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Are epistemological beliefs and motivational strategies related to study engagement in higher education?

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Abstract

The study investigated how students' motivational strategies and epistemologies are related to study engagement. Participants were engineering students (n = 246) who attended a student-activating philosophy course in spring 2011. Regression analysis, cluster analysis and ANOVAs were used as statistical methods.

The results in both variable-oriented and person-oriented analyses showed that study engagement was higher in those students who appreciated reflective learning, were optimistic, and did not avoid tasks. Three student groups were defined based on students' motivational strategies and epistemologies. Groups were called cook-book students, theorists and reflective professionals. Theorists and reflective professionals experienced stronger study engagement than cook-book students. Students in these groups scored high on reflective learning and optimism and low on task avoidance.

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1. Introduction

There is an emerging trend to look at students' well-being and positive academic emotions in the research of higher education (Pekrun, Goetz, Titz, & Perry, 2002; Lonka & Ketonen, in press). This approach is based on positive psychology that focuses on human strengths and optimal functioning rather than on weaknesses and malfunctioning (Seligman & Csikszentmihalyi, 2000). Recently, situational orientations have been investigated: A fresh study showed that contextual emotions were related to academic achievements on a student-activating lecture course. Interest, enthusiasm, engagement, and reported self-study time were related to the obtained course grade (Lonka & Ketonen, in press).

Usually, research has focused on more stable orientations. There is a long European tradition to look at university students' general study orientations (Entwistle & Ramsden, 1983; Vermunt, 1996). Orientations can be formed either by a variable-oriented approach, which investigates mutual relations between variables, or by a person-oriented approach, which tries to find factors that combine a number of sub-groups. In research on Nordic university students, general study orientations have most often been in

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focus, and also epistemological beliefs have been included (Lonka & Lindblom-Ylänne, 1996). Only recently emotions and motivational strategies have been included in such models by using both person- and variable-oriented approaches (Heikkilä & Lonka, 2006; Lonka, Sharafi, Karlgren, Masiello, Nieminen, Birgegård & Josephson, 2008; Mäkinen, Olkinuora & Lonka, 2004). Motivational strategies and epistemologies have been found to form systematic orientations, which in turn have relations to students' academic achievements and well-being (Heikkilä et al, 2011; Heikkilä et al., in press). In these studies, study engagement has not been looked at.

We were interested in general study engagement and factors that might either promote or hinder it. The present study investigates how students' motivational strategies and epistemologies are related to their study engagement. We look at such relations by using both variable- and person-oriented analyses.

1.1. *Study engagement*

Study engagement is defined as a positive, fulfilling, and work-related state of mind. It refers to a persistent and pervasive affective-cognitive state, which is not focused on any specific object, event or behaviour (Scaufeli et al., 2002). Study engagement can be divided into three dimensions: vigor, dedication and absorption. Vigor is characterized by high levels of energy and mental resilience while working. Dedication refers to being strongly involved in one's work and experiencing a sense of significance, enthusiasm, inspiration and challenge. Absorption is characterized by being fully concentrated and happily engrossed in one's work, whereby time passes quickly and one feels carried away by one's job (Schaufeli et al., 2002; Schaufeli & Bakker, 2004). In the present study, study engagement is investigated as a single entity, which includes all three dimensions.

Study engagement plays an important role in learning and studying (Salmela-Aro, 2009; Scaufeli et. al., 2002). It has been shown to relate to both study success and satisfaction (Salmela-Aro, 2009, Schaufeli et al., 2002). In this study we investigate whether students' motivational strategies and epistemologies play a role in terms of study engagement.

1.2. *Motivational strategies*

A number of differing motivational strategies have been introduced to explain university students' failures and successes (Cantor, 1990; Nurmi, Aunola, Salmela-Aro, & Lindroos, 2003; Eronen, Nurmi & Salmela-Aro, 1998). These strategies refer to the cognitive, affective and behavioral processes people apply to achieve their goals and to evaluate the outcomes of their actions (Cantor, 1990). Motivational strategies combine many psychological components, such as attributional beliefs, strategic planning, and relevant or irrelevant behavior (Nurmi et al., 2003). In the present study we focus on two strategies: optimism and task-avoidance (Nurmi et al. 1995, 2003).

Optimistic students apply active, task-focused strategies to meet their goals and attribute their successes positively. Based on their previous success they have high outcome expectations and a desire to enhance an already strong image of competence (Cantor, 1990). Optimistic strategy has been shown to relate to academic performance, satisfaction (Nurmi et al., 2003; Eronen et al., 1998), good self-regulation (Heikkilä & Lonka, 2006) as well as well-being and epistemological beliefs (Heikklä et al., in press.)

In contrast to optimistic students, task-avoidant students deliberately seek to avoid challenging situations rather than make an active effort to deal with them (Nurmi et al., 2003). Task-avoidance is especially related to anxiety-provoking situations and to situations where students are faced with the prospect of failure (Nurmi et al., 2003). Task-avoidance has been shown to relate to low academic performance, dissatisfaction (Nurmi et al., 2003) and low self-regulation (Heikkilä & Lonka, 2006). According to Nurmi et al. (1995), task avoidance and optimism have a strong negative relationship. However, a motivational strategy called defensive pessimism has been found. It combines a low level of optimism and low level of task avoidance (Showers & Ruben, 1990). In this case, anxiety and fear of failure may motivate the student to do well in a demanding situation (Norem & Cantor, 1986a,b).

1.3. *Epistemologies*

When students enter school and university, they entertain various kinds of conceptions in their minds. For instance, they may differ in terms of how they think about learning and knowledge (epistemologies). These epistemological beliefs are shown to be essential in relation to students learning outcomes and academic performance (Hofer, 2000; Schommer et al., 1990, 1993). In the beginning of studies, students often hold epistemological beliefs that reflect the need to have clear facts and certain answers, whereas more advanced students hold more relativist conceptions, where knowledge is created and evaluated in a specific context (Lonka & Lindblom-Ylänne, 1996; Perry, 1970.). Lonka et al. (2008) identified six dimensions that reflected various aspects of epistemological beliefs and ideas of learning. In the present study, we have included four of these dimensions. The first one is

reflective learning, which refers to study practices such as comparison of different explanations and active effort to integrate new knowledge to prior knowledge (Lonka et al., 2008). Second is *valuing metacognition*. Students who value metacognition think that knowing one's thought processes can be beneficial for learning (Lonka et al., 2008). Both reflective learning and valuing metacognition can be seen as dimension of a relativistic epistemology.

Valuing certain knowledge refers to the need to have unambiguous and explicit facts (Lonka et al., 2008). It is clearly quite dualistic in nature. Finally, *valuing practical knowledge* refers to the willingness to have practical and directly applicable knowledge (Lonka et al., 2008). In general valuing practical knowledge is not necessarily harmful. However, it is often related to quite superficial ideas of learning, referred to as a cook-book orientation. Students with this orientation are not satisfied with vague theoretical explanations, but instead would like to have certain, concrete and practical advice (Lonka et al., 2008). Valuing practical knowledge may also be related to more relativistic ideas of learning, for example, in the context of or professional orientation (Lindblom-Ylänne & Lonka, 1996). This orientation is typical in academic domains that prepare for profession (Lindblom-Ylänne & Lonka, 1996). Also Schön (1983) introduced the conception of reflective practitioner, which emphasizes reflection as a part of solving problems in authentic work situations.

1.4. *What forms a favorable study orientation?*

There is relatively little prior knowledge about how university students' motivational strategies, epistemologies and study engagement are related to each other. However, it has been shown that motivational strategies and approaches to learning can foster well-being and study success (Heikkilä et al., 2011, in press). Deep understanding, critical evaluation of knowledge, good self-regulation and optimism are related to a favorable cognitive-motivational predisposition. In turn, maladaptive position seems to combine the surface approach, problems of regulation and task avoidance (Heikkilä & Lonka, 2006). The aim of this study was to see how motivational strategies and epistemologies are related to study engagement. The study also investigates whether there are different kinds of student groups in which these variables combine to undermining or establishing factors for study engagement.

2. Methods

2.1. *Procedures and participants*

The participants were 247 engineering students who attended an optional philosophy course at the Aalto University in spring 2011. The teacher of the course was an awarded speaker and widely known to be an engaging lecturer (Saarinen, 2003). The course tried to provide students with the opportunity to reflect their personal life and values, without having explicit learning goals. Before the course, students received a request to answer an electronic questionnaire that deals with student's perceptions of knowledge and learning and student well-being. Participation in the study was voluntary. In the first lecture, students were reminded to respond, and the data include persons who responded after the first lecture. Overall, 45 % of the students who attended the course filled in the questionnaire used in this study. The majority (80 %) of students were between 21-31 years old (range = 19-64). Most of them (75 %) had started their studies between years 2003 and 2010 (M = 2003). On average, students had 117 credits (M = 192).

2.2. *Materials*

The self-report questionnaire consisted of Likert-type questions to assess students' epistemologies, motivational strategies and study engagement. All items were answered using a range from (1) strongly disagree to (6) strongly agree. Table 1. shows the number of cases, scales, ranges, means, standard deviations and Cronbach's alphas for each variable.

Students's epistemological beliefs were measured using the MED NORD -questionnaire (Lonka et al., 2008) which identifies seven dimensions of approaches to learning and knowledge. This study included four epistemological beliefs: reflective learning, metacognition, valuing certain knowledge and practical knowledge. Students' motivational strategies were measured by the Strategy and Attribution Questionnaire (SAQ) (Nurmi et al. 1995), comprising nine items that formed the scales Optimism and Task avoidance. Study engagement was measured by the OpInto-scale (Salmela-Aro, 2009), which is based on the student version of the Utrecht work engagement scale (UWES-S) developed originally by Schaufeli et al. (2002). The scale consists of nine items measuring three dimensions of study engagement. In this study, a sum score was calculated from all nine items to indicate the overall level of study engagement.

Table 1. The number of cases, scales, ranges, means, standard deviations and alphas

Variables	*n*	Scale	Range	M	SD	Alpha
Study engagement	236	1-6	1.5-6.0	3.7	.88	.91
Optimism	244	1-6	1.6-6.0	4.6	.70	.78
Task-avoidance	242	1-6	1-5.8	3.3	.90	.82
Reflective learning	244	1-6	2-6.0	4.5	.69	.66
Metacognition	245	1-6	1.5-6.0	4.7	.78	.73
Certain knowledge	241	1-6	1-5.5	3.3	.96	.80
Practical knowledge	242	1-6	1-6.0	3.8	1.06	.72

2.3. *Statistical analyses*

The statistical analyses began with a descriptive analysis. Bivariate correlations were computed to examine the relations between students' epistemologies, motivational strategies and study engagement. Next, stepwise hierarchical linear regression analyses were carried out to determine whether students' motivational strategy and epistemology scores were significant predictors of the measures of study engagement. Step-wise regression analysis was chosen because it tries to find the statistically most appropriate model for the data without actual background knowledge. Only the results of the final step, when all predictors were entered, are reported here.

After this, person-oriented approach was used to investigate what kinds of groups of individuals comprised the population. A hierarchical cluster analysis, selecting the squared Euclidean distance as a similarity measure, was carried out in order to determine the number of clusters. Ward's method was used to form the initial clusters without restricting their number. On the basis of the dendogram, a three-cluster solution was selected. After deciding the number of clusters, A Quick Cluster Analysis was done using a K-means algorithm to form the final groups. Finally, ANOVAs were conducted to examine between-group differences in study engagement. This was done using the Bonferroni post hoc -test.

3. Results

3.1. *Relations between motivational strategies, epistemologies, and study engagement*

The statistical analyses began with a descriptive analysis. Bivariate correlations were computed to examine the relations between students' motivational strategies, epistemologies and study engagement. As Table 2 shows, the strongest correlations were found between motivational strategies and study engagement. Optimism correlated positively whereas task-avoidance correlated negatively to study engagement. Also all epistemology variables were significantly related to study engagement. Reflective learning and metacognition correlated positively with study engagement. In turn, certain knowledge and practical knowledge were negatively correlated with study engagement.

Table 2. Pearson correlations between study engagement, motivational strategies and epistemologies

Variables	1	2	3	4	5	6
1. Study engagement						
2. Optimism	.36**					
3. Task-avoidance	-.41**	-.32**				
4. Reflective learning	.35**	.31**	-.18**			
5. Metacognition	.23**	.15*	-.08	.35**		
6. Certain knowledge	-.15*	-.15*	.16*	-.18**	-.13*	
7. Practical knowledge	-.15*	.01	.07	-.08	-.10	.44**

* $p < .05$, ** $p < .01$.

Regression analyses showed that reflective learning (epistemology) and optimism (strategy) were positively, whereas task avoidance negatively, related to study engagement. These three variables explained 32 % of study engagement (F (4,221) = 28, p < .001). The most important predictor was task-avoidance (β = -.30, p < .001). Also reflective learning (β = .25, p < .001) and optimism (β = .23, p <.001) were significant predictors of study engagement.

Table 3. Regression analyses of predictors of study engagement (n = 245)

Variables	*B*	*SE*	*β*	*p*	R^2	ΔR^2
Task-avoidance	-.29	.055	-.30	.000	.178	.178
Reflective learning	.30	.071	.25	.000	.276	.099
Optimism	.29	.074	.23	.000	.319	.042

* $p < .05$, ** $p < .01$.

3.2. *Student groups*

Table 4 shows that three groups of students were identified based on the cluster solution. Students in the first cluster (28 %) were the least optimistic and most often expressed task-avoidance. They also reported the least reflective learning and valuing metacognition and they emphasized the value of certain and practical knowledge more than the other groups. This cluster was labeled as *cook-book students*. Students in the second cluster (31 %) reported more optimism and less task-avoidance than cook-book students. A special feature of this group was that they reported high reflective learning and valuing metacognition and low values of certain and practical knowledge. This cluster was labeled as *theorists*. The third group included 41 % of the students. They were most optimistic and reported the lowest levels of task-avoidance. For them, all the epistemological variables had high values. Thus, they reported a high reflective learning and valuing metacognition, they also emphasized the value of certain knowledge and especially the value of practical knowledge. This cluster was labeled as *reflective professionals.*

Table 4. Student groups and their differences in motivational strategies and epistemologies

Variables		1.Cook-book students (n = 64)	2. Theorists (n = 73)	3. Reflective professionals (n = 94)	F	df	p
Optimism	*M*	4.0 [a]	**4.6** [b]	**4.8** [b]	36.01	2	.000
	SD	.72	.60	.52			
Task-avoidance	*M*	**4.3** [a]	3.1 [b]	2.9 [b]	87.14	2	.000
	SD	.65	.81	.61			
Reflective learning	*M*	4.2 [a]	**4.7** [b]	**4.6** [b]	13.77	2	.000
	SD	.80	.62	.61			
Metacognition	*M*	4.4 [a]	**4.9** [b]	4.7 [a]	5.87	2	.000
	SD	.81	.80	.61			
Certain knowledge	*M*	**3.8** [a]	2.4 [b]	**3.7** [a]	81.61	2	.000
	SD	.65	.74	.79			
Practical knowledge	*M*	**4.2** [a]	2.8 [b]	**4.4** [a]	95.52	2	.000
	SD	.81	.76	.78			

Means with different superscripts differ significantly ($p < .05$).

Finally, we examined whether there were differences between the groups as for study engagement. The main effect was significant (F (2, 223) = 22.5, $p < .001$). Pairwise comparison with Bonferroni's correction revealed that "the cook-book students" expressed a lower level of study engagement than the other groups ($p < .001$). For study engagement the cook-book students' mean score was 3.2 (SE = .76), the theorists' 4.0 (SE = .81), and the reflective professionals' 3.9 (SE = .78).

4. Discussion

It was demonstrated that optimism and reflective learning were positively, whereas task avoidance negatively, related to study engagement in engineering education. This was done by using both variable-oriented (regression) and person-oriented (cluster) methods.

The present study identified three student groups based on their epistemologies and motivational strategies: *cook-book students, theorists* and *reflective professionals.* Both the theorists and the reflective professionals scored higher on study engagement than cook-book students. Both of the two groups that had high study engagement valued reflective learning. This does not mean, however, that a practical and reliable knowledge-seeking would necessarily have been harmful to study engagement. The group labeled as reflective professionals appreciated certain and practical knowledge, but they were also willing to reflect on what they have learned. Based on this study, therefore, it seems that a reflective way of studying, which involves for example the critical assessment and comparing new knowledge with previously learned knowledge, increased study engagement in this context. The group labeled as reflective professionals resembles orientations like professional orientation (Lonka & Lindblom-Ylänne, 1996) and reflective practitioner (Schön, 1983). Previous research also shows that reflective learning has positive relations with deep understanding and good learning outcomes (Hofer, 2000; Schommer et al, 1990), and it is also an essential factor in the development of expertise (Bereiter & Scardamalia, 1993).

Another key finding of this study was that those students who scored high on study engagement also reported high optimism and low task-avoidance. This is not surprising, since previous research shows that an optimistic strategy is related to academic satisfaction (Eronen et el., 1998) and good self-regulation (Heikkilä & Lonka, 2006). As for task-avoidance, these relationships have been found to be reversed.

It should be taken into account that the data consisted of those engineering students who participated in a voluntary philosophy course. Although the data represented the Aalto University's engineering and science programs quite well, it must be kept in mind that those students who voluntarily sign up on a philosophy course might have different kinds of epistemological beliefs than engineer students in general. We have collected more extensive data to investigate whether the relationships between motivational strategies, epistemologies and study engagement vary in different educational contexts. We are also currently looking at how restructuring the physical, social and virtual learning spaces may foster study engagement and reflective learning in higher education.

4.1. *Implications for education*

According to the results presented in this study, study engagement can be fostered (at least among engineering students) by promoting students' study skills such as reflective learning and use of optimistic strategy to meet the challenges students encounter in their studies. These study skills should be fostered both on an individual and on more general level at universities. Previous research shows, that university pedagogy can either hinder or foster the development of these skills (Eley, 1992, Trigwell et al., 1996; Lonka & Ketonen, in press). Still, academic practices are often focused simply on knowledge transmission. These practices should be further developed to meet the need of fostering students' study engagement, reflection, and optimism.

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References

Bereiter, C. & Scardamalia (1993). Surpassing ourselves. An inquiry into the nature and implications of expertise. Chigago, IL: Open Court.

Cantor, N. (1990). From thought to behavior: having and doing in the study of personality and cognition. *American Psychologist*, *45*, 735–750.

Eley, M. G. (1992). Differential adoption of study approaches within individual students. *Higher Education*, *23*, 231–254.

Entwistle, N. & Ramsden, P. (1983). *Understanding Student Learning.* London: Croom Helm.

Eronen, S., Nurmi, J-E. & Salmela-Aro, K. (1998). Optimistic, defensive-pessimistic, impulsive and self handicapping strategies in university environments. *Learning and Instruction*, *8*, 159–177.

Heikkilä, A. & Lonka, K. (2006). Studying in higher education: students' approaches to learning, self-regulation, and cognitive strategies. *Studies in Higher Education, 31*, 99–117.

Heikkilä, A., Niemivirta, M., Nieminen, J. & Lonka, K. (2011). Interrelations among university students' approaches to learning, regulation of learning, and cognitive and attributional strategies: a person oriented approach. *Higher Education, 61*, 513–529.

Heikkilä, A., Niemivirta, M., Nieminen, J. & Lonka, K. (2012). Relations among teacher students' approaches to learning, cognitive strategies, well-being, and study success. *Higher education.* (In press).

Hofer, B. K. (2000). Dimensionality and disciplinary differences in personal epistemology. *Contemporary Educational Psychology*, *25*, 378–405.

Jehng, J., Johanson, S.D., & Anderson, R.C. (1993). Schooling and students' epistemological beliefs about learning. *Contemporary Educational Psychology*, 18, 23-35.

Lonka, K. & Ketonen, E. (2012). How to Make a Lecture Course an Engaging Learning Experience? *Studies for the Learning Society* (in press).

Lonka, K. & Lindblom-Ylänne, S. (1996) Epistemologies, conceptions of learning, and study practices in medicine and psychology, *Higher Education, 31*, 5–24.

Lonka, K., Sharafi, P., Karlgren, K., Masiello, I., Nieminen, J., Birgegård, G. & Josephson, A. (2008). MED NORD – A tool for measuring medical students well-being and study orientations. *Medical Teacher, 30*, 72–79.

Mäkinen, J., Olkinuora, E., and Lonka, K. (2004). Students at risk: how to predict study problems in higher education? Students' general study orientations and abandoning the course of the studies. *Higher Education, 48*, 173-188.

Norem, J., & Cantor, N. (1986a). Anticipatory and post hoc cushionary strategies: Optimism and defensive pessimism in ''risky'' situations. *Cognitive Therapy and Research, 10*, 347–362.

Norem, J., & Cantor, N. (1986b). Defensive pessimism: Harnessing anxiety as motivation. *Journal of Personality and Social Psychology, 51,* 1208–1217.

Nurmi, J-E., Salmela-Aro, K. & Haavisto, T. (1995). The strategy and attribution questionnaire: psychometric properties. *European Journal of Psychological Assessment*, *11*, 108–121.

Nurmi, J.-E., Aunola, K., Salmela-Aro, K., & Lindroos, M. (2003). The role of success expectation and task-avoidance in academic performance and satisfaction: three studies on antecedents, consequences and correlates. *Contemporary Educational Psychology*, *28*, 59–91.

Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of quantitative and qualitative research. *Educational Psychologist, 37*, 91–106.

Perry, W.G. (1970). *Forms of Intellectual and Ethical Development in the College Years: A Scheme*. New York, Holt: Rinehart & Winston.

Saarinen, E. (2003). Philosophical lecturing as a philosophical practice. *Practical Philosophy*, *6*, 7–23.

Salmela-Aro, K., Kiuru, N., Leskinen, E., & Nurmi, J.-E. (2009). School Burnout Inventory (SBI) – Reliability and Validity. *European Journal of Psychological Assessment*, *25*, 48–57.

Schaufeli, W. B., Martinez, I., Pinto, A. M., Salanova, M., & Bakker, A. (2002). Burnout and engagement in university students: A cross-national study. *Journal of Cross-Cultural Psychology*, *33*, 464–481.

Scheja, M. (2006). Delayed understanding and staying in phase: Students' perceptions of their study situation. *Higher Education, 52,* 421–445

Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology, 82*, 498–504.

Schommer, M. (1993). Epistemological development and academic performance among secondary students. *Journal of Educational Psychology, 85*, 406–411.

Schommer, M. & Walker, K. (1995). Are epistemological beliefs similar across domains? *Journal of Educational Psychology, 87*, 424–432.

Schön, D. (1983). *The reflective practitioner. How professionals think in action.* New York: Basic Books.

Seligman, M. E. P. & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist*, *55*, 5–14.

Showers, C., & Ruben, C. (1990). Distinguishing defensive pessimism from depression: Negative expectations and positive coping mechanisms. *Cognitive Therapy and Research*, *14*, 385–399.

Trautwein, U. & Ludtke, O. (2007). Epistemological beliefs, school achievement, and college major: A large-scale longitudinal study on the impact of certainty beliefs. *Contemporary Educational Psychology, 32,* 348-366.

Trigwell, K., & Prosser, M. (1996). Congruence between intention and strategy in university science teachers' approaches to teaching. *Higher Education*, *32*, 77-87.

Vermunt J. D. H & van Rijswijk F. A. W. M. (1998). Analysis and development of student's skill in self-regulated learning. *Higher education*, *17*, 647-682.