Teaching in Higher Education
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/cthe20

Self-efficacy and strategies to influence the study environment

Tomas Jungert [a] & Michael Rosander [a]
[a] Department of Behavioural Sciences and Learning, Linköping University, Linköping, Sweden

Available online: 20 Oct 2010

To cite this article: Tomas Jungert & Michael Rosander (2010): Self-efficacy and strategies to influence the study environment, Teaching in Higher Education, 15:6, 647-659

To link to this article: http://dx.doi.org/10.1080/13562517.2010.522080

Teaching in Higher Education
Vol. 15, No. 6, December 2010, 647–659

Routledge
Taylor & Francis Group

Self-efficacy and strategies to influence the study environment

Tomas Jungert* and Michael Rosander

Department of Behavioural Sciences and Learning, Linköping University, Linköping, Sweden

This study investigates the relationship between student influence and academic self-efficacy in a sample of 275 students in two Master's programmes in Engineering. Students in only one of the programmes studied according to problem-based learning (PBL). Results indicate that students choosing strategies to influence course content or structure, through course evaluation and recommending changes to teachers had significantly higher self-efficacy beliefs than those who did not use such strategies. It is principally the students who studied according to PBL that demonstrated higher self-efficacy beliefs, actively influenced their studies through engaging in debate with teachers. It can be claimed that increasing student self-efficacy beliefs is important not only in academic performance, but also in influencing in a positive way the institutional atmosphere.

Keywords: self-efficacy; student influence; engineering student; PBL

Introduction

In several studies on engineering students' experiences of their study environment (Case and Gunstone 2003; McCune and Hounsell 2005; Scheja 2006), the context of engineering students has been described as one that is highly demanding, with a lot of pressure on students, heavy workloads and in which students perceive that they are out of control and fall behind. Due to the heavy demands of engineering programmes, students need to be active in structuring their learning environment, which can be achieved by effectively communicating with their teachers and peers (Bateson and Taylor 2004). Furthermore, learning processes in higher education go further than interaction between students and teachers in the classrooms and lecture theatres (Kuh, Laird, and Umbach 2004; Pascarella and Terenzini 2005). Teacher–student relationships have been shown to have a positive effect on integrating students into college society (Pascarella 1980). In order to increase students' involvement in the shaping of the institutional climate and their engagement in purposeful activities, the institutions could increase students' opportunities to influence their study environment and encourage strategies that result in more interaction between students and teachers. Strategies that result in positive interactions with programme faculty have been related to positive academic outcomes (cf. Tinto 1993).

Academic self-efficacy, which refers to a student's perceived capability to reach explicit academic goals, has been positively linked to strategy use and self-regulation

*Corresponding author. Email: tomas.jungert@liu.se

ISSN 1356-2517 print/ISSN 1470-1294 online

DOI: 10.1080/13562517.2010.522080
http://www.informaworld.com

(Pintrich and De Groot 1990; Schunk and Zimmerman 2003). Better strategies are one of the reasons for the higher academic performance among students with high self-efficacy beliefs (Bandura 1997). A vast amount of research has furthermore shown that self-efficacy is one of the most important variables consistently associated with achievement (Bandura 1997; Chiu and Xihua 2008; Fenollar, Roman, and Cuestas 2007; Zajacova, Lynch, and Espenshade 2005). Self-efficacy has not, however, been related to students' opportunities to influence their study environment. Thus, in this article the focus is on the associations between students' strategies to influence the study environment and their academic self-efficacy, and these associations are linked to two different study environments.

Theoretical framework

Academic self-efficacy is a student's judgement of his or her own capability to organise and perform study-related courses of action necessary to reach selected types of academic performance, for example, to pass an exam (Bandura 1986, 1997). Self-efficacy differs from other similar constructs, such as self-esteem, as it is more predisposed to the contextual factors and concerns a specific goal. Perceived self-efficacy to master academic activities is furthermore a good predictor of academic achievement after controlling for prior achievement (Luszczynska, Gutierrez-Dona, and Schwarzer 2005; Pajares 1996).

Students who master a challenging task with limited assistance will increase their levels of self-efficacy. People with a high level of self-efficacy try challenging tasks more frequently and persist for longer with them (Bandura 1986). Furthermore, persons with high self-efficacy beliefs are more likely to evaluate demands as a challenge because they recognise that they can overcome obstacles and focus on opportunities (Jerusalem and Schwarzer 1992; Pintrich and De Groot 1990).

Student influence in the current study may be defined as various strategies that students use with the objectives to change the design or content of courses. Students may attempt to influence their study environment by adopting various strategies. One example is to interact with teachers attempting to influence course content or structure. In a longitudinal and qualitative study on 10 engineering students' perceptions of their opportunities to influence their study environment, their study motivation and beliefs in their capabilities were related to various forms of influencing their study environment (Jungert 2008a). Informal relationships with faculty enhanced regular achieving students' conceptions of their opportunities to influence courses, which were associated with their beliefs in their capabilities. Furthermore, students with high beliefs in their own capabilities were more persistent and emphasised that the programme should have a heavy workload and be demanding as they evaluated such conditions as challenging (Jungert 2008a). There is strong empirical evidence that self-efficacy beliefs influence effort and persistence (Bandura 1997), are positively related to strategy use (Schunk and Zimmerman 2003) and affect goal-setting processes and planning of the use of strategies (Schunk 1994). Moreover, associations have been found between students' expectations of positive interactions with programme faculty and their beliefs in their ability to complete degree requirements (Santiago and Einarson 1998; Tinto 1993).

In the longitudinal interview-based study, the participating students' beliefs in their capabilities were associated with various strategies to influence their studies

(Jungert 2008a). Those strategies were to fill in course evaluations, to seek contact with teachers to influence courses and to seek support from classmates. Students used such strategies to influence their studies on several levels, such as not only to influence the organisation of institutions and the design of courses, but also to increase their opportunities to enhance their learning and achievement. In the current study, strategies to influence the study environment have been elaborated and will be examined and linked to the students' self-efficacy beliefs.

In problem-based learning (PBL) students are active participants in their own learning. Students have opportunities to apply their content knowledge while working on authentic, conceptualised problems. The assumptions underpinning PBL come from pragmatism, cognitive psychology and social constructivism (Silén and Uhlin 2008). A problem-based approach begins with the constructivist assumption that learning is a product of social and cognitive interactions (Greeno, Collins, and Resnick 1996). Also, the importance of interaction and communication within an active learning process is emphasised. Hence, group dynamics and problem solving in tutorial groups are stressed as important (Gallagher 1997). Tutorials, a kind of cooperative learning method, are regarded as valuable for motivation, because by working together students support each other's individual persistence.

This cooperative learning provides peer-supported opportunities for success. Thus, the instructional strategies of authentic activities, collaboration and reflection in PBL all can serve as sources of self-efficacy information and through experiences of success, increase students' self-efficacy beliefs (Dunlap 2005). However, in a meta-analysis on the effects of PBL, it was concluded that PBL had more positive effects on some learning outcomes, while regarding other levels of knowledge, conventional teaching had more positive effects (Gijbels et al. 2005).

Research questions and hypothesis

Given the findings of research on self-efficacy and the longitudinal study, it is of great interest to investigate the links between students' self-efficacy beliefs and their decision-making processes and choices of influencing their study environment. It is of special interest for students in a study environment that is characterised by high demands, heavy workload and difficult course content, in which certain strategies may increase the possibilities of managing the situation.

The first question in this study is whether students' degree of academic self-efficacy is related to their perceptions of the workload and their opportunities to influence their study environment, their thoughts of dropping out and their academic performance. It is hypothesised that students who perceive the workload as moderate, who perceive their opportunities to influence their studies as good, who do not have thoughts of dropping out and who perform well academically will have higher degrees of academic self-efficacy than students who perceive the workload as heavy and their opportunities to influence their studies as poor, who have thoughts of dropping out and who do not perform well academically since students with a high level of self-efficacy more often try challenges, are boosted if they can master challenges with little assistance and perform better academically.

The second research question is how the students' degree of academic self-efficacy is related to their strategies to influence and take control over their study environment. It is hypothesised that students who engage in activities intended to

influence course content or structure have higher academic self-efficacy because self-efficacy is positively related to strategy and planning.

Finally, differences between students in a Master's programme in Applied Physics and Electrical Engineering (henceforth AP) and a Master's programme in Computer Engineering (henceforth CE) regarding their strategies to influence their study environment are explored. A hypothesis is that students in CE use more strategies to influence course content or structure, because they study according to PBL, which will increase opportunities to interact with peers and teachers.

With reference to the relationship between the earlier longitudinal study on engineering students and the current study, it must be stated that the two studies do not overlap. The data in the current study are recently collected by completely new measurements and with other participants.

Method

The context of the study

The context of this work is two 4.5-year Master's programmes in engineering at the same University: AP and CE. AP has been marketed as a prestigious programme with the aim of producing engineers capable of working at the international forefront of technical development and enhancing the competence of industry and society. Annually, over 100 students enrol in the programme. The programme has a large proportion of scheduled lectures and laboratory work. The content is organised into a large number of mainly parallel courses. Students from earlier cohorts of the programme participated in a longitudinal project initiated in 1998, in which the interviewed students reported highly demanding courses and heavy workloads (Jungert 2008a, 2008b).

CE, on the other hand, is designed according to the principles of PBL. Around 30 students enrol in the programme each autumn. These students are divided into four small tutorial groups, which constitute the basic working form of the programme.

Students in Swedish higher education have several formal rights to influence their study environment. They have the right to be represented on the boards of education and research of universities, to be represented in the decision making and preparing bodies of the universities and to take part in course evaluations that all Swedish higher educational institutions are required to carry out at the end of every course. In the course evaluations, the students who have participated in a course have the opportunity to express their opinions and experiences of the course and the appropriate higher education institution assembles the results of all course evaluations. Swedish universities are responsible for informing the students of the results and of possible measures to be taken on the basis of the course evaluation.

Both programmes in the present study have implemented reforms to decrease drop-outs and to maintain a good reputation. The formal influence opportunities have also been structured more clearly and involve formal meetings with students, student representatives and teachers twice each semester, where the pros and cons of courses are discussed. Course evaluations are made according to a scoring system on the Internet and communicated to the chair of the study board. At the board, the evaluations are assessed by the examiner receiving an honourable mention or being requested to make improvements.

Participants

Students from two Master's programmes in Engineering were asked if they wished to participate in the study. Of the 258 students registered in the first, the third and the fifth semesters in AP, 213 participated in the study and all of the 62 students enrolled in the first and fifth semesters in CE. This means that for students in AP, the total response rate was 83% and for CE it was 100%. Both programmes have few women enrolled (9% and 12%, respectively). It was reflected in the responses (12% of the answers for both programmes were from women). The average age of the participants was 21.3 years (SD = 2.0).

Measures

Academic self-efficacy

In the first week of the semester, a self-efficacy scale was utilised to assess the participants' semester-specific academic self-efficacy. The scale had seven items concerning specific semester-related academic self-efficacy for engineering students (See the Appendix). Students were asked to rate their confidence in being able successfully to learn and perform well in various elements during their semester. Ratings were recorded on a seven-point Likert scale (1 = no confidence; 7 = complete confidence). The items were developed specifically for this study by the author, to measure perceived self-efficacy conceptualised in the current semester (a situation-specific manner, which is recommended; Bandura 1995). The reliability of the scale was calculated by the use of Cronbach's α. The scale was suitable as the value was 0.86.

Influence and perceptions of the studies

To measure students' experiences and their attempts to influence their study environment, another questionnaire was developed, which was distributed to the participants during a later week of the semesters. The questionnaire comprised eight items: three items concerned the perceived workload, perceived opportunities to influence the study environment and if the students had thoughts of dropping out. Five items assessed which strategies students used to handle their situation. Interview findings from a previous longitudinal project on engineering students' study experiences (Jungert 2008a, 2008b) were used to develop these items. These items ranged from not trying to influence the study environment at all to trying to influence it by formal means (completing the course evaluations) and by means of informal opportunities (asking examiners to change the course). An item for formal influencing was 'I fill in course evaluations in order to promote changes in courses', whereas an item for informal influencing was 'I talk to teachers in class in order to recommend changes in courses'. Ratings were recorded on a seven-point Likert scale (1 = no confidence; 7 = complete confidence).

To control for other variables that can have an effect on strategies: sex, age and former academic performance were measured. Academic performance was measured by collecting data on student performance on individual examinations during the semester. To categorise students as high, moderate and low achievers, an index of the academic performance of each student was computed. The index comprised the

number of credits obtained and the grades obtained by each student, and were averaged to generate one summary score per student.

Results

First of all, the amount of random missing data was checked. The percentage of missing data per variable did not exceed 20% and the distribution was normal. To impute missing values, the EM algorithm was performed (Tabachnick and Fidell 2001). Little's MCAR test gave $\chi^2(846) = 662.20$, $p > 1.000$. The model was thus accepted.

Comparisons between student academic self-efficacy beliefs, perceptions of and the means to influence the study environment were estimated by means of between-subject designs. For variables concerning perception of the study environment and use of strategy, all participating students were divided into three groups: those students who perceived the workload as heavy and felt unable to influence the study environment were assigned to the first group; students who held the opposite perceptions were assigned to the third group; and the balance were assigned to the second/middle group. Students belonging to the first group had values ranging from the maximum mean value to half a standard deviation above the median value; students in the third group had values ranging from the minimum mean value to half a standard deviation below the median value; and students in the middle group had values around the median. The same method was used to divide the whole sample into three groups: (1) students who used strategies to influence and take control of the study environment; (2) students who used such strategies but to a far lesser extent; and (3) students who used strategies to a medium extent. Students were also grouped as high, medium or poor performers. Finally, the whole sample was divided into two groups based on the programmes the students were registered on: AP and CE.

The relationship between academic achievement and self-efficacy was tested with univariate analyses of variance (ANOVA). Two-way ANOVA designs were used to estimate if there were relationships between students in the three groups (high, medium and low in perception of the study situation), between the two programmes and their levels of academic self-efficacy and to estimate if there was an interaction between the two variables, programme and perception of the programme regarding academic self-efficacy. Two-way ANOVA designs were used to estimate if there were relationships between students in the three groups (high, medium and low in use of strategy), between the two programmes and their levels of academic self-efficacy and to estimate if there were interaction effects between the variables programme and use of strategy as regards academic self-efficacy. Finally, between-group differences (sex and the two programmes) were tested with one-way ANOVAs. Generalisations to students in Master's programmes in Engineering are made.

Academic self-efficacy, academic achievement and perceptions of the study environment

No differences in self-efficacy beliefs were shown between female and male students. As could be expected, high-achieving students had significantly higher academic self-efficacy than lower achieving students, $F(2,\ 275) = 6.49$, $p < 0.005$,

partial $\eta^2 = 0.05$. Students in CE, however, had significantly higher academic self-efficacy beliefs $F(1, 275) = 14.83$, $p < 0.001$, partial $\eta^2 = 0.05$ (see Table 1).

Students perceived the workload to be quite heavy and 76.2% thought it was heavy to extremely heavy while 52.6% perceived their opportunities to influence their study situation as very good to rather good. Of these measures, no significant differences were obtained between the two programmes. No significant differences in level of academic self-efficacy were obtained concerning students with different perceptions of the workload or of opportunities to influence the study situation (Table 2).

Finally, students with high thoughts of dropping out had significantly lower levels of academic self-efficacy than students with medium to no thoughts of dropping out of the programme, $F(2, 275) = 22.36$, $p < 0.001$, partial $\eta^2 = 0.15$ (Table 2).

Strategy to influence the study environment and self-efficacy

Comparisons between students who used strategies to influence their study situation to a large extent, to a medium extent and to a low extent were made according to their levels of academic self-efficacy. Differences were obtained for three strategies to influence the studies. Students who rarely filled in course evaluations in order to influence their courses had significantly lower levels of

Table 1. Self-efficacy means and standard deviations.

Category	*n*	*M* (SD)	*F*	Partial η^2
Female	33	4.98 (0.90)	0.40	0.00
Male	236	5.09 (0.93)		
AP	113	4.97 (0.96)	14.83***	0.05
CE	62	5.47 (0.66)		
High achievers	79	5.38 (0.82)	6.49**	0.05
Moderate achievers	112	5.02 (0.92)		
Low achievers	80	4.87 (0.97)		
Workload low	55	5.20 (1.07)	2.87	0.02
Workload moderate	125	5.16 (0.83)		
Workload heavy	95	4.90 (0.92)		
Opportunities good	67	5.21 (0.89)	1.47	0.01
Opportunities moderate	89	5.11 (0.82)		
Opportunities bad	119	4.98 (1.00)		
Few drop-out thoughts	63	5.43 (0.79)	22.36***	0.15
Moderate drop-out thoughts	116	5.10 (0.80)		
Many drop-out thoughts	90	4.50 (1.00)		

**$p < 0.01$; ***$p < 0.001$.

Table 2. Mean (standard deviation) for self-efficacy for the three groups in each strategy.

Strategy	Group	*n*	*M* (SD)	*F*	Partial η^2
Course evaluation	1	119	5.31 (0.86)	8.59***	0.06
	2	86	5.01 (0.88)		
	3	70	4.77 (0.97)		
Student representative	1	80	5.26 (0.93)	2.77	0.02
	2	114	5.06 (0.87)		
	3	81	4.93 (0.96)		
Out of class interaction	1	79	5.26 (0.87)	4.95**	0.04
	2	112	5.14 (0.94)		
	3	80	4.82 (0.90)		
In class interaction	1	78	5.36 (0.85)	5.71**	0.04
	2	84	5.05 (0.89)		
	3	111	4.91 (0.96)		

**$p < 0.01$; ***$p < 0.001$.

academic self-efficacy than students who used such a strategy to influence their study situation to a larger extent, $F(2, 275) = 8.59$, $p < 0.001$, partial $\eta^2 = 0.06$. Students who often talked to teachers out of class in order to influence courses had significantly higher levels of academic self-efficacy, $F(2, 275) = 4.95$, $p < 0.01$, partial $\eta^2 = 0.04$ and students who often talked to teachers in class in order to influence courses had significantly higher levels of academic self-efficacy, $F(2, 275) = 5.71$, $p < 0.01$, partial $\eta^2 = 0.04$, than students who used these strategies to a lower extent or not at all (Table 2).

There were, however, no significant differences in level of academic self-efficacy between students who, to different degrees, used the other strategies to influence or take control over their study environment.

Student influence and differences between the programmes

Students in the two programmes differed in three of the strategies to influence the study environment. Students in AP filled in course evaluations more often in order to influence their studies $F(2, 275) = 4.65$, $p < 0.05$, partial $\eta^2 = 0.02$. Students in CE, in contrast, talked with teachers significantly more often to influence their studies, both in class $F(1, 275) = 16.77$, $p < 0.001$, partial $\eta^2 = 0.06$ and out of class $F(1, 275) = 43.79$, $p < 0.001$, partial $\eta^2 = 0.14$ (Table 3).

No significant interaction effects for programme and strategy to influence the study situation were obtained for academic self-efficacy. This means that students in both programmes who use the same kind of strategy to influence their study environment do not differ regarding their level of academic self-efficacy.

Table 3. Mean values of strategies.

Strategy	Programme	*M* (SD)	*F*	Partial η^2
Course evaluation	AP	5.31 (1.38)	4.65*	0.02
	CE	4.87 (1.48)		
Student representative	AP	5.15 (1.31)	1.40	0.01
	CE	5.66 (1.26)		
Out of class	AP	2.39 (1.44)	43.79***	0.14
	CE	3.81 (1.62)		
In class	AP	2.61 (1.46)	16.77***	0.06
	CE	3.49 (1.53)		
Drop–out	AP	2.46 (1.45)	0.27	0.00
	CE	2.57 (1.68)		

*$p < 0.05$; ***$p < 0.001$.

Discussion

As was predictable, high self-efficacy beliefs were significantly associated with high academic achievement and fewer thoughts of dropping out. The results reflected a moderate association between academic self-efficacy and thoughts of dropping out but a less substantial association between self-efficacy and achievement. When students believe in their capabilities to perform well, they become more motivated and determined to persist in their studies and as a consequence they perform better, which is consistent with earlier research on self-efficacy (Bandura 1997; Fenollar, Roman, and Cuestas 2007; Zajacova, Lynch, and Espenshade 2005). Students who lack beliefs in their own capabilities are more likely to be less motivated and consequently they risk dropping out. On the other hand, the link between perceived workload and academic self-efficacy was not significant, i.e. even when students perceive their workload as heavy, it is not assumed that their self-efficacy will be lower. This finding may result from heavy workloads being evaluated in very opposite senses, either as a 'threat' or as a 'challenge'. This possibility is consistent with previous research that has found that persons with high self-efficacy beliefs evaluate demands as challenges, whereas persons with low self-efficacy beliefs evaluate demands as threats (Jerusalem and Schwarzer 1992; Pintrich and De Groot 1990).

Results indicate that students choosing strategies to influence their study environment had significantly higher self-efficacy beliefs than those who did not use such strategies. These results support earlier findings that academic self-efficacy is positively linked to strategy use. However, in this study, the focus is strategies, which refer to how students attempt to influence their study environment. Previous studies have not examined the relationship between self-efficacy and such strategies or explored such relationships in engineering programmes with two different pedagogies.

The results show that students on both programmes who talk to teachers and fill in course evaluations in order to influence their studies have significantly higher levels of academic self-efficacy beliefs. These results were significant with a modest

effect size. The results nevertheless indicate that students on engineering programmes with similar opportunities to influence the study environment and who use more of what may be called formal and informal strategies to influence their studies have higher beliefs in their capabilities to perform well than students who choose not to use such strategies to influence their study environment.

The result that those engineering students who talk more frequently than their peers to teachers, attempting to influence course content or structure, have significantly higher self-efficacy beliefs, is in line with findings from a longitudinal and interview-based study on 10 students of AP (Jungert 2008b). Students in that study claimed that before going to their teacher to ask the 'basic' questions, they wanted to feel secure about the course content. If they lacked self-confidence regarding the course, they did not want to put questions to their teacher. These findings, that students' self-efficacy is linked to willingness to interact with faculty, add to findings in the extant literature that as students enter a programme, there is a link between higher academic self-efficacy and expectations of positive faculty interactions (Santiago and Einarson 1998; Tinto 1993). That is, the link between self-efficacy and frequency of interaction with faculty is not just at programme entry, but also during later stages of the programme. Students with high beliefs in their own capabilities to do well use more formal strategies to influence their study environment. This may just be because students who are more self-efficacious reflect more about their studies in constructive ways. They may have more ideas concerning how courses can be improved and find it worthwhile to present these views to the study board. Completion of evaluations may be a kind of debriefing for students who want to express both satisfaction and discontentment with courses. In other words, students with high self-efficacy beliefs are active participants who are involved in the formation of the institutional atmosphere and help to create better courses in programmes, which according to Coates (2005) leads to high-quality learning. Earlier research has found that students with strong beliefs in their capabilities more often use cognitive strategies and are more self-regulated (Jerusalem and Schwarzer 1992; Pintrich and De Groot 1990).

The present study expands on earlier research (Pintrich and De Groot 1990; Schunk 1994; Schunk and Zimmerman 2003) by showing that high self-efficacy beliefs are linked with not only greater use of cognitive strategies, but also to strategies to influence the study environment. Students with lower academic self-efficacy on the other hand seem to lack both belief in their capabilities to influence teachers by talking with them and belief in their formal opportunities to influence and as a consequence they are not as involved in the informal and formal strategies to influence their study environment. Low-efficacy beliefs seem to be related to less use of strategies to influence the study environment. If this is a general trend, then it may be a problem concerning students at risk. One reason why the Swedish higher education system gives students many rights and opportunities to influence their studies is to improve retention rates. If, however, students with low beliefs in their capabilities to do well in their programmes are the ones who least attempt to influence their study environment by formal and informal means, there is a risk that they will not perform satisfactorily and hence drop-out. These students may be the ones who would benefit most from using formal and informal strategies to influence their study environment.

Although our data cannot address causality, it appears that the students who have high self-efficacy beliefs choose to use formal and informal strategies to influence their study environment. In varied causal tests, Bandura (1992) has shown that efficacy beliefs contribute significantly to human motivation and achievement. Thus, improving students' self-efficacy beliefs would lead to more use of these strategies because their beliefs in the opportunities to influence their study environment would be increased. Students with low self-efficacy beliefs should be encouraged to use the various methods to influence their study environment, because they would benefit if they expressed their difficulties and discontentment with their studies to teachers and the study board. Encouragements to recommend improvements in courses and scheduled invitations to teachers' offices for extra feedback are two concrete examples.

The significant difference in academic self-efficacy between the students in the two programmes is remarkable. The programmes are equally long. Very similar subjects such as mathematics, physics and electronics, are studied. The ratio of female to male students is highly comparable. Furthermore, students in both programmes perceive their opportunities to influence their studies and their workload in the same way. One difference is that AP is perceived as more prestigious and therefore probably more demanding, which may be an explanation for the difference in self-efficacy. However, the main difference between the two is that CE is based on PBL, where the opportunities to cooperate and solve problems in the tutorial groups are good (Gallagher 1997). Dunlap (2005) argues that the instructional activities in PBL, such as collaboration and reflection, may serve as sources of efficacy information that can actually increase academic self-efficacy. This is supported by findings in the current study, which furthermore show that students in CE significantly more often engaged teachers, both in and out of class, in order to influence their courses and their study situation. These opportunities might also have been good in project courses, but the students in AP did not have such in the semesters followed in this study. Thus, it could be claimed that the engineering students who study according to the form of PBL that is used in their courses manage to increase their academic self-efficacy because they have more sources of efficacy information than students in the programme, which does not promote PBL. Students in CE furthermore seem to develop better informal opportunities to influence their studies, while the students in the more conventional programme significantly more often use course evaluations to influence their studies.

In summary, the results provide valid empirical indications that student involvement in formal and informal strategies to influence their study environment is closely tied to students' academic efficacy beliefs. These results support the notion that increasing students' self-efficacy beliefs is not only important for their academic performance, but also for their involvement in the formation of the institutional atmosphere and the communication of goals and ideas between students and their teachers and administrators. The results also indicate that elements in PBL may provide students with more sources of efficacy information that can increase academic self-efficacy. However, even if the results show that students who study according to PBL use more informal strategies and have higher self-efficacy, no claims regarding positive effects on learning outcomes can be made (cf. Gijbels et al. 2005). Future research could explore both the relationship between students' self-efficacy and their strategies to influence their study environment in other settings and

to compare different programmes with various degrees of demands and prestige. At the same time, other components may be associated with student involvement in strategies to influence the study environment. Clearly, more research is needed on factors that may have an impact on those strategies. Students, regardless of level of self-efficacy, need to be involved in the development of the institutional environment.

Acknowledgements

Many thanks to Prof Gerhard Andersson, Linköping University, and Helena Dedic, Steven Rosenfield and Andy Fuchs, Vanier College and Concordia University, for their valuable help regarding this article.

References

Bandura, A. 1986. *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. 1992. Exercise of personal agency through the self-efficacy mechanism. In *Self-efficacy: Thought control of action*, ed. R. Schwarzer, 3–38. Washington, DC: Hemisphere.

Bandura, A. 1995. Guide for constructing self-efficacy scales. http://www.emory.edu/EDUCATION/mfp/effguide.html (accessed October 10, 2008).

Bandura, A. 1997. *Self-efficacy: The exercise of control*. New York: Freeman.

Bateson, R., and J. Taylor. 2004. Student involvement in university life beyond political activism and university governance: A view from Central and Eastern Europe. *European Journal of Education* 39: 471–83.

Case, J., and R. Gunstone. 2003. Going deeper than deep and surface approaches: A study of students' perceptions of time. *Teaching in Higher Education* 8: 55–69.

Chiu, M., and Z. Xihua. 2008. Family and motivation effects on mathematics achievement: Analyses of students in 41 countries. *Learning and Instruction* 18: 321–36.

Coates, H. 2005. The value of student engagement for higher education quality assurance. *Quality in Higher Education* 11: 25–36.

Dunlap, J. 2005. Problem-based learning and self-efficacy: How a capstone course prepares students for a profession. *Educational Technology Research & Development* 53: 65–85.

Fenollar, P., S. Roman, and P. Cuestas. 2007. University students' academic performance: An integrative conceptual framework and empirical analysis. *British Journal of Educational Psychology* 77: 873–91.

Gallagher, S.S. 1997. Problem-based learning: Where did it come from, what does it do, and where is it going? *Journal for the Education of the Gifted* 20: 332–62.

Gijbels, D., F. Dochy, P. Van den Bossche, and M. Segers. 2005. Effects of problem-based learning: A meta-analysis from the angle of assessment. *Review of Educational Research* 75: 27–61.

Greeno, J.G., A.M. Collins, and L. Resnick. 1996. Cognition and learning. In *Handbook of educational psychology*, ed. R.C. Calfee and D.C. Berliner, 15–46. New York: Simon & Schuster Macmillan.

Jerusalem, M., and R. Schwarzer. 1992. Self-efficacy as a resource factor in stress appraisal processes. In *Self-efficacy: Thought control of action*, ed. R. Schwarzer, 195–213. Washington, DC: Hemisphere.

Jungert, T. 2008a. Opportunities of student influence as a context for the development of engineering students' study motivation. *Social Psychology of Education* 11: 79–94.

Jungert, T. 2008b. A longitudinal study of engineering students' approaches to their studies. *Higher Education Research and Development* 27: 201–14.

Kuh, G., T.N. Laird, and P. Umbach. 2004. Aligning faculty activities & student behavior: Realizing the promise of greater expectations. *Liberal Education* 90: 24–31.

Luszczynska, A., B. Gutierrez-Dona, and R. Schwarzer. 2005. General self-efficacy in various domains of human functioning: Evidence from five countries. *International Journal of Psychology* 40: 80–9.

McCune, V., and J. Hounsell. 2005. The development of students' ways of thinking and practising in three final-year biology courses. *Higher Education* 49: 255–89.
Pajares, F. 1996. Self-efficacy beliefs and mathematical problem-solving of gifted students. *Contemporary Educational Psychology* 21: 325–44.
Pascarella, E. 1980. Student-faculty informal contact and college outcomes. *Review of Educational Research* 50: 545–95.
Pascarella, E., and P. Terenzini. 2005. *How college affects students*, 2nd edn. San Francisco, CA: Jossey Bass.
Pintrich, P.R., and E.V. De Groot. 1990. Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology* 82: 33–44.
Santiago, A.M., and M.K. Einarson. 1998. Background characteristics as predictors of academic self-confidence and academic self-efficacy among graduate science and engineering students. *Research in Higher Education* 39, no. 2: 163–98.
Scheja, M. 2006. Delayed understanding and staying in phase: Students' perceptions of their study situation. *Higher Education* 52: 421–45.
Schunk, D.H. 1994. Self-regulation of self-efficacy and attributions in academic settings. In *Self regulation of learning and performance. Issues and educational applications*, ed. D.H. Schunk and B.J. Zimmerman, 75–99. Hillsdale, NJ: Erlbaum.
Schunk, D.H., and B.J. Zimmerman. 2003. Self-regulation and learning. In *Handbook of psychology: Educational psychology*. Vol. 7, ed. W.M. Reynolds and G.E. Miller, 59–78. New York: John Wiley.
Silén, C., and L. Uhlin. 2008. Self-directed learning – a learning issue for students and faculty!. *Teaching in Higher Education* 13: 461–75.
Tabachnick, B.G., and L.S. Fidell.. 2001. *Using multivariate statistics*. Needham Heights, MA: Allyn & Bacon.
Tinto, V. 1993. *Leaving college: Rethinking the causes and cures of student attrition*, 2nd ed. Chicago, IL: University of Chicago Press.
Zajacova, A., S.M. Lynch, and T.J. Espenshade.. 2005. Self-efficacy, stress, and success in college. *Research in Higher Education* 46: 677–706.

Appendix. Academic self-efficacy items

I am confident that I have the capability to learn the course contents this semester.
I am confident that I will be able to correctly solve problems in the courses this semester.
I am confident that I will be able to work well with study-related tasks this semester.
I am confident that, with sufficient efforts, I will perform well on the courses this semester.
I will be able to do well on the examination on Course A.
I will be able to do well on the examination on Course B.
I think I will be able to explain most of the concepts in the courses by the end of this semester.