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CURRICULUM & TEACHING STUDIES | RESEARCH ARTICLE

Are marketing students in control in problem-based learning?

Gerry Geitz^{1*}, Desirée Joosten-ten Brinke² and Paul A. Kirschner²

Abstract: This study investigated to what extent self-efficacy, learning behavior, and performance outcomes relate to each other and how they can be positively influenced by students asking for and seeking feedback within a problem-based learning (PBL) environment in order to meet today's requirements of marketing graduates. An experimental pre-test-post-test nonequivalent group design intervention study was carried out with first-year marketing students. The predicted relation between self-efficacy, learning behavior, and performance outcomes was confirmed. Self-efficacy was found to positively influence performance outcomes, whereas surface learning was found to negatively influence performance outcomes. Regression analysis showed that self-efficacy was a significant predictor of deep learning. Significant increases of self-efficacy and surface learning were found in the group as a whole and in the control group. In the experimental group, deep learning was maintained on an individual level. Critical thinking, problem solving, linking concepts, transfer of knowledge, and metacognitive skills are all essential skills for today's marketing student. To educate students properly in these skills, it is important that influencing variables, such as self-efficacy and learning behavior, are taken into account. Learning environments such as PBL might contribute to enhance self-efficacy and a concomitant deep learning behavior.

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PUBLIC INTEREST STATEMENT

Contemporary society and with this the future working environment of marketing students in higher education is continuously changing and requires corresponding learning outcomes. Critical thinking, problem solving, linking concepts, transfer of knowledge, and metacognitive skills are all essential skills for today's marketing student. To educate students properly in these skills, it is important that influencing variables, such as self-efficacy and learning behavior, are taken into account. This study investigated to what extent self-efficacy, learning behavior, and performance outcomes relate to each other and how they can be positively influenced by students asking for and seeking feedback within a problem-based learning (PBL) environment in order to meet today's requirements of marketing graduates. Learning environments such as PBL might contribute to enhance self-efficacy and a concomitant deep learning behavior.

Subjects: Education Studies; Educational Research; Study of Higher Education; Teaching & Learning

Keywords: self-efficacy; learning behavior; feedback; problem-based learning; marketing education

1. Introduction

Contemporary society and with this the future working environment of marketing students in higher education is continuously changing and requires corresponding learning outcomes (Nijhuis, Segers, & Gijsselaers, 2005). A marketing practitioner that can meet today's requirements must be able to act on the micro-level of the customer, on the meso-level of value constellation, and on the macro-level of society (Webster & Lusch, 2013). This means that a marketing practitioner must be able to switch from one level to another and understand the reciprocal relations between these levels. Both knowledge construction and the ability to transfer this constructed knowledge to rapidly changing real-life contexts have become crucial elements of learning environments in higher education (Alt, 2015).

A learning environment in which learners construct knowledge through meaningful and complex problem solving in real-life situations would address this change (de Kock, Slegers, & Voeten, 2004). The intended learning outcomes are reflected in the academic performance outcomes that marketing students achieve. Students' beliefs in their capabilities (i.e. self-efficacy), have been found to be a strong predictor of academic performance outcomes (Zimmerman, 2000). Furthermore, their performance is influenced by their learning behavior. This behavior varies from student to student (Fennolar, Román, & Cuestas, 2007), and thus requires a learning environment in which individual self-efficacy and learning behavior are steered to positively influence performance outcomes (e.g. in terms of qualitative or quantitative outcomes). This study investigates to what extent self-efficacy, learning behavior, and performance outcomes relate to each other in first-year marketing students and how they can be positively influenced within a problem-based learning (PBL) environment.

1.1. Self-efficacy and learning behavior

Self-efficacy is a person's belief in her/his capabilities to execute behavior that is required to achieve prospective outcomes (Bandura, 1977). Feelings of student self-efficacy are related to students' belief that they *themselves* can influence outcomes through their own behaviors (Bandura, 1989). In education, this is important because students with high self-efficacy achieve high performance outcomes and display a deep learning behavior (Gębka, 2014). Also, when students have feelings of high self-efficacy, they exhibit intrinsic motivation and persistence in the face of failure, have strong outcome expectations, and attribute success or failure to the effort they themselves expend (Bandura, 2012; Bureau of Labor Statistics, 2014; Obilo & Alford, 2015; Usher & Pajares, 2008; van Dinther, Dochy, & Segers, 2011; Zimmerman, 2000). Bandura (1977) indicated that self-efficacy influences the choices people make, the way they act, the amount of effort they exert, and their persistence. However, perceived self-efficacy is not a general trait; it can vary for a person across domains and contexts. Someone can have high self-efficacy beliefs in one domain or situation and low self-efficacy beliefs in another. Even though it is known that self-efficacy can vary across domains and contexts, it is not clear whether it can be changed during a course (Fan, Meng, Billings, Litchfield, & Kaplan, 2008). Because of this, it is worthwhile to understand how to enhance students' self-efficacy in different contexts and among different student groups. In other words, this study investigates whether *self-efficacy changes over time during the execution of a substantial task within a marketing program*.

In addition to self-efficacy, students' learning behavior such as whether they learn at a deep or a surface level, is an important factor that influences their performance outcomes (Marton & Säljö, 1979). Deep learning is characterized by learning processes used to more fully understand the content and the message of an author, including searching for meaning and thinking critically. Surface learning is characterized by processes used for reproduction or memorization of the text and does not include any search for the meaning of the learning task. To meet the requirements of today's

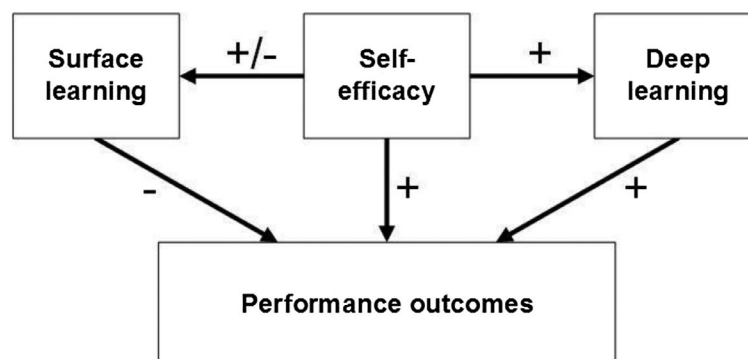
society and working environment whereby students are able to gain knowledge and transfer it to new novel situations, a deep learning approach is required during their studies and surface learning should be prevented.

Changing technological business environments and therewith evolving business needs, requires marketing students well prepared and educated to be succesful as marketing practitioners (Wymbs, 2011). To this end, some research has found a positive relation between self-efficacy and deep learning (Bandura, 1993; Fennolar et al., 2007; Greene & Miller, 1996; Liem, Lau, & Nie, 2008; Phan, 2010), while a negative relation has been found between self-efficacy and surface learning (Fennolar et al., 2007; Papinczak, Young, Groves, & Haynes, 2008). Self-efficacious students are willing to choose difficult and challenging tasks and to expend considerable effort (Bandura, 1997). According to Bandura (1993), students who doubt their own capabilities may avoid deep learning activities because they do not feel competent to meet the expected difficulties. In contrast, some research has found that feelings of self-efficacy may be positively related to surface learning (Phan, 2010). This suggests that self-efficacious students might adopt surface learning behavior if this strategy is better suited to their needs, such as achieving high outcomes. Although the relation between learning behavior and performance outcomes is inconclusive in previous research, in general it seems that deep learning is associated with higher performance outcomes and surface learning with lower performane outcomes (Gijbels, Van de Watering, Dochy, & Van den Bossche, 2005). However, Gijbels et al. (2005) stressed the influence of students' perceptions of the assessment methods on learning behavior as well.

Bandura (1997) presumed that self-efficacy beliefs originate from four sources of information. The first and most powerful source is *mastery experience*, which is the experience of succeeding (Usher & Pajares, 2008). Mastery experience provides people with information about their capabilities based on evaluation and reflection on the results obtained. A second source is *vicarious experience*, which includes observing others. Vicarious experiences can alter efficacy beliefs through comparison with others. *Verbal persuasion* is the third source of information provided by others to encourage a person to develop certain capabilities. Verbal persuasion is persuasive information provided by knowledgeable and reliable people. The fourth and final source is a person's *physiological and emotional state*. If a person is tense, learning becomes more difficult. To support students in their self-efficacy development, elements of the learning environment should be aligned with the information acquired from these sources. Previous research is not yet univocal regarding *which* source of information is most relevant for enhancing students' perceived self-efficacy (van Dinther et al., 2011). Because of the positive relation between self-efficacy, and deep learning and performance outcomes, it is important for educators to know how to positively influence their students' self-efficacy to obtain deep learning and high performance outcomes. Therefore, we investigate *how these concepts relate, and how they change over time during the execution of a substantial task*.

Overall, the relations between self-efficacy, learning behavior, and performance outcomes, found in previous research are shown in Figure 1.

Figure 1. Relations between self-efficacy, learning behavior, and performance outcomes.



1.2. Development of self-efficacy and deep learning in PBL environments

PBL is an instructional approach designed to enhance deep learning in which collaborative group work often is used (Barrows, 1996; Papinczak et al., 2008). Key elements of some forms of PBL are that it: employs ill-structured problems to encourage students to think of the cause of the problem and how to solve it; uses a student-centered approach where students have to determine what to learn; and employs tutors to facilitate and stimulate students to ask themselves questions (Barrows, 2010). In this sense, a PBL environment might contribute to enhancing self-efficacy and concomitant deep learning behavior and inhibiting surface learning.

Alt (2015) examined the presumed effects of the dimensions of a PBL environment on self-efficacy. The dimensions were measured using the Constructivist Practices in the Learning Environment questionnaire (Tenenbaum, Naidu, Jegede, & Austin, 2001). She found that the dimensions *motivation towards reflection* and *concept investigation* were the strongest predictors of self-efficacy regarding the PBL environment. She concluded that reflection on knowledge construction and learning capabilities within a PBL environment could develop a strong sense of self-efficacy, because these reflections contribute to a student's mastery experience. She also found that *sharing ideas with others* was the second strongest predictor of self-efficacy. Sharing ideas with others and social interaction can be stimulated via collaborative group work which provides students the opportunity to gain vicarious experience by observing the group members. In addition to the opportunity to gain vicarious experience, collaborative group work is aimed at stimulating students to engage in the learning material, develop critical thinking, and apply a deep learning approach. This is due to the assumption that students discuss and explore new ideas together, relate concepts to each other, and are encouraged to learn deeper (Fontenot, Schwartz, Goings, & Johnson, 2012; Johnston, James, Lye, & McDonald, 2000). The effectiveness of collaborative group work in terms of learning approaches and acquisition of knowledge has been investigated extensively with mixed findings. Hall, Ramsay, and Raven (2004) found a significant increase of deep learning after the implementation of group work with unstructured problem-solving exercises among accountancy students. Papinczak et al. (2008) found significant relations between high self-efficacy and a deep learning approach and low self-efficacy and a surface approach to learning among first-year medical students in a collaborative group work environment. Strobel and Barneveld (2015) conducted a meta-synthesis of meta-analyses in order to compare PBL with conventional classrooms and reported positive long-term retention of knowledge within PBL environments. Nijhuis et al. (2005) reported a decrease of deep learning after implementing a PBL course and attributed the disappointing results to aspects such as the alignment of the assessment and tutor behavior. In sum, the way in which the intended effects of enhancing self-efficacy and deep learning are achieved are not fully clear.

1.3. Feedback as an instrument to enhance self-efficacy and deep learning

Feedback has been found to have a considerable effect on learning; Hattie (2013) reported an overall effect size of .75. The sources of information from which learners derive their feelings of self-efficacy provide directions to adjust elements of the learning environment to enhance self-efficacy. Feedback could be tailored to these information sources and therefore directed to enhance self-efficacy. To positively stimulate self-efficacy, Fennolar et al. (2007) suggest feedback should be accurate to help students obtain a realistic view of themselves. They also recommend that feedback should be specific and tailored to the task. This information can support a student's *mastery experience*. Development of self-efficacy can also be steered by exposing students to appropriate role models and to positive feedback (Phan, 2010). These role models contribute to a student's *vicarious experience* and provide information through *verbal persuasion*. Bandura (1977) pointed out that when people experience the gradual development of their abilities, their self-efficacy will increase. The support in the form of feedback given by educators during this process should be diminished when students become more and

more experienced. In other words, the feedback should be directed toward the development of capabilities and the progress that is achieved. Based on the findings of Bandura (1997), Fennolar et al. (2007), and Phan (2010) it can be presumed that feedback might be an appropriate instrument to enhance students' feelings of self-efficacy. In addition, Boud and Molloy (2013) state that to be as effective as possible, feedback should be sought and asked for by students instead of tutors or lecturers giving the feedback without prior solicitation. The assumption is that self-efficacy in PBL and therefore deep learning is enhanced if students themselves are in control of their own feedback process by formulating their own feedback questions and seeking feedback from their peers and tutor. This active role of students in feedback processes is defined as sustainable feedback: "active student participation in dialogic activities in which students generate and use feedback from peers, self or others as part of an ongoing process of developing capacities as autonomous self-regulating learners" (Carless, 2013, p. 113). To sum up, the assumptions of effective feedback are that it should be directed toward developing capabilities while working on tasks, and students should play an active role by seeking feedback.

In this study, we investigate these assumptions by asking and answering the research question: What are the effects of asking for and seeking feedback from peers and tutors on self-efficacy, learning behavior, and performance outcomes of first-year marketing students in PBL groups? This main question is divided into the following sub-questions, and hypotheses.

RQ1. What is the relation between self-efficacy, learning behavior, and performance outcomes?

H1: Self-efficacy and learning behavior predict performance outcomes (the average of all the grades gained over the period).

RQ1A. What is the relation between self-efficacy and learning behavior?

H2: Students showing high self-efficacy also show a deep learning behavior, students showing low self-efficacy also show a surface learning behavior.

RQ1B. Do self-efficacy and learning behavior change over time during the execution of a substantial task, and if so, in what direction?

H3: Self-efficacy and learning behavior are subject of change over time.

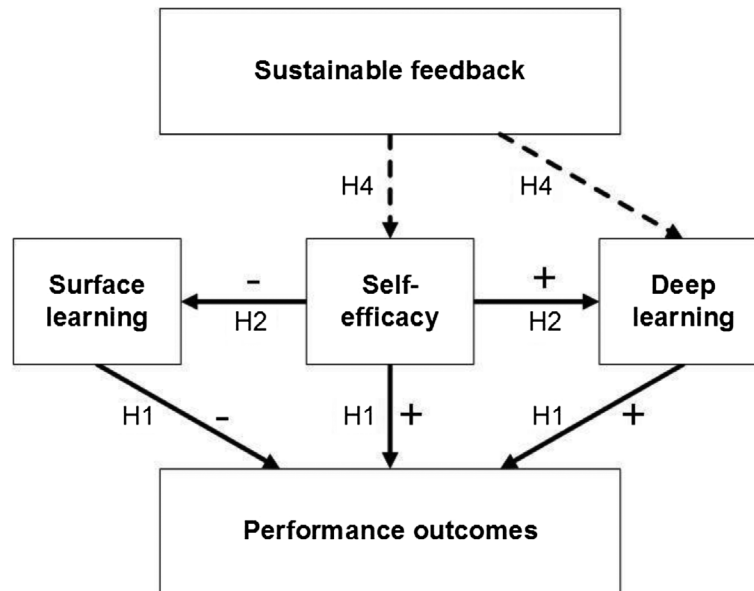
RQ2. What are the effects of asking for and seeking feedback from peers and tutors on self-efficacy and learning behavior?

H4: If students ask and seek for feedback from peers and tutors, self-efficacy and deep learning will increase.

In Figure 2 all hypothesized relations between self-efficacy, learning behavior, performance outcomes, and sustainable feedback are presented. A distinction is made between relations that will be replicated and new hypothesized relations.

Figure 2. Hypothesized relations between sustainable feedback, self-efficacy, learning behavior, and performance outcomes.

Notes: —→Hypothesized relations to be replicated (H1, H2).
-----→New hypothesized relation (H4) (i.e. research question).



2. Method

2.1. Context

This experiment was conducted in the context of first-year Dutch higher education in the domain of marketing. The academic year is divided in four periods of eight weeks and the experiment was carried out in the third period of the first year. The marketing students work together in PBL groups solving marketing problems, they meet twice a week. The learning environment is composed of group work and individual work. The scheduled work load in the third period is 15 European Credits (EC; 1 EC = 28.35 h of study), of which 3 ECs are for PBL group work and 4 × 3 EC are for courses on subjects related to a practical problem. The subjects of these four courses were: business, commerce, communication, and modern foreign languages. These courses were taught and individually assessed on higher order learning objectives by content experts on written and oral tests. The PBL group work was guided by a tutor and consisted of analyzing and solving a marketing problem. Assessment of the PBL group work took place on group level: the assignment consisted of a marketing report, presentation, and defense and were assessed by a content expert. The resulting group mark was individually adjusted based on the evaluation of active participation and attendance of the PBL sessions, given by the tutor. All assessments were scheduled after the end of the 8-week period and were expressed in figures from 1 to 10. Overall, the PBL group work, the four courses, and the assessments are a coherent program.

2.2. Participants

Participants were first-year students in marketing. The group consists of 105 first-year students ($N = 105$, 54 male, 51 female; $M_{\text{age}} = 20.29$; $SD = 2.37$; range: 17–30 year). Students were divided into 12 tutor groups, with seven tutors in total. An overview of tutors, groups, and conditions is given in Table 1.

Eight students in the experimental condition were randomly selected for an additional interview. They represented all tutor groups (4 males, 4 females; $M_{\text{age}} = 21.5$; $SD = 2.60$; range: 17–26 years). All 4 tutors in the experimental condition (2 males, 2 females; $M_{\text{age}} = 48.5$) participated as well.

2.3. Design

To investigate the effect of asking and seeking feedback on self-efficacy, learning behavior, and performance, an experimental pre-test–post-test nonequivalent group design intervention study

Table 1. The distribution of tutor group over tutors and experimental and control condition

Tutor	Experimental condition	Control condition
1	Groups 7 and 8	
2	Groups 3 and 4	
3	Groups 1 and 2	
4		Groups 5 and 6
5	Groups 9 and 10	
6		Group 12
7		Group 11

Table 2. Hypotheses and dependent and independent variables

Hypothesis	Independent variable	Dependent variable
1	Self-efficacy	Performance outcomes (grades)
	Learning behavior	
2	Self-efficacy	Learning behavior
3		Self-efficacy
		Learning behavior
4	Feedback	Self-efficacy
		Learning behavior

(Experimental: $N = 62$; Control group: $N = 43$) was carried out. Existing tutor groups were randomly assigned to the conditions, taking into account that all groups of a specific tutor were in the same condition (see Table 1). As a consequence, the number of students in the conditions is not equal. In Table 2 it is indicated which variables are tested in relation to the hypotheses.

2.4. Instruments

Two questionnaires were used, both of which were used and validated in previous research among undergraduate students.

- Self-efficacy was measured using the translated self- and task-perception questionnaire (STPQ-scale) (Van Meeuwen, Brand-Gruwel, Kirschner, De Bock, & Van Merriënboer, 2012), which is a 20-item, 5-point Likert scale.
- Learning behavior (i.e. deep and surface learning) was measured using a validated translated version of the Revised Study Process Questionnaire (R-SPQ-2F) (Biggs, Kember, & Leung, 2001), which is a 20-item, 5-point Likert scale.

Performance outcomes of the PBL group work and the four courses were collected per student from the back office of the program.

2.5. Procedure

The procedure for both experimental and control condition is summarized and presented in Table 3; all activities to be executed during the 8 weeks are presented. The students and tutors of the intervention condition worked with sustainable feedback, meaning formulating feedback questions based on their previous experiences in PBL groups. Subsequently they had to ask and seek for feedback, monitor their own feedback process and judge whether they improved in terms of their feedback questions. Students were in control of their own improvement, gained mastery experience, and developed self-regulating skills. In other words, the feedback was tailored to the information sources of self-efficacy and therefore directed to enhance self-efficacy. Students and tutors of the control condition worked according to the existing PBL procedures. There were no adjustments to their

Table 3. The procedure in both conditions

	Procedure experimental condition	Procedure control condition
Week 0	Tutors of the experimental PBL groups were given instructions on feedback	
Week 1—1st meeting	Students filled out questionnaires measuring self-efficacy and learning behavior	Students filled out questionnaires measuring self-efficacy and learning behavior
	Students received a bundle of feedback forms	Students received a feedback form
	Students wrote down individual learning points based on their experience in PBL groups in periods 1 and 2	Students wrote down individual learning points based on their experience in PBL groups in periods 1 and 2
	Learning points were formulated as a question and related to aspects of collaboration in PBL groups	Learning points were formulated as a question and related to aspects of collaboration in PBL groups
		Tutors checked completeness and students kept the formulated learning points for themselves
Week 1—2nd meeting	All group members shared their feedback questions with their peers and tutor	PBL activities and cooperation according to normal procedure
	Everyone was in possession of all the feedback questions	
Weeks 2, 3, 4	The tutor stimulated and guided the students to seek feedback on their own feedback questions	PBL activities and cooperation according to normal procedure
	All students wrote down their own judgments (evaluation) of their performance on the specific learning points (i.e. feedback questions)	
	At the end of every meeting, the students had to write down the feedback they sought and the feedback message they received	
Week 4—2nd meeting	An evaluative moment in which all students had to compare their own judgments with the external judgments	PBL activities and cooperation according to normal procedure
	If a student was satisfied with the feedback, then it was possible to rephrase the feedback questions to be able to ask and seek feedback for other learning points from that point on	
Week 5—1st meeting	All (rephrased) feedback questions were shared among the students	PBL activities and cooperation according to normal procedure
Weeks 5, 6, 7, 8	The tutor stimulated and guided the students to seek feedback on their own feedback questions	PBL activities and cooperation according to normal procedure
	Students wrote down their own judgments (evaluation) of their performance on the specific learning points (i.e. feedback questions)	
	At the end of every meeting, the students had to write down the feedback they sought and the feedback message they received	
Week 8—2nd meeting	The feedback questions were evaluated within the PBL group	Students filled out the questionnaires on self-efficacy and learning behavior
	Students filled out the questionnaires on self-efficacy and learning behavior	Afterward, the learning points formulated during week 1 were evaluated
	There were no formal (summative) judgments of the feedback process	
Week 9	Submission and presentation of PBL assignment and examination of the supporting courses (written tests)	Submission and presentation of PBL assignment and examination of the supporting courses (written tests)

procedures. Overall, at pre-test (i.e. the beginning of week 1) all students filled out the questionnaires (i.e. both experimental and control condition). At post-test (i.e. at the end of the period, after 8 weeks) all students filled out the questionnaires once again.

2.6. Data analysis

Descriptive and preliminary analysis was conducted to summarize and assess the data. To test whether self-efficacy and learning behavior were comparable among the experimental and control conditions at the start of the experiment, an independent *t*-test was conducted. To check differences between tutor groups at pre-test, a one-way ANOVA Bonferroni *post hoc* analysis was conducted. The relation between self-efficacy, learning behavior, and performance outcomes was investigated with a multiple regression analysis (RQ1) and correlation analysis (RQ1A). Performance outcomes were based on the individual mark on the PBL assignment and the marks on the written and/or oral tests (i.e. the average of all the marks gained at the end of the period was calculated). It was expected that the individual mark on the PBL assignment as such was not a representative measurement and calculation of the performance outcomes as a whole. To confirm these relations and test whether self-efficacy predicts deep learning, a linear regression analysis was used to test the predictive effect of self-efficacy on deep learning (RQ1A). Changes over time were tested by conducting a paired sample *t*-test and the reliable change index (RCI) (Zahra & Hedge, 2010) (RQ1B). The effect of the intervention was tested with a multiple regression analysis (RQ2).

3. Results

The reliability of the scales was calculated with Cronbach's α at pre-test and post-test.

The Cronbach α 's are sufficient to good and comparable to previous findings (see Table 4). α 's rated between $.9 > \alpha \geq .8$ are indicated as good; α 's rated between $.8 \geq \alpha \geq .7$ are indicated as acceptable; α 's rated between $.7 \geq \alpha \geq .6$ are indicated as questionable.

Preliminary analyses showed significant differences between both conditions (i.e. experimental and control) in self-efficacy ($t = -2.770$; $df = 102$, $p < .05$) and deep learning behavior ($t = -2.058$; $df = 101$, $p < .05$).

One-way ANOVA showed significant differences between tutor groups in self-efficacy at pre-test ($F(6, 97) = 4.295$, $p = .001$). Additional Bonferroni *post hoc* analysis showed a significant lower mean score for *n* tutor group 1 ($M = 3.29$; $SD = .491$) compared to tutor group 2 ($M = 3.74$; $SD = .239$; $p = .007$), tutor group 3 ($M = 3.73$; $SD = .277$; $p = .008$), and tutor group 4 ($M = 3.70$; $SD = .225$; $p = .017$). These differences are taken into account in further analyses.

Means and standard deviations are presented in Table 5.

Table 4. Cronbach's α at pre- and post-test

Measurement	Pre-test	Post-test	Items
Self-efficacy	.774	.797	19
Learning behavior			
Deep approach	.793	.832	2
Surface approach	.684	.764	2

Table 5. Means and standard deviations at pre-test and post-test for the control, experimental, and total group

	Control		Experimental		Total	
	M	SD	M	SD	M	SD
Self-efficacy pre-test	3.48	.38	3.67	.31	3.59	.35
Self-efficacy post-test	3.61	.36	3.71	.36	3.67	.36
Deep learning pre-test	2.72	.49	2.97	.67	2.87	.61
Deep learning post-test	2.70	.57	3.00	.59	2.88	.60
Surface learning pre-test	2.57	.44	2.73	.62	2.67	.56
Surface learning post-test	2.75	.58	2.81	.61	2.79	.60
Average of all the grades (Incl PBL grade*)	5.97	1.23	6.20	1.12	6.10	1.17

*Scale 1–10.

3.1. RQ1. What is the relation between self-efficacy, learning behavior, and performance outcomes?

In Table 6 the results of a multiple regression analysis are presented. Performance outcomes were predicted by self-efficacy and surface learning, $F(2, 98) = 8.035, p = .001, R^2 = .141$. In other words, high self-efficacy is associated with higher grades and surface learning is associated with lower grades. Performance outcomes were not significantly predicted by deep learning. Multiple regression analysis based on only the PBL assignment mark did not show any significant results.

3.2. RQ1A. What is the relation between self-efficacy and learning behavior?

As presented in Table 7, at both pre-test and post-test, deep learning and self-efficacy relate significantly positive to each other. These significant positive correlations also occur between pre-test and post-test.

The correlation analysis is complemented with a linear regression analysis to investigate whether self-efficacy is a predictor of learning behavior. Deep learning is predicted by self-efficacy at pre-test and post-test ($F(2, 100) = 29.319, p < .0005, R^2 = .370$). Beta-weights and their associated t-values are presented in Table 8. In other words, self-efficacy significantly predicts deep learning.

3.3. RQ1B. Do self-efficacy and learning behavior change over time during the execution of a substantial task, and if so, in what direction?

Paired sample t-tests were conducted to investigate whether students' self-efficacy and learning behavior changed during the course in the group as a whole and in both the experimental and control group. In the group *as a whole*, there was a significant increase between self-efficacy score at pre-test and post-test of .081, $p = .022$, Cohen's $d = .23$. A significant increase in surface learning was found between pre-test and post-test of .134, $p = .005$, Cohen's $d = .29$. In the *control* group, a significant increase in the self-efficacy score was found between pre-test and post-test of .143, $p = .018$, Cohen's $d = .38$; a significant increase in surface learning was also found, .190, $p = .019$, Cohen's $d = .38$.

Table 6. Multiple regression self-efficacy, surface learning, and performance outcomes (i.e. average of all the grades) for the total group

	B	SE	Standardized beta	T	Sig.	95% Confidence interval for B	
						Lower bound	Upper bound
Constant	5.122	1.343		3.815	.000	2.457	7.786
SE-2	.687	.311	.210	2.206	.030	.069	1.305
SL-2	-.554	.189	-.278	-2.928	.004	-.929	-.178

Notes: Dependent variable: average of all the grades.

SE-2 = self-efficacy, post-test; SL-2 = surface learning, post-test.

Table 7. Correlation matrix for the variables deep learning, surface learning, self-efficacy, at pre-test and post-test

Variable	1	2	3	4	5	6
1. Deep learning pre-test		-.19	.34**	.67**	-.22*	.44**
2. Surface learning pre-test			-.13	-.15	.67**	-.19
3. Self-efficacy pre-test				.45**	-.08	.50**
4. Deep learning post-test					-.12	.58**
5. Surface learning post-test						-.17
6. Self-efficacy post-test						

*Correlation is significant at the .05 level (2-tailed).

**Correlation is significant at the .01 level (2-tailed).

Table 8. Regression self-efficacy predictor of deep learning at pre-test and post-test

	B	T	Sig.	95% Confidence interval for B	
				Lower bound	Upper bound
Constant	-1.313	-2.328	.022	-2.432	-.194
SE-1	.360	2.282	.025	.047	.672
SE-2	.790	5.191	.000	.488	1.092

Notes: Dependent variable: deep learning.

SE-1 = self-efficacy, pre-test; SE-2 = self-efficacy, post-test.

Mean-level analysis is complemented with an analysis at an individual level (i.e. RCI; Zahra, 2010). In Table 9 the RCI for the group as a whole, and for the experimental and control group are presented. In the group *as a whole*, more students showed an increasing self-efficacy than a decreasing self-efficacy (an increase of 22.1% and a decrease of 8.7%); more students showed a decreasing deep learning behavior than an increasing deep learning behavior (an increase of 17.5% and a decrease of 21%); and more students showed an increasing surface learning behavior than a decreasing surface learning behavior (an increase of 28.8% and a decrease of 14.4%).

In the *experimental group*, more students exhibited an increase in self-efficacy (an increase of 14.5% and a decrease of 9.7%); deep learning remained stable. In terms of surface learning, there was a pattern of significant increase among students (an increase of 27.4% and a decrease of 16.1%). In other words, students while maintaining their deep learning behavior also reported an increase in surface learning.

In the *control group*, self-efficacy showed a similar pattern of increase (an increase of 33.3% and a decrease of 7.1%). On an individual level, more significant changes were found: more students decreased in deep learning (a decrease of 21.4% and an increase of 14.3%), whereas more students increased in surface learning (an increase of 31% and a decrease of 11.9%). In other words, students who did not receive the feedback intervention decreased in their deep learning behavior and reported the largest increase in surface learning.

Table 9. Overview of individual significant changes according to the RCI on self-efficacy and learning behavior

	Total of all groups		Experimental group		Control group	
	↓	↑	↓	↑	↓	↑
Self-efficacy (%)	8.7	22.1	9.7	14.5	7.1	33.3
Deep learning (%)	21.4	17.5	0	1.6	21.4	14.3
Surface learning (%)	14.4	28.8	16.1	27.4	11.9	31.0

Notes: ↓ denotes significant decrease; ↑ denotes significant increase.

3.4. RQ2. What are the effects of asking and seeking feedback from peers and tutors on self-efficacy and learning behavior?

Multiple regression analyses did not show any significant effects of the intervention on self-efficacy and learning behavior.

4. Conclusion and discussion

The hypothesized relations between self-efficacy, learning behavior, and performance outcomes was found (H1). Self-efficacy was found to positively influence performance outcomes, whereas surface learning was found to negatively influence performance outcomes. Within this predicted relationship, it was expected that students reporting high self-efficacy would also show a deep learning behavior (H2). This relationship was found at both pre-test and post-test. Regression analysis showed that self-efficacy is a significant predictor of deep learning. The presumed changeability of both self-efficacy and learning behavior was also supported in this study (H3). Significant increases of self-efficacy and surface learning were found in the group as a whole and in the control group. However, on an individual level the RCI provided additional insights in terms of deep learning. More students decreased than increased in terms of deep learning in the control group; in the experimental group almost all students remained stable in their deep learning approach. Overall, it is noticeable that at least 55% of all students did not report any change in self-efficacy and learning behavior. The expected positive influence of sustainable feedback on both self-efficacy and learning behavior was not directly found (H4). So it can be concluded that all hypothesized relations and changes over time were found. For a considerable part of the student population, self-efficacy and learning behavior changed. However, a direct effect of the feedback intervention in terms of increasing self-efficacy and deep learning was not observed; instead, deep learning behavior was maintained in most of the students. Overall, the relevance of intending to influence self-efficacy and learning behavior in order to increase performance outcomes has been shown. The possible causes and implications of the results are discussed in the following sub-paragraphs.

4.1. Self-efficacy, learning behavior, and feedback

The aim for enhancing self-efficacy and the concomitant deep learning behavior is in line with the evolving requirements in the working field of marketing practitioners. Critical thinking, problem solving, linking concepts, and metacognitive skills are all essential skills for today's marketing student. Some students in the experimental condition reported an increase of self-efficacy, but not as much as was aimed for. The—for the students—new experience of having to ask for and seek feedback might have muted the intended increase during this study. Mastery experience was found to be the strongest information source from which students derive their feelings of self-efficacy (Usher & Pajares, 2008); being immersed in this new feedback situation, students could not reflect on their previous experiences. Continuation of this approach might give students the opportunity to gain experience in asking for and seeking feedback, evaluating and reflecting, and thereafter adjusting their feelings of self-efficacy. As Hattie and Timperley (2007) state, for feedback to be effective three questions are important: Where am I going? How am I going? and Where to next? Explicit attention to these mechanisms for feed up, feed back, and feed forward provides valuable information about the students' goals and progress, including how to better support this process of gaining mastery experience.

The feedback intervention was aimed at enhancing self-efficacy and in doing so increasing deep learning. The intervention was directed at the sources of information from which students derive their self-efficacy. *Mastery experience* was made explicit by formulating and asking questions about two specific individual aspects; for example, collaboration with peers, chairing a meeting, and presenting. This approach helped students gain a realistic view of themselves, tailored to a specific task (Fennolar et al., 2007). Peers and tutors were specifically asked to comment on these individual questions in order to add *verbal persuasion*, and through the collaboration they had the opportunity to gain *vicarious experience* (Phan, 2010). Self-evaluation was part of the procedure to help students

to evaluate and reflect as part of the feedback cycle (Shute, 2008). In the experimental groups students were able to maintain their deep learning approach, but their self-efficacy increased only modestly. One initial explanation might be that students need more time to gain more mastery experience related to asking for and seeking feedback in order to further increase their self-efficacy.

Another explanation might be the students' perception of the somewhat "hybrid" learning environment composed of PBL groupwork/assessment and individual courses/assessment. In the first two periods of year 1 they might have experienced that a deep approach was not necessary to pass the exams. This, in turn, might have caused the increase of self-efficacy and surface learning to be modest. The results of our study in terms of the changeability of self-efficacy and learning behavior are mixed: on the one hand significant changes were found, but on the other hand more than half of the students did not report significant changes.

4.2. Performance outcomes

In line with previous research, self-efficacy proved to be a positive predictor of performance outcomes and that surface learning is a negative predictor (Fennolar et al., 2007; Zimmerman, 2000). The performance outcomes of the students in the experimental groups are slightly higher compared to the control condition, but these differences were not significant. On the mean level, surface learning increased significantly in the control group; on the individual level, there were more students with an increased surface learning behavior in the control group. An explanation for the lack of significant differences in performance outcomes between the control group and the experimental group might be that students perceived that a surface learning approach was "enough" to be successful. The students in the experimental group who maintained their deep learning approach did not achieve significantly higher grades.

4.3. Learning environment

The learning environment in this study was a PBL environment. The contribution of a PBL environment to self-efficacy and deep learning produced mixed results in previous research (Hall et al., 2004; Nijhuis et al., 2005; Papinczak et al., 2008; Strobel & Barneveld, 2015). The PBL environment in this study was characterized by both group and individual work; students had to prepare for both group and individual assignments. Nijhuis et al. (2005) reported an increase of surface learning in PBL groups and related this to lower scores on appropriate workload and appropriate assessment. The marketing students in this study might have perceived the workload and assessment as not adequately aligned with the PBL environment. As Biggs stated with respect to constructive alignment (1996), the objectives of learning, approach to teaching and learning, and assessment of the intended learning outcomes need to be properly aligned.

5. Methodological limitations and practical implications

A methodological limitation—and therefore a possible explanation for the limited effects of the intervention—might be that this research was conducted in a real-life setting, not in a highly controlled and controllable laboratory, and thus not all variables could be controlled for. For example, tutors of the experimental condition were instructed as to how to implement the intervention and how to guide the students during this new feedback approach, but the actual tutor behavior could not be controlled (Nijhuis et al., 2005). Another resulting limitation of the real-life setting was the limited intervention period. Adjustment of feelings of self-efficacy and the concomitant deep learning behavior might require more time to gain mastery experience.

It can be concluded that the relation between self-efficacy and deep learning is important for marketing education due to the continuously changing requirements of the working field. Critical thinking, problem solving, linking concepts, transfer of knowledge, and metacognitive skills are all essential skills for today's marketing student. Learning environments such as PBL might contribute to enhancing self-efficacy and a concomitant deep learning behavior if objectives, teaching, learning, and assessment are properly aligned.

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