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## Investigation of Prospective Science Teachers' Learning Approaches in Terms of Different Variables<sup>1,2</sup>

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### ABSTRACT

The aim of the study is to examine the learning approaches of prospective science teachers in terms of different variables. Survey method was used in the study. The study group consists of a total of 274 prospective teachers from the department of science education of a university in the Western Black Sea region during the fall semester of 2015-2016. Learning Approach Scale have been used for data collection. The scale consists of two subscales: Meaningful Learning Approach Scale and Rote Learning Approach Scale. SPSS 22 program was used to analyze the data and statistics of variables were performed. It has been concluded that the scores of prospective science teachers on rote and meaningful learning approach subscale did not change significantly according to (1) gender, (2) class level; (3) the rote learning approach subscale showed a significant difference according to the liking of the program, it was determined that the meaningful learning approach subscale did not show a significant difference according to the liking of the program and (4) there is no relation between rote learning approach subscale and meaningful learning approach subscale. Suggestions have been developed according to the results of the research.

**Keywords:** Learning approach, prospective science teacher, gender, grade, liking the program

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## Fen Bilgisi Öğretmen Adaylarının Öğrenme Yaklaşımlarının Farklı Değişkenler Açısından İncelenmesi

### ÖZET

Çalışmanın amacı, fen bilgisi öğretmen adaylarının öğrenme yaklaşımlarını farklı değişkenler açısından incelemektir. Araştırmada tarama modeli kullanılmıştır. Çalışma grubu, 2015-2016 öğretim yılı güz döneminde Batı Karadeniz bölgesindeki bir üniversitenin fen bilgisi öğretmenliği bölümünde öğrenim görmekte olan toplam 274 öğretmen adayından oluşmaktadır. Veri toplama aracı olarak Öğrenme Yaklaşımı Ölçeği kullanılmıştır. Ölçek, Anlamlı Öğrenme Yaklaşımı Ölçeği ve Ezbere Öğrenme Yaklaşımı Ölçeği olmak üzere iki alt ölçekten oluşmaktadır. Verilerin analizinde SPSS 22 programından yararlanılmış, değişkenlere ait istatistikler gerçekleştirilmiştir. Fen bilgisi öğretmeni adaylarının ezbere ve anlamlı öğrenme yaklaşımı alt ölçeğinden aldıkları puanların (1) cinsiyete, (2) sınıf düzeyine göre anlamlı bir şekilde değişmediği, (3) ezbere öğrenme

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<sup>2</sup> This study was presented at the 12<sup>th</sup> National Science and Mathematics Education Congress.

yaklaşımı alt ölçeğinden aldıkları puanların programı sevme durumuna göre anlamlı farklılık gösterirken anlamlı öğrenme yaklaşımı alt ölçeğinden aldıkları puanların programı sevme durumuna göre anlamlı farklılık göstermediği ve (4) ezbere öğrenme yaklaşımı alt ölçeği ve anlamlı öğrenme yaklaşımı alt ölçeği arasında herhangi bir ilişkinin bulunmadığı sonuçlarına ulaşılmıştır. Araştırmadan çıkan sonuçlar doğrultusunda öneriler geliştirilmiştir.

**Anahtar Kelimeler:** Öğrenme yaklaşımı, fen bilgisi öğretmen adayı, cinsiyet, sınıf düzeyi, programı sevme durumu

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## INTRODUCTION

Today, it can be said that the most effective way of raising modern individuals that are lifelong learners is to choose quality and beneficial teaching methods and models. Individuals should know how to reach the information in the most efficient way rather than exerting an unmeaningful effort to acquire the entire set of information that is rapidly growing and renewing. Teachers, who play the key role in this matter, should be knowledgeable of how their students learn and what learning styles they have so that they can offer the suitable environment to their students. In this regard, learning approaches are more affected by specific learning environments than individuals' personalities (Rhem, 1995). Ekinçi (2008) states that a learning approach is determined by the relationship between the "learner" and the "environment". Accordingly, the learner may learn by adopting a deep or superficial approach depending on the features of the learning environment. A learning approach is not a personality trait though it is affected by the learner's personality traits to a limited degree. It is different from learning styles because of this. Especially Bandura suggested that individuals' difference in factors such as (I) attention, (II) remembering/retention, (III) reproducing, and (IV) motivation implies that different individuals reflect the same behavior in different ways (Bayrakçı, 2007). This view of Bandura may be associated with the concept of learning approach. While everyone learns through their unique learnings, differences occur in individuals' handling of learning (i.e. their learning approach preferences).

The present study takes learning approach types as deep/meaningful learning approach and superficial/rote learning approach. In the deep learning approach, students read what is provided with the aim of comprehending, connect evidences with results, associate new ideas with their prior knowledge and personal experience, and can derive the main theme and adopt a critical stance (Ekinçi, 2008). In the superficial/rote learning approach, however, students strive to determine and memorize the information and/or ideas they consider important in a text, endeavor to memorize the details which, in their opinion, will provide an answer to the questions likely to be asked in the future rather than seeking for the holistic meaning, and make no effort to make sense of what is provided (Ünal Çoban & Ergin, 2008).

Some factors play a role in the learner's learning approach preference within a learning process. According to Ekinçi (2009), some of these factors are gender, grade, age, introversion, extroversion, academic self-confidence, subject area, previous educational experience, and the characteristics of the teaching-learning environment.

The relevant literature contains national (Batı, Tetik & Gürpınar, 2009; Başer, 2007; Beşoluk & Önder, 2010; Çolak & Fer, 2007; Doğru Atay, 2006; Ekinçi, 2008, 2009; Kılıç, 2009; Korkmaz, 2001; Ozan & Çiftçi, 2013; Ozan, Köse & Gündoğdu, 2012; Öner, 2008; Özkal, 2007; Özkan, 2008; Şeker, 2015; Tekkaya & Yenilmez, 2006; Ünal Çoban & Ergin, 2008; Ünal & Ergin, 2006; Yıldız Feyzioğlu & Ergin, 2012; Yılmaz ve Orhan, 2011) and international (Cavallo ve Schafer, 1994; Chamorro Premuzic ve Furnham, 2008; Fransson, 1977; Hativa & Birenbaum, 2000; Kember & Harper, 1987; Marton & Saljo, 1976; Ramsden & Entwistle, 1981) studies on learning approaches. It can be said that there are a lot of researchers studying on learning approaches and that this is quite important for learning. We consider that determining prospective science teachers' learning approaches, which are individual in essence, based on various variables (gender, grade, state of liking the program)

is important to reveal the current situation, make necessary adjustments, and improve the success of the program.

### Research Focus

The purpose of this study is to explore prospective science teachers' learning approaches based on various variables. To this end, an attempt was made to answer the questions below.

1. Do prospective science teachers' learning approaches vary by gender?
2. Do prospective science teachers' learning approaches vary by grade?
3. Do prospective science teachers' learning approaches vary by state of liking program?
4. Is there a relationship between the scores of prospective science teachers' learning approach subscales?

## MEHTOD

### Research Design

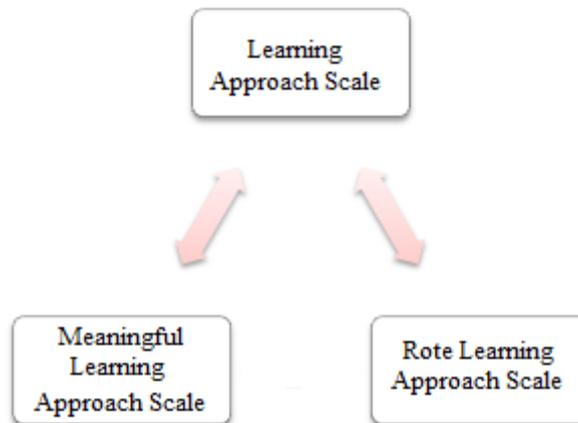
The study adopted a quantitative perspective and employed the survey model, which is a quantitative method used for determining the currents situation about a problem, illuminating/explaining the specified situation, and revealing the similarities and differences between the events (Çepni, 2012). Therefore, studies of this kind try to find answers to "what?" questions. What matters in these studies is to observe the handled situation properly and reveal it without making an effort to modify it (Karasar, 2011). Since the present study intended to explore prospective science teachers' learning approaches based on various variables, it applied the survey model.

### Study Group

The study group consists of a total of 274 prospective teachers from the department of science education of a university in the Western Black Sea region during the fall semester of 2015-2016. The study group consisted of 87 first-grade, 70 second-grade, 64 third-grade and 53 prospective science teachers in the 4th grade.

### Data Collection Tool

The Learning Approach Scale, which was adapted by Cavallo and Schafer (1994) and translated into Turkish by Yenilmez (2006) was used as a data collection tool. The adapted scale consists of 22 items and has a 4-point Likert type (Strongly Disagree, Disagree, Agree, Strongly Agree). The scale consists of two subscales (see Figure 1).



**Figure 1.** Learning Approach Scale Subscales

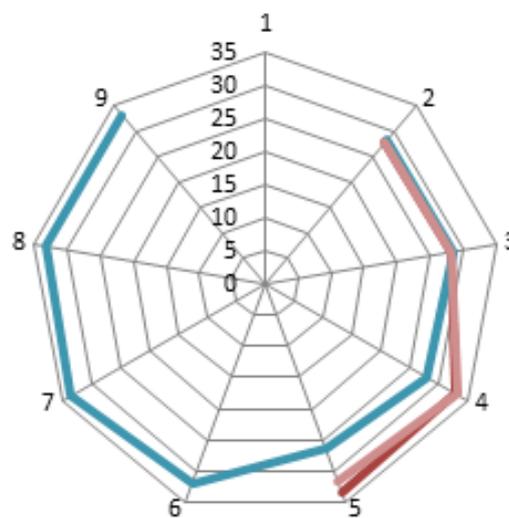
The reliability coefficient (Cronbach's alpha) for the Meaningful Learning Approach Scale (MLAS) was 0,81 and for the Rote Learning Approach Scale (RLAS) to be 0.76.

### Data Analysis

In the analysis of the data, it has been checked whether the assumptions related to the appropriate analysis have been provided for the sub problems by using SPSS 22 program. Inferential statistics are used for different variables and descriptive statistics and inferential statistics are presented in the findings section. In the evaluation of the results ,05 significance level was accepted.

## RUSULTS

The mean descriptive statistics ( $\bar{X}$ ) the prospective science teachers obtained from the learning approach subscales based on gender, grade, and state of liking the program are shown in Graph 1.



2	<b>Red Line- Gender</b> RLAS-female	<b>Blue Line- Grade</b> RLAS-1 <sup>st</sup>	<b>Pink Line- State of Liking the Program</b> RLAS-yes
3	RLAS-male	RLAS-2 <sup>nd</sup>	RLAS-no
4	MLAS-female	RLAS-3 <sup>rd</sup>	MLAS-yes
5	MLAS-male	RLAS-4 <sup>th</sup>	MLAS-no
6		MLAS-1 <sup>st</sup>	
7		MLAS-2 <sup>nd</sup>	
8		MLAS-3 <sup>rd</sup>	
9		MLAS-4 <sup>th</sup>	

**Graph 1.** Descriptive statistics of prospective teachers on variables

Graph 1 shows that the male prospective teachers' RLAS mean ( $\bar{X}$ =28.05) was higher than that of the female prospective teachers ( $\bar{X}$ =27.86). This was also true for MLAS (males:  $\bar{X}$ =33.44; females:  $\bar{X}$ =32.81). As to grade, the 1<sup>st</sup>-graders and the 2<sup>nd</sup>-graders had very close RLAS means ( $\bar{X}$ = 28.32 and  $\bar{X}$ =28.40, respectively) (see Graph 1), and they were followed by the 3<sup>rd</sup>-graders ( $\bar{X}$ =28.01). The 4<sup>th</sup>-graders had the lowest mean ( $\bar{X}$ =26.45). For MLAS, the 2<sup>nd</sup>-graders had the highest mean ( $\bar{X}$ =33.59), and they were followed by the 4<sup>th</sup>-graders ( $\bar{X}$ =33.38). While the 1<sup>st</sup>-graders had the lowest mean ( $\bar{X}$ =32.07), the mean of the 3<sup>rd</sup>-graders was  $\bar{X}$ =33.15. Based on the state of liking the program (see Graph 1), those who said “no” had

a higher RLAS mean ( $\bar{X}$ =28.05) than those who said “yes” ( $\bar{X}$ =27.86), whereas those who said “yes” had a higher MLAS mean ( $\bar{X}$ =33.16) than those who said “no” ( $\bar{X}$ =31.68).

The inferential statistics concerning whether the above-mentioned differences between the means was significant are given in the tables below. First, the result of the independent samples t-test for gender is presented in Table 1.

**Table 1.** Results of the scores of prospective teachers on the subscales according to their gender

	<b>Gender</b>	<b>N</b>	<b>t</b>	<b>p</b>
RLAS	Female	208	-0,250	0,803
	Male	66		
MLAS	Female	208	-0,862	0,389
	Male	66		

As shown in Table 1, the independent samples t-test indicated no significant difference between the prospective teachers’ total RLAS scores and gender and between their total MLAS scores and gender ( $t_1=-0,250$ ;  $p>0,05$ ;  $t_2=-0,862$ ;  $p>0,05$ ). Table 2 presents the result of the one-way ANOVA made to see whether there was a significant difference between the prospective science teachers’ RLAS scores in terms of grade.

**Table 2.** One-way ANOVA test analysis results of prospective teachers on the scores obtained from RLAS according to grade

	<b>Source of Variance</b>	<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>p</b>
RLAS	Between Group	144,555	3	48,185	2,527	0,058
	Within Group	5147,494	270	19,065		
	Total	5292,048	273			

As shown in Table 2, the one-way ANOVA indicated that the difference between the prospective teachers’ RLAS scores by grade was not statistically significant [ $F(3,270)=2.527$ ;  $p>0.05$ ]. The Bonferroni post hoc test also showed no significant difference between the groups. Table 3 presents the result of the Kruskal-Wallis H test applied to see whether there was a significant difference between the prospective science teachers’ MLAS scores in terms of grade.

**Table 3.** Kruskal-Wallis H-test results of prospective teachers’ scores on the MLAS subscale according to their grade

	<b>Grade</b>	<b>N</b>	<b>Mean Rank</b>	<b>df</b>	<b>X<sup>2</sup></b>	<b>p</b>
MLAS	1	87	124,91	3	3,709	0,295
	2	70	147,25			
	3	64	138,01			
	4	53	144,68			

Since the total MLAS scores did not have a normal distribution over the grades, the Kruskal-Wallis H test, which is a non-parametric equivalence of one-way ANOVA, was carried out. As shown in Table 3, the Kruskal-Wallis H test indicated that the difference between the prospective teachers’ MLAS scores by grade was not statistically significant [ $X^2(3)=3,709$ ;  $p=,295$ ;  $p>0,05$ ]. Table 4 presents the result of the independent samples t-test performed to see whether there was a significant difference between the prospective science

teachers' scores obtained from the learning approach subscales based on the state of liking the program.

Table 4. *The results of the scores of the prospective teachers on the subscales according to their liking of the program*

	State of Liking the Program	N	t	p
<b>RLAS</b>	Yes	228	-2,308	0,022
	No	43		
<b>MLAS</b>	Yes	228	1,739	0,083
	No	43		

As shown in Table 4, the independent samples t-test indicated a significant difference between the prospective teachers' RLAS scores by the state of liking the program but no significant difference between their MLAS scores by the state of liking the program ( $t_1 = -2,308$ ;  $p < 0,05$ ;  $t_2 = 1,739$ ;  $p > 0,05$ ). Table 5 presents the correlation results concerning the scores the prospective science teachers obtained from the subscales.

Table 5. *The results of prospective teachers' scores on subscales*

		MLAS	RLAS
<b>MLAS</b>	Pearson correlation	1	-0,018
	p		0,773
<b>RLAS</b>	Pearson correlation	-0,018	1
	p	0,773	

As shown in Table 5, Pearson's correlation test indicated no significant relationship between RLAS and MLAS.

### CONCLUSION, DISCUSSION AND RECOMMENDATIONS

The results of the study aiming to explore prospective science teachers' learning approaches are evaluated below based on various variables handled (gender, grade, and state of liking the program). With regards to the first sub-problem of the study, it was found out that the prospective science teachers' MLAS and RLAS scores did not significantly vary by gender. Ünal Çoban and Ergin (2008) also detected no significant difference between the female and male students in terms of learning approaches. However, in that study, a significant difference was detected in favor of the males in the superficial motive factor, which is a sub-dimension of the superficial learning approach, and in favor of the females in the anxiety factor. Ozan and Çiftçi (2013) also determined no significant difference between the prospective teachers in terms of gender. Based on some studies in the literature that have been mentioned here, it can be said that the results of the present study are consistent with the results reported in the literature. Ozan, Köse, and Gündoğdu (2012) reported a difference between the prospective teachers by gender only for the superficial/rote learning approach. The male students were seen to adopt the superficial/rote learning approach significantly more than the female students. They could not find a significant difference between the female and male prospective teachers for the deep/meaningful and strategic learning approaches. This may be because the researchers studied different study groups.

For the second sub-problem of the study, the prospective teachers' RLAS and MLAS scores did not significantly vary by grade. Ozan, Köse, and Gündoğdu (2012) determined a significant difference by grade in terms of the superficial learning approach. Such differences in terms of the superficial learning approach were between the 1<sup>st</sup>- and 2<sup>nd</sup>-graders and the 4<sup>th</sup>-graders and in favor of the former (i.e. the 1<sup>st</sup>- and 2<sup>nd</sup>-graders). They found no significant difference by grade in terms of the deep learning and strategic learning approaches. Ozan and

Çiftçi (2013) reported no significant difference by grade in terms of prospective teachers' learning approach preferences. These are consistent with the findings of the present study. On the other hand, according to Ekinçi (2009), there are significant relationships between students' learning approach preferences and such teaching-learning process variables as university, subject area, grade, academic success, and perceived teaching-learning environment. This is inconsistent with the findings of the present study.

In relation to another sub-problem of the study, the prospective teachers' RLAS scores significantly varied by the state of liking the program, whereas their MLAS scores did not significantly vary by it. While the prospective teachers engaged in meaningful learning were seen to be not liking their program, the prospective teachers liking their program were seen to be engaged in rote learning. This implies that the prospective teachers did not start their program willingly/fondly, but they just got into the program their placement scores allowed. The examinations held by the Student Selection and Placement Center of Turkey in the process of choosing the program of study (Kılıç, 2009) and/or previous learning experiences (Ekinçi, 2008) are influential on prospective teachers' learning approach preferences. It can be said that rote learning will bring no benefit other than enabling students to pass the exams in their relevant program of study and be of no use for their personal development. From the perspective of the social identity of prospective teachers who are to teach science and science subjects in the future, it can be argued that being a teacher who tries to transfer knowledge to students through memorizing or rote learning may inevitably lead to prejudices in the eyes of parents and students. In addition, having a negative social identity may cause a loss of self-confidence. This may point to a lack of an effective and productive pedagogical science education communication between them as teachers and students in the future. On the contrary, if prospective teachers establish close relationships with their students in the future, they may make their students motivated and maintain control in the classroom environment through strong teacher-student relations. As the planner of the course, they may make science courses and other courses about science more fluent/enjoyable, thereby changing students' perspectives on the courses. This will positively affect prospective teachers' confidence and willingness to teach science subjects, which will also raise students' interest in the courses about science. This will lead to an inevitable success in the science course and courses about science for teachers and prospective teachers that can improve their learning approaches.

Another result of the study is that there is no relationship between RLAS and MLAS. Indeed, this finding may change depending on participants. It was determined that prospective teachers learn based on the experience they have gained in their previous educational life, which is also observed to affect their learning approach preferences. Şeker (2015) states that students preferring meaningful learning obtain more successful results, and thus, individuals should be informed about learning approaches.

Based on the obtained results, it is possible to say that if a learner-oriented structure that takes effective learning approaches as basis is adopted by universities, students' learning orientations may be changed in the direction of meaning-based learning. Prospective teachers should be supported through in-service trainings following the commencement of their active professional teaching life besides their university education. This is because not everyone has the same kind of learning, and each student is unique. In this regard, more productive, more enjoyable, stronger, and more permanent learning can be achieved through methods and techniques that are adopted by an awareness of students rather than conducting straightforward teaching. The study was conducted with the prospective teachers attending a university in the West Black Sea Region of Turkey. It is recommended to administer the learning approach scale to the prospective teachers attending the universities in other regions and to make inter-regional comparisons for the extension of this study, which is considered to light the way for relevant researchers, and for the revelation of other potential results.

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