

The effect of learning approaches on prospective chemistry teachers' self-regulated learning skills: The survey research

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Abstract. The purpose of this research was to examine the effect of the learning approaches on prospective chemistry teachers' self-regulated learning skills. 92 prospective chemistry teachers from the Department of Chemistry Education at one of the public university in Turkey participated in the research. "The Study Process Questionnaire" and "Self-regulated Learning Skills Scale" were used as the data collection tools. It was consequently found that 59.8 % of prospective chemistry teachers adopted deep learning approach, 40.2% of them adopted surface learning approach and their self-regulated learning skills scale scores for planning and goal setting scores differed significantly according to their learning approaches. Furthermore, it was determined that self-regulated learning skills mean score of prospective teachers' who adopted deep approach are higher than mean score of prospective teachers' who adopted surface approach but their self-regulated learning skills total scores did not differ significantly according to their learning approaches.

1 Introduction

In order to improve the quality of student learning, one of the most important research topics in the field of education is "how" students learn. Each individual is different, and the difference is reflected into the individual's learning needs. Students prefer different ways in receiving and processing knowledge. Biggs [1] defined the students' approach to learning as a combination of an appropriate strategy and a motive. Ramsden [2] described the learning approach as a qualitative direction (aspect) of learning. Learning approaches express how students approach to academic assignments [3]. Learning approaches are based on studies performed by Marton and Säljö [4]. Researchers state that individuals process what they read deeply or superficially [4]. As a result of subsequent research, a third component labelled as "strategic approach" [5] or as "achieving approach" [6] was added. Studies have found that university students choose one of the following approaches when addressing the learning task given to them: "comprehending a topic (deep)", "focusing on evaluation (strategic)" or "memorizing the details (surface)" [7]. "The Study Process Questionnaire" used in this study analyses learners' learning approaches at two

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dimensions namely deep and surface. Depending on the situation they are in, students sometimes prefer deep learning approach and sometimes surface learning approach to achieve success [8].

Individuals adopting surface learning approach choose rote learning if they are to use the knowledge in the short term [9]. It is enough for them to learn the amount of knowledge they are expected to learn. They consider the task given to them as external forcing. They aim to memorise the knowledge to be assessed and just to fulfil the duty [2]. One of the most frequently employed strategies in this learning approach is the memorization of the content without the meaningful learning [10, 11]. Those who adopt surface learning approach achieve success especially at examinations testing memorization-based knowledge. But they fail at answering comprehension questions and upper level questions. Their motivation sources are usually to complete the assigned task successfully. High marks and teachers' and parents' praise are important to them. They like traditional teaching in which there is plenty of instructing and note-taking [12].

The aim of individuals who adopt deep learning approach is to comprehend. Deep learning approach is defined as being eager to learn, setting up ties between prior knowledge and newly learnt knowledge, associating concepts with daily experience, setting up cause and effect relationship and as tendency to analyse the rationale behind a subject [13]. The deep learner students require challenging assignments that allow them to develop their understanding and they consider their teacher as a facilitator in the learning process [cited in 14]. The deep learners can re-organize knowledge in accordance with their cognitive structure. Therefore, they can easily answer the questions testing comprehension and upper level skills. They have intrinsic motivation. They learn to satisfy their curiosity and to learn. They like student-centred teaching methods and problem-based teaching [12].

Today's education focusses on raising individuals who know how to reach knowledge, who inquire, who are aware of the learning process, who can control the process and who learn how to learn. Individuals' skills and desires such as learning skills, social skills, self-control knowledge development, and motivation to learn should be developed in addition to gaining knowledge in order for individuals to become life-long learners [15, 16]. Self-regulation skill which can be learned and developed, is referred to as one of the basic elements of life-long learning by theoreticians of the field [17, 18]. The term self-regulation, which becomes important in this sense, is related to the degree to which students participate actively in their own learning processes in terms of metacognition, motivation and behaviour [19]. According to Pintrich [17], self-regulation is an active and constructive process in which individuals set their own learning goals, use their cognition actively and regulate their behaviours. Self-regulated learners have the skills of choosing an appropriate learning strategy, implementing the strategy in line with their objectives and monitoring and evaluating their individual development [20]. SRL is an important aspect of learners' academic performance [21]. The successful students are generally described as self-regulated students in the literature [22, 23]. It is emphasized in the literature that there is a positive relationship between individuals' achievement and learning approaches [24 -30, 9]. Learners use self-regulatory processes to develop and use study skills [31].

In this regard, the purpose of this study was to determine the learning approaches and self-regulated learning skills of prospective chemistry teachers and to examine the effect of the learning approaches on their self-regulated learning skills. In accordance with the purpose of the study, the following research questions were addressed:

- Are there any statistically significant differences between prospective chemistry teachers' self-regulated learning skills (motivation and action to learning, planning and goal setting, strategy using and assessment and lack of self-directedness) according to their learning approaches?

- Are there any statistically significant differences between prospective chemistry teachers' self-regulated learning skills total scores according to their learning approaches?

2 Method

2.1 Research model

In order to determine the effect of learning approaches on prospective chemistry teachers' self-regulated learning skills, survey method [32] was used in this study.

2.2 Study group

This study was conducted with 92 prospective chemistry teachers (25 male and 67 female) from one of the public university in Turkey. Prospective chemistry teachers' ages ranged from 18 to 26 years.

2.3 Data collection tools

Self-regulated Learning Skills Scale (SRLSS), a 5 point Likert-type scale was developed by Turan and Demirel [33] was used to determine self-regulated learning skills of prospective teachers. The scale is comprised by 41 items and 4 factors: motivation and action to learning, planning and goal setting, strategy using and assessment, and lack of self-directedness. Cronbach's alpha reliability coefficients for factors and for all scale are calculated respectively as 0.88, 0.91, 0.83, 0.76 and 0.91 [33].

The Study Process Questionnaire (SPQ), was used to identify the prospective teachers' learning approaches. The SPQ, a 5 point Likert-type scale was developed by Biggs [1] (1987), revised by Biggs, Kember and Leung [34] and adapted into Turkish by Yılmaz and Orhan [35]. The SPQ included 20 items and 2 factors. Cronbach Alpha coefficients values were calculated for the deep approach factor as 0.79 and the surface approach factor as 0.73[35].

2.4 Data analysis

Descriptive statistics and MANOVA were used for the data analysis.

3 Results

In order to determine the learning approach of prospective chemistry teachers the total scores for each group of learning approaches were computed. It has been identified that they adopt the learning approach which they get high scores. Accordingly, there are two groups: 55 prospective teachers are in deep approach group and 37 prospective teachers are in surface approach group.

Having checked whether or not the assumptions were met, the MANOVA analysis was performed in order to find whether or not there were any differences between the scores for the dependent variables (four factors score) according to learning approaches. An examination of the one-way MANOVA analysis results demonstrated that prospective chemistry teachers' self-regulated learning skills scale scores for motivation and action to learning, planning, strategy using and assessment and lack of self-directedness differed

significantly according to their learning approaches, Wilks Lambda (Λ) = .88, $F(4, 87) = 2.79$, $p = .03$, $p < .05$; Partial Eta Squared = 0.114, and the effect size was large.

An examination of Table 1, it was found that prospective chemistry teachers' planning and goal setting scores differed significantly according to their learning approaches [$F(1, 90) = 5.73$, $p = .019$, $p < .05$, partial eta squared = .060]. But their motivation and action to learning scores [$F(1, 90) = 1.33$, $p > .05$, partial eta squared = .015], strategy using and assessment scores [$F(1, 90) = 1.29$, $p > .05$, partial eta squared = .014] and Lack of self-directedness scores [$F(1, 90) = 1.51$, $p > .05$, partial eta squared = .017] did not differ according to their learning approaches.

Table 1. Follow-up MANOVA for each dependent variables.

Dependent Variable	Group	n	Mean	df	F	p	Partial Eta-Squared
Motivation and action to learning	Deep approach	55	28.2727	1	1.330	.252	.015
	Surface approach	37	27.4595				
Planning and goal setting	Deep approach	55	33.109	1	5.738	.019	.060
	Surface approach	37	31.054				
Strategy using and assessment	Deep approach	55	72.964	1	1.298	.258	.014
	Surface approach	37	70.189				
Lack of self-directedness	Deep approach	55	72.964	1	1.512	.222	.017
	Surface approach	37	70.189				

The significant difference in mean score of planning and goal setting for deep approach adopted prospective teachers ($\bar{X} = 33.109$, $SD = 3.44$) was significantly different from surface learning approach adopted prospective teachers ($\bar{X} = 31.054$, $SD = 4.78$).

The results for the independent samples t-test, which was performed so as to find whether or not there were any statistically significant differences self-regulated learning skills total scores of prospective chemistry teachers according to their learning approaches are shown in Table 2.

Table 2. Independent sample t-test results of prospective teachers SRLSS total scores.

Group	N	Mean	SD	df	t	p
Deep approach	55	158.61	12.42	90	1.307	.197
Surface approach	37	153.40	22.01			

According to Table 2, the prospective chemistry teachers' SRLSS total scores did not differ significantly according to their learning approaches, $t(90) = 1.307$, $p > .05$. However, it was found that SRLSS mean score of prospective teachers' who adopted deep approach ($\bar{X} = 158.61$) are higher than mean score of prospective teachers' who adopted surface approach ($\bar{X} = 153.40$).

4 Conclusion and Discussion

The study proposed to determine the learning approaches of prospective chemistry teachers and to examine the effect of different learning approaches on their self-regulated learning skills. A total of 92 prospective chemistry teachers were included in this study and 59.8 % of them adopted deep learning approach and 40.2% of them adopted surface learning approach. It was also found in the literature that the more of Turkish prospective teachers adopt the deep learning approach [36-38].

Whether or not there were any differences between the self-regulated learning skills (motivation and action to learning, planning, strategy using and assessment and lack of self-directedness) of prospective chemistry teachers with differing their learning approaches was checked through one-way MANOVA analysis. According to results, it was found that prospective chemistry teachers' self-regulated learning skills scale scores for planning and goal setting scores differed significantly according to their learning approaches. But their motivation and action to learning scores strategy using and assessment scores and lack of self-directedness scores did not differ according to their learning approaches. In addition, it was determined that SRLLS mean score of prospective teachers' who adopted deep approach are higher than mean score of prospective teachers' who adopted surface approach but their SRLSS total scores did not differ significantly according to their learning approaches.

It is noted in the literature that there is a positive relationship between individuals' high achievement levels and the deep learning approach [24, 25, 27, 30, 9]. Students adopting deep learning approach are the individuals who are concerned with the structure of learning tasks and who aim to learn whereas students adopting surface learning approach are the individuals who consider the task as external forcing and who intend to perform the task assigned only [2]. Furthermore, self-regulation skills assist to the learners for selecting the suitable learning strategies for their goals and using its procedures [39]. Núñez et al. [22] stated that the successful university students are generally described as self-regulated learners in the literature and these learners are intrinsically motivated to improve their learning approach [18, 40]. High quality learning takes place using a deep learning approach [41]. When the items in the factor of "planning and goal setting" were surveyed, it was seen that the items were related to learners' adopted learning approaches: "I make a plan to utilize resources and strategies in order to reach my goal, I make a plan as to how I will carry out the learning process, I prioritize my goals, I manage my time in order to learn as efficiently as possible, I make a plan to utilize learning resources efficiently, I identify the resources needed during the learning process, I clearly identify the objectives to be achieved at the end of the learning process, I identify the learning materials that will help me to learn" [42].

Individuals should firstly be aware of their own skills and learning approaches, as learning approaches and self-regulated learning skills can be modified and improved. These factors, which are important in becoming lifelong learners, are especially important for prospective teachers who will raise their own students in the future. The reason for this is that educators who are aware of their own learning process will be able to instil in their students these skills [43]. This study is restricted to prospective chemistry teachers. Studies to be performed in the future could investigate the learning approaches adopted by prospective teachers and teachers of different branches and their self-regulated learning skills. Additionally, the effects of the learning-teaching approaches on these variables could also be investigated.

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