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SELF-REGULATION IN HIGHER EDUCATION: STUDENTS' MOTIVATIONAL, REGULATIONAL AND LEARNING STRATEGIES, AND THEIR RELATIONSHIPS TO STUDY SUCCESS

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ABSTRACT

This study investigates how in the self-regulation of learning (SRL; Pintrich 2000; Zimmerman, 2000), the motivational and affective factors are related to regulation strategies of behaviour and context, and learning strategies - and identifies different profiles in SRL. The study also aims to explore which factors of SRL are related to study success and study progress during master degree studies. The data consist of undergraduate students' (N = 1248) responses to IQ Learn self-report questionnaires, and of data (n = 229) retrieved from the university's study register. The results revealed that the sub-processes of SRL: motivational and affective components, regulation strategies and learning strategies are systematically related with each other. In addition, motivational and affective factors, especially Intrinsic motivation predicted the use of strategies regulating behaviour and context and the use of learning strategies. Study success correlated slightly positively with accumulation of credits indicating that students with better grades proceed efficiently in their studies. Yet, accumulation of credits was evidenced to relate slightly and negatively with expectancy components of SRL and the use of deep learning strategies. Finally, three student profiles in SRL were encountered: (1) Aiming high with insufficient SRL, (2) Excellent in SRL, and (3) Distressed performers. Educational implications and the needs for future research are discussed.

Keywords: academic achievement; academic success; higher education; self-regulation in learning; self-report.

INTRODUCTION

Previous research has shown that self-regulated learning (SRL) is related to academic achievement and study success (e.g. Vermunt, 2005; Zimmerman & Schunk, 2008) and there is common understanding that to achieve academic excellence, learners must be able to self-regulate their actions and maintain their academic goals despite difficult academic tasks (Pintrich and Zusho, 2007; Richardson et al., 2012; Schunk and Zimmerman, 2006). Earlier studies have also demonstrated that SRL is intertwined with other favourable aspects of students' learning such as deep approach to learning and optimistic learning strategy (Heikkilä and Lonka, 2006; Vermunt, 1998; Lonka & Lindblom-Ylänne, 1996). Also, it is proven that SRL, success expectations, deep understanding, and critical evaluation are related to each other, and

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students possessing these qualities are more successful in their studies (Heikkilä, Niemivirta, Nieminen & Lonka, 2011). However, there is also evidence that some aspects of SRL are not related to study success (Kitsantas, Winsler, & Huie, 2008; Phan, 2010) and that the correlation between study success and the aspects considered as favourable for learning is low, though significant (Cazan, 2012; Heikkilä & Lonka, 2006; Heikkilä et al., 2011; Richardson et al, 2012; Sperling, Howard, Staley, & DuBois, 2004) or even negative (Kosnin, 2007). In addition, some previous research on SRL and study success has not investigated SRL separately in various phases and sub-processes as presented by theorists (e.g. Pintrich, 2000; Zimmerman, 2000; 2008) but on a fewer dimensions e.g. self-regulation, external regulation, and lack of regulation, covering each a few sub-dimensions of SRL.

Nevertheless, evidence suggests that quite a number of higher education students lack self-regulated learning skills (e.g. Lonka and Lindblom-Ylänne, 1996; Virtanen and Nevgi, 2010), and that they also have unrealistic conceptions of their use of learning strategies (Winne & Jamieson-Noel, 2003). Vrugt and Oort (2008) suggest that there might be qualitative and quantitative differences between the self-regulatory processes of effective and less effective self-regulated learners. Actually, Winne (1996) noted that students who are not given explicit instructions about metacognitive knowledge and skills related to effective SRL, even though they were inherently self-regulating, they do not develop forms of SRL on their own. Thus, more research is not only needed on the relations between study success and SRL with its' various sub-processes, but also from a perspective that reveals how effective and less-effective self-regulatory students differ in their learning and academic achievement. Understanding how learners use SRL may provide clearer guidance about how to support the development of effective SRL (Vrugt & Oort, 2008). The aim of the present study is to explore how the components of SRL are related to each other, how students with different SRL profiles act as learners, and how self-regulation in learning at the beginning of studies is related to study progress and success in master's studies.

SELF-REGULATED LEARNING AND ACADEMIC ACHIEVEMENT

The theoretical constructs, terminologies and perspectives vary in the major models of SRL; however, the theorists (e.g. Boekaerts, 1997; Pintrich, 2004; Schunk, 2001; Winne, 2001; Zimmermann & Schunk, 2001) are in agreement that SRL consists of goal setting, metacognition and the use of metacognitive and cognitive learning strategies (as cited in Vrught & Oort, 2008). Pintrich and McKeachie (2000) identify in their conceptual framework of SRL several motivational and affective components that influence educational outcomes. Motivational components consist of *value components* which refer to a learner's goals and beliefs about the importance of the task. *Expectancy components* concern a learner's belief about his or her ability to perform the task. *Affective components* include test anxiety and self-worth which refer to a learner's emotional responses to the learning task (Pintrich & McKeachie, 2000). In addition, SRL includes several regulation strategies to manage the context and the resources. These include strategies for time and study management, effort regulation, and peer learning and help-seeking. Effort regulation is considered to be a learner's capability to persist by regulating his/her behaviour when a learning task is difficult or uninteresting (Corno, 1993; Garcia, McCann, Turner, & Roska, 1998). To be able to regulate these processes, it is crucial to plan, monitor and reflect on one's learning experiences and behaviour: a learner needs to use metacognitive strategies (Pintrich & McKeachie, 2000).

Vrugt and Oort (2008) evidenced that effective self-regulated students had significantly higher achievement goals, scored significantly higher on metacognition and earned significantly higher exam scores than the less effective students in SRL – even though the mean intellectual ability was same in the two groups. In addition, the use of metacognitive strategies was evidenced to have a positive effect on students' scores. They also found evidence that students' knowledge of cognition, knowledge of how to regulate their cognitive engagement in the task, and metacognitive experience contribute to the selection and use of learning strategies, which we discuss in more detail in the next chapter.

There is evidence that academic self-efficacy is a strong predictor of higher education outcomes when measured as a cumulative Grade Point Average (GPA) (Lynch, 2006; Robbins et al., 2004; Richardson et al., 2012; Zeegers, 2004). On the contrary, Kosnin (2007) discovered that among high achieving engineering students, self-efficacy had a negative effect on GPA. Meanwhile, students' academic intrinsic motivation was a small significant positive correlate of GPA (Richardson et al., 2012), as well as of external goal orientation (Lynch 2006). Cazan (2012) used the MSLQ (Pintrich, Smith, Garcia, & McKeachie, 1991, 1993) among first-year students of psychology and education science and found a moderate correlation between GPA and motivational self-regulation strategies. Chapell et al. (2005) reported a significant but small relationship between test anxiety and cumulative GPA: low test-anxious students averaged higher than high test-anxious students.

In addition, there is evidence on the relations between resource management and study success. Previous research has demonstrated that effort regulation has a medium positive correlation with GPA (Richardson et al., 2012). In addition, Vrugt and Oort (2008) reported that the use of resource management strategies and persistence had a positive effect on course exam scores. In contrast, Phan (2010) found no significant relation between effort and achievement. Diseth and Kobbeltvedt (2010) found evidence for positive correlations between the examination grade in the introductory courses in economics and psychology and learning strategies, such as time management and organised studying. However, Kitsantas, Winsler, and Huie (2008) observed that time-management predicted academic success only for the first- and second-year students. Mikkonen and Ruohoniemi's (2011) study revealed that the most successful veterinary students described themselves as having good learning skills and habits and students who had delayed in their studies described as being lazy and having poor study skills.

Van Der Hurk (2006) found a positive significant correlation between first year psychology students' self-monitoring and their scores on a block test. Vermunt (2005) determined that the self-regulation strategies used for learning processes and testing, adjusting and reflecting on one's results correlated positively and external regulation and lack of regulation correlated negatively with the means of test scores. Likewise, Heikkilä and Lonka (2006) employed the Inventory of Learning Styles (ILS; Vermunt 1998) and reported that the GPA had low positive correlations with self-regulation, and had negative correlations with lack of regulation. Moreover, Tynjälä, Salminen, Sutela, Nuutinen, and Pitkänen (2005) demonstrated that students scoring high in self-regulation succeeded best in their studies and students with high scores in lack of regulation and in external regulation succeeded the worst. Moreover, Zeegers (2004) stated that a positive correlation occurred between the annual GPA of first- and third-year science students and their SRL.

Kosnin (2007) compared the high and low achieving second-year engineering students' SRL using the MSLQ. The results indicate that SRL predicts GPA better for the high achievers (33.6% of the variance) as compared to the low achievers (13.7% of the variance). Moreover, the significant predictors were different in these two groups. Among the high achievers, factors that had significant positive effects on GPA were the control of learning behaviour and resource management strategies. Among the low achievers, the metacognitive learning strategies and test anxiety had positive effects on GPA, but the control of learning behaviour and task value had low negative effects on GPA. Among this group, a strong predictor of success was the managing strategies (managing time and study environment, regulating effort, peer learning and help seeking).

LEARNING STRATEGIES AND ACADEMIC ACHIEVEMENT

The learning strategies include various activities, tactics and strategies that students apply before and during their learning process. These strategies include the cognitive strategies to memorise, to elaborate and organise material, to solve problems, to deepen learning and thinking, and also metacognition (Pintrich, 2004). In the current study, we distinguish six cognitive learning strategies: revision, utilising keywords and advance organisers, finding essential information, constructing knowledge, critical thinking, and approaching theoretically. Revision reflects a 'shallow' and basic cognitive strategy and a learning technique to memorise the facts of the material (Richardson et al., 2012, 360; Pintrich, 2004). However, one should not consider memorising only as a surface strategy, instead, memorizing is a necessary activity when instigated by metacognitive monitoring and regulation with the aim to understand a material or topic (Elliot, McGregor, & Cable, 1999; Vrugt & Oort, 2008).

Vrugt and Oort (2008) evidenced that effective self-regulated students scored significantly higher on all study strategies. They also discovered that the less effective self-regulatory students' use of deep cognitive strategies overruled the use of metacognitive strategies, which regulates and controls deep or surface processing. Thus, less effective students used deep cognitive strategies but could not regulate their use, for example were not able to adapt them to the task requirements.

There is an extensive research body to evidence what kind of learning strategies are related to academic achievement. Vrugt and Oort (2008) reported that the use of surface cognitive strategies had a negative effect on scores but a limited use of surface strategies resulted in higher exam scores. Deep learning strategies such as metacognition, critical thinking, and elaboration, are evidenced to correlate with academic achievement in terms of GPA moderately positively (Richardson et al., 2012) and positively (Zeegers, 2004). In contrast, measures of organisation and rehearsal were not significantly associated with GPA (Richardson et al., 2012).

Vermunt (2005) found significant positive correlations between the mean exam score and deep processing strategies, namely relating and structuring, and critical processing - but no correlations associated with achievement and memorising and revision

strategies. Furthermore, in the study of Haarala-Muhonen, Lindblom-Ylänne, Parpala, and Komulainen (2011), first-year law students scoring high in deep learning achieved better grades than students using the surface approach. Phan (2010) showed that first year students' performances in an Educational Psychology course were directly and positively influenced by deep-study processing strategies, and were negatively influenced by surface processing strategies. Sperling et al., (2004) found little relationship between the academic achievement and metacognition among the first-year students. In contrast, Kitsantas et al. (2008) reported that metacognitive self-regulation measured by the MSLQ did not play a role in predicting academic achievement in first- or second-year of studies and Cazan (2012) found only weak correlations between the GPA and the cognitive and metacognitive strategies.

Furthermore, previous studies have identified diverse student profiles in terms of deep approach, self-regulation in learning, and cognitive and attributional strategies (Heikkilä & Lonka, 2006; Heikkilä et al. 2011). Student groups with profiles consisting of negative aspects of learning such as surface approach, lack-of-regulation, and self-handicapping tend to succeed in studies worse than student groups with profiles consisting of favourable aspects of learning such as deep approach, self-regulation, and optimistic strategies (Heikkilä & Lonka, 2006). In their study focusing on first-year students' profiles in approaches to learning, regulation of learning, cognitive and attributional strategies, Heikkilä et al. identified three diverse student profiles; non-academic students, self-directed students, and helpless students. Compared to non-academic students and helpless students, the self-directed students scored significantly higher on GPA, but regarding the accumulation of credits, the self-directed students differed only marginally (Heikkilä et al., 2011). Bruinsma (2004) evidenced that students with deep information processing approach earned more credits.

THE PRESENT STUDY

Based on previous research, we conclude that there are several sub-dimensions of SRL that affect learning. In addition, there is contradictory evidence on the relation between students' SRL and academic achievement in terms of study success and accumulation of credits. Though, most of the previous research evidenced positive relations between academic achievement and the aspects considered as favourable for learning. However, most of the previous studies have been conducted on the course level and the studies focusing on relationship between SRL and academic achievement on the level of master's studies are scarce. To investigate the relationship between the variety of SRL dimensions and academic achievement in the context of master's studies, we pose the following research questions:

(1) What kinds of correlational relations can be identified between motivational and affective factors, regulation strategies of behaviour and context and learning strategies?

(2) Which motivational and affective factors are related to regulation and learning strategies?

(3) What kinds of student profiles in SRL can be identified?

(4) Is SRL of first study years related to later study success?

METHODS

The context of the study

The participants in this study are Finnish students who used an interactive online system of the IQ Learn to assess their motivational and affective factors and skills in SRL in higher education contexts. (Niemi, Nevgi, & Virtanen, 2003; see IQ FORM website at: http://iqform.it.helsinki.fi/iqform/?node=iq_etusivu_eng).

The main idea of the IQ Learn system is to increase students' awareness of SRL and to support students in their development of learning strategies and self-regulatory skills (Niemi et al., 2003). The IQ Learn system was introduced to the teachers of several faculties in Finnish universities who applied this tool in their study orientation courses or encouraged students to use the system independently for self-evaluation.

The sample and data collection

A total of 5091 student responses to IQ Learn questionnaires were retrieved from the data matrix saved by the IQ Learn system from April 2004 to October 2008. The matrix provided us with the self-report results, the students' electronic mail addresses and the datum concerning when a student had used the system. A total of 3843 participants were excluded from the sample owing to the missing data on self-reports or due such an email address that the demographic variables could not be identified from the email address or from the email directories. As a consequence of these reasons, the final sample consisted of 1248 students from eight Finnish universities representing different disciplines (see Virtanen & Nevgi, 2010). The sample consisted of 464 (37.3%) males, 512

(41.0%) females, and 271 (21.7%) respondents whose gender was not elicited.

The data for the students' study achievements and additional demographic background variables were gathered retrospectively from the university's student register in June 2010 for a total of 229 undergraduate students (172 females, 57 males) with majors in Biosciences (*n*=54), Educational Sciences (*n*=115), Humanities and Art (*n*=7), and Sciences (Computer Science in most cases) (*n*=53). The demographic background variables included their gender, age, registration year for university studies, total number of study years, and major. The ages of the participants ranged from 17 to 55 years (mean 27.09 years, S.D.=7.36).

Most of the participants used the online system IQ Learn during their first study years. Most of them utilised the IQ Learn's self-reporting system as a part of an orientation course for university studies or as a tutoring activity. The students in the later stages of their studies used the system voluntarily out of curiosity or when they aimed at improving their learning skills independently. However, because the data consist of the student responses that were saved to the IQ FORM system, we are not able to distinguish the student groups who utilised IQ Learn as a part of their orientation studies, voluntarily, or independently.

Materials and measurements

IQ Learn self-evaluation and tutoring system

The self-report inventories in the IQ Learn self-evaluation and tutoring system are based on Ruohotie's (2000) Abilities for Professional Learning (APL) questionnaire for vocational learning in a Finnish HE setting, which was modified from the MSLQ (Pintrich et al., 1991; 1993). The IQ Learn inventories were developed further from the APL to be suitable for HE adults and to be used in a web-based environment (IQ-Research group, 2001; Nevgi, 2002; Niemi et al., 2003). The IQ Learn inventories consist of Motivational and Affective Factors in Learning (c.f. Pintrich's Motivational Components of Forethought), Regulation Strategies of Behaviour and Context, and Learning Strategies (c.f. Pintrich's Cognitive Strategies and Learning Skills) (Pintrich 1995, 1999, 2000; Pintrich & Garcia 1991; Pintrich & Ruohotie, 2000). The scales of the inventories consist of five-point Likert- type statements, anchored to (1) Disagree and (5) Agree. The scales of the inventories are presented in Table 1.

Measurements of Academic achievement

Students' academic achievement was considered as study success and academic progress. The most common measurements for undergraduate HE students' study success is cumulative grade point average (GPA), which is the mean of grades weighted by the courses contributing to the calculation of a final grade. In addition, study success has been measured by a grade in a single course (e.g. Heikkilä & Lonka, 2006). Academic progress has been measured by the number of earned credits within a specific time period (Rytkönen et al., 2012).

The assessment of *study success* in this study was based on the University's student register data. University of Helsinki uses a universal six-level grading scale from 0 to 5, 0 indicating fail, 1 passable, 2 satisfactory, 3 good, 4 very good, and 5 indicating excellent. The study success was operationalized as the mean of all the grades weighted with the study credits earned during a student's academic years. Study success ranged from one to five (M = 3.52, SD = 0.80).

The *study progress* was defined as consisting of the total number of credits earned during studies divided by the sum of active study terms. The Bachelor's degree consists of a total of 180 ECTS credits, while the Master's degree requires the completion of an additional 120 ECTS credits. Students are recommended to plan their studies in such a way that they do not exceed the target duration of the degree programmes (3+2 years). A student progressing well should earn 30 credits per active study term. The study year in Finland consists of two terms: the autumn and spring terms, which last approximately four months each. Students at the University of Helsinki can interrupt their studies for a study term by registering as absent. For this reason, we calculated only the active study terms as an indicator of study progress and not the sum of study years. Study progress ranged from 5.38 to 59.00 credits per active study term.

Scales and reliabilities

The means and Cronbach's Alphas of the current data in the self-report instrument are presented in Table 1. They correspond the values of the earlier studies varying from .63 to .80 (Nevgi, Virtanen, & Niemi, 2005, see also Niemi et al. 2003; Virtanen & Nevgi, 2010).

Statistical procedures and analyses

The correlations were computed in order to examine the relationships between the motivational and affective factors, regulation strategies of behaviour and context, and learning strategies. Furthermore, the correlations were computed to examine which motivational and affective factors, regulation strategies, and learning strategies were related with study progress and success.

Table 1. The reliabilities of the scales for components of SRL: motivational and affective factors, regulation strategies of behaviour and context, and learning strategies: internal consistency (Cronbach's Alpha), number of items, item means (standard deviation) and the minimum and maximum values per scale.

Scales	*n* of items	Cronbach *α*	Item means (*SD*)	Min./Max.
Motivational and affective factors				
Expectation of success	4	.76	3.60 (0.66)	1.25/5.00
Self-efficacy	4	.71	4.06 (0.58)	1.50/5.00
Intrinsic motivation	4	.68	3.87 (0.62)	1.25/5.00
Utility value of studies	4	.75	4.50 (0.56)	1.00/5.00
Performance anxiety	4	.66	2.67 (0.76)	1.00/5.00
Regulation strategies				
Time management	4	.80	3.10 (0.83)	1.00/5.00
Self-management	4	.67	3.38 (0.71)	1.25/5.00
Persistency	4	.74	3.41 (0.76)	1.00/5.00
Help-seeking strategies	4	.80	3.41 (0.87)	1.00/5.00
Self-assessment	3	.68	3.09 (0.81)	1.00/5.00
Learning strategies				
Revision	3	.65	3.48 (0.79)	1.00/5.00
Utilising keywords and advance organisers	3	.58	3.51 (0.85)	1.00/5.00
Finding essential points	3	.63	3.78 (0.73)	1.00/5.00
Constructing knowledge	3	.71	4.10 (0.64)	1.67/5.00
Critical thinking	3	.73	2.96 (0.88)	1.00/5.00
Approaching theoretically	3	.67	3.48 (0.80)	1.00/5.00

Regression analyses were carried out to analyse which motivational and affective factors predicted the use of resource management and learning strategies. We used the forced entry method for the initial analyses.

To reveal what kind of different student groups in terms of SRL existed in the data we applied clustering-by-cases procedure on the basis of their responses on the IQ Learn inventories. In order to make a decision about the number of clusters, a hierarchical cluster analysis was carried out, selecting the squared Euclidian distance as a similarity measure and using Ward's method to form the initial clusters without restricting their number. On the basis of the dendrogram and on theoretical grounds, a three-cluster solution was selected and the clusters were formed based on the identification of three clusters by Ward's method and on the cluster membership. Later in the text the clusters are referred as the group profiles.

RESULTS

Relationships between the components of self-regulated learning

To address our first research question, we examined the correlations between motivational and affective factors, regulation strategies of behaviour and context, and learning strategies. In order to explore these relationships, the Pearson correlation coefficients were calculated (see Table 2).

Expectation of success indicating the optimistic attitude towards studies correlated positively and strongly with self-efficacy, and with intrinsic motivation. Furthermore, Expectation of success correlated positively with all resource management strategies, and with all learning strategies indicating that students with optimistic attitude towards their learning also monitor and control their learning process and

Table 2. Pearson product-moment correlations between motivational and affective factors, regulation strategies, and learning strategies.

Sum-scales	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Expectation of success	-														
2. Self–efficacy	.73**	-													
3. Intrinsic motivation	.48**	.43**	-												
4. Utility value of studies	.33**	.33**	.33**	-											
5. Performance anxiety	-.23**	-.29**	-.07*	-.06*	-										
6. Time management	.39**	.34**	.34**	.31**	-.08**	-									
7. Self-management	.38**	.30**	.41**	.28**	-.02	.52**	-								
8. Persistency	.48**	.42**	.45**	.32**	-.19**	.62**	.46**	-							
9. Help-seeking strategies	.10**	.06*	.14**	.22**	.00	.12**	.25**	.15**	-						
10. Self-assessment	.42**	.36**	.51**	.18**	-.05	.34**	.52**	.40**	.19**	-					
11. Revision	.23**	.20**	.26**	.24**	-.08**	.34**	.41**	.37**	.15**	.28**	-				
12. Utilising keywords	.38**	.32**	.39**	.26**	-.06*	.40**	.52**	.44**	.23**	.42**	.45**	-			
13. Finding essential points	.36**	.35**	.31**	.21**	-.13**	.37**	.46**	.34**	.15**	.44**	.29**	.56**	-		
14. Constructing knowledge	.38**	.39**	.46**	.27**	-.14**	.29**	.41**	.38**	.17**	.52**	.29**	.42**	.46**	-	
15. Critical thinking	.38**	.35**	.42**	.01	-.13**	.26**	.38**	.29**	.01	.60**	.14**	.29**	.38**	.46**	-
16. Approaching theoretically	.39**	.38**	.44**	.14**	-.13**	.30**	.42**	.33**	.11**	.64**	.23**	.36**	.43**	.54**	.66**

Notes:
* Correlation is significant at 0.05 level (2-tailed)
** Correlation is significant at 0.01 level (2-tailed)

apply diverse learning strategies. However, between *Performance anxiety* and Expectation of success appeared a negative correlation, as well as between Performance anxiety and Self-efficacy. *Self-efficacy* in learning indicates that a student trusts his/her capability to achieve one's learning goals. Self-efficacy correlated moderately positively with regulation strategies except with Help-seeking strategy and self-efficacy was positively related with all learning strategies. *Intrinsic motivation* indicates student's inner interest to learn the subject for the sake of substance. Intrinsic motivation correlated positively with all regulation strategies, especially high with self-assessment and with all learning strategies except revision strategy. Utility value refers to students' conceptions of how useful they consider their studies. *Utility value* correlated more weakly with regulation strategies, and with learning strategies, and had no correlations with critical thinking indicating that conceptions of the usefulness of studies is more weakly related to SRL than e.g. intrinsic motivation is. *Performance anxiety* correlated negatively with almost all regulation strategies and with learning strategies and had no correlation with help-seeking strategy.

Positive and high correlations were found between regulation strategies of behaviour and context, namely *time management, self-management, persistency* and *self-assessment*. Also, the use of help-seeking strategies correlated positively but not so strongly with other regulation strategies. Positive correlations were also found between the regulation strategies and the learning strategies. The highest correlations were found between self-assessment strategy and the deep learning strategies as *approaching theoretically, critical thinking*, and *constructing knowledge*. Strong positive correlations were also found between these deep learning strategies.

Motivational and affective factors as predictors for regulation strategies and learning strategies

Our second research question focused on which motivational and affective factors have a strongest relationship with regulation strategies of behaviour and context, and learning strategies. The associations between explanatory variables criterion and variables were low or moderate. The summary of regression

Table 3. Summary of regression analyses: motivational and affective factors and regulation strategies.

Model	Dependent variable	Independent variable	B	S.E.	β	*t*
1	Time-management	Expectation of success	.29	.05	.23	5.85***
		Self-efficacy	.09	.06	.06	1.63
		Intrinsic motivation	.20	.04	.15	5.04***
		Utility value of studies	.25	.04	.16	6.00***
		Performance anxiety	.01	.03	.01	.49
Model summary: $R^2 = .21$, $F(5, 1242) = 65.96$, $p < .000$						
2	Self-management	Expectation of success	.26	.04	.24	6.28***
		Self-efficacy	-.00	.05	-.00	-.06
		Intrinsic motivation	.31	.03	.27	9.30***
		Utility value of studies	.15	.03	.12	4.38***
		Performance anxiety	.10	.02	.10	3.96***
Model summary: $R^2 = .24$, $F(5, 1242) = 76.98$, $p < .000$						
3	Persistency	Expectation of success	.30	.04	.26	7.15***
		Self-efficacy	.08	.05	.06	1.68
		Intrinsic motivation	.30	.03	.25	9.07***
		Utility value of studies	.18	.03	.13	5.11***
		Performance anxiety	-.09	.02	-.09	-3.73***
Model summary: $R^2 = .32$, $F(5, 1242) = 116.54$, $p < .000$						
4	Help-seeking	Expectation of success	.05	.06	.04	.97
		Self-efficacy	-.10	.06	-.06	-1.53
		Intrinsic motivation	.11	.05	.08	2.45*
		Utility value of studies	.31	.05	.20	6.68***
		Performance anxiety	.01	.03	.01	.33
Model summary: $R^2 = .05$, $F(5, 1242) = 14.26$, $p < .000$						
5	Self-assessment	Expectation of success	.25	.05	.20	5.63***
		Self-efficacy	.08	.05	.06	1.65
		Intrinsic motivation	.51	.04	.40	14.40***
		Utility value of studies	-.05	.04	-.04	-1.42
		Performance anxiety	.04	.03	.04	1.49
Model summary: $R^2 = .30$, $F(5, 1242) = 107.35$, $p < .000$						

* = p< .05, ** = p<.01, *** = p< .001

Table 4. The summary of regression analyses: Motivational and affective factors and learning strategies.

Model	Dependent variable	Independent variable	B	S.E.	β	*t*
1	Revision	Expectation of success	.15	.49	.12	2.99*
		Self-efficacy	.05	.06	.04	.87
		Intrinsic motivation	.18	.04	.15	4.65***
		Utility value of studies	.22	.04	.15	5.23***
		Performance anxiety	.15	.03	.14	5.07***
Model summary: R^2 = .12, F(5, 1242) = 34.37, p < .000						
2	Keywords and advance organisers	Expectation of success	.25	.05	.20	5.05***
		Self-efficacy	.07	.06	.05	1.27
		Intrinsic motivation	.34	.04	.25	8.45***
		Utility value of studies	.15	.04	.10	3.58***
		Performance anxiety	.03	.03	.03	.97
Model summary: R^2 = .21, F(5, 1242) = 66.45, p < .000						
3	Finding essential	Expectation of success	.18	.04	.16	3.99***
		Self-efficacy	.18	.05	.14	3.54***
		Intrinsic motivation	.18	.04	.16	5.20***
		Utility value of studies	.07	.04	.06	1.95
		Performance anxiety	-.03	.03	-.03	-1.28
Model summary: R^2 = .17, F(5, 1242) = 51.12, p < .000						
4	Constructing knowledge	Expectation of success	.07	.04	.07	1.99*
		Self-efficacy	.17	.04	.15	4.18***
		Intrinsic motivation	.34	.03	.33	11.69***
		Utility value of studies	.10	.03	.09	3.24**
		Performance anxiety	-.04	.02	-.05	-1.84
Model summary: R^2 = .27, F(5, 1242) =92.83, p < .000						
5	Critical thinking	Expectation of success	.24	.05	.18	4.85***
		Self-efficacy	.18	.06	.12	3.24**
		Intrinsic motivation	.49	.04	.35	12.13***
		Utility value of studies	-.32	.04	-.20	-7.62***
		Performance anxiety	-.04	.03	-.04	-1.38
Model summary: R^2 = .26, F(5, 1242) = 86.99, p < .000						
6	Approaching theoretically	Expectation of success	.18	.05	.15	3.90***
		Self-efficacy	.19	.05	.14	3.80***
		Intrinsic motivation	.41	.04	.33	11.39***
		Utility value of studies	-.09	.04	-.06	-2.36*
		Performance anxiety	-.03	.03	-.03	-1.27
Model summary: R^2 = .25, F(5, 1242) = 83.47, p < .000						

* = p< .05, ** = p< .01, *** = p< .001

analyses for regulation strategies is presented in the Table 3 and for learning strategies in the Table 4.

The motivational and affective factors explained 21 % of variation of *Time-management*, 24 % of variation of *Self-management*, 32 % of variation of *Persistency*, 5 % of variation of *Help-seeking*, and 30 % of variation of *Self-assessment*. *Intrinsic motivation* was positively related with Time-management, Self-management, Persistency, and Self-assessment, but only weakly positively with Help-seeking. *Utility value* was positively related with Help-seeking, Time-management, Self-management, and Persistency, but not significantly related with Self-assessment. This indicates that students scoring high in Utility value score high also in regulation strategies except in Self-assessment. Also *Expectation of success* was positively related with other resource management factors but Help-seeking. This indicates that students expecting to succeed in their studies actively try to manage time and their actions, persist and reflect their learning, but necessarily do not seek help from peers or tutors. *Performance Anxiety* was positively related with Self-management and negatively related with Persistency indicating that students who feel anxious in performance situations actively try to manage their learning activities but however tend to give up systematic efforts for studying if they feel the task is difficult or uninteresting.

The motivational and affective factors explained 12 % of variation of Revision, 21 % of variation of use of Keywords and advance organizers, 17 % of variation of Finding essential points, 27 % of variation of Constructing knowledge, 26 % of variation of Critical thinking, and 25 % of variation of Approaching theoretically (see Table 4).

For learning strategies, the strongest explanatory factor revealed to be *Intrinsic motivation* which was strongly and positively related to all learning strategies. Intrinsic motivation explained most of the variation for learning strategies, except for Revision. The variation in revision was explained almost equally by Utility value, Performance anxiety, and Intrinsic motivation. *Utility value* was negatively related with learning strategies as Critical thinking and Approaching theoretically and positively related with use of Keywords and advance organisers, and Revision. Thus, extrinsically motivates students seem to use less and simpler learning strategies than intrinsically motivated students. *Expectation of success* was positively related to the use of all learning strategies. *Self-efficacy* was significantly and positively related to strategies related to deep learning. *Performance anxiety* was significantly positively related only to Revision and negatively but not statistically significantly related to several other learning strategies.

Profiles in self-regulated learning

To address our third research question we classified the participants using cluster analysis by cases based on their self-reported SRL dimensions. As a result of this analysis, we were able to identify three groups of students (see table 5) differing in their SRL. The first group was labelled as *Aiming high with insufficient SRL*. In this group, students scored high on both motivational factors: especially on Utility value of studies, but also on Intrinsic motivation indicating that they had very good, but maybe slightly utilitarian motivation for university studies. However, they scored mediocre in regulation strategies and in learning strategies, and especially low in Critical thinking indicating that at the beginning of university studies they had not yet developed the critical approach towards issues under study. The second group was labelled as *Excellent in SRL*. These students were highly motivated and optimistic with capability to monitor and manage their learning using versatile learning strategies, namely strategies typical for deep learning. The third group of students was labelled as *Distressed performers*. These students were extrinsically motivated scoring clearly higher on Utility value of studies compared with their scores on Intrinsic motivation. They scored high in Performance anxiety and low in Critical thinking and in Approaching theoretically, which indicate the deep approach to learning. They had also poor regulation strategies, namely Time-management, Self-management, and Self-assessment indicating that they had difficulties in reflecting, monitoring and controlling their learning process.

SRL in relation to study success and study progress

Our fourth research question concerned the relations between the components of SLR at the first study year and study success in master's studies. First, a low positive correlation (.22, $p < .05$) was found between study success and study progress indicating that students with better grades also proceed efficiently in their studies. However, no correlations were found between study success and SRL dimensions: motivational and affective factors, regulation strategies, or learning strategies. Only, low negative correlations were found between study progress and Expectation of success (-.15, $p < .05$), and Self-efficacy (-.15, $p < .05$). Furthermore, low negative correlations appeared to be between study progress and those learning strategies, which indicate the use of deep approach to learning such as Critical thinking (-.13, $p < .05$) and Approaching theoretically (-.13, $p < .05$). The correlations between SRL and study success and progress were also calculated within the three SRL profile groups, but no statistically significant relations were found.

Table 5. Significance testing of means of individual scales by clusters.

Scale	Cluster 1 *(n = 620)* *M*	Cluster 2 *(n = 498)* *M*	Cluster 3 *(n = 130)* *M*	*F*(2, 1244)
1. Expectation of success	3.45	3.99	2.83	275.53***
2. Self–efficacy	3.95	4.35	3.45	183.07***
3. Intrinsic motivation	3.67	4.29	3.23	313.38***
4. Utility value of studies	4.43	4.68	4.12	66.77***
5. Performance anxiety	2.65	2.63	2.92	7.99***
6. Time management	2.82	3.59	2.49	204.61***
7. Self-management	3.15	3.85	2.61	328.63***
8. Persistency	3.18	3.90	2.67	290.14***
9. Help-seeking strategies	3.33	3.64	2.92	44.021***
10. Self-assessment	2.85	3.64	2.08	401.07***
11. Revision	3.29	3.89	2.88	148.91***
12. Use of keywords and advance organisers	3.22	4.10	2.65	343.58***
13. Finding essential points	3.62	4.20	2.97	245.07***
14. Constructing knowledge	3.96	4.49	3.33	296.71***
15. Critical thinking	2.78	3.45	1.95	243.33***
16. Approaching theoretically	3.33	3.95	2.39	339.70***

DISCUSSION

This study explored the kinds of relationships that can be identified among the components of SRL — motivational and affective factors, regulation strategies of behaviour and context and learning strategies — and how motivational and affective factors predict use of regulation and learning strategies. In addition, we examined the kinds of SRL profiles that can be identified among university students. Lastly, we investigated whether SRL in the first year of study was related to later study progress and success.

Our findings indicate that those components of SRL classified by theorists (Pintrich, 2000; Ruohotie, 2000; Zimmerman, 2000) are related to each other systematically and that motivational and affective factors predict the regulation of behaviour and context and the use of learning strategies. Among the *value components* of SRL (Pintrich & McKeachie, 2000), intrinsic motivation, in particular, revealed to be the main factor predicting students' regulation of their behaviour and the learning environment. Intrinsic motivation also predicts the use of strategies indicating deep information processing, such as critical thinking and theoretical approach. This finding is in line with several earlier studies (e.g. Bruinsma, 2004; Pintrich, 2000b). In addition, Hidi (2006) and Renninger (2000) concluded that when students are intrinsically interested in study content, their learning, generally is more self-regulated. In addition, previous research has demonstrated that SRL is connected with a deep approach to learning and an optimistic learning strategy (Heikkilä and Lonka, 2006; Vermunt, 1998; Lonka & Lindblom-Ylänne, 1996). Our findings also indicate that the utility value of studies predicts the use of regulation strategies, especially time-management and help-seeking, but do not predict self-assessment or the use of deep learning strategies.

Among the *expectancy components* of SRL, we measured self-efficacy, which is the belief that one can learn even the most difficult issues, and expectation of success, which can be defined as expectancy of high grades and other course results rather than as interest on depth of learning. Interestingly, expectation of success predicted regulation and learning strategies more strongly than self-efficacy did. However, self-efficacy was a stronger predictor for the use of learning strategies considered typical for deep learning. This finding, that utility value and expectation of success were more strongly related to self-regulation strategies than intrinsic interest and

self-efficacy may be connected to a phenomena called *academic delay of gratification* (ADOG). This theory, originated by Bembenutty and Karabenick (2004), is defined as students' postponement of immediately available opportunities that would satisfy impulses in favour of pursuit of important academic rewards or learning goals that are temporarily remote but ostensibly more valuable (Bembenutty, 2009). Our data indicated slightly more probability that students regulated their behaviour and the learning context to get high grades than to achieve their own learning goals. However, because self-efficacy beliefs were stronger predictors of the use of deep learning strategies than expectation of success was, and utility value of studies did not predict use of these strategies, we might construe that students with a deep learning orientation might also differ in their motivational orientation to learning. This finding points out the need to develop methods of teaching and learning assessment that direct HE students' learning and goal-setting toward deeper learning instead of high grades.

In this study we identified the types of SRL profiles extant among university students. The three SRL profiles we identified at the beginning of master's studies offered a detailed picture of various student learning types. We aimed to contribute to the claim of SRL theorists (Boekaerts, 1997; Pressley 1995; Winne, 2005) by drawing a clearer picture of how effective and less-effective SRL students differ in their learning. The profile of students *Excellent in SRL* was characterised by high intrinsic motivation and other positive motivational components of SRL and low performance anxiety. These students were able to regulate their performance effectively and actively used versatile learning strategies. Pintrich (2000b) showed strong positive relations among use of mastery goals (or intrinsic interest), cognitive strategies and self-regulatory strategies. This profile resembles the findings of Lonka and Heikkilä (2006) regarding *Optimistic students*, the findings of Heikkilä et al. (2011) regarding *Self-directed students*, and the *Effective self-regulators* identified by Vrugt and Oort (2008). Typical features of all these student profiles are optimistic strategy, focus on achieving mastery goals in learning, deep approach to learning and less anxiety or less fear of failure. Despite the different theoretical conceptualisations and different research traditions used in these studies, it seems evident that some students begin their university studies with good or excellent SRL skills, set their learning goals high, aim to succeed in their studies, are persistent and self-assess and reflect on their learning.

In contrast to these optimistic students, we identified a student group labelled as *Distressed performers*. Typical features of this profile were high test anxiety and low use of management strategies and deep learning strategies. This finding is in line with those of Heikkilä et al. (2011), who identified *Helpless students*, those of Heikkilä and Lonka (2006), who identified a student group they called *Reproducing students with insufficient regulatory skills* and those of Vrugt and Oort (2009), who identified *Less-effective self-regulators*. Different features of insufficient SRL skills have been identified depending on the conceptualisations, theoretical constructs and measurements applied. Heikkilä and Lonka (2006) emphasised how lack of regulation is related to a surface approach to learning and task-irrelevant behaviour. In our study, as in the study by Vrugt and Oort (2008), poor SRL is related to affective components such as test anxiety and fear of failure. Poor SRL skills and poor study skills seem to be related to students' low self-efficacy, low expectation of success and less intrinsically motivated study orientation.

Our third student group profile could be described as students who are *Aiming high with insufficient SRL*, in the sense that they lack deep learning strategies. These students enter HE studies with high hopes to succeed, and they are both intrinsically and externally motivated for studies. However, they have doubts about their abilities and they lack regulation skills needed to learn efficiently at the university level. Specifically, they score low in critical thinking, which could be interpreted as an indication of a surface approach to learning or incapability to apply previous knowledge to new situations to make critical evaluations (Pintrich & McKeachie, 2000). Our finding of this type of profile in SRL resembles the finding by Heikkilä et al. (2011), who labelled a profile *Non-academic students* because these students demonstrated hardly any critical evaluation or deep understanding and showed low levels of self-regulation. Their lack of critical thinking may be the key to understanding the needs of this student group. They need support to develop a critical approach to learning and the material they study.

Lastly, we investigated the relationship between SRL in the first year of study and later study progress and success. Our results showed that students' SRL as measured by multiple components at the beginning of studies did not predict their study progress and success. This finding is contrary to previous research proving that students' study success is related to their SRL (Heikkilä & Lonka, 2006; Tynjälä et al., 2005) and their academic progress related to a deep approach to learning (Bruinsma, 2004; Haarala-Muhonen et al., 2011; Lindblom-Ylänne & Lonka, 2009; Parpala, Linblom-Ylänne, Komulainen, Hirsto, & Litmanen, 2009; Ruohoniemi, Parpala, Lindblom-Ylänne, & Katajavuori, 2010). We did not find a positive relationship between single SRL components and study progress and success. This is contrary to previous findings that GPA positively correlated with intrinsic interest (Richardson et al, 2012) and with

other motivational components of SRL, such as self-efficacy (Lynch, 2006; Robbins et al., 2004; Richardson et al., 2012; Zeegers, 2004), or regulation strategies like effort regulation (Richardson et al., 2012), persistence (Vrugt & Oort, 2008) and time management (Diseth & Kobbeltved, 2010). This finding was disappointing and contrary to our aim of identifying specific aspects of SRL related to later study success in master's level studies. How should we interpret this lack of correlations between SRL and academic achievement in terms of study progress and success?

This finding may be explained in terms of students maturing and developing SRL during studies. This means that students' SRL is not static, and students develop regulation of their learning process over years of study. Students who begin their studies with poor SRL maybe benefited from study orientation courses or even from using the IQ Learn online tutorial.

Another possible explanation for our finding is that grades do not tell the truth concerning students' learning and understanding. Research on validity and reliability of assessments of student learning outcomes has revealed multiple sources of structural inadequacy in assessment practices, such as misunderstanding or no common understanding of criteria applied to assess learning outcomes and problems in numerical representation of grades (c.f. Hornby, 2003; Knight, 2002; Sadler, 2009). Furthermore, recent research in which teachers were interviewed about their assessment practices and how aware they were of the assessment criteria applied found that the assessment criteria teachers apply changes from assignment to assignment and grades change accordingly (Hailikari, Postareff, Tuononen, Räisänen, & Lindblom-Ylänne, in press). This interpretation is supported by those studies that found study success to be related to regulation of learning, metacognition and approaches to learning. In such studies, the correlative relation between SRL and study has been weak, although statistically significant (Heikkilä & Lonka, 2006; Heikkilä et al., 2011, Tynjälä et al., 2005; Zeegers, 2004). In addition, in previous research, SRL has often been measured as a more general characteristic compared to e.g. lack of regulation or external regulation in relation to study success. We investigated SRL as a multifaceted phenomenon, so our results are not directly comparable to those of earlier studies.

In addition, even in earlier research, there are contrary findings. Rytkönen et al. (2012) found that the deep approach to learning adopted by first-year Biosciences students was not related to their academic progress. Heikkilä et al. (2011) found that accumulation of credits was only marginally higher for self-directed students than non-academic students.

We may conclude that the reason why good SRL skills do not predict academic progress is that many obstacles and unexpected changes are possible during years of master's studies. In addition, although a student may aim to progress within the target duration, the curriculum may not support this. Not all university courses favour the use of deep learning strategies or students' self-regulated learning. It is a huge challenge for a big or multidisciplinary university to develop and harmonise methods, as there are several traditions regarding study attainment.

Our findings show that students' SRL at the beginning of studies is not related straightforwardly to their progress and success in master's studies. Instead, self-regulated learning is a complex phenomenon, various components of which are related dynamically to each other and to academic achievement. In addition, when measuring SRL, students' maturation and other intervening variables must be taken into account. Thus, research attempting to find linear relationships between SRL and study success will not succeed. In previous studies, research has focused on only the relationship of one or two components of SRL, such as self-efficacy or persistence (e.g. Vrugt & Oort, 2008) to academic achievement. However, when multiple components of SRL are used in the same model to investigate SRL and academic achievement, it becomes evident that each of the SRL components affects students' study progress and success differently.

LIMITATIONS

There are some methodological limitations of this study. Firstly, to measure SRL we used a self-report instrument, which was not context-specific and not applied on course level as recommended by Pintrich (2004). Furthermore, self-report instruments may not be able to capture all the relevant processes of the actual cognitive and metaconitive actions that are utilised by students as they learn (Vermetten, Vermunt, & Lodewijks 1999; Winne & Jamieson-Noel, 2002). On the contrary, it has been argued that self-report instruments may be able to measure general aptitudes or propensities to use different self-regulatory processes (Pintrich, Wolters, & Baxter, 2000; Winne, Jamieson-Noel, & Muis, 2001; Winne & Perry, 2000).

Secondly, the students of this study represented quite a heterogeneous group in terms of age. This could affect our finding of no relationship between SRL and study success and study progress. Students' skills in SRL tend to increase by maturing and aging.

Thirdly, we measured study success as a cumulative grade point average (GPA), but grades may tend to approach towards means when they are combined

from many courses. Furthermore, the grades may not be accurate measurement of study success due to the variation in grading criteria between different courses and modules (e.g. Sadler 2009). In a single course level, a grade may indicate study success if a teacher / evaluator is well skilled in how to assess, aware of the criteria of assessment, and also informs students about the criteria of assessment.

EDUCATIONAL IMPLICATIONS AND FUTURE RESEARCH

Perhaps the most important educational implication of this study is that it reminds educators that university students at the beginning of their studies are a heterogeneous group and there is a broad variation in their SRL skills. Though after highly selective admission procedures, they have begun their studies in a university, not all of them owe good metacognitive skills to monitor and regulate their learning, nor do they necessarily owe deep learning strategies.

The finding that intrinsically motivated students scored high on all regulation strategies of behaviour and context and on learning strategies indicates that it is important for educators to arouse students' intrinsic motivation at the beginning of studies. Interest for studies should not be taken as a self-evident fact. On the contrary, educators should develop learning environment for students as engaging to active learning (Lonka & Ketonen, 2012) in order to enhance first-year students' positive learning experiences and offer means for the use of deep learning strategies. As a previous study (Mikkonen & Ruohoniemi, 2011) revealed, students lacking study progress may be well aware of their insufficient use of learning strategies and persistence. How could these not-so-successful but aware students be motivated to develop learning strategies and enhance their intrinsic interest? Perhaps the positive relation that we found among deep learning strategies, intrinsic interest and effective SRL, could be interpreted in a way showing that HE demands use of deep learning strategies to ensure passing courses. Then, perhaps, gradually, students would become more interested and willing to develop these strategies.

There is also a strong need to develop academic curriculum to support students to progress faster in their studies. In the Faculty of Arts at University of Helsinki, were obtained encouraging results from a pilot project allowing students to complete their master's studies in a year. Good skills in SRL benefit students to learn and understand deeper the issues they study, however, students need also a learning environment and curriculum which engage them to learning and support their progress in studies.

In our study the relation between SRL and academic achievement was explored based on cross-sectional research design and had limits especially in measurement of academic achievement. Furthermore, grades are not accurate indicators for learning (e.g Hornby, 2003; Sadler 2009). Thus we suggest that in the future the research focusing on relations between SRL and academic achievement, should be conducted in longitudinal research design with both follow-up of students from the beginning of studies to graduation and including case studies focusing on relations between SRL and study success with investigating the assessment practices and the accuracy of assessment as an indicator for learning.

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