20	0.04 (.10)	0.00	0.33
Uses destructive criticism	0.02 (.06)	0.00	0.20	0.01 (.03)	0.00	0.11
Does not allow input from the students	0.03 (.06)	0.00	0.20	0.04 (.07)	0.00	0.22
Chaos						
Loses time with the reorganisation of groups, equipment.	0.03 (.09)	0.00	0.33	0.13 (.21)	0.00	0.56
Doesn't know the students' names.	0.01 (.03)	0.00	0.11	0.01 (.03)	0.00	0.11
Allows chaos, and leaves the students to it	0.01 (.04)	0.00	0.13	0.39 (.49)	0.00	1.57
Uses an illogical and inconsistent structure	0.00 (.00)	0.00	0.00	0.12 (.18)	0.00	0.56
Cold						
Does not pay much attention to the students	0.03 (.11)	0.00	0.38	0.05 (.13)	0.00	0.44
Is acting unfriendly and cold	0.04 (.08)	0.00	0.22	0.04 (.10)	0.00	0.33
Takes distance from the students	0.00 (.00)	0.00	0.00	0.02 (.06)	0.00	0.22
Is distracted	0.05 (.09)	0.00	0.25	0.02 (.06)	0.00	0.22
Is acting inconvenient and annoying	0.02 (.06)	0.00	0.20	0.02 (.06)	0.00	0.22

The most observed behaviour was leaving students to it and allowing chaos (chaos; see Figure 2(e)[,3]). To a lesser extent this was observed with: is irritated, loses patience (control; see Figure 2(f)) and keeps distance from the students (cold teaching; see Figure 2(g)[,2]). This exploration indicates that although these behaviours had a low occurrence, it was mostly teachers in the least engaging lessons that used them at the start of the lesson.

Discussion

Student engagement is a prerequisite for optimal deep-level learning (Barkoukis et al. 2014; Skinner 2016; Skinner, Zimmer-Gembeck, and Connell 1998) and an important determinant of students' vocational success and future occupational outcomes (Abbott-Chapman et al. 2014). In this study we used observational data to describe how (de) motivating teaching behaviours were associated with different aspects of student engagement. Additionally, we investigated the use of (de)motivating teaching behaviours in contrasting lessons (the most versus the least engaging lessons).

The occurrence of (de)motivating teaching behaviours and student engagement in lessons

Overall, observations showed that specifically the level of active student engagement seemed to lag behind on the emotional and more passive behavioural engagement of students, which could be expected, considering VET students' motivational challenges (Cents-Boonstra et al. 2018; Vugteveen et al. 2016). With regards to the use of motivating teaching behaviours, the low occurrence of teaching behaviours related to autonomy support and structure during activity was most striking, while quite high levels of relatedness support were observed.

The low occurrence in autonomy support and guidance is in line with previous research indicating that these types of behaviour were hardly ever put into practice within VET (De Bruijn and Leeman 2011; Jossberger et al. 2018). While VET students do not feel equipped to take control of their own learning process (Biemans et al. 2009; Elffers 2013), VET teachers see their students struggling with regulating their own learning process (De Bruijn and Leeman 2011). The high levels of teaching behaviour related to relatedness support, however, may indicate that teachers tend to 'take over' and provide students with more empathy and enthusiasm, instead of guidance (De Bruijn and Leeman 2011; Heusdens 2018). This may indicate that there might be an imbalance between guiding students' learning activities and relatedness support, causing students to become more passive rather than being challenged to actively take charge of their own learning.

Associations between (de)motivating teaching behaviours and indicators of student engagement

Within the results of our study, quite distinct differences were found in the specific teaching behaviours fostering either more passive or active student engagement. For example, inviting language and giving students a say in the lesson content (autonomy support) and relatedness support seemed important in fostering more passive student
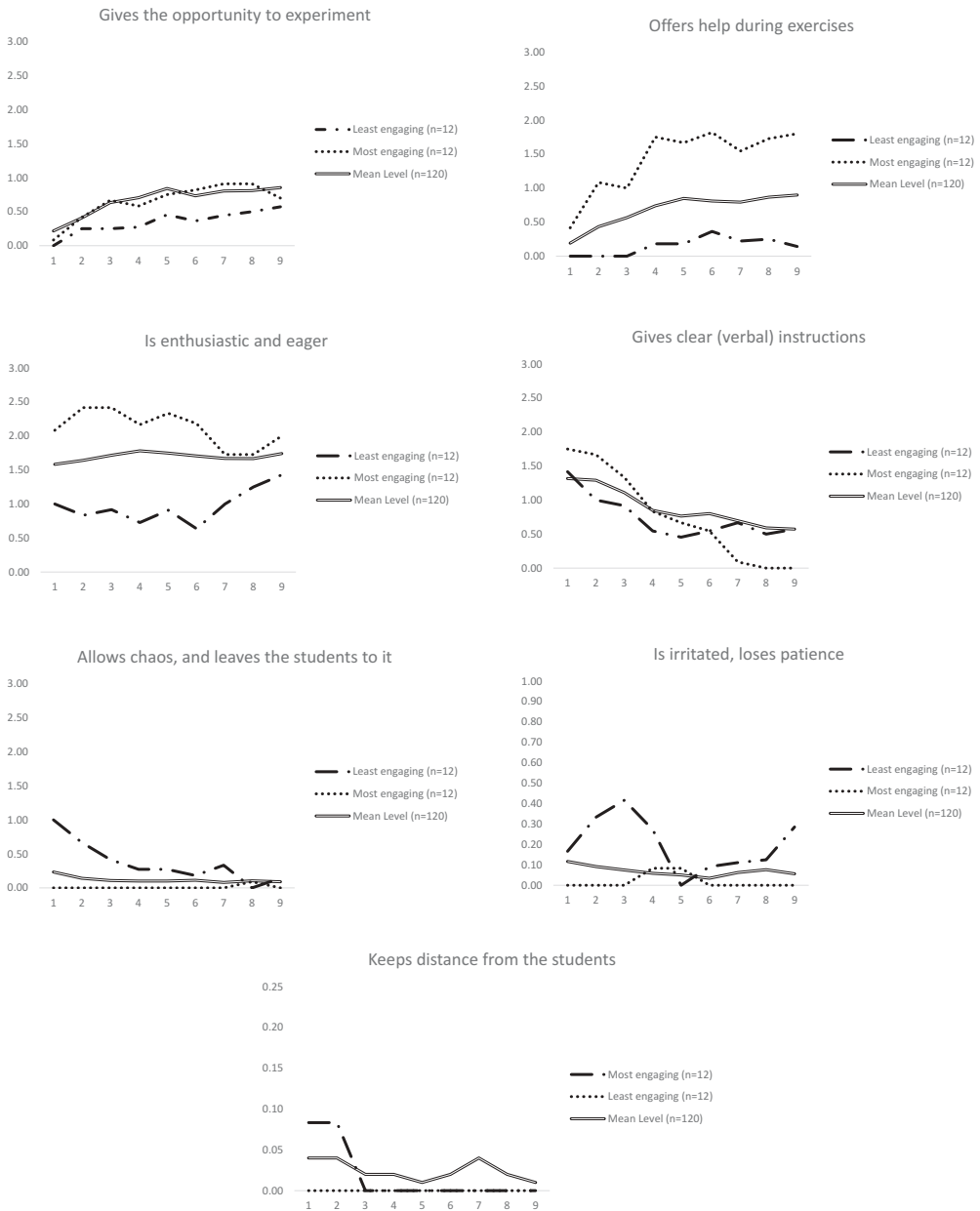
Figure 2. (a) Mean levels of 'gives the opportunity to experiment' (Autonomy support) per five-minute interval of the lesson for the entire sample, most and least engaging lessons. (b) Mean levels of 'offer help during exercises' (Structure during activity) per 5-minute interval of the lesson for the entire sample, most and least engaging lessons. (c) Mean levels of 'is enthusiastic and eager' (Relatedness support) per 5-minute interval of the lesson for the entire sample, most and least engaging lessons. (d) Mean levels of 'giving clear verbal instructions' (Structure before activity) per five-minute interval of the lesson for the entire sample, most and least engaging lessons. (e) Mean levels of 'allows chaos' (Chaos) per 5-minute interval of the lesson for the entire sample, most and least engaging lessons. (f) Mean levels of 'is irritated, loses patience' (Control) per 5-minute interval of the lesson for the entire sample, most and least engaging lessons. (g) Mean levels of 'keeps distance from the students' (Cold) per 5-minute interval of the lesson for the entire sample, most and least engaging lessons.

engagement, which refers to students' attention and enjoyment. On the other hand, participative and guiding behaviours (Aelterman et al. 2019) such as offering choice and help with exercises seemed more important for fostering active student engagement, which refers to students asking questions and their effort.

Furthermore, different demotivating teaching behaviours were found to be negatively related to student engagement. Teachers' control and chaotic teaching were negatively associated with more passive student engagement and to a lesser extent also with students' effort. Whereas asking questions was negatively associated with chaos. These findings are in line with earlier findings of De Meyer et al. (2014) and Van den Berghe et al. (2013) who found that demotivating teaching behaviours are particularly harmful for students, despite their low occurrence, as one negative experience can have a more severe impact than a positive experience. The results showed this was particularly true for destructive criticism, which was positively associated with students giving up.

Differences in motivating teaching behaviour between lessons with either high or low student engagement

With regards to differences between contrasting lessons, results showed that teachers in the highly engaging lessons used more inviting language (autonomy support), positive feedback, help during exercises (guidance during learning activities), more empathy and attention for their students and put more effort and enthusiasm into their lessons (relatedness support). In contrast, teachers in the least engaging lessons were observed to allow more chaos.

The way teachers in engaging lessons employ motivating teaching behaviours corresponds with a more constructivist, student-centred approach (Adams 2006; Wilkinson et al. 2006) to learning. This approach is in line with the SDT, given the focus on self-determined learning of the students. A student-centred perspective on learning encompasses methods of teaching that shift the focus of instruction from the teacher towards the active learning of the student (Stroet, Opdenakker, and Minnaert 2015b). The differences in the use of motivating teaching behaviours seem to resemble the findings of Stroet, Opdenakker, and Minnaert (2015b) when comparing constructivist and traditional classrooms. In line with the constructivist classrooms (Stroet, Opdenakker, and Minnaert 2015b), teachers in the highly engaging lessons (present study) used more individual guidance to support students' activities and provided structure so students could guide their own learning process. In contrast, comparable to teachers in traditional classrooms, teachers in the present study in the lowly engaging classes showed relatively low levels of guidance during learning activities.

In addition, as expected, there were quite a number of differences in levels of engagement and (de)motivating teaching from lesson to lesson (e.g. Hornstra et al. 2018; Krijgsman et al. 2019; Van den Berghe et al. 2013). Contrary to what one would expect, lessons with the highest levels of student engagement did not necessarily equal the highest levels of motivating teaching behaviours. Nor were lowly engaging lessons also the ones with the absolute lowest levels of motivating behaviour. This may be partly explained by the lesson subjects. Five out of the 12 highly engaging lessons had a creative subject. For lessons with a vocational or general subject this seemed to vary, as they were among the most and the least engaging lessons. Teachers may engage students quite easily when they teach a subject in which students have a great interest (Reeve 2016). Yet, teachers of subjects that

most students dislike. such as general subjects, may need more motivating interventions to foster students to engaged themselves within the lesson (Jang 2008; Reeve 2016).

In addition to variation in students' interest in the lesson subject, it would be very interesting to investigate which other situational or contextual factors influence the use of (de)motivating teaching behaviours. These could be factors such as teachers' heavy workloads, feeling pressured (Pelletier, Seguin-Levesque, and Legault 2002; Pelletier and Sharp 2009) and/ or negative perceptions of students' abilities or motivation (Hornstra et al. 2015). Studying how these factors influence teachers' use of motivating behaviours within lessons could create more awareness of the influence of these factors on student engagement among teachers.

Teachers use of (de-)motivating teaching during the course of lessons with either high or low student engagement

Within the course of the lessons, there seemed to be quite distinct differences in the start of lessons with either high or low levels of student engagement. Teachers in lessons with high levels of engagement were observed to start the lessons with higher levels of enthusiasm. In contrast, teachers in lessons with low levels of engagement were observed to start their lessons with higher levels of irritation, allowing chaos and distance from students. These differences might support the argument made by Van den Berghe et al. (2016). In their study, they discussed that the start of the lesson is often more centred around the teacher providing instructions and maintaining classroom management, making teachers less inclined to react in a motivating way.

In general, teachers in the highly engaging lessons seemed to offer less structure at the start of the lesson, for example in the sense of verbal instructions and rationales and more information while the students were most actively working on assignments. Slightly contradictory to Reeve (2016) it seemed more important to provide help or a rationale while students were working rather than before students' activities in the lesson, considering the negative association with the students' engagement. It could be that for VET students it is more beneficial to learn while working (Heusdens 2018).

Towards the end of the lesson, particularly teachers in the lowly engaging lessons seemed to become more irritated, provide more verbal instructions again and reach their highest level of room for experimenting. Yet these teachers also reached the highest levels of enthusiasm at the end of the lesson. This may indicate that they are quite eager and rush to bring the learning activities to a quick close, making them more enthusiastic as the lesson is almost finished but also irritated if last-minute demands stand in the way of ending the lesson (Reeve 2016). The observed differences in the use of certain (de)motivating teaching behaviours between the highly and lowly engaging lessons seemed to further support the argument that timing, namely providing the right kind of motivating teaching behaviour at the right time, is of importance for fostering students' positive engagement (Reeve 2016).

Limitations and directions for future research

This study has some limitations that need to be considered. Given the explorative and descriptive nature of our study, we were not in the position to draw conclusions about causal relationships or to statistically test the relations between (de)motivating teaching behaviours and student engagement. Students' and teachers' behaviours were rated at the

same time and our analyses did not enable us to disentangle whether it is the teaching behaviour that triggers students' engagement or the other way around. Recent research (Jang et al. 2016; Matos et al. 2018) suggests that it is a reciprocal relationship: more (specifically more active) student engagement leads to more motivating teaching behaviour and vice versa. Clearly, more in-depth sequential studies are needed to further understand the relation between teaching behaviour and student engagement. In addition, multilevel analyses could further test the described relations between motivating teaching behaviours and different aspects of student engagement. Due to the complexity of our nested data and our descriptive research aim this was not the focus of the current study. Thus, future research with a more systematic and controlled data collection approach could complement our findings with multilevel analyses.

In addition, rating (de)motivating teaching behaviour from zero to three to indicate whether behaviour is occurring almost never or all the time gives a broad indication of the actual behaviour the teacher was using. The explored differences in the use of behaviours across the most and least engaging lessons seemed to be quite logical per stage of the lesson. At the beginning of a lesson teachers tended to use more structure before the activity (such as providing an overview, Haerens et al. 2013) followed by structure during the activity as students started to work on exercises, while behaviours of relatedness support were observed to be more stable across the lesson. Aggregating the means for these behaviours over the entire lesson might falsely suggest they do not occur often, whilst it would probably be counterproductive if a teacher were to provide students with an overview of the lesson every five minutes. Thus, for several motivating teaching behaviours it would not be expected that they ever reach the maximum score of the scale for every interval, because they are logically not applied in every part of the lesson. Therefore, it would be interesting for future research to investigate (de)motivating teaching behaviour and its association with student engagement from a microlevel perspective instead of using aggregated scales of a variety of teaching behaviour across the entire lesson. Hereby, it could be recommended to decide on the time intervals per lessons depending on the activity of the teacher or students. This could create an even better understanding of the use of motivating teaching behaviour during different parts or activities within lessons: the start of a lesson (which could be five minutes in one lesson and 15 in another); instruction; exercises or small group work; and at the end of a lesson.

Furthermore, student engagement was operationalised as collective student engagement. In this study, however, we did not measure which situational and contextual factors of students influence students' engagement, nor the differences in individual engagement among students in one class. For future research, it would be very interesting to investigate why – and which – students show more engagement in one lesson than in another. This may include, for example, students' interest, their perception of teachers' motivating behaviours, feelings of stress or their motivation for completing their track.

In addition, observing student engagement with five items, showed some differences in results among the three different aspects of student engagement. In order to further contribute to the understanding of student engagement as a multidimensional concept, it would be beneficial to expand the research to include more indicators of student engagement. Specifically, active and agentic engagement (Reeve and Tseng 2011) need to be further investigated including different indicators, such as student constructive contributions in lessons, complementing the teachers or showing initiative.

Practical implications

Given the relatively low levels of students' active engagement, it seems important for teachers to explore ways to actively engage students in lessons (Nguyen, Cannata, and Miller 2018). Students' positive engagement is fostered with the right timing of the use of (de)motivating teaching behaviours (Nicholson and Putwain 2018). More specifically, these teaching behaviours should include using high levels of relatedness support from the start of the lessons (teachers' enthusiasm, energy, empathy and attention). Teachers need to engage students early on in the lesson with learning activities and room for experimenting, while observing the students with patience and providing guidance with positive feedback, rationales and support during exercises. SDT offers concrete recommendations on which behaviours are more effective in which part of the lessons (Reeve 2016). In order to further foster especially students' active engagement, teachers would need to reflect upon their approach towards teaching and the use of these behaviours within the course of their lessons.

A very suitable tool to promote these reflections among teachers may be the recordings of the lessons. Watching back their own lessons could create awareness among teachers about their own concrete behaviours, allows them to reflect on what they think they do and what they are actually doing, how their behaviours affects their students' behaviour and help them to specify concrete possibilities to foster more active student engagement (Pennings et al. 2014). Reflections based on classroom observations could be further strengthened by involving some kind of supervision, like a coach (Brophy & Good). Another promising avenue might be peer learning in which teachers from different subjects observe each other's lessons to get inspired and exchange promising ways to further engage their students.

In addition, several intervention studies have demonstrated that teachers can be trained to adopt these motivating strategies to the benefit of students' engagement and motivation (Su and Reeve 2011). Within our study there appeared to be quite some differences in the use of motivating teaching behaviours from lesson to lesson. It might therefore be beneficial to acknowledge these fluctuations and teachers could reflect on what causes them to vary in their behaviour as part of the intervention (Hornstra et al. 2016) to create more awareness (Pennings et al. 2014) on how they personally engage their students.

Besides interventions on individual teachers, providing interventions for a team of teachers or peer learning could prove to be a beneficial addition to existing interventions. As teachers in VET work need to work as a team to foster students' positive engagement for their particular track, cooperation and peer learning between teachers providing different types of lessons (vocational, general, creative and counsellors) is a necessity in creating powerful learning environments (De Bruijn and Leeman 2011).

Notes

1. Vocational education in the Netherlands is divided into four levels. For example, in a specific track these levels correspond to:
   1. Assistant employee (Care aid)
   2. Employee (Supporting in care and welfare)
   3. Independent employee (Practical Nurse)
   4. Specialised professional (Nurse).

2. The sample included six student teachers teaching independently in their last year of study; they were not employed by the institute.
3. As the behaviours depicted in Figure 2(e,g) were observed in a very low frequency, we adjusted the scale of the y-axis figures to be able to show their use within lessons.

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