Predicting Law Students' Study Progress in a Problem-based Learning and Traditional, Lecture-Based Environment

This chapter is in preparation as:

Wijnen, M., Loyens, S. M. M., Smeets, G., Kroeze, M. J., & Van der Molen, H.T. Predicting Law Students' Study Progress in a Problem-based Learning and Traditional, Lecture-based Environment. Manuscript in preparation.

ABSTRACT

Study delay and student dropout are serious concerns in higher education institutes. Both student characteristics and characteristics of the learning environment appear determinative in study success and progress. Problem-based learning (PBL), a student-centered educational approach is believed to stimulate study progress. In the present study, two different learning environments were compared regarding study progress and its predictors. Students enrolled in a traditional, lecture-based university law program were compared to students enrolled in a PBL university law program (i.e., cohort comparison at one faculty) regarding their completion of the three-year Bachelor's program within four years. Results showed no statistically significant differences on study progress between both programs. However, some differences emerged regarding the type of predictors that played a role. In the traditional program, age turned up as a predictor, while in the PBL program gender appeared predictive. Pre-university GPA predicted degree completion regardless of the instructional method used. Additionally, observed learning activities (i.e., a rating of students preparation for and participation in meetings) proved to be the strongest predictor of completing the Bachelor's program within four years in the PBL program. Working in small groups with a tutor who is able to observe study behavior, can help in detecting students who are at risk of failing.

INTRODUCTION

Predicting study success and study progress has received a lot of attention in higher education research, given the high student dropout and study delay in higher educational institutes (Educational Inspectorate, 2009). Knowing which factors relate to study progress could help improving the graduation rates and lowering dropout. In the Netherlands, graduation rates are worrying especially among law students (Educational Inspectorate, 2009). Policymakers in the Netherlands aim to increase the quality of student learning within universities by (1) raising the bar for students (i.e., more strict criteria for continuing the academic program) and by (2) stimulating the implementation of small-scaled, activating educational programs (Ministry of Education, Culture and Science, 2011). The rationale for these changes is that they lead to a higher quality of learning and consequently to better study progress. The Erasmus School of Law endeavored to meet these propositions. To achieve better study success, problem-based learning (PBL), a student-centered instructional method has been implemented within the three-year Bachelor's program at the Erasmus School of Law. Secondly, the number of course credits that first-year students need to obtain in order to continue to the second academic year has been raised.

Student Characteristics as Predictors of Study Success and Progress

In the existing literature on predictors of study success and progress, both demographic and non-demographic student characteristics emerged, which will be outlined below. The majority of these studies are conducted in traditional, lecture-based curricula.

Demographic Student Factors

In general, gender is shown to be an important predictor, as female students obtain more course credits, higher grades, and pass academic years more often during the academic program (Bruinsma & Jansen, 2009; Jansen, 2004; Jansen & Bruinsma, 2005; Richardson, Abraham, & Bond, 2012; Stegers-Jager, Themmen, Cohen-Schotanus, & Steyerberg, 2015; Van den Berg & Hofman, 2005; Van der Hulst & Jansen, 2002). Second, age has an influence on study success. Some studies found that younger students obtain more course credits and pass the academic program more often than older students (Bruinsma & Jansen, 2009; Jansen, 2004; Van den Berg & Hofman, 2005; Van der Hulst & Jansen, 2002), while other studies found the opposite, that older students have better study success (Richardson et al., 2012; Stegers-Jager et al., 2015). Another demographical factor related to study success and progress is ethnicity. In general, it is shown that students of ethnic minorities opposed to students of an ethnic majority obtain less credit points at the end of the academic program (Van den Berg & Hofman, 2005), are

less likely to complete the first year or the entire academic program (Stegers-Jager et al., 2015), and are more likely to dropout (Chen, 2012).

Non-Demographic Student Factors

Academic achievement before entering university, also referred to as pre-university general point average (i.e., GPA) relates positively to study success and progress in terms of obtaining a higher GPA at the end of the first academic year (Jansen & Bruinsma, 2005), earning more course credits (Van der Hulst & Jansen, 2002), and passing the first academic year (Jansen, 2004; Stegers-Jager et al., 2015; Suhre, Jansen, & Torenbeek, 2013). In addition, grades obtained at the beginning of the academic program have shown to be predictors of academic success later in the program, as it relates to obtaining more course credits (Busato, Prins, Elshout, & Hamaker, 2000), and completion of the first year and the entire program (Stegers-Jager et al., 2015). Moreover, a negative relation between obtained grades during the academic program and dropout is shown (Chen, 2012).

Predictors of Study Progress in Different Learning Environments

Besides student characteristics, elements in the learning environment and curriculum seem to play a role in study success as well. In terms of more strict criteria for students, Vermeulen et al. (2012) demonstrated that raising the number of required course credits at the end of the first academic year to the maximum obtainable credits (i.e., 60 credit points instead of 40 credit points), in combination with a reduction of resits and a compensatory model for the examinations, improved study progress (referred to as "Nominal is Normal"; Vermeulen et al., 2012). More students obtained all course credits in the first academic year compared to the prior situation in which the minimum number of required credits was lower (i.e., 40 out of 60 course credits), but which offered for every exam one or more resits, and in which no compensation of insufficient marks was allowed.

Regarding curriculum organizations, several studies found that when less courses are given in parallel, students obtained more course credits and more students passed the first academic year (Jansen, 2004; Van den Berg & Hofman, 2005; Van der Hulst & Jansen, 2002). Further, it is found that more hours spent on lectures in the academic program was associated with less students passing their first year (Jansen, 2004; Schmidt et al., 2010). Moreover, Van den Berg and Hofman (2005) demonstrated that more activating educational formats were related to better study progress in the first academic year. In addition to the implemented changes in assessment system (i.e., requirement of 60 course credits in the first-year, reduction of resits, and compensation possibilities), the Bachelor's program at the Erasmus School of Law underwent changes in line with the above described curriculum organizations as well: Courses were offered serial, the

number of lectures became limited, and the PBL approach was implemented. The PBL approach is described in more detail up next.

Problem-Based Learning

In PBL, students start their learning process by discussing a realistic, complex problem in small groups under the guidance of a tutor (Barrows, 1996; Hmelo-Silver, 2004; Loyens, Kirschner, & Paas, 2012; Schmidt, 1983; Schmidt, Van der Molen, Te Winkel, & Wijnen, 2009b). Students together try to explain the problem, which is often a realistic description of a situation. By doing so, prior knowledge about the topic of the problem is activated. As the problem is the starting point, students end up with questions about the problem's topic. They formulate so called learning issues; i.e., questions about the problem that need further study. These activities happen in the first phase of the PBL process, the initial discussion phase. Afterwards, students individually search for and study relevant literature (e.g., study books, research articles) to answer the formulated learning issues in the second PBL phase, i.e. self-study phase. After self-study, students return to the group and collaboratively address the learning issues, in the final phase, which is called the reporting phase. The tutor is present during the initial discussion and reporting phase and adopts a role as facilitator. This holds that the tutor will not directly provide information with respect to the to-be-learned material, but that he or she stimulates students to elaborate on the material themselves by asking for example in-depth questions (Barrows, 1996; Hmelo-Silver, 2004; Loyens et al., 2012; Schmidt, 1983; Schmidt et al., 2009b).

Several aspects of PBL contribute to the development of knowledge (Hmelo-Silver, 2004; Loyens et al., 2012; Norman & Schmidt, 1992). These aspects are prior knowledge activation in the initial phase, stimulation of elaboration (i.e., connecting existing knowledge to new, to-be-learned knowledge), and learning in a realistic context (i.e., learning with realistic problems that relate to practice; Schmidt, 1983). It could be argued that the activating components of PBL (e.g., stimulation of elaboration) improve academic performance and hence study progress. Previous studies that compared students in a PBL approach to students in traditional, lecture-based curricula regarding study progress showed that PBL students have a shorter study duration and are less likely to dropout (Iputo & Kwizera, 2005; Schmidt, Cohen-Schotanus, & Arends, 2009a). Studying which predictors affect study success and progress is not often conducted in PBL curricula. In the study of De Koning, Loyens, Rikers, Smeets, and Van der Molen (2012) however, this was investigated.

Predictors of Study Success in Problem-Based Learning

In the study of De Koning et al. (2012) it was demonstrated, in line with previous findings (e.g., Bruinsma & Jansen, 2009; Jansen, 2004; Van den Berg & Hofman, 2005; Van

der Hulst & Jansen, 2002), that younger, female students with higher pre-university GPA obtain higher academic achievements later in the program (i.e., higher GPA's and more course credits). Further, obtained GPA in the first year was a strong predictor of study success in the second year. In addition, a specific PBL characteristic, namely observed learning activities, was included as predictor. Observed learning activities is a grade tutors give with regards to students' preparation for and participation during the tutorial meetings. Observed learning activities turned out a strong predictor of study success (De Koning et al., 2012).

To summarize, study success and progress in a PBL curriculum have not been studied often before. The majority of studies on predicting study success and progress are conducted in traditional, lecture-based curricula. However, the organization of the learning environment influences study progress as well. Characteristics of the PBL environment (e.g., activating elements) could positively influence students' study progress. The study of De Koning et al. (2012) on predictors of study success was performed in a PBL curriculum, and a specific characteristic of PBL (i.e., observed learning activities) appeared a strong predictor of study success. However, a direct comparison between study success factors in both a traditional and PBL environment has not been conducted yet. Therefore, in the present study, predictors of study progress are compared between a traditional, lecture-based program and a PBL program. The main aim is to explore possible differences in the factors that contribute to completion of the Bachelor's program. The activating components of PBL could influence several predictors for study success.

The Present Study

In the present study the following research questions were investigated. First, "What is the difference in study progress between students of the traditional and the PBL curriculum?" It was expected that students in the PBL curriculum would have better study progress compared to students of the traditional program, based on findings of previous studies (Iputo & Kwizera, 2005; Schmidt et al., 2009a). Due to prior knowledge activation and the stimulation of elaboration in PBL, construction of knowledge structures is promoted (Schmidt, 1983), which in turn affects study success and progress. The second research question was "Are there differences in predictors of study progress between the traditional and the PBL curriculum?" Several determinants that have shown to predict study progress, such as gender, age, and pre-university GPA (e.g., Bruinsma & Jansen, 2009; De Koning et al., 2012; Richardson et al., 2012; Stegers-Jager et al., 2015) will be included in answering this question. Two student cohorts within the same faculty were compared: Students of the *last* cohort of the traditional program (from now on referred to as traditional cohort) and students of the *first* cohort of the PBL program (from now on referred to as PBL cohort). No specific hypotheses were formulated here, as this comparison was explorative in nature.

In addition to the second research question, the added value of the PBL characteristic, observed learning activities, was investigated as predictor of study progress within PBL. Therefore, besides the first comparison between the traditional and PBL cohort, a second comparison was made. Study progress in PBL was predicted based on the predictors mentioned before (excluding observed learning activities as a predictor). This was compared to a model predicting study progress in PBL with the same predictors and, in addition, the variable observed learning activities was included as a predictor. Based on findings of De Koning et al. (2012), it was expected that observed learning activities would be an important predictor of study success and progress in the PBL program.

METHOD

Learning Environment

The Erasmus School of Law offers three study programs: Dutch law, tax law, and criminology. All three study programs contain a three-year Bachelor's and a one-year Master curriculum. A total of 180 study point credits (i.e., European Credit Transfer System [ECTS], 60 ECs a year) needs to be achieved in the Bachelor's program to enroll in one of the Master programs. The instructional method of the Bachelor's program changed in September 2012. The instructional method before September 2012 was traditional, lecture-based.

In the traditional learning environment, four ten-week periods were offered each academic year. Two or three courses during these periods were given parallel, containing multiple lectures per week. During these lectures professors provided information to a large group of students. This was the core method of instruction in the academic program at that time. Some courses offered a weekly workgroup in which a specific law case was discussed by a teacher. The lectures and the majority of the workgroups were non-mandatory. There were four examination weeks during each academic year in which two or three courses were examined (i.e., parallel assessment). In order to continue from the first to the second academic year, students needed to obtain a minimum of 40 out of 60 course credits during the first year. Course credits could be earned by obtaining a sufficient grade (i.e., 5.5 points out of 10) for a course exam. It was not possible for students to compensate insufficient grades (e.g., compensating a 5.0 with a 7.0 to maintain a mean of 6.0), but students had several opportunities to resit the exams on which they failed.

From September 2012 on, all students who started their first year of the Bachelor's program enrolled in the PBL environment, which contained several differences compared to the former lecture-based program. First of all, the main focus in PBL lies on (mandatory) tutorial meetings that occur twice a week. In these meetings, the initial

phase and reporting phase (of the previous problem) take place under guidance of a tutor. Tutorial meetings last about 2.5 hours. In between meetings, students have two or three days available for self-study, in which they (individually) study relevant literature sources. Second, opposed to the traditional program, the number of lectures is limited in PBL (i.e., approximately two per week). Third, a total of eight courses each academic year are given sequential, lasting five weeks each. During each course, eight problems are discussed and all courses end with a course exam directly after the course, resulting in eight exams each academic year (i.e., sequential assessment). Fourth, next to each course, a practical course is given as well. During these practicals, students develop new academic and professional skills (e.g., practice court in which students plea in front of a lawyer). Fifth, changes were made in the assessment system as well when PBL was implemented. In order to continue from the first to the second academic year, all 60 course credits need to be obtained (Vermeulen et al., 2012). Furthermore, opposed to the former program, students are able to compensate their grades, as long as their mean grade at the end of the year is a 6.0 (on a scale from 0 to 10) or higher (e.g., a 5.0 can be compensated with a 7.0). In contrast, while students could retake the exams multiple times in the old program, the number of retakes is limited (i.e., maximum of 2 out of 8) in the new program. This examination system became known as "Nominal is Normal," indicating that it should be normal for students to complete a first year in the nominally available time of 12 months.

Participants

As mentioned above, students of two cohorts that were taught with different instructional methods (traditional vs. PBL) within one law school were compared. The traditional cohort started the first academic year at one of the three Bachelor's programs (i.e., Dutch law, tax law, criminology) in September 2011 and students were taught in a lecture-based curriculum. The PBL cohort started the first year in September 2012 and hence, these students were taught in the PBL curriculum. Certain conditions were set for students to be included in the analyses. First, only students who enrolled in *one* academic program at the university were included. This left out students who were enrolled in two or more Bachelor's programs at the same time (e.g., Dutch law and criminology, or Dutch law and economics). Second, students who switched to a different academic program, either within the faculty (e.g., from Dutch law to Tax law) or outside the faculty (e.g., from Dutch Law to Psychology), but completed their new Bachelor's program within four years, were excluded from further analyses. Third, only students who had complete data on all predicting variables were included. Fourth, students who enrolled in the traditional cohort (2011) but took the same courses later in the PBL program were excluded from further analyses. After exclusion of all students based on these conditions, the dataset contained data of 772 students for further analyses.

In the traditional cohort, 382 students (38.7% male) were included. Of them, 245 students enrolled in the Dutch law program, 66 in the Tax law program, and 71 in the Criminology program (respectively, 64.1%, 17.3%, and 18.6%). Mean age at the start of the first academic year of these students was 19.36 years (*SD* = 1.59). The majority of these students, 234, belonged to the ethnic majority group (61.3%), whereas 119 (31.2%) belonged to the non-Western ethnic minority group, and 29 students (7.6%) to the non-Dutch, Western ethnic minority group. Regarding pre-university education, 288 students (75.4%) completed university preparatory education (i.e., highest level in secondary education in the Netherlands), 74 students (19.4%) completed the first year of higher vocational education, and 20 students (5.2%) completed another pre-university degree.

In the PBL cohort, 390 students (41.3% male) enrolled in their first year at the Erasmus School of Law in September 2012. The majority of them started the Dutch law program, (244 students), 58 students the tax law and 88 the criminology program (respectively, 62.6%, 14.9%, and 22.6%). Mean age at the start of the first academic year was 19.16 (*SD* = 1.60). Of these students, 251 belonged to the ethnic majority group (64.4%), whereas 110 (28.2%) belonged to the non-Western minority, and 29 students (7.4%) to the non-Dutch, Western minority. With respect to their pre-university education, 294 students (75.4%) completed university preparatory education, 82 students (21.0%) completed the first year of higher vocational education, and 14 students (3.6%) completed another pre-university degree.

There were no significant differences between the PBL and non-PBL cohort regarding gender ($\chi^2(1)= .52$, $p = .472$), ethnicity ($\chi^2(2) = .87$, $p = .648$), pre-university education ($\chi^2(2)= 1.45$, $p = .485$), and age ($t(770) = 1.74$, $p = .083$).

Predicting variables

Information of students was retrieved from the university database. However, in order to secure for students' privacy and anonymity, variables were linked to each other by a data manager. The authors received an anonymous dataset and were not able to trace the identity of students.

Demographic characteristics

Gender, age (at the start of the academic program), and ethnicity were included in the analyses as demographical factors. Ethnicity was distinguished into (1) ethnic majority, (2) Western ethnic minority, or (3) non-Western ethnic minority. Ethnicity was treated as a dummy variable, with ethnic majority as the baseline group. Dummy variable D1 (Western minority = 1, ethnic majority + non-Western minority = 0) holds that students belonged to a Western ethnic minority. Dummy variable D2 (non-Western ethnic minor-

ity = 1, ethnic majority + Western ethnic minority = 0) indicates that students belonged to the non-Western ethnic minority.

The registration of ethnicity was traced from the national registration of students in the Netherlands. An individual is part of an ethnic minority group if at least one parent or the students himself/herself was born outside the Netherlands.

Pre-university education

This represents the latest, completed pre-university education before accessing university. The distinction was made between (1) university preparatory education, (2) completion of first year of higher vocational education, and (3) other pre-university education. Again, dummy variables were created for report of pre-university education, with university preparatory education as baseline group. Dummy variable D1 (higher vocational education = 1, university preparatory education + other pre-university education = 0) holds that students reported completion of higher vocational education as pre-university education. Dummy variable D2 (other = 1, university preparatory education + higher vocational education = 0) holds that students reported other pre-university education.

Pre-university GPA

Students' pre-university GPA is the average grade obtained at the end of pre-university education and is the final mean grade mentioned on the pre-university degree. It is presented as a number between 0 and 100.

Pre-university Dutch GPA

This is the mean grade of the Dutch course tests and the accompanying Dutch exam grade of secondary education. Pre-university Dutch GPA is a grade between 0 and 10.

Course test GPA B1

The mean grade of all obtained grades of course exams in the first academic year was calculated. It should be noticed here that all students who at least earned one grade during the academic year were included and a mean grade of the participated courses was calculated.

Observed learning activities B1

This variable only counts for the students in the PBL cohort. In PBL, the tutor grades students on their learning and professional behavior. This rating is based on (1) students' preparation for the tutorial meetings, (2) students' active involvement and participation during the meetings, and (3) how well they perform in their role of chair (i.e., leading the discussion by structuring it, summarizing the contributions, and making sure all

students participate) and scribe (i.e., taking notes during the meeting; De Koning et al., 2012). The tutor rates several statements belonging to one of these three components. A grade (0 – 10) is calculated for each student during each course. For this study, a mean grade was calculated for students' observed learning activities in all courses of the first academic year.

Dependent variables

Study progress

Study progress was the outcome measure in the analyses. Study progress was a dichotomous variable that was defined by completing the Bachelor's program within four years (yes or no). As the Bachelor's program consists of three years, a small study delay of one year was already taken into account. This definition of study progress is in line with the national definition of study progress in higher educational institutes and was also the definition of study progress used in the report of the Educational Inspectorate (2009).

Statistical Analyses

In order to answer the first research question "What is the difference in study progress between students of the traditional and the PBL curriculum?", a chi-square test was conducted with the variables cohort (traditional vs. PBL) and study progress (completion of Bachelor's program in four years vs. no completion of Bachelor's program in four years).

To answer the second research question, three multivariable logistic regression analyses were conducted. First, the traditional cohort and PBL cohort were compared on the predictors. Therefore, the first regression analysis (model I) was conducted with students of the traditional cohort. Age, gender, ethnicity, pre-university education, pre-university GPA, pre-university Dutch GPA, and GPA of the course tests of the first academic year of the Bachelor's program, were evaluated as predictors. The second analysis (model II) was similar to the first, however this time with students of the PBL cohort.

To further investigate study progress predictors in the PBL cohort, a third regression analysis (model III) was conducted in which the variable observed learning activities was included as predictor. This analysis was compared to the second, in order to identify whether the variable observed learning activities adds in predicting study progress.

RESULTS

Table 7.1 provides the characteristics of all predictors and outcome measure in both student cohorts. No major discrepancies in mean scores were shown between both student cohorts, indicating that both groups were similar. Only the course test GPA of the first

year is striking: It indicates that students in PBL in general obtained about half a grade higher on the course tests compared to the students of the traditional, lecture-based program. This difference is significant ($t(770) = -5.66$, $p < .001$).

Table 7.1. Student characteristics

	Traditional program (cohort 2011) n = 382	PBL program (cohort 2012) n = 390
	n (%) / Mean (*SD*)	n (%) / Mean (*SD*)
Independent variables		
Gender		
Male	148 (38.7%)	161 (41.3%)
Female	234 (61.3%)	229 (58.7%)
Mean age at start program	19.36 (*SD* = 1.59)	19.16 (*SD* = 1.60)
Ethnicity		
Ethnic majority	234 (61.3%)	251 (64.4%)
non-Western ethnic minority	119 (31.2%)	110 (28.2%)
Western ethnic minority	29 (7.6%)	29 (7.4%)
Prior education		
University preparatory education	288 (75.4%)	294 (75.4%)
Higher vocational education	74 (19.4%)	82 (21.0%)
Other	20 (5.2%)	14 (3.6%)
Pre-university GPA (0 - 100)	65.87 (*SD* = 4.22)	65.54 (*SD* = 3.98)
Pre-university Dutch GPA (0 - 10)	6.50 (*SD* = .66)	6.52 (*SD* = .62)
Course test GPA Ba1 (0 - 10)	6.06 (*SD* = 1.20)	6.54 (*SD* = 1.12)
Observed learning activities Ba1 (0 - 10)	-	7.28 (*SD* = .58)
Dependent variable		
Passed Bachelor's study program in four years		
Not passed	151 (39.5%)	132 (33.8%)
Passed	231 (60.5%)	258 (66.2%)

Study Progress in Traditional vs. PBL cohort

In order to answer the first research question, "What is the difference in study progress between students of the traditional and the PBL curriculum?" a chi-square test was conducted. As shown in Table 1, the percentage of students passing their Bachelor's degree in four years was higher among PBL students than the students of the traditional progam, respectively 66.2% and 60.5%. Although this difference is in the expected direction, it was not statistically significant, $\chi^2(1) = 2.68$, $p = .101$, and our first hypothesis was not supported.

Predictors of Study Progress in Traditional vs. PBL cohort

To answer the second research question, "Are there differences in predictors of study progress between the traditional and the PBL curriculum?" multivariate logistic regressions were conducted. Before conducting the analyses, assumptions were checked in both cohorts. The assumption of linearity of the logit for two predictors, "course test GPA Ba1" and "pre-university Dutch GPA", was violated in the PBL cohort. Therefore, these predictors were excluded from the analyses in model II and III. As a consequence, we decided to leave these two predictors out in the first analysis with the traditional cohort as well, in order to make a good comparison between both educational programs. Results of the multivariable logistic regression analyses with predictors of study progress are shown in Table 7.2.

Traditional program

Younger age (odds ratio (OR) .84, 95% confidence interval [CI] .711 - .995; $p = 0.044$) and having a higher pre-university GPA (OR 1.17, 95%CI 1.09 – 1.25, $p < .001$) were identified as significant predictors for study progress in the traditional cohort, after controlling for gender, ethnicity, and pre-university education. These two predictors explain between 12-17% of the variance of study progress.

PBL program

In the PBL cohort, female gender (OR 1.60, 95%CI 1.01 – 2.53; $p = 0.046$) and having a higher pre-university GPA (OR 1.16, 95%CI 1.08 – 1.23, $p < .001$) were identified as significant predictors for study progress after adjustment for age, ethnicity, and pre-university education. These two predictors explain between 10-13 % of the variance of study progress in the Bachelor's program.

The influence of observed learning activities in PBL was assessed by conducting a third multivariable logistic regression analysis that included this variable. Hence it could be compared to the former analysis with the PBL cohort that left this variable out. In the new regression model, female gender (OR 1.72, 95%CI 1.04 – 2.85; $p = 0.031$) and high pre-university GPA (OR 1.08, 95%CI 1.01 – 1.16, $p = .031$) were still predictors of study progress, and observed learning activities had a statistically significant influence as well (OR 7.98, 95%CI 4.42 – 14.42, $p < .001$). This indicates that the variable observed learning activities has additional predictive value to the other variables. This confirms our hypothesis regarding the additional value of this variable in a PBL program. These three predictors together explain 24 to 33% of the variance of study progress, which show a large increase in explained variance compared to both previous models.

Table 7.2. Predictors of study progress in a traditional, lecture-based program and PBL program.

	Model I[c]			Model II[d]			Model III[e]		
	Traditional program (cohort 2011)			PBL program (cohort 2012)			PBL program (cohort 2012)		
	Completion Bachelor's degree in four years			Completion Bachelor's degree in four years			Completion Bachelor's degree in four years		
Characteristic	**β (SE)**	**Odds ratio (95% CI)**	***p*-value**	**β (SE)**	**Odds ratio (95% CI)**	***p*-value**	**β (SE)**	**Odds ratio (95% CI)**	***p*-value**
Female gender	-.343 (.238)	1.409 (.884 – 2.246)	.149	.469 (.235)	1.598 (1.008 – 2.533)	**.046**	.544 (.036)	1.723 (1.040 – 2.854)	**.031**
Age (in years)	-.173 (.086)	.842 (.711 – .995)	**.044**	.145 (.033)	.919 (.784 – .1078)	.301	-.175 (.090)	.839 (.703 – 1.002)	.052
Ethnicity[a]									
Western ethnic minority	-.230 (.424)	.795 (.346 – 1.826)	.589	-.559 (.434)	.572 (.244 – 1.340)	.198	-.382 (.480)	.682 (.266 – 1.748)	.426
Non-Western ethnic minority	-.475 (2.52)	.622 (.380 – 1.019)	.060	-.334 (.258)	.716 (.432 – 1.188)	.196	-.184 (.282)	.832 (.478 – 1.447)	.514
Pre-university education[b]									
Higher vocational education	-.303 (306)	.738 (.406 – 1.344)	.321	-.465 (.292)	.628 (.354 – 1.114)	.112	-.257 (.328)	.773 (.406 – 1.471)	.433
Other	.867 (.580)	2.381 (.764 – 7.417)	.135	.858 (.769)	2.358 (.522 – 10.642)	.265	.846 (.800)	2.330 (.486 – 1.471)	.290
Pre-university GPA	.154 (.033)	1.166 (1.093 – 1.245)	**< .001**	.145 (.033)	1.156 (1.083 – 1.234)	**< .001**	.078 (.036)	1.081 (1.007 – 1.160)	**.031**
Observed learning activities B1	-	-	-	-	-	-	2.077 (.302)	7.981 (4.419 – 14.415)	**< .001**

[a]Compared to ethnic majority

[b]Compared to university preparatory education

[c]R^2 = .126 (Cox & Snell), .171 (Nagelkerke); model $\chi^2(7) = 51.599$; $p < .001$

[d]R^2 = .097 (Cox & Snell), .134 (Nagelkerke); model $\chi^2(7) = 39.708$; $p < .001$

[e]R^2 = .237 (Cox & Snell), .329 (Nagelkerke); model $\chi^2(8) = 105.618$; $p < .001$

GPA = General point average

DISCUSSION

In the present study differences in and predictors of study progress were investigated within a traditional learning environment and a PBL environment at the Erasmus School of Law. A cohort comparison was made between students who entered the Erasmus School of Law in 2011 in a traditional, lecture-based program, and students who enrolled at the Erasmus School of Law in 2012 in a PBL program. Several student characteristics (i.e., demographic and non-demographic) were included in order to predict completion of the Bachelor's program within four years. The first research aim focused on whether there was a *difference* between both student cohorts in study progress. The second research aim focused on *which* specific factors contributed to study progress in both educational methods.

Study Progress in Traditional vs. PBL Cohort

The first research question was directed at a difference in study progress (i.e., graduation rate of the three-year Bachelor's program in four years) between students in the traditional and PBL program. The percentage of students who completed the Bachelor's program within four years is higher among PBL students compared to their non-PBL counterparts, respectively 66.2% and 60.5%. However, although it is in the expected direction, this difference is not statistically significant and therefore, our first hypothesis, that PBL students have higher graduation rates, based on previous finding in literature (Iputo & Kwizera, 2005; Schmidt et al., 2009a) is not supported. Still, even though the difference is non-significant, the gain in graduation of about 5% should not be underestimated. The absolute number of students who graduated the three-year Bachelor's program within four years increased after the implementation of multiple changes at the Erasmus School of Law. Although not statistically significant, we consider this increase as "educationally" relevant.

A possible explanation for the non-significance of our finding lies in the first implementation and the novelty of the PBL program. When applied for the first time in an educational environment that was used to the traditional lecture based approach, some issues might arise regarding PBL processes. Examples of these issues are tutors who provide students with too much information and lack of active involvement of students (Dolmans, Wolfhagen, Van der Vleuten, & Wijnen, 2001; Dolmans, De Grave, Wolfhagen, & Van der Vleuten, 2005). Previous research at the faculty under study indicated that despite positive changes (e.g., more active participation of students), there is still room for improvement of the PBL program (Wijnen, Loyens, Smeets, Kroeze, & Van der Molen, 2017). The complications that showed up could have influenced the processes in PBL (e.g., insufficient group discussions) and hence the effectivity of PBL.

A striking finding was that the course test GPA of the first academic year was significantly higher among the PBL students. This indicates that, although it is not reflected in significantly improved graduation rates, academic achievement is better in the new implemented program. A possible explanation here is that students in the former educational program *need* four years to graduate, but that the students in the PBL program *take* four years to graduate. The PBL students might either use the extra time to put more effort in their study, which results in higher grades. Or they use the extra time to take part in extracurricular activities like internships or the board of a society. Because these activities take time as well, this could lead to the same graduation rates of students in the former, more traditional program. In sum, factors on the account of both organization as students might explain why there is no significant increase in graduation rates after the implementations. However, improvements are shown in terms of an increase of about 5% of graduated students and a higher GPA of the first year course tests among the PBL students.

Predictors of Study Progress in Traditional vs. PBL Cohort

The second research question focused on *which* factors predicted study progress in the traditional and PBL method, and what the similarities and differences were between both methods when predictors are concerned. Results indicated that GPA of one's pre-university education is a strong influence in both instructional methods. Previous studies on study success in traditional programs (Jansen, 2004; Jansen & Bruinsma, 2005; Suhre et al., 2013; Stegers-Jager et al., 2015, Van der Hulst & Jansen, 2002) and in PBL (De Koning et al., 2012) have found similar results. When students obtain high grades during their pre-university education, they are able to complete the Bachelor's program more timely. Interestingly, the type of pre-university education is not of influence on study progress, but *how* students performed during pre-university education does matter.

Predictors in Traditional Cohort

Some differences between predictors showed up between both cohorts. In the traditional program, age turned out to be a predictor for study progress. Younger students pass the Bachelor's program more often within four years than older students. Previous studies have found similar results (Bruinsma & Jansen, 2009; Jansen, 2004; Van den Berg & Hofman, 2005; Van der Hulst & Jansen, 2002). A possible explanation here is that older students have had a study delay in their previous education, like doing a class two times in pre-university education. This could indicate that these students have more difficulties with studying or are less motivated.

Another interesting predictor in the traditional cohort was ethnicity, in which a trend was visible in the first regression model. Even though not statistically significant, students with an ethnic majority seem to pass the Bachelor's program more often in time

than students of the non-Western ethnic minority group in the traditional, lecture-based program. This is in line with findings of previous literature that investigated ethnicity in relation to study success and progress (Chen, 2012; Stegers-Jager et al., 2015; Van den Berg & Hofman, 2005). An explanation is that students of ethnic minorities feel in general less at home at the institution, which can cause dropping out of the program (Meeuwisse, Severiens, & Born, 2010). This explanation can be traced back to the model of Tinto (1975), which stresses integration (i.e., formal and informal contact with peers and staff) for persistence in the academic program. Absence of these feelings of connection might especially be stronger in a traditional, lecture-based program. A large-scale environment like this creates a sense of anonymity among students. Still, it should be mentioned that only a trend, and not a statistical difference, was identified with regards to ethnicity, so these assumptions should be interpreted with caution.

Predictors in PBL Cohort

In the PBL program gender turned up as a predictor of study progress, next to the strong influence of pre-university GPA. Female students more often pass the Bachelor's program in time than male students in the PBL program. Better study success and progress by female students is found in the majority of existing studies (Bruinsma & Jansen, 2009; Jansen, 2004; Jansen & Bruinsma, 2005; Stegers et al., 2015; Van den Berg & Hofman, 2005; Van der Hulst & Jansen, 2002). A general explanation for the finding of better study progress by female students is that they have more work discipline and better time-management skills (Jansen, 2004; Van der Hulst & Jansen, 2004). If this is the case, it is possible that female students benefit more from the PBL system and the additional changes of "Nominal is Normal" than male students do. Time-management is a useful and necessary skill of students in PBL. Students need to be prepared for each tutorial meeting, which requires that they are able to plan their study time efficiently. If students experience difficulties with time-management, they might experience difficulties in the PBL system, making that they drop out of the program or have a study delay. Moreover, time-management is desirable when students are required to obtain all course credits in the first academic year. Again, if students have difficulties with time-management, it is likely that they are not able to obtain all course credits during the first year, making them drop-out of the program. Still, only assumptions can be made here, so further research is necessary to explain the gender differences.

As discussed before, in the traditional program, a trend was shown regarding ethnicity in such a way that students of an ethnic majority have better study progress than students of a non-Western minority. This trend, however, disappeared in the PBL program, as the second and third regression analyses show. If feeling connected to and feeling at home at the university institute is indeed the reason that students of a non-Western ethnic minority have worse study progress in the traditional program, it is likely that this is

changed in the PBL program. In a PBL environment, students could feel more integrated due to the small-scaled group meetings twice a week. Evidence for this assumption can be found in the study of Severiens, Meeuwisse, and Born (2015). In that study a student-centered environment was compared to a lecture-based environment and it was found that students in the student-centered environment reported to feel more at home at the institute. Again, this could be of greater influence for students of ethnic minorities, as these students feel less at home at institutes (Meeuwisse et al., 2010) and more isolated in a large-scale learning environment (Van den Berg & Hofman, 2005).

An important finding in the PBL cohort regarding predictors of study progress was the added value of observed learning activities as predictor. After adding this predictor, it turned out that it was the strongest predictor of passing the Bachelor's program in time. Observed learning activities appeared also a strong predictor for academic achievement in the first and second academic year of psychology in the study of De Koning et al. (2012). Further, the study of Loyens, Rikers, and Schmidt (2007) found that observed learning activities had a large effect on academic achievements in a first-year PBL curriculum, and was negatively related to drop-out. The present study shows that observed learning activities is even predictive for passing or failing the whole Bachelor's program, not just academic achievements during the program. Ratings of observed learning activities are based on several student activities that tutors detect. Examples are active involvement during discussion, application of deep processing (e.g., connecting concepts), and being able to see the bigger picture of the learning material. Findings here indicate that the more students show these types of study activities, the better they proceed in the academic program.

Practical Implications

As stated in the Introduction, study progress should be improved within higher educational institutes, due to disappointing graduation rates (Educational Inspectorate, 2009). Some improvements after the implementation of PBL are shown in the present study in terms of a small (non-significant) increase in graduation rates and higher academic achievement in the first year. However, the findings of the present study also provide some practical implications to achieve even better study progress. First of all, study progress seems to be strongly predicted by pre-university GPA. Students who enter university with a low pre-university GPA should therefore be closely monitored from the beginning and could be offered extra guidance throughout the academic program. This could help them to sufficiently study and could lead to better study results.

The same implication accounts for observed learning activities in PBL. Students with low scores on observed learning activities could be monitored in the first academic year and provided with additional guidance on how to study more effectively and efficiently. Moreover, the predictive value of observed learning activities shows the benefits of a

small-scaled learning environment like PBL. The small group meetings, in which a tutor is close to students, offers the opportunity to observe how students learn. This is more difficult to accomplish in a large-scale, traditional educational environment.

LIMITATIONS

The present study yields some limitations worthwhile mentioning. First of all, only two cohorts of the Erasmus School of Law were included in the analyses, the last cohort of the traditional program and the first cohort of the new, PBL program. As mentioned earlier, a first year of an educational reform might go hand in hand with some "children's diseases". To get a clearer image of study progress in the PBL program, more cohorts of students who started after September 2012 at the Erasmus School of Law should be included. A second limitation is that only a select pair of predictors was taken into account. Other student characteristics, like motivation, personality, and ability could be predictors for study success and progress as well. However, the focus of the present study lied on exploring differences in predictors of study progress in a traditional and PBL program. Future research should replicate the present study and add other variables as well.

CONCLUSIONS

The present study shows some improvements after the implementation of PBL at the Erasmus School of Law. Although not significant, graduation rates of the three-year Bachelor's program in four years improved with about 5%, and higher academic achievements in the first year were obtained by PBL students. Still, room for improvement is left to increase study progress more. Pre-university GPA appeared an important factor for predicting study progress, despite the educational method used. However, in the PBL program, an important additional predictor was observed learning activities by the tutor. These observations could and should be used more, in order to monitor students and offer them additional guidance which eventually would lead to improved study progress.