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Exploring perspectives for improving students' motivation in pre-vocational secondary education

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Chapter 2

Student-centred and teacher-centred learning environment in pre-vocational secondary education: Psychological needs and motivational engagement

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Abstract

In this study the perception of psychological need fulfilment and motivational engagement in a student-centred and a teacher-centred learning environment are compared, using Self Determination Theory as a framework. The self-report Intrinsic Motivation Inventory was completed by 230 students (mean age 16.1 years) in pre-vocational secondary education. School records on absenteeism and achievement were also analyzed. As predicted, multi-level analyses showed that students in the student-centred learning environment reported higher levels of perceived autonomy, competence, relatedness, and motivational engagement, measured by pleasure and effort. Furthermore, boys were less absent. No differences were found for achievement. These results suggest that a student-centred form of learning can be more beneficial for students' motivational engagement if granted autonomy is embedded in a supportive environment.

Key words

Motivational engagement; Learning environment; Psychological needs.

2.1 Introduction

Motivation directs, energizes, and regulates behaviour (Ford, 1992), but many students seem to lack motivation for learning at school (Martens, De Brabander, Rozendaal, Boekaerts, & van der Leeden, 2010) or their motivation decreases during adolescence (Eccles, 2004; Peetsma, Hascher, van der Veen, & Roede, 2005). This displays itself in less pleasure, effort and interest, and can lead to absenteeism and dropout (Peetsma & Van der Veen, 2008), especially in vocational education. This tendency can be seen all over Europe (OECD, 2011), including the Nordic countries (Markussen, Frøseth, & Sandberg, 2011; Statistics Norway, 2012; Statistics Sweden, 2008).

Motivation for learning is a process that partly takes place within the person and partly arises from the interaction between the individual and the environment (Bandura, 1986; Ryan & Deci, 2000a). Accordingly, schools shift from teacher-centred learning environments (TLEs) to student-centred learning environments (SLEs) (Cannon & Newble, 2000; Savery & Duffy, 2001), assuming this will affect students' motivation positively.

Underpinnings of the effect of new learning concepts on motivation, however, are scarce. In this study the Basic Needs Theory, a theory within Self Determination Theory, is used to explain the relation between different learning environments and motivation. The Basic Needs Theory states that the fulfilment of three basic psychological needs, the need for autonomy, competence and relatedness, supports and enhances students' intrinsic and autonomously regulated motivation, leading to more pleasure and effort in relation to schoolwork (Deci & Ryan, 1985; Ryan & Deci, 2000a, 2000b). The characteristics of SLEs correspond with the core of the Basic Needs Theory, as will be illustrated in this article. It is therefore assumed that SLEs will fulfil students' needs, and consequently enhance students' motivational engagement. However, there are doubts about the mechanism of need fulfilment in the actual practice of the classroom, especially where it concerns the need for autonomy

and competence (Assor, Kaplan, & Roth, 2002; Kirschner, Sweller, & Clark, 2006). In addition, little research has been done in more complex real-life situations (Lowyck, Elen, & Lehtinen, 2004).

This study aims to explore differences in students' motivation between a student-centred learning and a teacher-centred learning environment in practice, using Basic Need Theory as a framework. First, we describe the theoretical foundations of new forms of learning and the characteristics of both learning environments. Next, the three needs and their effect on motivational engagement will be discussed and, finally, learning environments will be related to need fulfilment and motivational engagement.

2.2 Student-centred and teacher-centred learning environments

New forms of learning are based on psychological and educational theories, stating that learning is a constructivist, situated, and social activity (De Kock, Slegers, & Voeten, 2004). According to these theories knowledge is situated in real life contexts and students construct their personal representations of knowledge, and link new information to prior knowledge and the context (Brown, Collins, & Duguid, 1989). Furthermore, learning takes place through a dialogue with teachers, peers, and one self, through e.g., the articulation of problems and the encounter of different solutions (Simons, Van der Linden, & Duffy, 2000; Vygotsky, 1978). For a more extended overview of new forms of learning and instruction we refer to Slavich and Zimbardo (2012).

Student-centred learning is based on these learning theories that consider learning as a constructivist, situated, and social activity. It is defined by Cannon and Newble (2000) as “ways of thinking about teaching and learning that emphasize student responsibility and activity in learning rather than content or what the teachers are doing” (p.16). We describe the TLEs and SLEs with five tangible characteristics as that are formulated by Savery and

Duffy (2001): tasks, student activities, teacher activities, sources of information, and assessment.

First, tasks in SLEs are problem based and situated in a rich, authentic context. This provides students with a clear purpose and different perspectives to approach the learning material. It also enables attachment of new information to familiar situations (Brown et al., 1989; Simons et al., 2000). Furthermore, tasks are presented like a “smörgåsbord” (Arnqvist, 2010, p. 54) from which students can make their choice. Second, students’ role in SLEs is an active one; they perform real life activities and are challenged to be mentally active through problem based tasks. Learning is also meant to be self-regulated: students are stimulated to set goals and take responsibility for the learning process (Van Hout-Wolters, Simons, & Volet, 2000). Furthermore, students learn cooperatively to enable negotiation and social construction of knowledge (Simons et al., 2000; Vygotsky, 1978). Third, teachers take the role of coach, expert, model, and facilitator of the learning process. In dialogue with the student, learning goals are set, and the learning process is monitored and evaluated as teachers gradually hand over responsibilities for the learning process (Boekaerts, 2002a). Fourth, sources of information in the SLEs are extended from teachers and text books to e.g., the Internet. Teachers also provide scaffolds to help students obtain knowledge and skills that are almost within their reach (Vygotsky, 1978). Finally, learning is assessed through reflection on both the product and the process of learning with a focus on improvement of tasks to come (Black & William, 2009).

In traditional learning environments, like TLEs, tasks are mainly theoretical (De Corte, 2003). Knowledge in these tasks is de-contextualised. The focus of learning is on content, not on the learning process. Second, students’ role is mainly passive; knowledge is transferred from teachers to students, whereupon students practice the assigned exercises individually. The learning activities are identical for all students and performed

simultaneously. Third, teachers mainly provide whole class instruction and control the learning process. Fourth, teachers and text books are the main sources of information and, finally, assessment concerns the content only, tested with traditional tests that wind up a learning period. We described the learning environments according to the theory and as two extremes on a continuum (O'Neill & McMahon, 2005). However, in practice, learning environments hardly ever are fully teacher-centred or student-centred, but take on hybrid forms (De Kock et al., 2004; Stroet, 2014) .

2.3 The need for autonomy, relatedness, and competence in relation to motivational engagement

School activities are rarely performed solely for pleasure or out of curiosity. An important question raised by Ryan and Deci (2000a) is “how to motivate students to value and self-regulate these activities and, without external pressure, to carry them out on their own?” (p. 60). The Basic Needs Theory identifies the need for autonomy, competence, and relatedness, as “innate psychological needs essential for on-going psychological growth, integrity and well-being” (Ryan & Deci, 2000a, p. 227). Need fulfilment or the thwarting of need fulfilment supports or disturbs innate intrinsic motivation. Moreover, if an activity is not inherently motivating, need fulfilment establishes autonomously regulated motivation, relocating motives for learning and the regulation of learning from external motives to the individual. The extent to which external motives are being internalized, determines the quality of motivation, and affects school engagement, effort, pleasure, persistence and achievement (Deci & Ryan, 1985; Ryan & Deci, 2000a; 2000b).

The need for autonomy, first, refers to the need for self-determination (Deci & Ryan, 1985); students need to feel they can contribute to their learning process, and have a choice in subjects and learning activities. Several studies show that teachers, who support autonomy,

enhance motivation, curiosity, and engagement (Assor, Kaplan, Kanat-Maymon, & Roth, 2005; Backman et al., 2011; Levesque, Zuehlke, Stanek, & Ryan, 2004), whereas teachers who display controlling behaviour have a negative effect on motivational engagement (Assor et al., 2005; Stornes, Bru, & Idsoe, 2008). Moreover, autonomy-supportive contexts are of vital importance for students to appreciate intrinsic goal setting (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004), and offer opportunities in the classroom for students to pursue multiple goals, acquiring a high level of student involvement (Hijzen, Boekaerts, & Vedder, 2006).

Second, the need for competence refers to the need to feel able to perform a task successfully (Backman et al., 2011; Deci & Ryan, 1985). Students who feel competent show more persistence when meeting obstacles on their learning path (Bandura, 1994). It enhances their motivational engagement and increases the use of deep level learning strategies (Levesque et al., 2004) such as asking critical questions and thinking up concrete examples (Segers, Martens, & Van den Bossche, 2008). In our study a distinction is made between perceived personal competence and perceived organisational competence. The basic assumption is that students can feel competent on their own account and on account of empowering facilities from the organisation (De Brabander, Rozendaal, & Martens, 2009). Since criticism about new learning environments especially concerns too much autonomy and the lack of support and structure provided by teachers, we operationalized perceived organisational competence as perceived support from the teacher.

Finally, the need for relatedness refers to the need for attachment and secure relations to important others. We studied the relatedness to teachers, which implies trust, reliability, and feeling at ease with teachers. Relatedness improves students' well being. Also, students who trust their teachers are inclined to value their teachers' opinion (Ryan & Deci, 2000a; 2000b), and students who perceive their teacher as indifferent are less motivated, even when

tasks are reported as interesting (Ryan & Grolnick, 1986). Relatedness, therefore, is a predictor of motivation for learning (Backman et al., 2011; Furrer & Skinner, 2003).

2.4 The learning environment in relation to fulfilment of psychological needs

‘New’ learning concepts, like student-centred learning, have emerged assuming this will lead to more active engagement (Simons et al., 2000) and increase students’ motivation.

However, many assumptions remain implicit (Martens, Bastiaens, & Kirschner, 2007). In this study we used the Basic Need Theory as a framework, arguing that SLEs fulfil the three basic psychological needs more extensively than TLEs and therefore are more motivating for students. We will illustrate this in the next paragraphs.

First, Urdan and Turner (2005) studied the effect of learning environments on students’ perceived personal competence. They report that tasks embedded in a realistic context are comprehensible for students and therefore increase their feeling of competence. This is confirmed by Dochy, Segers, Van den Bossche, and Gijbels (2003). Furthermore, choice in subject and working methods enables students to choose tasks within reach of their capability. Also, feedback, assessment, and teacher support, provided at individual level, support students’ sense of competence (Urdan & Turner, 2005). These features correspond with the characteristics of SLEs, as described earlier in this article. Second, autonomy is automatically embedded in SLEs; students are expected and stimulated to self-regulate their learning and to choose subjects and working methods. Moreover, realistic tasks in authentic contexts often have no clear cut solutions and require autonomy to solve the problems that these tasks evoke (Simons et al., 2000). The perception of relatedness, finally, is fed by cooperative learning and by the interaction with teachers in the roles of coach, guide, expert and provider of feedback (Savery & Duffy, 2001).

It is assumed that the fulfilment of these three needs will have a positive effect on students' motivational engagement. However, the positive effect of SLEs on perceived need fulfilment is not self-evident. Educational researchers heavily debated the balance between granted autonomy and lack of structure in new forms of learning. They expressed concerns about the minimisation of guidance, leaving students with a decreased feeling of competence (Assor et al., 2002). Kirschner et al. (2006) even named an article "Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry based teaching." (p.75). Indeed, students who experienced new forms of learning, reported difficulties in finding an appropriate way of tackling real life, and therefore ill-defined tasks (Mayer, 2004) and showed higher achievements when tasks are well-defined (Lodewyk, Winne, & Jamieson-Noel, 2009). The cognitive challenge of SLEs can even be detrimental to motivational engagement (Lehtinen, Vauras, Salonen, Olkinuora, & Kinnunen, 1995).

In conclusion, although experimental research proved that perceived fulfilment of the three psychological needs affects motivational engagement positively, there are doubts about this mechanism in the actual practice. This study aims to examine need fulfilment and motivational engagement in a more complex, real-life situation.

In addition achievement and absenteeism are taken into account. The effect of motivation on achievement is not straightforward. Ahmed, Minnaert, Van der Werf, and Kuyper (2010) found a positive relation between motivation and grades, whereas Sanchez, Colón, and Esparza (2005) state that grades are poor predictors. However, as grades are one of the main aspects students are judged on in practice, grades are taken into account. Absenteeism is a significant predictor for dropout (Hammond, Linton, Smink, & Drew, 2007). However, little research has been done on this aspect. Sánchez, et al., (2005) show that learning environments, especially the lack of relatedness with teachers, predict absenteeism.

This is confirmed by Baker, Sigmon, and Nugent (2001), who mention relatedness as one of many predictors. Teasly (2004) adds a feeling of incompetence as a predictor of absenteeism; students avoid feeling incompetent by not attending. A feeling of incompetence often becomes more visible in secondary education

Finally, gender differences are studied. Boys show more drop-out from school than girls (Central Bureau for Statistics, 2011; Statistics Norway, 2012). Research also reports gender differences in motivation (Martin, 2003; Sánchez, et al., 2005); boys pointed out that e.g., a feeling of relatedness and autonomy at school is important to them (Martin, 2003), but differences are small (Martin, 2004).

2.5 Aim – hypotheses

The aim of this study was to compare a student-centred learning environment with a teacher-centred learning environment to answer the main research-question “Is the learning environment related to students’ need fulfilment and motivational engagement?”.

In this study it is hypothesized that students in the SLE will perceive more autonomy (Simons et al., 2000) (Hypothesis 1a); more relatedness with teachers (Simons et al., 2000) (Hypothesis 1b); more personal and organisational competence (Urdan & Turner, 2005) (Hypothesis 1c & 1d) than students in the TLE. Furthermore, we assume, based on the Basic Need Theory, that the perception of autonomy, competence, and relatedness will lead to motivational engagement, indicated by more pleasure and effort (Deci & Ryan, 1985; Ryan & Deci, 2000a; 2000b) (Hypothesis 2). Also, we expect that boys will be more motivated in the SLE than boys in the TLE (Martin, 2003) (Hypothesis 3). Finally, as relatedness and perceived competence are related to absenteeism (Baker et al., 2001; Sánchez et al., 2005; Teasly, 2004), we assume that students in the SLE are less absent (Hypothesis 4). Findings

in previous studies on achievement in relation to motivation are not decisive and therefore no hypothesis is formulated.

2.6 Method

2.6.1 Participants

For this study, 17 classes in third and fourth years of pre-vocational secondary education filled in a one-time self-report questionnaire at the end of the school year. This was done during school time in the classroom, in 25 to 40 minutes, supervised by the researcher and the teacher. One class filled in the questionnaire after school time in less than ten minutes and therefore probably inattentively; the class was kept out of the analyses.

Pre-vocational secondary education prepares students in four years for vocational training. Assignment to type of secondary education is mainly based on an entrance test in the final year of primary education; those with the lower test results, about 60% of the pupils, are referred to pre-vocational secondary education. The first two years the curriculum consists of general subjects and at the end of the second year students choose a vocational discipline. In the third and fourth years, general subjects cover approximately two third of the school time, and the vocational subject covers one third of the school time.

The analyses included 123 students in 7 classes (boys 61%) in the teacher-centred learning environment with a class size ranging from 9 to 21 students with a mean age of 16 ($SD = 1.16$), and 107 students in 9 classes (boys 58%) in the student-centred learning environment, with a class size ranging from 7 to 22 students ($M = 13.7$, $SD = 1.45$). Students' age ranged from 15 to 18 years ($M = 16.1$; $SD = 0.70$).

2.6.2.Design

This study was carried out in one school, gradually changing from teacher-centred to student-centred learning, discipline per discipline, over several years. The aim of the school was to involve students in the learning process, and to increase their motivation. School management decided when a discipline was to switch from TLE to SLE. At the time the study was executed the SLE had been in practise for four years in the vocational discipline ICT, for three years in Sport, Services & Security and for one year in Care & Well Being. The vocational disciplines with a TLE were Commerce, Graphics & Media, Administration, and Mechanics.

Obviously, we could not assign students to a vocational discipline randomly. That choice was made by the students. However, as preferences for a particular learning environment or discipline could bias the findings a question was added to the questionnaire about students' choice (e.g., the way that is being taught in this discipline, appealed to me; I like this discipline; I like the teachers in this discipline). The questions could be answered with yes or no. A chi square test to determine the distribution of reasons over the TLE and SLE, showed no specific preferences for disciplines related to a specific learning environment.

2.6.4 A description of the learning environments in practice

We verified if the learning environments indicated by the school as SLE and TLE, actually met the characteristics as described in theory. For both learning environments, we compared curricula, interviewed team managers and observed a lesson in each discipline. Also, documents on school policy were consulted. We used the five characteristics formulated earlier in this article to describe both learning environments in practice: tasks, role of the student, role of the teacher, sources of information, and assessment. We start with the learning environment indicated by the school as SLE.

Tasks

Tasks for the vocational subjects are either real assignments (from e.g., businesses, the city council and non-profit organisations), or simulations. The subject Dutch language is almost fully integrated in the vocational subjects; letters of application, tenders, reports and presentation skills are linked to the assignments. Students choose the task they want to execute in consultation with the teacher or tasks are assigned by the teacher according to students' level and interest. Tasks also comprehend the learning and application of meta-cognitive skills; planning, monitoring and evaluating the work is essential in the learning process.

Teacher activities

For the vocational subject and Dutch language every lesson starts and ends plenary, discussing the progress of the tasks. Subsequently, students work independently, individually or in groups. Teachers lecture the whole class, a group or an individual student, depending on what students ask and need to execute the task. Otherwise, teachers are available for questions, actively monitor students' progress and provide scaffolds where necessary.

Student activities

Students are actively involved in the lessons, choosing tasks and activities. They work individually or in groups. The exact problem, and the skills and knowledge necessary to execute these tasks, are determined by the students in dialogue with customers, teachers, and peers. Students use their prior knowledge and figure out what aspects of the assignment are unknown to them and whether they require help. Students also keep account of their development of competences and meta-cognitive skills in a workbook.

Assessment

Every six weeks the teacher discusses the learning process with each student individually to determine which progress is made and what aspects need further improvement. This is recorded in the workbook and will be used for next assignments.

Furthermore, the utility and quality of the results related to the real life setting, is assessed. For example, a welding is tested to determine whether it holds heavy objects in collisions. Also, students keep account of their work in a digital portfolio. Finally, the product is assessed by the teacher with grades, based on the requirements from the government.

Sources of information

Every classroom in the school has two computers, except for the discipline ICT, which has a computer available for every student. Students are allowed to use the computers when necessary. Furthermore, the teacher provides information.

The TLE in this study is almost identical to the description earlier in this article, based on De Corte (2003), except for the discipline Graphs & Media that has been working with real life tasks for several years. Also, most subjects in the TLE work occasionally with projects that grant certain autonomy and are executed in groups.

In conclusion, the SLE is carried out quite thorough, but only within the limited area of the Vocational subject and Dutch language, covering approximately one third of the time at school. The other subjects in the SLE and all subjects in the TLE are taught in a teacher-centred manner. Graph & Media forms an exception because it shows some SLE characteristics.

2.6.5 Instruments

Students' motivational engagement and their perception of psychological needs were measured with the Intrinsic Motivation Inventory (IMI). The items inquired about schoolwork in general. The validity of the IMI was tested by McAuley, Duncan, and Tammen (1989). For this study, scales were added to measure perceived organisational competence. The questionnaire was thoroughly inspected by a group of experts and tested by 20 students. One item was deleted because of a poor language fit. The analyses were performed with 230 students. All answers were scored on a five-point Likert scale from 1 (*I don't agree at all*) to 5 (*I fully agree*).

Pleasure/interest, effort, perceived autonomy, and relatedness

Pleasure and interest were measured with one scale, in line with the IMI, with six items (e.g., 'I think schoolwork is fun'). Five items measured effort (e.g., 'I put a lot of effort into schoolwork'). Cronbach's α was .85 for both scales. Five items measured perceived autonomy (e.g., 'I feel I can determine what I do at school'). Two negatively formulated items were recoded, but not reliable; after deletion perceived autonomy showed a Cronbach's α of .71. Perceived relatedness was measured by six items (e.g., 'Teachers make me feel at ease', Cronbach's $\alpha = .90$).

Perceived personal and organisational competence

Four different aspects of competence were measured. Perceived personal competence consisted of five items (e.g., 'I think I am good at doing schoolwork most of the time'). Three aspects of perceived organisational competence were measured; five items on usefulness of help (e.g., 'Teachers make sure I understand what I have to do'), five items on accessibility of help (e.g., 'Teacher are present when I need help), and six items on help with looking up

information (e.g., ‘Teachers help me find my way on Internet’). The competence scales differed from the original IMI, therefore the data were analyzed using confirmatory factor analysis with a maximum likelihood method (for the results see Table 1). After two recoded items were removed, the four hypothesized factors fitted the data satisfactory (model 1). However, the factor on usefulness of help and the factor on accessibility of help were highly correlated ($r = .83$). In model 2 we joined them in one factor ‘quality of teacher help’. Within this factor, some items showed a common denominator, for instance where help finding information in the computer was mentioned explicitly. The items clearly belonged to this specific factor, but caused variance, visible in the covariance of error terms. Allowing the covariance of some of the error terms to be estimated (model 3) improved the fit significantly. A multilevel analysis, taking class level into account completed the analysis with very satisfactory fit values (model 4).

Table 1. Fit values of four models from confirmatory factor analyses on aspects of competence (N = 230).

Model	Chi 2 (df), p	CFI	NNFI	RMSEA
1	276.58 (163), < 0.0001	0.95	0.94	0.056
2	378.07 (166), < 0.0001	0.91	0.90	0.075
3	207.94 (157), < 0.004	0.98	0.97	0.038
4	293.62 (325), < 0.894	1.000	1.036	0.000

This resulted in a total of three scales of perceived competence; perceived personal competence, measured with five items (Cronbach’s $\alpha = .81$), perceived organizational competence ‘quality of teacher help’, measured with ten items (Cronbach’s $\alpha = .94$) and perceived organizational competence ‘help with information’ consisting of six items (Cronbach’s $\alpha = .86$).

Grades and absenteeism

The mean grade over one year for the Vocational subject, and the subjects Dutch, provided by the school, were also taken into account. The tests that underlie these grades are identical for both learning environments. Grades can take the value of 1 (*poor*), to 10 (*excellent*), with a value of 5.5 and above as a passing grade. Absenteeism involved counts of hours absent during the school year, recorded by the school in the same way for both learning environments. A distinction was made between non-permitted absenteeism (NA) and permitted absenteeism (PA). Three NA values and one PA value were identified as outliers and excluded from the analyses.

2.7 Statistical analyses

The main purpose of this article is to attribute differences in need fulfilment and motivational engagement to different learning environments. However, the data are nested, therefore outcome variance maybe determined by class membership. Accordingly, multi-level analyses were performed (Hox, 2002). The number of 16 classes is small, but sufficient (Snijders & Boskers, 2011) and we used the restricted function (RML) of MlWin 2.0, suitable for a small number of classes (Rasbach, Steele, Browne, & Prosser, 2003).

We deal with two levels and in case of a multivariate response (e.g., different aspects of competence), a third level is added that represents variance resulting from differences between variables. Categorical variables were represented by dummy variables (SLE = 1, TLE = 0; boys = 1, girls = 0). To assure comparability between different variables, their scores were standardised. As a first step the unconditional model is estimated. Explanatory terms are added stepwise, and the final model includes only significant main effects and interaction effects. Interpretation of the results is based on explained variance and differences between models that were tested.

2.8 Results

2.8.1 Descriptive analyses

Means, standard deviations, and correlations for the variables on motivational engagement and perceived needs are presented in Table 2. The descriptive statistics for grades and absenteeism are presented in Table 3.

Table 2. Means (M), standard deviation (SD), and intercorrelation coefficients for motivational engagement and perceived needs in the student-centred learning environment (SLE) and the teacher-centred learning environment (TLE)

		SLE	TLE						
Variable		M (SD)	M (SD)	1	2	3	4	5	6
1.	Pleasure/interest	3.19 (0.87)	2.78 (0.87)						
2.	Effort	3.95 (0.82)	3.66 (0.93)	.59**					
3.	Autonomy	3.51 (0.81)	3.26 (0.74)	.42**	.36**				
4.	Relatedness	3.34 (0.99)	2.65 (0.89)	.47**	.35**	.37**			
5.	Personal competence	3.71 (0.73)	3.46 (0.76)	.53**	.55**	.49**	.37**		
6.	Organisational competence quality	3.54 (0.89)	3.07 (0.86)	.42**	.35**	.32**	.81**	.38**	
7.	Organisational competence information	3.27 (0.93)	2.80 (0.99)	.44**	.28**	.36**	.55**	.33**	.60**

Effort and pleasure are moderately to highly correlated, also with perceived needs, and especially with perceived personal competence. Furthermore, results show a strong relation between perceived relatedness and perceived organisational competence ‘quality of teacher help’. A multicollinearity check showed variance inflation factors with permissible values, ranging from 1.4 to 1.9 (Kutner, Nachtsheim, & Neter, 2004).

Table 3. Means (M) and standard deviations (SD) for grades and absenteeism in the student-centred learning environment (SLE) and the teacher-centred learning environment (TLE)

Variable	SLE	TLE
	M (SD)	M (SD)
Grade Dutch	6.67 (0.93)	6.67 (0.87)
Grade Vocational practice	6.23 (0.87)	6.63 (0.81)
Permitted absenteeism	41.95 (33.27)	54.73 (45.47)
Non-permitted absenteeism	4.47 (6.00)	6.38 (7.89)

2.8.2 Multi-level analyses

Motivational engagement: effort and pleasure

Effort and pleasure are both indicators of motivational engagement and therefore analysed together. To distinguish between the effort and pleasure score, a dummy variable was used (effort = 1, pleasure = 0). A three-level analysis was carried out, with the variables at the first level, the respondents on the second level and the classes on the third level.

Table 4. Multi-level analysis of motivation (effort and pleasure)

	Model	
	Unconditional	Final
<i>Coefficients</i>		
Intercept	0.000 (0.103)	0.086 (0.118)
Learning environment		0.367 (0.141), $p = 0.018$
Gender		-0.439 (0.122), $p < 0.001$
<i>Variance components</i>		
Class	0.119	0.028
Respondent	0.471	0.472
Response	0.407	0.407
N responses	460	460
Deviance	1186.556	1172.786
Δ		13.77, $df=2$, $p=0.001$

The unconditional model (Table 4) showed that part of the variance in motivational engagement can be explained at class level with an intra-class correlation (ICC) of .119, and a larger part of the variance can be attributed at the respondent level (ICC = .471). In the final model the predicting variables learning environment and gender explained part of the variance at class level (ICC = .028). The log-likelihood-ratio test shows that the final model is significantly better than the unconditional model ($\chi^2(3) = 28.46$, $p < .001$), with a significantly higher level of motivational engagement on the whole in the SLE (t -ratio = 2.60, $p = .018$). Also, there is a significant but negative relation between gender and motivational engagement (t -ratio = - 3.59, $p < .001$); boys are less motivated than girls.

Personal and organisational competence

Perceived personal competence and the two forms of organisational competence were distinguished with two dummy variables ('personal competence' = 1 respectively 0, 'quality of teacher help' = 0 respectively 1, 'help with information' = 0 respectively 0).

Table 5. Multi-level analysis of perceived personal and organisational competence

	Model	
	Unconditional	Final
<i>Coefficients</i>		
Intercept	-0.010 (0.090)	-0.013 (0.097)
Learning environment		0.431 (0.110), $p < .001$
Gender		-0.322 (0.104), $p = .018$
<i>Variance components</i>		
Class	0.089	0.009
Respondent	0.353	0.357
Response	0.561	0.561
<i>N</i> responses	686	686
Deviance	1810.501	1795.012
Δ	0.561	15.489, $df = 2$, $p < 0.001$

The unconditional model shows (Table 5) that a small part of the variance can be explained at class level (ICC = .089) and a substantial part of the variance can be attributed to the respondent (ICC = .353). The results show that the learning environment is a very significant predictor of perceived competence on the whole (t -ratio = 3.92, $p < .001$). Also, there is a significant but negative relation between gender and perceived competence on the whole; boys have significantly lower perceptions of competence than girls (t -ratio = - 3.10, $p = .002$).

Autonomy

Autonomy is a single variable and therefore we performed a two-level analysis. The unconditional model shows (Table 6) that a very small part of the variance can be explained at class level (ICC = .017). Adding learning environment as a predicting variable, there is a significantly higher level of autonomy in the SLE (t -ratio = 2.46, $p = .014$). There is no effect for gender.

Table 6. Multi-level analysis of perceived autonomy

	Model	
	Unconditional	Final
<i>Coefficients</i>		
Intercept	0.000 (0.074)	-0.150 (0.090)
Learning environment		0.322 (0.131), $p = 0.014$
<i>Variance components</i>		
Class	0.017	0.000
Respondent	0.984	0.978
<i>N</i> responses	228	228
Deviance	645.764	640.067
Δ		5.697, $df = 1$, $p = 0.017$

Relatedness to teachers

Relatedness is measured as a single variable, therefore we used a two-level analysis. The unconditional model shows (Table 7) that a fair amount of the variance ($ICC = .119$) can be attributed to class level. Still, there is a significant effect of the learning environment on relatedness ($t\text{-ratio} = 3.41$, $p < .001$), implying relatedness to teachers is much stronger in the SLE. Gender had no significant effect.

Table 7. Multi-level analysis of perceived relatedness with teachers

	Model	
	Unconditional	Final
<i>Coefficients</i>		
Intercept	-0.043 (0.128)	-0.328 (0.130)
Learning environment		0.661 (0.194), $p < 0.001$
<i>Variance components</i>		
Class	0.199	0.087
Respondent	0.814	0.816
<i>N</i> responses	227	227
Deviance	619.627	610.377
Δ		9.25, $df = 1$, $p = 0.002$

Practise-based outcomes: absenteeism and achievement

Absenteeism is measured by the number of hours absent during the school year. PA covers permitted absence, NA covers non-permitted absence. Both variables were analysed with generalized linear mixed modelling using the log link function for the Poisson distribution.

We performed these analyses with the lmer function of the lme4 R package. The models were fit by the Laplace approximation. With respect to PA, none of the predictors contributed significantly. In the final model for NA, however, gender ($z = 2.59$, $p = .0097$) and the interaction between gender and the learning environment ($z = -2.66$, $p = .0078$) were significant; boys are less absent in the new learning environment (Table 8). Grades, finally, showed no differences between the SLE and the TLE.

Table 8. Multi-level analysis of non-permitted absenteeism

	Model	
	Unconditional	Final
<i>Coefficients</i>		
Intercept	1.7017 (0.1164)	0.086 (0.118)
Gender		0.367 (0.141), $p = 0.018$
Gender*learning environment		-0.439 (0.122), $p < 0.001$
<i>Variance components</i>		
Class	0.2011	0.3024
Gender		0.2855
N responses	218	218
Deviance	1460.186	1398.169
Δ		62.017, $df=4$, $p < 0.0001$

2.9 Discussion

Currently, student-centred learning environments (SLEs) are designed to enhance and increase students' motivation, especially in vocational education. According to Self-Determination Theory the fulfilment of the need for autonomy, competence and relatedness, is essential for motivation; SLEs seem to meet the fulfilment of these needs. However, SLEs can also be quite demanding, granting students too much autonomy and, consequently, have a less positive or even detrimental effect on motivation. Our goal was to examine to what extent students' motivational engagement and perceived need fulfilment differ in a SLE and TLE.

The results of this study are in favour of the SLE. First, students in the SLE, compared with the students in the TLE, perceive more autonomy (Hypothesis 1a), more relatedness

with teachers (Hypothesis 1b), more personal competence (Hypothesis 1c) and more organisational competence (Hypothesis 1d). Furthermore, students report more pleasure and effort (Hypothesis 2). Gender differences were seen for non-permitted absenteeism; boys were less non-permitted absent in the SLE compared to boys in the TLE (Hypothesis 3 & 4). Achievement, finally, showed no significant differences between learning environments.

Returning to the discussion about autonomy and lack of structure, the results of this study justifies placing question marks with the article by Kirschner et al. (2006) that automatically relate new forms of learning to minimal guidance. First, the present study shows that students in the SLE, based on constructivist learning theories, perceive more autonomy, and simultaneously more organisational competence. This is consistent with new forms of learning described by Simons et al. (2000); the guiding role of the teacher and the organisational support from the learning environment are essential aspects of SLEs. Hmelo-Silver, Duncan, and Chinn (2007), too, state that “both problem based learning and inquiry learning employ scaffolding extensively” (p.99).

Second, students in the SLE perceive more relatedness with teachers. Several studies emphasise the importance of relatedness in relation to autonomy; making autonomous behaviour possible has an emphatic, supportive character (e.g., Assor et al., 2002). Finally, according to this study students can perceive more autonomy and simultaneously feel more competent. To put it more clearly, increased perceived autonomy goes hand in hand with perceived relatedness and perceived competence very well.

We do not deny that new forms of learning can and do coincide with students being left to their own devices. We do argue, however, against the statement that new forms of learning are equal to leaving students to their own devices. What are the underlying reasons for the negative statements about SLEs? The implementation of SLEs is essential in order to establish the intended learning effects, but often is poor (Boekaerts, 2002a). Mayer (2004)

speaks of “a naïve interpretation of constructivism” (p.18) and the underestimation of the complexity of learning concepts based on constructivist principles.

One could also argue that the concept of autonomy is interpreted too naïve and too straight forward. We support research that takes more complex relations into account, reporting that fulfilling students’ need for autonomy also involves teachers taking students seriously (Assor et al., 2002) and providing rationales for learning (Jang, Reeve, & Deci, 2010). Hansson (2010) and Slavich and Zimbardo (2012) translated social constructivism to the instructional practice of the classroom, including both active involvement of students and development of their responsibility for learning, as well as teachers’ responsibility to provide content and support. It goes without saying that, although it sounds paradoxical, SLEs put great demands on teachers. This has to be taken into account when implementing such an environment.

In this research we also studied absenteeism, achievement and gender. Grades do not differ in the learning environments. This means that the SLE does not necessarily have detrimental effects on motivational engagement, as suggested by Lehtinen et al. (1995), but clearly, it did not boost students’ achievement either. Hebb’s principle of optimal arousal could explain this result; people thrive on challenges as long as it is not too difficult (Hebb, 1955). The motivational challenges of the SLE might have a positive effect on students’ motivational engagement and simultaneously have no effect on achievement; it may be motivating, but too difficult to obtain high grades. Finally, results show that the difference for non-permitted absenteeism is more explicit for boys. This is an important finding: boys generally are less motivated than girls (Martin, 2004) and show higher dropout rates (Central Bureau for Statistics, 2011). The SLE seems to be more inviting for boys to attend the lessons.

The results of this exploratory study are interesting, but some limitations have to be taken into account. First, this research has been executed in one school; therefore results can not be generalized to other schools. Second, the research design shows some weaknesses. We compared the students in two learning environments with a one-time measurement, which makes determination of causal relations difficult. Also, students were not randomly assigned to the learning environments. Comprehensive changes in real-life educational settings make random assignment to conditions almost impossible. We recommend that schools regularly monitor their students to enable the evaluation of educational innovations with longitudinal research. The third limitation concerns the threat of external validity (Kazdin, 1999). The novelty of the SLEs might influence the enthusiasm of those involved. However, one could also argue that enthusiasm is part of the SLE, as can be inferred from its description. Nonetheless, longitudinal research is necessary to test the stability of the results reported in this study. Furthermore, we question the use of grades as outcome measure; previous research showed mixed results. Moreover, the tests underlying the grades stem from TLEs and mainly require rote learning, which does not give credit to the knowledge and skills students learn in SLEs. We recommend the development of tests that measure knowledge and skills, both on the level of rote learning and deep level learning, but that also test whether learning environments differ in how students are prepared for professional practice. Finally, the SLE in this study focused mainly on the role of the learning environment in students' motivation. To shift students' motives for learning from external sources to the individual even more, SLEs should also focus on motivational processes within the person (Slavich & Zimbardo, 2012), e.g., students' goals (Ford, 1992), and motivational strategies (Boekaerts & Corno, 2005; Wolters, 2004) thereby opening up students' full potential to become active, self-regulated learners (Bandura, 1986, 1994).

In conclusion, although we do not want to trivialize the findings on achievement, being present at school and perceiving school as pleasurable has proved to be important. A more appealing learning environment that supports need fulfilment is highly desirable. This study shows that an SLE can be such an appealing learning environment.