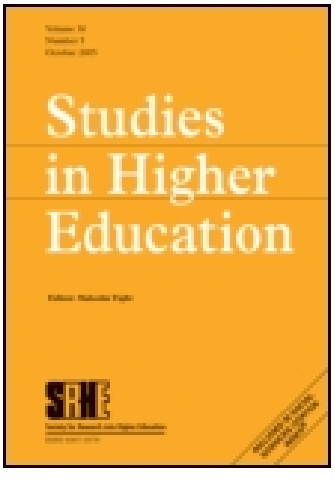
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Studying in higher education: students' approaches to learning, self-regulation, and cognitive strategies

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Studying in higher education: students' approaches to learning, self-regulation, and cognitive strategies

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The authors looked at aspects of successful and problematic studying in terms of three different research traditions: students' approaches to learning, self-regulated learning and cognitive strategies. These frameworks have been widely applied when explaining university student learning. However, relations among different traditions have not been sufficiently looked at. In this study the authors explored the relations between learning approaches, regulation of learning and cognitive strategies. The subjects were students at the University of Helsinki who filled in the Task Booklet of Learning and the Strategy and Attribution Questionnaire. Their academic achievement was coded from university archives. It was found that approaches to learning, regulation of learning, and cognitive strategies were related to each other, and further, to study success.

Introduction

Why do some intelligent students fail while seemingly less capable students do well in their studies? Earlier cognitive theories of learning often searched for the answers from individual differences or from intellectual functioning only. However, it seems that even highly selected, intelligent students sometimes do poorly in their studies.

Motivation was previously largely ignored by those researchers who were interested in learning, and motivational explanations were seen as alternative to cognitive ones. Only in the late 1990s did educational psychologists start to be truly interested in the relations between motivation and cognition (Järvelä, 2001). Currently the idea of motivation as a personality trait has been largely abandoned and researchers acknowl-

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edge that motivation may vary in terms of context and subject area (Boekaerts, 2001). Cognitive and situational explanations have been introduced in order to explain the complex interplay between student learning and motivation (Volet, 2001).

In the present study we look at aspects of studying in terms of three research traditions: students' approaches to learning, self-regulated learning and cognitive strategies. These frameworks have been previously applied when explaining university student learning. However, relations among different traditions have not been sufficiently looked at. Our present study is exploratory and correlative in nature. Our intention is to look at whether it is possible to get empirical support for our theoretical idea: that concepts used in different traditions are intertwined and possibly somewhat overlapping.

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Students' approaches to learning

The student approaches to learning (SAL) perspective and models derive from in-depth qualitative interviews with students about their learning, studying and motivation in the university context. This phenomenographic tradition originated in Europe: research started in the 1970s when Marton and Säljö (1976a) conducted an ecologically valid study of the strategies students used when reading texts. They introduced a model of qualitative differences in learning. In that classic study they showed that there are two different approaches to process the text material to be learned: deep and surface. A student who applies a deep approach to learning pays attention to the fundamental idea or message of the materials to be learned. A student who applies a surface approach to learning concentrates more on the surface features of the text itself and tries to remember it word for word. If the only goal of the student is to remember and repeat what is being written in the text, the student will not adopt the active problem-solving and thinking skills that are needed in order to deeply understand the material being read. The intention becomes to reproduce other people's ideas.

Entwistle and Ramsden (1983) and Biggs (1987) introduced a third approach: strategic or achieving. Students adopting this approach work hard to achieve good grades. They choose their learning strategy to maximize the chances of academic success: they appear cue conscious and very aware of assessment practices (see also Biggs, 1993).

The positive relationship between a deep approach and study success has been very well demonstrated. Marton and Säljö (1976b) showed that a deep approach was associated with qualitatively better learning outcomes. Later quantitative studies have confirmed this finding (see, for example, a recent meta-analysis by Watkins, 2001). The achieving approach has also shown to be related to academic achievement (Watkins, 2001).

Students' approaches to learning are connected to several other aspects of students' learning, such as conceptions of learning, motivational orientations and regulation of learning. Combinations of these variables have been referred to as study orientations or learning styles (Entwistle & Ramsden, 1983; Lonka, 1997; Vermunt, 1998; Mäkinen *et al.*, 2004). A differing number of orientations have been introduced, of which two main orientations, meaning and reproducing, are commonly

used (Richardson, 1997). A meaning orientation typically includes a combination of self-regulated learning and the deep approach to learning (Vermunt & Van Rijswijk, 1988; Lonka & Lindblom-Ylänne, 1996; Richardson, 1997), and has been shown to be related to good study success (Pintrich & De Groot, 1990; Lindblom-Ylänne & Lonka, 1999; Watkins, 2001).

Self-regulated learning

Recently, researchers have increasingly emphasized the importance of self-regulation or, more broadly, the role of metacognition in learning. Biggs (1993) suggests a distinction should be made between SAL position, deriving from students' reports of their own study processes, and information processing position, based on analyses of actual cognitive processing. Today a more accurate characterization of information processing would be the 'self-regulated learning' (SRL) perspective, since this perspective includes not only cognitive but also motivational, affective and contextual factors (Pintrich, 2000).

A growing body of literature is providing finer theoretical conceptualizations of self-regulation (e.g. Pintrich & De Groot, 1990; Boekaerts, 1997; Vermunt & Verloop, 1999; Boekaerts & Niemivirta, 2000; Pintrich, 2000). On a descriptive level, researchers seem to be unanimous about what self-regulated learning is: a student who is regulating his or her learning is able to set task-related, reasonable goals, take responsibility for his or her learning, and maintain motivation. It is also assumed that self-regulated learners are able to use a variety of cognitive and metacognitive strategies. These students are able to vary their strategies to accomplish academic tasks. That means that they are able to monitor their strategy use and, if necessary, modify their strategies if task demands change (Butler & Winne, 1995; Zimmerman, 2000).

As Wolters (1998) points out, many studies have operationalized self-regulation as the monitoring and controlling of cognitive strategies. However, it seems that self-regulated learning has other important aspects as well, which are more motivational or affective in nature. For example, students' management and control of their effort is shown to be an important component of self-regulation: Pintrich and De Groot (1990) reported that self-regulating students are able to maintain their cognitive engagement in the task even if there are distractions.

Sometimes students have difficulties with regulating their own learning processes. If a student does not self-regulate his or her learning the regulation is typically taken over by the teacher, which is referred to as external regulation (Vermunt, 1998; Vermunt & Verloop, 1999). Problems of studying may arise, for example, when there is a destructive friction between students' own individual learning preferences and the practices and demands of the learning environment (Vermunt & Verloop, 1999).

Cognitive strategies

At the same time as educational psychologists have been examining approaches and regulation of learning, there has been increasing interest in examining the regulation

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of action, and the different ways in which students approach and respond to challenges in the academic environment (Norem & Cantor, 1986; Eronen *et al.*, 1998; Nurmi *et al.*, 2003). In this tradition university students' failures and successes, as well as the time in which they manage to complete their studies, have been explained in terms of the goals and cognitive strategies individuals apply (Cantor, 1990; Eronen *et al.*, 1998; Nurmi *et al.*, 2003). In the context of the cognitive strategy literature, the term 'cognitive strategy' refers to the cognitive, affective and behavioural processes people apply to achieve their goals and to evaluate the outcomes of their actions (Cantor, 1990).

A number of differing cognitive strategies have been introduced, but there are few studies exploring several strategies at the same time (for exceptions, see Eronen *et al.*, 1998 and Nurmi *et al.*, 2003). Eronen *et al.* (1998) have shown that three strategies are mainly used in academic achievement situations: illusory optimism, defensive pessimism and self-handicapping. The first two strategies have been shown to be successful in the university setting (Cantor & Norem, 1989; Eronen *et al.*, 1998).

Users of illusory optimism are striving for success. Based on their previous success they have high outcome expectations and desire to enhance an already strong image of competence (Norem, 1989; Cantor, 1990). These students apply active, task-focused strategies to meet their goals, and attribute their successes positively. Zuckerman (1979) introduced the concept of a self-serving bias that people seem to hold in order to maintain competency beliefs. When evaluating their behavioural outcomes, optimistic people are willing to take credit for their successes and to blame other people and situational factors for their failures.

Unlike optimists, students using a defensive-pessimistic strategy have low expectations and feel very anxious before performance. This does not seem to be a problem for all students. Martin *et al.* (2001) have suggested that defensive pessimism is a strategy to protect one's self-worth, and thus should be regarded as a dysfunctional strategy. However, in the light of previous findings, these negative feelings need not become self-fulfilling prophecies, but rather may serve as a motivator before performance and attributional cover after the performance. An interesting finding of Eronen *et al.* (1998) is that, in an academic environment at the beginning of study, a defensive-pessimistic strategy seems to be even more productive than an optimistic strategy. During the first two years, optimistic students passed fewer courses than defensive-pessimistic students. Despite this, optimistic students were more satisfied with their studies than defensive-pessimistic students. In the long run, an optimistic strategy turned out to be the most successful (Eronen *et al.*, 1998).

Jones and Berglas (1978) introduced self-handicapping in the context of academic achievement. Self-handicappers are afraid of potential failure and they concentrate on task-irrelevant behaviour in order to create excuses for their failure. This provides them with an attributional cover, but simultaneously it also decreases the likelihood of success. Eronen *et al.* (1998) showed that university students using self-handicapping strategies were less satisfied and less successful in their studies, in comparison to optimistic and defensive-pessimistic students. The use of self-handicapping strategies is shown to be associated with poor study success and a low level of well-being in general (Jones & Berglas, 1978; Eronen *et al.*, 1998; Nurmi *et al.*, 2003).

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What do the traditions have in common and how do they differ in both constructs and research methodologies?

The three traditions share basic assumptions deriving from cognitive psychology. They all emphasize that students' expectations, prior experiences and beliefs are unique filters that colour the way they perceive events. Marton and Säljö (1976b) concluded: 'Students adopt an approach determined by their expectations of what is required of them' (p. 125). Assumptions about the nature of learning are also shared between the traditions: they all emphasize active, constructivist, situational and collaborative aspects of learning (Lonka *et al.*, 2004, Pintrich, 2004).

In all these theories or frameworks it is assumed that students set tasks or goals for themselves. Motives or motivation are at least implicitly embedded in the theoretical constructs. For example, the notion of approach to learning describes both what students do and why they do it. Intention is included in the construct. According to Biggs (1987), an approach to learning can be described as a 'congruent motive-strategy package'. Similarly, Pintrich and DeGroot (1990) have introduced the idea of 'the will and the skill' to describe metacognition. Students need to ask themselves what motivates them to do learning tasks and how they are going to accomplish them. Referring to the work and conceptualizations of Pintrich, DeGroot and Biggs, Case and Gunstone (2002) argue that it is clear that constructs of metacognition and approach to learning are strongly related.

Nurmi (1989) has suggested that regulation of action consists of two major stages: cognitive planning and the evaluation of behavioural outcomes. In order to succeed in a task, a person has to first set task-related goals and then construct efficient plans that lead to goal achievement. Strategies are used as individuals attempt to gain control and make progress on their significant tasks. The more efficient plans and, especially, strategies people are able to construct, the more likely they are to succeed (Norem, 1989). This conceptualization of cognitive strategies binds together motives and strategies.

SAL models do not include general expectancy and efficacy as components, whereas in SRL and cognitive strategy models they play a significant role. Pintrich (2004) argued that the absence of these affective components is a serious omission in SAL models, because recent research has shown that efficacy is closely tied to actual performance, achievement and self-regulation of behaviour.

Differences between the traditions and constructs emerge both from theoretical backgrounds and from methodologies. SAL models are usually bottom–up models derived from in-depth qualitative interviews. This phenomenographical approach emphasizes students' qualitative reports of their own learning and motivation. In contrast, researchers of self-regulated learning and cognitive strategies have used the information processing approach, described as being derived in a top–down manner from theoretical constructs and theories in cognitive and educational psychology. Research designs include think-aloud protocols, experimental designs and quantitative methods.

In inventories of self-regulation there has been an attempt to bring together an information processing view of cognition and a social-cognitive perspective on

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motivation (Pintrich, 2004). Cognitive strategy literature has its historical roots in the cognitive perspective on personality. This tradition emphasizes the 'doing' side of personality, by focusing on how the dispositional structures of personality are cognitively expressed and maintained in social interaction (Cantor, 1990).

Because of such profound differences in theory building, the grain size difference of the constructs is evident (Pintrich, 2004). SAL models focus on much larger grain size: its units of analysis are quite general, such as general approaches to learning. In turn, SRL models usually try to capture specific phases and strategies in the regulation of learning. A large number of inventories have been developed to assess student approaches to learning, and the original phenomenographic background may not be evident for the users of the inventories any more. While Marton and Säljö originally referred to what students do while reading a text, the inventories ask what they usually do while learning and studying. In other words, the inventories are measuring general dispositions, not actual processes.

In current theories of motivation, situational and contextual thinking has recently become dominant (Volet, 2001). Such a complex phenomenon as academic studying cannot be explained without adopting a multidimensional and systemic view. All three traditions introduced share a general assumption that 'self-regulatory activities are mediators between personal and contextual characteristics and actual achievement or performance' (Pintrich, 2004, p. 388). Volet (2001) talks about the 'experiential interface' which mediates between the predispositions of the students and the context of learning. The learning context is not an objective entity, but, rather, it is perceived, observed or interpreted by the students.

It is inevitable that, in explaining university studying, we need to integrate the different research traditions. The three research perspectives introduced (SAL, SRL and cognitive strategies) provide differing explanations for the same phenomena: success and duration of studies in the university context. However, the interplay between motivational, cognitive and affective aspects of student learning, which is present in these frameworks at least implicitly, has not been systemically examined yet (Boekaerts, 1997; Pintrich, 2000). Although a considerable amount of research has been carried out on learning approaches, self-regulated learning, and cognitive strategies separately, we do not know how these constructs are interrelated.

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Aims of the study

In this study we explored the relationship between cognitive strategies, learning approaches and self-regulatory skills. We studied the relationships both in variable and person-oriented ways. In addition, we investigated whether these belief systems are related to study success. As presented above, learning approaches, self-regulatory skills and cognitive strategies are all related to study success. However, we do not know whether these cognitive and emotional aspects together contribute to academic achievement. We investigated the following research questions:

1. Are students' cognitive strategies related to their learning approaches and self-regulatory skills?
2. What kinds of groups of individuals, who apply different strategies and approaches to learning, can be identified?
3. Are cognitive strategies, learning approaches and self-regulatory skills related to study success?

We assumed that a deep approach to learning, self-regulation and success expectations would be related to each other. Therefore, we expected to find clusters of students who expressed all of these. We also expected that such adaptive cognitive emotional beliefs would be positively related to study success.

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Methods

The context of the study

The participants in this study were students who attended a course, 'Think Fearlessly', and filled in the questionnaires used. The course was a new instructional innovation by Kirsti Lonka, the second author of this article, and philosopher Esa Saarinen. The intention was to activate the students during mass lectures: they were encouraged to externalize their previous knowledge and beliefs, and to open them up to discussion and reflection with other students. This was done both during lectures, by small group discussions, and in written personal journals. The content of the course was unusual compared to conventional university courses. The themes were: revision of thought systems, mental training techniques, career planning and tools for personal change, as well as applications of constructivist learning theories, study and thinking skills and process writing (Lonka, 1998; Lonka & Saarinen, 2000).

The assessment practice was in line with the educational framework of the course: students were encouraged to write personal journals during the term, and to write a course paper based on their journals and course literature. The course was open to all students, and there were about 500 students at different phases of their studying (i.e. undergraduate and postgraduate students) from many different faculties. The course was of general interest and also attracted non-students. About half of the students attended the course only occasionally. The data for the present study consists of those approximately 250 students who were active participants in the course, and who completed it by returning an essay based on their personal journals.

Participants

The participants were 366 students of various subjects at the University of Helsinki, of whom 291 indicated their sex (226 women, 65 men) and age. The ages ranged from 18 to 55 years old (mean 28.5, SD = 8.38). The sample was not randomly selected. Women were overrepresented in the study. Women form the majority of students in humanities and social sciences in the University of Helsinki, and the population of this study is dominated by students from the Faculty of Arts and the

Faculty of Social Sciences. There were no gender differences on any of the scales. In this exploratory study, the population is treated as a whole. We do not have research questions concerning differences between the faculties or main subjects, because the subgroups of students were too small and heterogeneous. The participants studied in 13 different programmes.

Procedures

The Task Booklet of Learning (Lonka & Lindblom-Ylänne, 1996) and the Strategy and Attribution Questionnaire (Nurmi *et al.*, 1995) were given to the students during the first lectures of the course. They completed them in their own time and returned them the next week. It was possible to answer anonymously. In statistical analyses the largest possible number of participants was included, and therefore the numerus of the different analyses varies a little. Study success for those students who had given their names (n = 197) was assessed on the basis of University archives.

Materials

Students filled in the questionnaires between lectures. Because of the nature of the course students were not pushed to return the questionnaires.

The Task Booklet of Learning (Lonka & Lindblom-Ylänne, 1996) was filled in and returned before the third lesson, the topic of which was learning. The booklet consisted of open-ended and Likert-type questions; the latter are included in this study. Students rated a set of 71 statements concerning learning approaches, regulation of learning and conceptions of learning on a five-point scale. Each item asked the student how strongly he or she agreed or disagreed with a statement. The scale varied from (1) totally disagree to (5) totally agree. The first 14 statements consisted of three scales adopted from the Approaches to Studying Inventory (Entwistle & Ramsden, 1983). The three scales measured:

- the deep approach, for example: 'I usually set out to understand thoroughly the meaning of what I am asked to be read';
- the surface approach, for example: 'The best way for me to understand what technical terms mean is to remember the textbook definitions'; and
- achievement motivation, for example: 'It's important to me to do really well in the courses here'.

Three regulation-of-learning scales adopted from the Inventory of Learning Styles (Vermunt & Van Rijswijk, 1988) were computed out of 25 statements:

- Self-regulation measures the extent to which the student is able to set goals and diagnose their own learning process. For example: 'When I am studying, I also pursue learning goals that have not been set by the teacher but myself'.
- External regulation measures the extent to which the student is relying on goals given by the teachers or textbooks: 'If I am able to give a good answer to the

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questions posed in the textbook or by the teacher, I decide that I have a good command of the subject matter'.
- Lack of regulation indicates problems that the student may have with the regulation of learning. For example: 'I notice that I have trouble processing a large amount of subject matter'.

The scale in the regulation items varied from (1) I seldom or never do this to (5) I (almost) always do this.

Students' cognitive and attributional strategies in achievement situations were assessed using the Finnish version of the Strategy and Attribution Questionnaire (Nurmi *et al.*, 1995), which consisted of 40 statements. Four subscales were calculated:

- Success expectation measures the extent to which the student expects success and is not anxious about the possibility of failure ('When I go into new situations, I usually expect I will manage'). The scale measures the optimistic strategy.
- Task-irrelevant behaviour measures the extent to which the student tends to behave in a way that prevents them from carrying out the task to be done. This scale measures behavioural self-handicapping, which is a prominent component of the self-handicapping strategy. For example: 'If something begins to go wrong with my school work, I quickly disappear to the cafeteria or to some other place'.
- Reflective thinking measures the extent to which people report spending time thinking ahead, exploring and considering different solutions when facing a challenge or a problem. This scale measures cognitive planning orientation. Cognitive planning is typical for people using the defensive-pessimistic strategy. For example: 'If difficulties arise, it usually helps to think them over'.
- Mastery-orientation measures the extent to which a student believes that he or she has personal control over the situation compared with external factors. 'Careful preparation for an exam leads to good results'.

The participants were asked to rate the statements on a four-point rating scale from (1) Strongly agree to (4) Strongly disagree.

Study success was assessed on the basis of University archives. In this study, academic achievement was operationalized as the mean of all grades a participant had received during his or her academic years. The grades ranged from one to three, 1.0–1.49 indicating a satisfactory grade, 1.5–2.49 indicating good success, and 2.5–3.0 indicating excellent performance. Less than 'satisfactory' would indicate failed performance, and therefore no students below satisfactory were included.

Scales and reliabilities

Means and Cronbach alphas for different scales were calculated. Number of items comprising the scales, the reliabilities of the scales, item means and minimum and maximum scores are presented in Table 1. For comparison, there are corresponding scale means in parentheses obtained from the previous Finnish data (Lonka &

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Table 1. The reliabilities of the scales: internal consistency (Cronbach alpha), number of items, item means (in parentheses: corresponding scale means obtained from the previous Finnish data [Lonka & Lindblom-Ylänne, 1996 and Nurmi *et al.*, 1995]), and minimum/maximum values per scale (n = 230)

Scales	n of items	Cronbach α	Item means	Min./Max.
Learning approaches				
Surface approach	6	.70	2.54 (2.56)	1.0/4.3
Deep approach	4	.58	3.68 (3.72)	1.8/5.0
Regulation of learning				
Self-regulation	10	.84	2.56 (2.49)	1.0/4.9
External regulation	10	.67	2.58 (2.41)	1.3/4.3
Lack of regulation	5	.72	2.45 (2.19)	1.0/4.8
Achievement strategies				
Mastery orientation	7	.62	3.59 (3.57)	2.29/4.0
Task-irrelevant behaviour	5	.76	2.10 (2.13)	1.0/4.0
Success expectations	6	.69	3.07 (2.89)	1.5/4.0
Reflective thinking	7	.64	3.29 (3.32)	1.6/4.0

Note: Maximum score was 5 in the Task booklet of learning and 4 in the Strategy and Attribution Questionnaire.

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Lindblom-Ylänne, 1996 and Nurmi *et al.*, 1995). The comparison indicated that the participants of this study were not different from other tested Finnish student populations.

Statistics and measures

Correlations were computed in order to examine the interactions between learning approaches, regulation of learning, cognitive strategy components and grade point average. We found correlational methods useful for looking at relationships among the scales. This variable-oriented approach did not, however, reveal what kind of groups of individuals existed in the study population. Therefore, we wanted to apply a person-oriented approach in order to examine what kinds of subgroups of students can be found. Thus, a clustering-by-cases procedure was used to classify the participants on the basis of their responses to the Strategy and Attribution Questionnaire and the Task Booklet of Learning.

In order to make a decision about the number of clusters, a hierarchical cluster analysis was carried out, selecting the squared Euclidan distance as a similarity measure and using Ward's method to form the initial clusters without restricting their number. This analysis provides a tree model, a dendrogram, based on the distance between the clusters. On the basis of the dendrogram and on theoretical grounds a two-cluster solution was selected. Once the number of the clusters was decided, a Quick Cluster Analysis was used to form the final groups. Initial cluster centres were

selected using a K-means algorithm. Later in this text the clusters are referred to as group profiles. A *t*-test was used to explore if there was a difference in study success between the two groups.

Results

Our first question concerned the relationship between cognitive strategies, students' approaches to learning and regulation of learning. In order to explore these relationships, Pearson correlation coefficients were calculated (Table 2).

Success expectation, indicating an optimistic strategy, correlated positively with deep approach and self-regulation of learning, and negatively with surface approach, external regulation and lack of regulation. In other words, students who rated high on success expectations also expressed a deep approach to learning and readiness to regulate their own learning processes.

Task-irrelevant behaviour, an indication of self-handicapping, was positively related to surface approach, external regulation and lack of regulation, and negatively to deep approach and self-regulation.

Table 2. Pearson product-moment correlations between learning approaches, regulatory strategies, cognitive strategies and grade point average

	1	2	3	4	5	6	7	8	9
1. Deep approach									
2. Surface approach	–.46**								
3. Self regulation	.61**	–.34**							
4. External regulation	–.14*	.42	–.11						
5. Lack of regulation	–.27**	.52	–.25**	.32**					
6. Success expectations	.28**	–.36	.30**	–.24**	–.56**				
7. Task-irrelevant behaviour	–.20**	.27**	–.24**	.47**	.48**	–.47**			
8. Reflective thinking	.17**	–.08	.10	.03	.11	–.17**	.08		
9. Mastery orientation	.15*	–.28**	.04	.03	–.31**	.33**	–.22**	.17**	
10. Grade point average	.16*	–.09	.18*	–.12	–.17*	.11	–.08	.06	.07

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

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The mastery orientation scale had negative correlations with surface approach and lack of regulation, and a low positive correlation with the deep approach. Reflective thinking had low positive correlation with the deep approach.

Students' group profiles

To examine what kinds of combinations of cognitive strategies and learning approaches individual university students applied, we used a cluster analysis by cases to classify the participants according to the extent to which they showed success expectations, task-irrelevant behaviour, reflective thinking, mastery orientation, surface approach, deep approach, achievement motivation, self-regulated learning, external regulation of learning, and lack of regulation. As a result of this analysis, we were able to identify two groups of students. The first group was labelled reproducing students with insufficient regulatory skills, expressing a surface approach to learning, problems with regulation of learning, and task-irrelevant behaviour. The first cluster consisted of 190 students. Its members showed a higher level of surface approach, external regulation of learning, regulation problems of learning and task-irrelevant behaviour than members of the second cluster (see Table 3).

The second group was labelled meaning oriented and optimistic students, expressing a deep approach to studying, self-regulation of learning and success expectations. This cluster consisted of 176 students. Members of the second cluster expressed more deep-level learning, self-regulation of studying and success expectations than students in the first cluster.

Table 3. Significance testing of means of individual scales by clusters

Scale	Cluster 1 (n = 190) M	Cluster 2 (n = 176) M	F
Task Booklet of Leaning			
Deep approach	3.39	3.99	76.3***
Surface approach	2.94	2.10	168.1***
Achievement motivation	2.76	2.78	.03
Self-regulation	2.21	2.93	68.62***
External regulation	2.86	2.26	104.2***
Lack of regulation	2.91	1.94	179.2***
Strategy and Attribution Questionnaire			
Success expectations	2.82	3.31	98.2***
Mastery orientation	3.53	3.65	13.1***
Reflective thinking	3.30	3.28	.09
Task-irrelevant behaviour	2.42	1.78	119.6***

Note: *$p < .05$, **$p < .01$, ***$p < .001$. Maximum score was 5 in the Task Booklet of Learning and 4 in the Strategy and Attribution Questionnaire.

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Study success

Our third question concerned the relations between cognitive strategies, approaches to learning and study success. Table 2 shows the correlations between study success (grade point average) and strategies, approaches, and regulation of learning. Grade point average had low positive correlations with the deep approach to studying and self-regulation of learning, and negative correlations with lack of regulation. External regulation also correlated negatively with grade point average, but the correlation was not statistically significant.

In this study it was of interest whether study success was related to the individual profiles. It did appear that meaning oriented and optimistic students (mean = 2.28, SD. 0.27) received better grades than reproducing students with insufficient regulatory skills (mean = 2.17, SD. 0.29, $t = -2.27$, $p < .05$).

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Discussion

In the present study we quantitatively explored relations between constructs emerging from three different research traditions: student approaches to learning, self-regulated learning and cognitive strategies. Our main findings indicate that approaches to learning, self-regulatory skills and cognitive strategies, measured with self-report inventories, are intertwined. Favourable aspects of students' learning—deep approach, self-regulation of learning, and optimistic strategy–clustered together, while problematic aspects, such as surface approach, problems with regulation of studying and self-handicapping, were also related to each other. To our knowledge, this is the only study in which approaches to learning, regulation of learning and cognitive strategies are all looked at together. There is a need for conceptual discussion in the field of educational psychology. The inventories that we used are all quite widely used, but their relations have not been looked at. This study can help us in building new integrative theories for explaining university student learning in rapidly changing learning environments, and in clarifying the concepts used in educational psychology.

There are some specific methodological limitations to the present study. First, learning approaches were measured by using self-report instruments, which were not context-specific. Pintrich *et al.* (2000) recommended an instrument adapted at the course level, pointing out that it is a good compromise between an overly global level, focused on college learning in general, and a more micro-analytic level, focused on different tasks within a course. However, Mäkinen *et al.* (2004) showed that an instrument measuring the general personal meaning students give to their university studies (the Inventory of General Study Orientations) also predicted study persistence and drop-out quite well. Because of the explorative and cross-disciplinary nature of the present study, we decided to use general-level inventories for all the students coming from several differing domains and departments. This methodological decision led to some theoretical problems in terms of context specificity, but we had to accept such a trade-off.

Secondly, the population of the study can be expected to be rather heterogeneous, due to the nature of the course from which the data was collected. However, comparison to the previous Finnish data (reported in Table 1) showed that the means and standard deviations of the scales were not exceptionally high or low.

Thirdly, the mean age of the population in this study is somewhat high. Mature students appear to be more likely to adopt a deep approach, and conversely they appear to be much less likely to adopt a surface approach (for a review, see Richardson, 1994). We compared the means with the previous Finnish data, and the comparison revealed that they were not exceptionally high.

The fourth limitation concerns the low reliabilities of some individual scales. There are several possible reasons for the low reliabilities: as Richardson (1994) argued, the phenomena that we are studying are not very well defined or simple to operationalize.

It is also possible that university students answer in a socially desirable way: some items might be more transparent than others. This might lower reliability. However, in earlier Finnish studies where quantitative and qualitative data were triangulated, measures of approaches and regulation of learning showed good criterion and construct validity (Lonka & Lindblom-Ylänne, 1996; Lindblom-Ylänne & Lonka, 1999, 2001).

As expected, adaptive ways of approaches to learning, such as optimistic strategy, deep approach to learning and self-regulation, were intertwined. The relationship between deep approach and self-regulation has been established in previous studies (Vermunt & van Rijswijk, 1988; Beishuizen *et al.*, 1994; Lonka & Lindblom-Ylänne, 1996), but to our knowledge no previous study has showed that an optimistic strategy is connected with a deep approach and self-regulation. As Entwistle and McCune (2004) point out, it is surprising that there is a lack of emphasis on emotion in inventories of learning. Earlier research indicates that such variables as self-esteem and locus of control are related to learning approaches (Watkins, 2001). We showed that cognitive strategies are also related to these approaches. Pintrich (2004) has argued that students' attempts to monitor, control and regulate their motivation or affect should be included in conceptual models and measurement instruments of student learning. These strategies are shown to be important in self-regulated learning (Wolters, 1998; Boekaerts & Niemivirta, 2000). Our findings demonstrated the need for the assimilation of affective variables into models of student learning.

Bandura (1997) has argued that students with strong self-efficacy beliefs set higher goals, exert greater effort and persist with academic tasks in demanding situations. Research shows that high-achieving children are more self-regulated and less disruptive in their behaviour than children who underachieve (Vauras *et al.*, 2001). Based on the present study, we could continue the list of desirable, adaptive cognitions in an academic environment by demonstrating that optimistic students are also likely to adopt a deep approach to the material to be learned.

Pintrich and De Groot (1990) showed that self-regulation is closely related with success beliefs in elementary school students. Our results with university students demonstrate the same tendency. Prior research also shows that efficacy beliefs can be used to predict students' use of self-regulated learning strategies (Wolters, 1998).

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Even though we did not study the use of particular learning strategies, and cannot draw causal conclusions, our results suggest that success expectations are closely related to approaches to learning and the regulation of learning. These, in turn, have been shown to be related to study strategies reported by university students (Lonka & Lindblom-Ylänne, 1996; Vermunt, 1998).

Previous studies show that both task-avoidant strategy and reproducing orientation predict poor academic performance at university, while optimistic strategy and meaning orientation are related to study success (Lonka & Lindblom-Ylänne, 1996; Eronen *et al.*, 1998; Watkins, 2001; Nurmi *et al.*, 2003). Our results gave support to the earlier results: meaning oriented and optimistic students received better grades than reproducing students who possessed insufficient regulatory skills.

Our results further showed that various maladaptive ways of approaching learning, such as task-irrelevant behaviour, problems with regulation of learning, surface approach and external regulation clustered together. Previous literature has showed the link between surface approach and external regulation (Vermunt & van Rijswijk, 1988; Beishuizen *et al.*, 1994; Lonka & Lindblom-Ylänne 1996), and, further, that a surface approach is associated with fear of failure (Entwistle & Ramsden, 1983). On the other hand, the cognitive strategy literature has proposed that a self-handicapping strategy is used in the classroom context to protect self-worth (Garcia & Pintrich, 1996).

Lack of commitment may prove crucial in predicting drop-out rates at universities. Vermunt & Van Rijswijk (1988) introduced the idea of 'undirected learning', reflected in a factor with high loadings of 'lack of regulation', and an 'ambivalent learning orientation'. Vermunt (1992) showed that undirected learning was consistently and negatively related to all types of examination results, in both types of universities and in all subject areas. Analogically, Mäkinen *et al.* (2004) showed that non-commitment was the most important predictor of drop-out across domains. Our results showed that cognitive strategies as measured by the Strategy and Attribution Questionnaire were systematically related to such dysfunctional features as 'lack of regulation'. We therefore assume that our measures have diagnostic value in predicting and preventing problems in studying.

Mäkinen *et al.* (2004) further showed that students who were not committed to their studies expressed high levels of anxiety. They showed that students in the humanities belonged to the group of non-committed students more often than students in other faculties. Difficulty of finding meaning and commitment to studying may thus cause anxiety. Students in the humanities may be especially prone to such problems, because their professional goals are often unclear. Thus, as Volet (2001) and Boekaerts (2001) point out, the context of studying and the subject domain are closely related to motivational and affective factors.

We need to remind the reader here of the context of this study. The data was collected from a student-activating course addressed to students from all faculties of a university. Therefore, the measures used were quite general and many contextual aspects having to do with students' specific study culture were dismissed. In this exploratory cross-disciplinary study we used grade point average as a measure of

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study success because the participants were from many faculties and in differing phases of their studies. In future studies it would be very interesting to explore not only grades but also the accumulation of study weeks and the quality of learning outcomes. However, that we managed to get quite clear and easily interpretable findings with this heterogeneous population may increase the generalizability of our results.

We tried, however, to avoid interpretations of our data that would reflect seeing approaches and strategies as trait-like entities. We wanted to adopt a more systemic view and explain approaches and strategies in terms of adaptation to the learning environment. However, there are parts of students' predispositions that are more stable, reflecting their history and background. This does not mean that the students would exhibit similar predispositions across all learning situations and subject domains. Nor does this mean that the approaches would be unchangeable.

Stability of some thinking and learning strategies does not imply determinism. Vauras *et al.* (2001) pointed out that it is possible to see developmental trends that are not straightforward and linear-causal. Maladaptive practices by parents, students and teachers may cumulatively produce patterns of thinking and behaviour that become internalized by the students and become a part of their typical way of approaching the learning tasks. These patterns may even generalize across contexts. There is a clear need for longitudinal research to determine causality and we cannot make causal deductions on the basis of our correlational evidence. Developing methodologies and new measuring instruments represent a great opportunity for future studies.

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Implications for instruction

The suggestion that students' cognitive strategies, learning approaches and self-regulatory skills are intertwined also has important implications for counselling and instruction. Because approaches to learning and cognitive strategies both seem to be somewhat stable across the years (Vermunt, 1998; Eronen *et al.*, 1998; Nurmi *et al.*, 2003), it is important to develop teaching and counselling strategies which promote the chance for developing more functional learning approaches, self-regulatory skills, diminishing negative self-related attitudes and causal attributions. By designing learning environments that promote active knowledge construction, self-regulation of learning and personal goal setting, it may be possible to change these belief systems.

When designing new learning environments, it is important to keep in mind that they may solve some problems but create new ones. Even if the overall student feedback from the present course was very positive, not all students liked the activating methods, especially those who expressed a surface approach to learning (Lonka, 1998). Learning environments that resemble real-life settings and call for high-level thinking skills may be extremely stimulating and truly promote learning. At the same time, these environments may be threatening to some students (Vauras *et al.*, 2001). In particular, students who have problems in regulating their own learning may encounter serious destructive frictions and feel completely lost. It is, therefore, important to follow and

monitor students' approaches to learning, their self-regulatory skills and cognitive strategies. Even our brightest students are not free from motivational and emotional frustrations. It is very difficult to know when frictions are constructive or destructive for them. Academic life is mediated through individual experiential interfaces (Volet, 2001). It is, therefore, important to provide sufficient instructional scaffolding and monitor the effectiveness of different instructional procedures.

It is important to develop better diagnostic and research instruments that help us to monitor our students' development. Identifying problems early will help us to intervene in a constructive way that provides sufficient instructional support for those students who need it. We need to consciously promote a positive study atmosphere and the self-regulation and success expectations of our students. Our study demonstrated that motivational factors do matter in higher education. Future research will show what kinds of learning environments or interventions would promote meaningful learning and well-being in our students.

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