Is Problem-Based Learning Associated with Students' Motivation? A Quantitative and Qualitative Study

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ABSTRACT

In this study, a mixed method design was employed to investigate the association between a student-centered, problem-based learning (PBL) method and law students' motivation. Self-Determination Theory (SDT) states that autonomous motivation, which is associated with higher academic performance, can be reached when there is fulfillment of three psychological needs; autonomy, competence, and relatedness. PBL aims to trigger autonomous motivation. In Study 1, 85 third-year PBL law students (37% male; Mean age = 21.99) and 69 third-year law students of a traditional, lecture-based program (39% male; Mean age = 22.72) filled out the Self-Regulation Questionnaire and an adapted version of the Work-related Basic Need Satisfaction Scale, in order to measure autonomous and controlled motivation and perceived autonomy, competence, and relatedness. In order to compare both groups, two MANOVAs were conducted and results showed no differences on autonomous and controlled motivation, nor on feelings of autonomy and competence. However, PBL students experienced more relatedness. Additionally, in Study 2, focus group discussions were conducted and indicated that PBL contains both autonomy-supportive and controlling elements, which might explain why no differences were found on perceptions of autonomy, autonomous, and controlled motivation between PBL students and students of the traditional, lecture-based program. Furthermore, students reported that tutorial groups in PBL contribute to feelings of relatedness.

INTRODUCTION

Low graduation rates and high student dropout are two major issues that universities in higher education face all over the world: On average, 30% of the students enrolled in tertiary education leave without a degree (Organisation for Economic Co-operation and Development, 2013). In the Netherlands, these are serious issues especially in law schools compared to students of other disciplines. Of all discipline's, the graduation rate among Dutch law students after four years was the lowest (i.e., 21.4%) and dropout the highest (i.e., 60.3; Educational Inspectorate, 2009). A construct that is often associated with better academic achievement and graduation rates is students' motivation. For example, students' motivation highly correlates with academic achievements, such as grade point average (GPA; Richardson, Abraham, & Bond, 2012) and less intrinsically motivated students are more likely to dropout (Vallerand, Fortier, & Guay, 1997). Hence, increasing and maintaining students' motivation in higher education is desirable. The design of a learning environment could help in this regard. Problem-based learning (PBL), a student-centered instructional method, aims to stimulate motivation. More specifically, one of the objectives of PBL is to foster intrinsic motivation in students (Barrows, 1986; Hmelo-Silver, 2004; Norman & Schmidt, 1992).

The present research will explore whether PBL can positively affect students' motivation, by conducting a quantitative (i.e., Study 1: a comparison between a PBL cohort and a traditional, lecture-based cohort student cohort) as well as qualitative study (i.e., Study 2: focus group discussions). These studies will be conducted within the Erasmus School of Law, since study progress issues are worrisome especially among Dutch law students. Self-Determination Theory (SDT), a well-known theory of motivation by Deci and Ryan (2000) will be used as the theoretical framework of the studies. SDT has been applied to the learning context, and components of SDT are much in line with the instructional method PBL (cf. Black & Deci, 2000), on which we will elaborate later.

Self-Determination Theory

According to SDT, three basic, psychological needs, namely autonomy, competence, and relatedness, are to be satisfied in every individual in order to stimulate psychological growth and well-being. Autonomy refers to having internal control over study activities and the learning process. Competence refers to the feeling of being capable to successfully perform study-related activities. Finally, relatedness refers to the need to feel warmth and support of others, such as teachers and fellow students (Deci & Ryan, 2000; Ryan & Deci, 2000). As mentioned, SDT has been applied in the learning context, meaning that when the learning environment satisfies the three basic needs, students are more likely to become intrinsically motivated to learn (Katz, Kaplan, & Gueta, 2009).

Satisfaction of basic psychological needs determines the level of self-determination that is experienced. In SDT, a self-determination continuum is proposed consisting of different types of extrinsic motivation that move beyond the classic distinction between intrinsic versus extrinsic motivation. In the classic distinction, extrinsic motivation is often seen as detrimental for learning performances. However, not all types of extrinsic motivation hamper learning performances, depending on the amount of autonomy that is experienced (Ryan & Deci, 2000). Instead, the distinction between different types of motivation can better be expressed by the differentiation between *autonomous* and *controlled* motivation. In autonomous motivation, self-determination is high. Autonomously motivated individuals act upon the activity because it is fun or interesting (i.e., intrinsic motivation) or because it enables personal development (i.e., identified motivation; Deci & Ryan, 2000; Ryan & Deci, 2000). Although the latter reason is extrinsic, that is the activity is not undertaken because it is interesting in itself, it is completely accepted and integrated with the self. In contrast, controlled motivation represents the kind of motivation in which self-determination is low. Students study because they experience pressure, such as trying to obtain a reward or avoiding punishment (i.e., external regulation) or to avoid feelings of shame and experience feelings of pride (i.e., introjected regulation).

Previous studies indicated positive relations between autonomous motivation and learning behavior. A meta-analysis by Taylor et al. (2014) demonstrated a moderately strong, positive relation between autonomous motivation and school achievement. In the meta-analysis studies from elementary school, high school, and college were included. Furthermore, positive effects of autonomous motivation have been demonstrated on deeper learning and persistence in high school and college students of different educational programs, (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004), better concentration and time-management in Chinese university students (Vansteenkiste, Zhou, Lens, & Soenens, 2005), and lower dropout intentions in American high school students (Hardre & Reeve, 2003). Controlled motivation, on the contrary, has been negatively related to concentration and time management and positively related to undesirable study behavior, such as performance anxiety and dropout (Vansteenkiste et al., 2005).

Where Problem-Based Learning Meets Self-Determination Theory

Considering the positive effects of autonomous motivation on learning outcomes, this type of motivation is desirable in students. Therefore, PBL specifically aims to stimulate students' intrinsic or autonomous motivation (Barrows, 1986; Hmelo-Silver, 2004; Norman & Schmidt, 1992). PBL consists of three phases: the initial discussion phase, the self-study phase, and the reporting phase. In the initial discussion, a collaborative discussion of a realistic problem (e.g., description of a real-life situation) takes place at the start of the learning process. Based on common sense and prior knowledge, students try to

explain the problem. With the problem as the starting point of the learning process, knowledge on the topic addressed is limited and students collaboratively formulate questions about to-be-learned aspects of the problem, called learning issues. In the second PBL phase, self-study, students individually search for and study relevant literature sources in order to answer the learning issues. After self-study, students return to the tutorial group to discuss the studied literature and address the learning issues together (i.e., the reporting phase). A tutor is present during the initial discussion and reporting phase. A tutor guides the process, for example by intervening when students focus too long on irrelevant issues. He or she asks in-depth questions to make sure students themselves elaborate on course material, instead of providing them with factual knowledge (Barrows, 1996; Loyens, Kirschner, & Paas, 2012; Schmidt, 1983). One could argue that several aspects of PBL encourage feelings of autonomy, competence, and relatedness and subsequently students' autonomous motivation.

Students' needs for autonomy can be stimulated when students are provided with choice and when they can take control of their own learning (Ryan & Deci, 2000). It is assumed that PBL stimulates students' autonomy in different ways. Due to its student-centered nature, students take control of their own learning, whereas the tutors have a facilitating role. The facilitating or guiding role of teachers in student-centered learning is assumed to support students' need for autonomy in SDT (Black & Deci, 2000). Furthermore, PBL offers choice to students due to its emphasis on self-regulated learning. For instance, students formulate learning issues by themselves instead of receiving fixed learning issues from the tutor. Further, students choose and select their own set of literature sources, which stimulates autonomy. An empirical study by Wijnia, Loyens, Derous, and Schmidt (2015) showed that student-selection of literature resources resulted in higher autonomous motivation scores, when compared to receiving mandatory literature sources by an instructor in a PBL setting. The amount of autonomy increases when students are progressing in the academic program in PBL. For example, first-year students receive more guidance (e.g., more tips in providing literature and active scaffolding by the tutor) than third-year students.

Competence is experienced when students feel successful in a study task. Providing positive, informational feedback is one way to contribute to this (Deci, Koestner, & Ryan, 2001). In PBL, the tutor provides formative feedback on how students function in tutorial group meetings (i.e., preparation for and participation in the reporting phase). Another way to anticipate on feelings of competence is by providing problems that are based on real-life situations that need to be explained or solved. These "authentic", realistic tasks can help to students to feel more competent and confident in handling situations they will encounter in real-life and later in their profession (Dunlap, 2005). It is likely that if students feel they can handle those types of situations, this will make them feel more confident and hence contribute to the second need of SDT, competence.

Regarding the third need, feelings of relatedness have a positive impact on students' intrinsic motivation (Ryan, Stiller, & Lynch, 1994; Sheldon & Filak, 2008). Students want to feel connected to and feel warmth of significant others, which, in the learning context, regards relationships with teachers and fellow students. In a small, collaborative group setting (10-12 students), it is easier for students to contact peers and to build friendships and therefore helps to increase their feelings of relatedness. In line with this assumption, PBL students were found to perceive collaboration in the tutorial groups as motivating (Wijnia, Loyens, & Derous, 2011). Additionally, in PBL, a tutor is present during small group meetings. Because the groups are small, the tutor is able to give more individual support when needed and show interest in all students, which can stimulate feelings of relatedness as well.

Problem-based Learning and Motivational Outcomes So Far

Several studies on the PBL effect on student motivation have been conducted. In these studies, a comparison is made between PBL students and students of a more traditional (i.e., lecture-based) setting. Some studies indicate that PBL students report higher on several motivational aspects, such as intrinsic goal orientation and enjoyability (Sangestani & Khatiban, 2013; Sunger & Tekkaya, 2006), which are important aspects of autonomous motivation. Other studies have found positive effects on self-efficacy (Liu, Hsieh, Cho, & Schallert, 2006). As mentioned when students feel more confident and competent they are more likely to experience intrinsic or autonomous motivation. However, other studies show no differences on motivational outcomes between PBL and non-PBL students (Galand, Raucent, & Frenay, 2010; Loyens, Rikers, & Schmidt, 2009; Wijnia et al., 2011). For example, Wijnia et al. (2011), using the SDT framework, found no differences on autonomous and controlled motivation. Similarly, Galand et al. (2010) found no differences on mastey and performance goals, constructs that share close associations with autonomous and controlled motivation, respectively (Deci & Ryan, 2000).

A difference between the studies that found positive effects of PBL on motivational aspects (Liu et al., 2006; Sangestani & Khatiban, 2013; Sungur & Tekkaya, 2006) and studies where no differences between these student groups were found (Galand et al., 2010; Loyens et al., 2009; Wijnia et al., 2011) is the length of implementation. In studies were PBL positively relates to motivation often implemented PBL for a short period of time (e.g., fifteen days, Liu et al., 2006; six weeks, Sungur & Tekkaya, 2006; one semester, Sangestani & Khatiban, 2013), while a curriculum-wide implementation of PBL was investigated in the studies where no differences were found (e.g., Galand et al., 2010; Loyens et al., 2009; Wijnia et al., 2011).

Why no differences on motivation were found in studies conducted in existing PBL curricula is puzzling. The need satisfaction of SDT (i.e., autonomy, competence, and relatedness) is not taken into account in PBL effect studies on motivation outlined above.

Yet, the three needs are connected to several aspects of PBL (e.g., feelings of autonomy in PBL due to student-selection of literature), making the SDT an interesting framework for PBL studies on motivation. In order to learn more about students' motivation in curriculum-wide PBL implementations, more insight into the relation between PBL and the need satisfaction is needed. The present study will investigate students' motivation in a Dutch law school, the Erasmus School of Law, where a curriculum-wide implementation of PBL has taken place, and will specifically focus on the role of PBL characteristics in students' perceptions of the three psychological needs.

The Present Study

This research consisted of two studies: A quantitative and a qualitative study. Two research questions are addressed in Study 1: 'What are the differences between PBL students and students of a traditional, lecture-based program regarding perceived autonomy, competence, and relatedness?' and 'What are the differences between PBL students and students of a traditional, lecture-based program regarding autonomous and controlled motivation?' In order to answer these questions, a quasi-experimental study was conducted, in which third-year PBL law students and law students of a traditional, lecture-based (i.e., non-PBL) method were compared on their self-reported autonomous and controlled motivation, and their perception of need satisfaction in their learning environment. Regarding the first research question, it is hypothesized that PBL students perceive more feelings of autonomy, competence, and relatedness. PBL is assumed to foster these three needs, because of certain characteristics that are present in this environment, such as students' selection of literature (i.e., for autonomy), use of real-life problems (i.e., for competence), and collaborative working in small groups (i.e., for relatedness). In turn, satisfaction of these needs in PBL is assumed to foster autonomous motivation and diminish controlling motivation. Therefore, with regards to the second research question, it is hypothesized that autonomous motivation is higher among PBL students, and controlled motivation lower compared to students of the traditional, lecture-based program.

In order to elaborate on findings regarding the three needs, motivation, and PBL, Study 2, followed up findings of the Study 1 by conducting focus group discussions on the role of motivation and the three needs in PBL. Focus groups are discussion groups concerning specific questions and are helpful in exploring quantitative data (Kitzinger, 1995).

STUDY 1: QUASI-EXPERIMENTAL STUDY

Method

Learning environment

The Dutch law program under study consists of a three-year Bachelor's program. In September 2012, all first-year law students who enrolled at the Erasmus School of Law at the university under study started in the PBL program. Students who had already enrolled in the Erasmus School of Law *before* September 2012 followed the Bachelor's program in a more traditional, lecture-based instructional environment. The differences between both educational programs are indicated in Table 3.1.

The Dutch law study program in the traditional, lecture-based program consisted of four eight-week periods with two to three parallel courses. Lectures were emphasized as the main instructional method and hence, students could attend multiple lectures each week in which a teacher transmitted information. Some courses offered a weekly workgroup, in which a teacher explained and discussed a particular law case regarding the topic of the given course. Both the lectures and the majority of the workgroups were non-mandatory. Examination weeks were held four times each academic year at the end of each eight-week period. During these examination weeks, multiple courses were examined.

Table 3.1. Differences between the Lecture-Based and PBL Method

	Traditional, lecture-based program	PBL program
Courses	Eight courses per academic year	Eight courses (i.e., blocks) per academic year
	Each course is 8 weeks in duration	Each course is 5 weeks in duration
	Courses are offered parallelly (i.e., 2-3 courses per 8-week period)	Courses are offered sequentially (i.e., 1 course per 5-week period)
Assessment	Examination weeks every eight weeks	Examination after each course
	Four examination weeks with multiple exams	Eight examinations, one at the time
Instructions	Lectures are emphasized	Tutorial meetings are emphasized
	Up to ten lectures per week	Two or three lectures per week
	Weakly workgroups	Two tutorial meetings per week

In September 2012, the Dutch law program shifted from traditional, lecture-based learning to PBL. Teachers were trained to adapt their teaching style from a teacher-centered, directive style to a more guiding, facilitating role. Additionally, new tutors were hired and trained as well. Further, training for changing courses and creating problems was provided. The new PBL program is different from the traditional program in several ways. The PBL program consists of eight sequential courses each academic year, meaning courses are not offered parallelly anymore. Each course takes five weeks (i.e., block) and ends with a written examination instead of four examination weeks within the

academic year. The tutorial group meetings, which are held twice a week, are considered an important element in the PBL program. The groups consist of ten tot twelve students and a tutor. The group composition changes each block. Each 5-week course consists of eight problems, all addressing different, but related topics within the course. To give an example, one of the problems in a criminal law course could focus on self-defense. A (fictive) news article could serve as problem, describing a realistic situation in which a man is using self-defense when he is attacked. During a tutorial meeting, the reporting phase of a problem and the initial discussion of a new, subsequent problem take place. In the example of the problem regarding self-defense, students will discuss in the initial phase whether they think the man was in his right to defend himself, ending with questions (i.e., learning issues) when self-defense applies. Between these meetings, students have two to three days of self-study in which they prepare themselves for the upcoming meeting. They search for and select information from different sources, like text books, laws, and jurisprudence and will use this to address the learning issues. In the reporting phase, students collaboratively will discuss the studied materials and learning issues. Law students in general need to learn how to reason about legal cases. The problems used in PBL help students to think about realistic situations in which they need to apply what they have learned. In the Dutch law system, rules and principles are applied more often than comparison with prior cases.

Besides the tutorial meetings and self-study, students participate in practical courses that help students learn how to apply the learned knowledge. For example, students learn to plea a front of a judge and a lawyer with a realistic law case. Students earn study credits when passing the assignments of these courses. Further, non-mandatory lectures are provided by teachers two or three times a week, to expand the knowledge that is acquired during the tutorial meetings.

Participants

In the current study, participants were third-year Dutch law students of two cohorts. A comparison between both student cohorts took place, and hence participants were students from the *first* cohort of the PBL program and students from the *last* cohort of the traditional, lecture-based program (i.e., non-PBL students). Eighty-five PBL students (37% male) and 69 students of the traditional, lecture-based program (39% male) participated. Mean age was respectively 21.99 (SD = 2.02) and 22.72 (SD = 3.15) years. Students in both cohorts did not differ with respect to age, $t(152) = 1.76$, $p = .081$, or gender, $x^2(1)= 115$, $p = .735$. The male/female ratio in both groups is representative for Dutch law schools (Central Bureau for Statistics, 2014).

Materials

Students' perceptions of autonomy, competence, and relatedness and their autonomous and controlled motivation, were measured with two existing questionnaires. It was explicitly stated that students should base their answers on their experiences of the *entire* Bachelor's program (i.e., the first three years of the academic program), and not solely on experiences of the course they participated in at the time they received the questionnaire.

Satisfaction of needs.

The way students perceive autonomy, competence, and relatedness, in their learning environment was measured with the Work-related Basic Need Satisfaction Scale (W-BNS; Van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010). The W-BNS was originally developed to measure satisfaction of the three needs in the workplace environment (Van den Broeck et al., 2010). Therefore, some adjustments were made in order to fit the items of the questionnaire to a learning environment (e.g., the word 'work' was replaced by 'study'). The adapted version of the W-BNS contained 18 items that were rated on a five-point Likert scale (1 '*totally disagree*' to 5 '*totally agree*'). The questionnaire consists of three subscales with six items each scale. Table 3.2 presents questionnaire characteristics of the adapted WBN-S.

Table 3.2. Adapted version of Work-related Basic Need Satisfaction Scale

Scale	Cronbach's alpha	Example item
Autonomy ($k = 6$)	$\alpha = .72$	'I feel free to study the way I think it could best be done'
Competence ($k = 6$)	$\alpha = .79$	'I am good at the things I do in my study'
Relatedness ($k = 6$)	$\alpha = .82$	'Some people I study with are close friends of mine'

Autonomous/controlled motivation.

The Self-Regulation Questionnaire (SRQ; Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009) was used to measure autonomous and controlled motivation. In this questionnaire, students were asked to rate different reasons to study on a five-point Likert scale ranging from 1 (*not important at all*) to 5 (*really important*). The SRQ contains a total of 16 items, divided over four subscales: external regulation, introjected motivation, identified motivation, and intrinsic motivation.

Based on previous research (e.g., Vansteenkiste et al., 2009), the four scales were combined to two types of motivation, controlled motivation (i.e., average scores of the subscales introjected motivation and external regulation; Cronbach $\alpha = .85$) and autono-

mous motivation (i.e., average scores of the subscales identified motivation and intrinsic motivation; Cronbach α = .89). See Table 3.3 regarding questionnaire characteristics.

Table 3.3. Self-Regulation Questionnaire

Composite	Scale	Cronbach's alpha	Example item
Controlled motivation (*k* = 8)	External regulation (*k* = 4)	α = .79	'I am motivated to study, because others (e.g., parents) force me to do this'
	Introjected motivation (*k* = 4)	α = .79	'I am motivated to study, because I would feel guilty if I would not do this'
Autonomous motivation (*k* = 8)	Identified motivation (*k* = 4)	α = .86	'I am motivated to study, because this is an important life goal for me'
	Intrinsic motivation (*k* = 4)	α = .86	'I am motivated to study, because I like to do this'

Procedure

A cohort comparison between PBL students and students of a traditional, lecture-based program was carried out within one university. The PBL students entered the Erasmus School of Law in their first year in September 2012 and the students of the traditional, lecture-based program entered their first year in September 2011. Both student groups participated when they were in their third year. Hence, students of the PBL cohort filled out the questionnaires in April 2015 and students of the traditional, lecture-based cohort a year earlier, in April 2014. This way, PBL students and students of a traditional, lecture-based program could be compared while they were in the same phase of the academic program (i.e., third year).

Due to the shift of the educational program, there were some changes in the course order as well. Students of the traditional, lecture-based cohort received the questionnaires during a non-mandatory lecture of the course 'Business and Corporate Law'. One of the authors handed out the questionnaires to the students and collected them after they were filled out. In the PBL cohort, questionnaires were distributed during a tutorial meeting. Tutors administered the questionnaires during the final (mandatory) tutorial meeting of the course 'Philosophy of Law'. Completing the questionnaires took students about 10 to 15 minutes. Afterwards, tutors collected the questionnaires and handed them over to one of the authors.

Statistical Analysis

To investigate the effects of PBL on students' perception of the satisfaction of the three psychological needs and their motivation, two separate Multivariate Analysis of Variances (MANOVAs) were conducted. The first MANOVA focused on the three needs. Instructional method (i.e., PBL vs. traditional, lecture-based) served as between-subject

factor and scores on satisfaction of the three needs in the learning environment (i.e., autonomy, competence, and relatedness) were dependent variables. The second MANOVA concerned scores on the SRQ. Again, instructional method (i.e., PBL vs. lecture-based) served as between-subjects factor and motivation scores (i.e., autonomous and controlled motivation) as dependent variables. Effect sizes were expressed in partial eta squares (i.e., partial η^2), and were indicated as small, medium, or large effects when values were .01, .06, and .14 respectively (Richardson, 2011b).

Results

Mean scores for both student cohorts on the adapted version of the W-BNS and the SRQ are given in Table 3.4. First inspection of the scores on the three needs showed they were all rather high, especially scores on competence. Scores on autonomous motivation were higher compared to controlled motivation in both student groups. Table 3.5 provides correlations between all variables. The psychological needs were positive and highly correlated with autonomous motivation, with exception of relatedness (i.e., non-significant correlation). Correspondingly, controlled motivation negatively correlated with perceived autonomy and competence. Again, no correlation with relatedness was present.

Table 3.4. Mean scores on subscales of the Self-Regulation Questionnaire and the adapted version of the Work-related Basic Need Satisfaction Scale (SDs in parenthesis)

Questionnaire	Scales	PBL (n = 85)	Lecture-based (n = 69)
Work-related Basic Need Satisfaction Scale (W-BNS)	Autonomy	3.39 (0.72)	3.53 (0.67)
	Competence	3.77 (0.59)	3.75 (0.60)
	Relatedness	3.54 (0.71)	3.21 (0.87)
Self-Regulation Questionnaire (SRQ)	Autonomous motivation	3.82 (0.75)	3.85 (0.64)
	Controlled motivation	2.32 (0.81)	2.22 (0.75)

Note. Scores on both questionnaires could range from 1 to 5.

Table 3.5. Pearson correlations between all variables

		1.	2.	3.	4.
1.	Autonomous motivation	-			
2.	Controlled motivation	.02	-		
3.	Autonomy	.41**	–.23*	-	
4.	Competence	.48**	–.22*	.38**	-
5.	Relatedness	.11	.04	.15	.23*

Note. N = 154.

* p <.01, ** p <.001.

Before conducting the MANOVAs, assumptions were checked and met (e.g., normality of residuals of dependent variables, Box' test for homogeneity of covariance matrices was non-significant for the first and second MANOVA, respectively $p = .175$ and $p = .109$). The first MANOVA on the three basic needs autonomy, competence, and relatedness, showed a medium effect of instructional method, Pillai's Trace (V) = .06, $F(3, 150) = 3.31$, $p = .022$, partial $\eta^2 = .06$. To follow-up this MANOVA, separate Analyses of Variances (ANOVAs) were conducted. In order to reduce the chance of Type I error, a Bonferroni-correction was applied and results were only considered significant when an alpha level of .017 was reached (.05/3). Results showed no differences between both student groups on perceived autonomy, $F(1, 152) = 1.60$, $p = .207$, partial $\eta^2 = .01$, nor on perceived competence, $F(1, 152) = .04$, $p = .844$, partial $\eta^2 < .01$. However, a significant difference emerged for the satisfaction of the need for relatedness, $F(1, 152) = 6.88$, $p = .010$, partial $\eta^2 = .04$ (i.e., small effect), in favor of the PBL students. The second MANOVA on autonomous and controlled motivation showed no effect of instructional method on students' motivation, Pillai's trace (V) = .01, $F(2, 151) = .36$, $p = .696$, partial $\eta^2 = .01$.

Discussion

PBL and students of the traditional, lecture-based program did not differ on their feelings of autonomy and competence in the learning environment. These results were unexpected, because it is believed that PBL stimulates autonomy (e.g., choice in literature sources) and competence (e.g., work on realistic tasks). Further, it was found that feelings of relatedness were higher in PBL students, meaning that PBL students experience more support by others such as teachers and peers. There was, however, no correlation between autonomous motivation and relatedness, nor between controlled motivation and relatedness. Despite higher scores on relatedness, students' motivation was not influenced by this need, which is in contrast to SDT (Ryan & Deci, 2000). Possible explanations are discussed in the general discussion.

Results further demonstrated no differences between PBL students and students of the traditional, lecture-based program on their autonomous and controlled motivation. These findings were not in line with findings of Sangestani and Khatiban (2013), and Sungur and Tekkaya (2006), which demonstrated positive effects of PBL on student motivation, but they were in line with results reported by Galand et al. (2010), Loyens et al. (2009), and Wijnia et al. (2011). While the studies that found positive outcomes implemented only a short-term PBL intervention, the other studies (Galand et al., 2010; Loyens et al., 2009; Wijnia et al., 2011), as well as the current study, were conducted in *existing* PBL curricula. Introducing students to a short PBL intervention might only influence their motivation, as the method is completely new to them then. Conducting the studies in existing curricula is more ecologically valid. Furthermore, correlations indicated that perceived autonomy and competence were positively and moderately

to highly correlated with autonomous motivation and negatively and moderately correlated to controlled motivation (see Table 3.5). Because scores on competence and autonomy feelings were high in both PBL students and students of a traditional, lecture-based program, the absence of significant differences on autonomous and controlled motivation between both groups become clearer.

Considering that most of the findings were not in line with the hypotheses, with the exception of higher relatedness scores in PBL students, a follow-up study with focus group discussions was conducted to add to and explain these findings. The focus group discussions attempted to elaborate more on elements in PBL that can satisfy or thwart the three needs and on motivating and demotivating elements in PBL. Specifically, students discussed which PBL characteristics influence feelings of autonomy, competence, and relatedness in order to acquire more understanding on the lack of differences regarding autonomous and controlled motivation and on perceived autonomy and competence.

STUDY 2: FOCUS GROUP DISCUSSIONS

As we were interested in the relation between different aspects of PBL and the components of SDT, two focus group discussions with PBL students took place. During focus groups, students give their opinions on certain topics and collaboratively discuss them. Findings from focus group discussions add to data of quantitative studies (Kitzinger, 1995) and offer more understanding on why certain results showed up. During the focus groups, students elaborated on PBL characteristics and whether these were experienced as motivating or demotivating and students discussed the degrees of autonomy, competence, and relatedness they experience in PBL and which elements in PBL contributed to this.

Method

Participants

Third-year Dutch PBL law students were recruited. They were explained the process of the focus groups and were told beforehand that the discussion would focus on PBL. They were guaranteed that their contribution would be reported anonymous. In total, thirteen students volunteered to participate and they were assigned to one of two focus groups, depending on the time of their tutorial meeting, as the focus group took place prior to or after their meeting. PBL students who participated in the focus groups were also involved in the quantitative study and filled out the questionnaires on autonomous and controlled motivation. The first group consisted of five students (one male, four females), the second group of eight students (three males, five females). The focus groups were held on one day, directly before or after one of the tutorial meetings in the final

course of the third academic year (June 2015). Students were recruited from different tutorial groups.

Procedure

The first author acted as interviewer in both groups. She asked the questions, took notes and made sure certain topics would be covered in the discussion. The first open-ended question was: 'Which aspects of PBL do you consider motivating and which aspects do you consider demotivating?' Additionally, the interviewer introduced the three psychological basic needs of SDT briefly. Thereafter the following three questions were asked: 'Do you have the feeling there is autonomy in PBL and which characteristics of PBL contribute to this feeling?', 'Do you feel competent in PBL and which characteristics of PBL contribute to this feeling?', and 'Do you experience relatedness in PBL and which characteristics of PBL contribute to this feeling?' Students were instructed to answer freely and discuss each other's opinions. The authors agreed beforehand that certain topics, concerning the most important characteristics of PBL, needed to be addressed, such as the tutor, the problems used in PBL, collaboration, self-regulated learning, connection with practice. Furthermore, topic concerning the implementation of PBL in the curriculum under study, such as the lectures, needed to be addressed. When these topics were not addressed spontaneously, the interviewer asked students' opinion about the role of the particular topic with respect to their motivation/demotivation. Both focus group discussions took about 60 minutes and were recorded.

Analysis

The first focus group discussion was transcribed literally. Due to a technical problem, recording of the second discussion failed. Therefore, the interviewer directly wrote the discussion down after it took place, based on the written notes and memory. This summary of the discussion was analyzed instead. Statements in the transcriptions were classified under one of five categories, which are based on SDT: motivating aspects, demotivating aspects, autonomy, competence, and relatedness. One of the authors and an independent rater both categorized all statements. There was substantial agreement between raters ($\kappa = .80$) and discrepancies were resolved through discussion.

Results

Motivating aspects

Students experienced PBL overall as satisfying. The structure PBL offers, such as a period of self-study prior to a group discussion, and the fact that courses are offered in succession, were pleasant. The tutor and the problems used, which are specific characteristics of PBL, were perceived motivating, as long as they meet certain conditions. Students were enthusiastic about the tutor when he/she showed interests, had expertise, and

was actively involved in the group (i.e., asking in-depth questions and helping when students discus irrelevant information). In general, students were positive about the problems used in PBL. For example, students indicated that when the problem is used to apply the acquired knowledge in the reporting phase, this is enjoyable.

> *I think it is motivating in PBL that the case [the problem] triggers you to find things out.* FG1, S2

> *[…]. That is motivating to me, when at the end of the reporting phase you understand how it [the problem] in a realistic situation works.* FG1, S4

> *It is motivating when I get the feeling the tutor understands the learning material […].* FG1, S4

Demotivating aspects

There were also some perceived demotivating aspects of PBL. For example, in students' opinion, the initial discussion was sometimes redundant and could be shortened (e.g., formulating the learning issues more directly without a discussion). Moreover, if the initial phase of PBL lacks discussion, students were demotivated. When the topic of the problem is too abstract or too far removed from the students, they lack prior knowledge and experience difficulties discussing the topic.

> *For example, in the course Philosophy of the Law, one can take different perspectives, which makes discussion possible. But for example in the course (Dutch) Civil Procedural Law, all we need to know is written down in the Civil Code, so you don't really have an opinion about it. This makes it hard to enter discussion in the initial discussion.* FG1, S1

Some specific elements of PBL that were earlier described as motivating (i.e., tutor and problems), can also be considered demotivating under other conditions. For example, a tutor was considered very demotivating when he/she was passive during the meetings (i.e., hardly asking questions and being inattentive in the discussion). Further, problems that were too long or similar to previous problems were also unsatisfying.

> *It is really demotivating when a tutor is passive and does not intervene in the discussion when necessary and gives us the feeling he/she doesn't understand what is discussed in the group.* FG1. S4.

Another aspect of the educational system that caused a lot of discussion in the focus groups was the mandatory presence requirement for tutorial meetings. In the PBL curriculum under study, students are required to be present during the tutorial meetings. They are allowed to miss only one meeting per course that needs to be compensated with a compensatory assignment. Although understanding the importance of attendance in the tutorial meetings, students felt this rule is too strict. Lectures were also perceived demotivating, especially when they are not interactive. Students argued that there were too much lectures in a row, taking too long for them to stay focused (approximately four to six hours).

> *Lectures are good when the lecturer let's students participate, but only a few lecturers do this […].* FG1, S2.

Autonomy

When students were asked directly whether they experienced autonomy in PBL, the majority reported low feelings of autonomy. Factors that contributed to this were the mandatory presence, lack of choice in courses and not being able to select their own tutorial group, as students are randomly assigned to their tutorial group. However, students did mention some autonomy-supportive elements in PBL as well, such as choice in literature sources and room for own discussions in the tutorial meetings, without interruptions of the tutor. Interestingly, students indicated to be *unsatisfied* with these autonomy-supportive aspects of PBL.

> *I think it is demotivating that teachers want you to read multiple literature sources during one course. They recommend five to six books, but you will never study all of them. […] I think this is confusing.* FG1. S2

> *It would be nice if the tutor guides more often in a way that he or she would make it more clear what we need to know during the discussion*. FG1.S4

Further, the required preparation for every meeting, which is more a controlling element in PBL, served as an incentive to study. Students study on a regular basis that way.

Competence

In general, students felt competent during their study. Both nonspecific PBL elements (e.g., achievements in form of grades) as PBL specific elements (e.g., the phases of PBL) contributed to feelings of competence. During the phases of PBL (i.e., initial discussion, self-study, and reporting phase), students first activate their prior knowledge, then individually study the material and afterwards discuss the material collaboratively. It

seems that being actively involved in the learning process contributes to feelings of competence.

> *I believe that PBL offers the possibility to really understand the material, because you can ask a lot of questions and you can discuss [about the material]. So you'll know whether you get it or not and this gives a feeling of certainty before you enter your examination. Because you know you have discussed all of it.* FG1.S4

As mentioned before, students like to apply the learned knowledge to the problem. In addition to the fact that this is motivating, connecting theory and practice helps create feelings of competence and helps students build coherent understanding of the material.

> *[…]. You can apply the theory you learned on a practical case [when working with the problem]. Otherwise it [learned course material] stays so abstract*. FG1.S4

Relatedness

All students indicated that they felt connected with others. The most important PBL factor that contributes to this is the tutorial group, because students get to know each other in the meetings. Additionally, students feel the tutor is approachable in PBL, and hence they are more likely to ask questions or start a conversation with him/her.

> *You know a large number of law students by now, because there are different students in your tutorial group every course. I really like that, meeting so many new people*. FG1. S5

Discussion

Results of the focus groups analysis showed that PBL students indicated presence of both motivating as well as demotivating elements in the learning environment. In general, students are satisfied with PBL. Especially the process of PBL (i.e., self-study before discussion of the material), sequential courses (i.e., one course for five weeks, ending with an examination), and an active tutor was motivating. Yet, there were some perceived demotivating aspects in PBL as well, such as the initial discussion, a passive tutor, and mandatory presence.

Other statements in the focus group discussions concentrated on the three psychological needs according to SDT (Ryan & Deci, 2000). Students experienced some autonomy, but also felt they were controlled by certain PBL elements such as the mandatory presence and required preparation. Feelings of competence were attained by PBL specific

elements (i.e., realistic problems) and non-specific PBL elements (i.e., grades). Further, the tutorial meetings with fellow students contributed to relatedness.

General Discussion

As motivation is of importance for academic success and study progress (Richardson et al., 2012; Vallerand et al., 1997), motivation needs to be stimulated in students. PBL is an instructional method that aims to foster intrinsic motivation (Barrows, 1986; Hmelo-Silver, 2004; Norman & Schmidt, 1992). Hence, the present study investigated the relation between PBL and Dutch law students' motivation with a mixed-methods design. SDT was used as a theoretical framework to investigate the claim whether PBL can indeed foster students' intrinsic, or in SDT-terms, autonomous motivation. In Study 1, a comparison between students of a PBL cohort with students of a traditional, lecture-based cohort on their perceived feelings of autonomy, competence, and relatedness in the learning environment and their autonomous and controlled motivation was conducted. Perceptions of students' need satisfaction were included because these needs are important for the experience of motivation (see Deci & Ryan, 2000). Results showed no differences on feelings of autonomy and competence, but PBL students experienced more relatedness in their learning environment, Further, no differences were found on both types of motivation. In Study 2, qualitative data on the role of PBL for motivation and need satisfaction (i.e., autonomy, competence, and relatedness) was collected with focus group discussions to follow-up the results of Study 1.

Autonomy, Competence, and Relatedness

SDT states that when the social context of a learning environment satisfies the needs for autonomy, competence, and relatedness, students become autonomously motivated (Ryan & Deci, 2000). Previous studies investigating differences between PBL and non-PBL students' motivation did not include students' perception of this need satisfaction. Examining need satisfaction might be insightful because these needs are important antecedents of motivation (Ryan & Deci, 2000). It was expected that feelings of autonomy, competence, and relatedness would be stimulated more in PBL, than in a traditional, lecture-based curriculum. Yet, results were not completely in line with these expectations.

With regard to autonomy, no differences were found between PBL student and students of the traditional, lecture-based program. In the focus group discussions, it appeared that there were a number of autonomy-supportive elements present in PBL (e.g., some choice in literature), but also controlling elements (e.g., lack of choice in tutorial group composition). One can assume that in the traditional, lecture-based environment also both autonomy-supportive (e.g., choice in fellow students for collaborative assignments) and controlling elements (e.g., prescribed literature) were present. The presence

of controlling elements in PBL and probable autonomy-supportive elements in a traditional, lecture-based environment could help explain why no differences turned up on perceived autonomy.

When asked directly during the focus group discussions, students indicated to experience low degrees of autonomy and high feelings of control. The mainly contributing factor to this feeling was the mandatory presence to tutorial meetings. However, one could argue that mandatory presence does not refer to an autonomy-supportive or controlling element, but more to a *structural* element in PBL. Providing structure holds that students are offered clear instructions of what is expected of them (Jang, Reeve, & Deci, 2010), which for example are instructions about presence. In general, providing structure is beneficial with regards to educational results, opposed to no structure in class (Jang et al., 2010). Yet structure can be offered in an autonomous-supportive way (i.e., discussing rationale, taking students' feelings into account), which is beneficial for students, or in a controlled way (i.e., no discussion of rationale, not taking students' feelings into account), which has a detrimental effect on students (Jang et al., 2010). It is possible that communication about the mandatory presence in the curriculum under study was perceived as controlling rather than autonomy supportive.

Moreover, although elements, such as choice in literature sources and limited interferences of the tutor are intended to be autonomy supportive in nature, students indicated to be unsatisfied with these elements. It is possible that the amount of autonomy expected from students, with respect to literature selection for example, is too high, making students feel lost in the course material (Sierens, Soenens, Vansteenkiste, Goossens, & Dochy, 2006). Kirschner, Sweller, and Clark (2006) described this in terms of minimal guidance, which is, according to them, harmful for learning. In PBL, the amount of instructions should be adapted to the level of the student (i.e., scaffolding; Schmidt, Loyens, Van Gog, & Paas, 2007). For example novice students (e.g., first-year students) are provided more help in literature search (e.g., more tips) compared to experienced students (e.g., third-year students), because novice students lack experience (Schmidt et al., 2007). Possibly, in the curriculum under study, students, even in their third year, experienced difficulties with respect to students' responsibility for literature choices, resulting in feelings of uncertainty.

Considering the need for competence, students indicated that the phases of PBL help them in experiencing feelings of competence. PBL offers opportunities to rehearse course material, which make students feel confident about the learned material. Moreover, the discussion during the reporting phase helps students to create a rich understanding of the course material. Students indicated that the use of realistic problems also contributed to feelings of competence, which is in line with the study by Dunlap (2005). Real-life problems support a connection between theory and practice, leading to a better understanding about the material. Yet, students of the traditional, lecture-

based cohort also reported high feelings of competence in the learning environment. A first explanation is that some courses in the traditional, lecture-based curriculum also offered work groups in which students worked on a realistic law case, contributing to feelings of competence in these students as well. Second, non-specific PBL factors that contribute to feelings of competence, such as obtaining good grades, are common in both instruction types, explaining why no difference on competence showed up. Finally, students of both cohorts were third-year students and probably all experienced feelings of competence, as they all succeeded so far in their academic carrier.

The only difference between PBL students and students of the traditional, lecture-based program was found on feelings of relatedness. Specifically, PBL students reported higher feelings of relatedness when compared to students the traditional, lecture-based program. Analysis of the focus group discussions demonstrated that this feeling can be explained by the opportunity to form peer connections in tutorial meetings. In PBL, students meet twice a week in a small (i.e., ten to twelve students) tutorial group and the groups change each course. In PBL, students therefore get to know a large number of fellow students this way. Alternatively, it is likely that large-scaled, lecture-based curricula (i.e., traditional) create a sense of anonymity among students and are more impersonal. The teacher will be less involved and more distant than in PBL.

Correlations between relatedness and autonomous and controlled motivation were non-significant. This finding was not in line with results of previous studies (e.g., Sheldon & Filak, 2008), in which positive relations between feelings of relatedness and intrinsic motivation were demonstrated. Still, even though there is no relation with motivation, high feelings of relatedness are beneficial for other student outcomes such as student dropout. Tinto's (1975) model stresses the interaction between students and the academic environment and its influence on student dropout. If students are socially integrated in the academic environment, commitment increases, making it less likely that students voluntary drop out of college (Tinto, 1975). Social integration is the result of connections with peers and interaction with staff. Results of our study suggest that social integration is present in PBL, more than in a traditional, lecture-based environment. Students feel related through small-scale tutorial groups in PBL, as they get to know one another in both a formal (i.e., collaborate on study activities) and informal (i.e., friendship) way. In addition, interaction with tutors in the groups contributes to social integration as well. This result is in line with findings of a study by Meeuwisse, Severiens, and Born (2010), which indicate that an active learning environment (i.e., such as PBL) fosters interactions with both teachers and students.

Autonomous and Controlled Motivation

It was expected that PBL students would report higher scores of autonomous motivation. However, Study 1 revealed no differences on autonomous and controlled motiva-

tion between both student cohorts. The PBL students and students of the traditional, lecture-based program reported rather high autonomous motivation scores (M = 3.82 and M = 3.85 respectively, range 1-5). These results indicate that the PBL's claim that it can stimulate students' intrinsic motivation was not supported by our results. A first explanation has to do with the findings on the three psychological needs. No differences between PBL students and their non-PBL counterparts were found on perceived autonomy and competence. Correlations demonstrated a positive relation between perceived autonomy and competence with autonomous motivation, and a negative relation between perceived autonomy and competence with controlled motivation. As scores on perceived feelings of autonomy and competence did not differ, it is not surprising that no differences on autonomous and controlled motivation were found.

Another possible explanation for why there were no differences between the PBL students and students of the traditional, lecture-based program on autonomous motivation is that the participation in our studies of third-year students took place at the end of the academic year. Apparently, all participants were enthusiastic about their study and were motivated to finish the Bachelor's program. In general, students who are autonomously motivated continue the academic program, while controlled motivated (or demotivated) students dropout at an earlier stage (e.g., Vansteenkiste et al., 2005; Vallerand et al., 1997). Nevertheless, third-year law students were chosen, because these students had more experience with the academic program and curriculum (opposed to first-year students), making their opinions rather valuable for the focus group discussions. Nevertheless, we expect that similar effects would have been found if first-year students were questioned. Results are in line with a study that was conducted with predominantly first- and second-year students of a PBL psychology program (Wijnia et al., 2011). In that study, similar to our results, no differences were found between PBL and lecture-based students on autonomous and controlled motivation. Therefore, we assume that the results can more likely be explained by the fact that no differences were found on the perceived needs of autonomy and competence.

Limitations, Recommendations for Future Research and Implications

The present study has some limitations worthwhile mentioning. A first limitation considers the participation of third-year students. It is likely that third-year students are more motivated and confident about their study, because they almost finished the Bachelor's program. However, third-year students are also more experienced with the PBL program and their opinions were therefore valuable for the focus group discussions. Second, the students of the traditional, lecture-based program filled out the questionnaire during a non-mandatory lecture, while the PBL students filled out the questionnaires during a mandatory meeting. It is likely that the students who were present during the lecture, were highly motivated, which could have biased our results. Nevertheless, results were

in line with previous studies conducted in existing PBL curricula (e.g., Galand et al., 2010). Further, administration of the questionnaires took place during different courses in both student groups, due to changes in course order. Even though students were instructed to base their answers on the entire Bachelors' program, it cannot be ruled out that the content of the course has had some sort of influence on the answers. Finally, with regards to the focus group discussions, recording of one of the discussions failed. Even though the interviewer directly wrote down the content of the discussion, exact statements are missing for this group.

Partly based on these limitations, we have some recommendations for further research. Although the main focus of the present study was on the influence of *PBL* on student motivation, it would be interesting to conduct focus groups among students of the traditional, lecture-based cohort as well. At this point, we can only make assumptions on which factors influence student motivation in a traditional instruction method. Further, the present study indicated that there was no correlation between perceived relatedness and autonomous, nor with controlled motivation. Further research is needed why this relation is absent. Moreover, it might be valuable to connect dropout to motivation, especially feelings towards relatedness. Relatedness, which appeared higher among PBL students, might influence student dropout according to Tinto's model.

In this study, we used SDT as the theoretical framework. We realize that other motivational theories might be of interest as well, such as achievement goal theory or expectancy-value theory. However, in the current study, we were mainly interested in investigating whether PBL can indeed stimulate higher levels of intrinsic or autonomous motivation.

Both the quantitative and qualitative studies were conducted with Dutch law students, as they might benefit most from improvements in motivation (with regard to low graduation rates among Dutch law students; Educational Inspectorate, 2009). However, results are also insightful for other higher educational programs: Student-centered instructional methods, based on constructivist learning theories, have received much attention over the past decades (Baeten, Struyven, & Dochy, 2013) and these methods replace conventional lecture-based programs more and more in several disciplines (White et al., 2016). As PBL can be considered an active and constructivist learning approach, findings of the present study on an activating learning approach and motivation are therefore important for other programs and disciplines as well.

Conclusion

The present study showed no differences between PBL students and students of the traditional, lecture-based program regarding autonomous and controlled motivation, and perceptions of autonomy and competence. Students in both educational forms were highly autonomously motivated and experienced feelings of autonomy and com-

petence in their learning environment. This could be due to the presence of both autonomy-supportive and controlling elements in the PBL learning environment, although a difference on feelings of relatedness was found, in favor of PBL. The small tutorial groups in PBL seem to contribute to these high feelings of relatedness, as students get to know their peers and feel that their teachers are more approachable.