



Investigation of VARK Learning Styles of Pre-Service Science Teachers in terms of Various Variables

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Abstract

In this study, to reveal the VARK learning styles of pre-service science teachers, to examine them in terms of grade level and gender variables and to get their opinions about VARK was aimed. The study was conducted as triangulation design. 178 (144 women, 34 men) pre-service science teachers were studied. The VARK scale and semi-structured interviews were used. In terms of VARK learning styles, a significant difference was determined between 1st and 2nd grades in favor of 2nd grades, between 1st and 3rd grades in favor of 3rd grades and between 2nd and 4th grades in favor of 2nd grades. Kinesthetic learning style was the most dominant in all grade levels. However, no significant difference was found in terms of gender. The PSTs prefer to learn a subject by reading and writing and to teach the lesson with actions that will make the student active, and that they learn more through reading and writing activities while studying for an exam. The study will contribute to the PSTs to be aware of their own learning styles and to guide their students with different learning methods and techniques when they start to work.

Keywords: Gender, Grade level, Pre-service science teachers, VARK learning style.

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Ethics Declaration:

This study followed all the rules stated to be followed within the “Higher Education Institutions Scientific Research and Publication Ethics Directive” scope. None of the actions specified under the title of “Actions Contrary to Scientific Research and Publication Ethics,” which is the second part of the directive, were not carried out.

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Fen Bilgisi Öğretmen Adaylarının VARK Öğrenme Stillерinin Çeşitli Değişkenlere Göre İncelenmesi

Öz

Bu çalışmada fen bilgisi öğretmen adaylarının VARK öğrenme stillerinin ortaya çıkarılması, sınıf düzeyi ve cinsiyet değişkenleri açısından incelenmesi ve VARK hakkındaki görüşlerinin alınması amaçlanmıştır. Çalışma çeşitleme deseni ile yürütülmüştür. 178 (144 kadın, 34 erkek) fen bilgisi öğretmen adayı ile çalışılmıştır. Veriler VARK ölçeği ve yarı yapılandırılmış görüşmeler ile toplanmıştır. VARK öğrenme stilleri bakımından 1. ve 2. sınıflar arasında 2. sınıflar lehine, 1. ve 3. sınıflar arasında 3. sınıflar lehine ve 2. ve 4. sınıflara arasında 2. sınıflar lehine anlamlı farklılık belirlenmiştir. Ayrıca tüm sınıf seviyelerinde en çok kinestetik öğrenme stili baskın olduğu görülmüştür. Cinsiyet bakımından ise gruplar arasında anlamlı bir farklılık belirlenmemiştir. Fen bilgisi öğretmen adaylarının bir konuyu öğrenmede en çok okuyup yazarak öğrenmeyi ve dersin öğrenciyi aktif kılacak eylemlerle işlenmesini tercih ettikleri ve bir sınava çalışırken daha çok okuma yazma aktiviteleri sayesinde öğrendikleri görülmüştür. Çalışma, öğretmen adaylarının kendi öğrenme stillerinin farkında olmalarına ve göreve başladıklarında öğrencilerine farklı öğrenme yöntem ve teknikleriyle rehberlik etmelerine katkı sağlayacaktır.

Anahtar Kelimeler: Cinsiyet, Fen bilgisi öğretmen adayları, Sınıf seviyesi, VARK stili.

Introduction

The concept of learning includes various definitions according to different approaches. According to behaviorism, learning is defined as a change in behavior with permanent traces through one's own experiences, while according to constructivism, learning is defined as creating schemas in the mind by associating old information with new information (Şaşan, 2002). As the concept of learning is expressed differently in definitions, learning styles may also differ from individual to individual. While some individuals learn better by touching, some learn better by observing and some learn better by hearing. This situation arises from individual differences in learning (Erden & Altun, 2006). In this context, it is necessary to mention the concept of learning style. There are various definitions of learning style. According to Kolb (1984), learning style is defined as an individual's preferred method of perceiving and processing information, while Dunn and Dunn (1993) define learning style as a process arising from differences in environment. It is stated that individuals learn subjects more easily and the learning process is more effective when a teaching environment suitable for learning styles is provided (Felder, 1996). In this context, taking learning styles into consideration will improve the education and training process can be said.

Although there are different opinions about the concept of learning styles, Coffield et al. state that there are more than 70 learning styles. One of these is the modality style. According to this style, individuals have innate or fixed characteristics and that using learning strategies appropriate to their preferred approach will provide more effective learning. According to the modality style, there are four types of learning styles: visual, aural, read/write and kinesthetic (Rolfe & Cheek, 2012). One of the most important scales developed to determine learning styles according to modality style is the VARK model developed by Fleming (1987). In this abbreviation, the English initials of each concept are abbreviated and defined. In the VARK model, in addition to the information exchanges of individuals, the preferences of individuals to process information in the mental process are also tried to be determined (Düzgün, 2018; Hawk & Shah, 2007; Rolfe & Cheek, 2012). In the VARK model, it is possible to measure individuals' visual, auditory, literacy and kinesthetic learning preferences. In the VARK model, visual learners learn best when information is presented in a visual and written form. Aural learners learn best when information is presented verbally. Individuals who learn better with reading and writing are more effective when they learn information by read/write. Kinesthetic learners learn best when they physically perform an activity (Yeşilyurt, 2019).

Determining the learning styles of students with the VARK model will contribute to them in terms of a healthier education and training process. Measuring the learning styles of teachers and pre-service teachers will help them to recognize themselves and increase their awareness, and will contribute to their education and training process by being aware of their learning styles while conducting their lessons (Düzgün, 2018). In this context, it is important to determine the VARK learning styles of teachers and pre-service teachers.

Looking at the studies on the identification and application of VARK learning styles, primary school teachers (Düzgün & Selçuk, 2018), preschool students (Güneş & Erkan, 2017), university students in different faculties (Baykan & Naçar, 2007; Husmann & O'Loughlin, 2019; Karabörklü & Argut et al., 2017; Katırcı & Kırmacı, et al., 2019; Koçak & Büyükdere, 2018; Kurgun & İşıldar, 2016; Marcy, 2001; Thepsatitporn & Pichitpornchai, 2016), non-thesis master's students (Usta, 2019), secondary school students in Turkish course (Ömeroğlu & Onan, 2021) and pre-service computer teachers (Ateş & Altun, 2008). No study was found in which the learning styles of pre-service science teachers (PST) were determined according to VARK and examined in terms of different variables. In the literature, it is generally seen that there are studies on Kolb learning style in determining the learning styles of the PSTs and secondary school students (Biçer, 2010; Bike, 2020; Çoban, 2019; Denizoğlu, 2008; Güçlü, 2020; İpekşen, 2019; Köse, 2010; Sokur, 2018). In this respect, it is thought that this study is different from the literature and will contribute to the relevant literature if completed. In addition, this study will contribute to the PSTs to be aware of their own learning styles and to provide education by taking into account the learning styles of themselves and their students when they start to work.

Research Questions

The general research question of this study:

- What are the VARK learning styles of the PSTs?

Within the framework of the general research question, answers to the following sub-problems will be sought:

1. Do the VARK learning styles of the PSTs differ in terms of grade level variable?
2. Do the VARK learning styles of the PSTs differ in terms of gender variable?
3. What are the views of the PSTs about VARK learning styles?

Method

Research Design

Since quantitative and qualitative data will be collected simultaneously in this study, triangulation design, one of the mixed research approaches, was used. In triangulation design, data are collected and evaluated independently or simultaneously for the purpose of combining or comparing quantitative and qualitative results. Since both methods are complementary to each other, they are equally important (Clark & Inavkova, 2016). It was deemed appropriate to use this design to reveal the VARK teaching styles of the PSTs, to compare them in terms of various variables and to obtain their opinions.

Participants

The sample of the study consisted of 178 (144 women, 44 men) PSTs from an university Science Teacher Education Program. In the selection of the sample to be formed to collect quantitative data, random sampling method was used. In addition, semi- structured interviews were conducted with 8 PSTs to collect qualitative data.

Data Collection Tools

In this study, VARK scale and semi-structured interview form were used as data collection tools. The VARK scale, created by Fleming in 1987 and updated in 2012, aims to determine how people exchange information and what their information processing preferences are and consists of 16

items. The English version of the VARK scale and its validity and reliability studies were conducted by Leite et al. (2010). The scale was translated into Turkish by Kalkan (2008). The validity-reliability study of the scale was carried out by Düzgün (2018). The reliability coefficient of the scale was determined as Cronbach Alpha (α) 0.76. Also, semi-structured interviews were also conducted to obtain the opinions of the PSTs about VARK styles. In this context, a semi-structured interview form was prepared. The interview form includes four open-ended questions and sub-questions about VARK styles. Expert opinion was taken for the validity of the questions and pilot application was made to two PSTs for reliability. Then the interview form was finalized.

Data Analysis

The data obtained from the study were analyzed with quantitative and qualitative data analysis methods. For the VARK scale, firstly, learning styles were scored while scoring. Visual learning style was scored 1 point, aural learning style 2 points, read/write learning style 3 points and kinesthetic learning style 4 points. Here, the scores do not indicate the size or smallness of the styles. It is used to distinguish one from the other. Accordingly, in all 16 questions in the VARK scale, an individual who chooses visual learning style can get 16 points, an individual who chooses aural learning style can get 32 points, an individual who chooses read/write learning style can get 48 points and an individual who chooses kinesthetic learning style can get 64 points. A person can choose options for different learning styles in one question. Accordingly, since a total of 10 points can be obtained from each question, a maximum of 160 points can be obtained in 16 questions in the VARK scale. Interpretations were made according to which learning style the averages of the scores were closer to. After each PST's answers to the VARK scale were analyzed in this way, total scores were calculated. Accordingly, for the analysis of quantitative data, normality values of the data were calculated first. In the calculation of normality, Kolmogorov-Smirnov test was used since the number of the PSTs in all grade levels (1st grade 48 people, 2nd grade 57 people, 3rd grade 39 people and 4th grade 34 people) and the number of the PSTs in terms of gender (women 144 people and men 34 people) were more than 30. According to this, the data of the 1st grades were suitable for normal distribution ($p=.200$, $p>.005$), while the data of the 2nd, 3rd and 4th grades were not suitable for normal distribution ($p=.00$, $p<.005$). For this purpose, Kruskal Wallis test, one of the nonparametric tests, was used for comparison among grades. Mann Whitney U test was used to determine which group was in favor of the difference between the groups. When the normality of the data in terms of gender was examined, the data of women and men were not suitable for normal distribution ($p=.00$, $p<.005$). For this reason, Mann Whitney U test was used for comparison between groups. In addition, effect size values were analyzed. For the analysis of qualitative data, content analysis was performed on the data obtained from the semi-structured interview form, and themes and codes were determined.

Validity and Reliability

In the quantitative part of the study, participants were randomly selected. The VARK scale used in the study is valid and reliable. In addition, the necessary ethical permissions were obtained for the study. Participants were ensured to participate in the study sincerely. The answers of participants who did not answer the entire scale were not evaluated. While developing the interview form in the study, a comprehensive literature review was conducted and validity was increased by obtaining expert opinions. Participants were asked to confirm their opinions in the interviews. In this way, comprehensibility was increased. Direct quotes were given in the findings section without any changes. For reliability, consistency between ratters was examined. The analysis was ensured to be consistent with each other by negotiating the themes suggested by the researchers.

Ethics Declaration

In this study, all the rules specified in the "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed. None of the actions specified in the second section of the directive, "Actions Contrary to Scientific Research and Publication Ethics", were carried out.

Ethics committee permission information

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Results

The data obtained from the study are presented in two parts: the data obtained from the VARK scale and the data obtained from semi-structured interviews.

Findings Obtained from the VARK Scale

For the analysis of the data obtained from the VARK scale, comparisons were made in terms of grade level and gender.

Since the data obtained from the VARK scale were not suitable for normal distribution, the data were analyzed with the Kruskal Wallis test in comparisons among groups. Kruskal Wallis test results are given in Table 1.

Table 1.

Kruskal Wallis test results (grade level)

Groups	N	Mean rank	SD	χ^2	p
1st grade	48	68.95	3	16.802	.001
2nd grade	57	108.81			
3rd grade	39	93.68			
4th grade	34	81.35			

According to the Table 1, there is a significant difference among the groups in terms of learning styles ($\chi^2 = 16.802$; $p < .05$). The η^2 value was determined as 1.59, which indicates a large effect. According to this, especially 2nd graders have more than one learning style. Mann Whitney U test was conducted to determine which groups were in favor of the significant difference. Mann Whitney U test results are given in Table 2.

Table 2.

Mann Whitney U test results (grade level)

Groups	n	Mean Rank	Sum of Ranks	U	p	η^2
1st grade	48	40.28	1933.50	757.500	.000*	.09
2nd grade	57	63.71	3631.50			
1st grade	48	38.49	1847.50	671.500	.024	.03
3rd grade	39	50.78	1980.50			
1st grade	48	39.18	1880.50	704.500	.293	.01
4th grade	34	44.78	1522.50			
2nd grade	57	51.86	2956.00	920.000	.152	.01
3rd grade	39	43.59	1700.00			
2nd grade	57	51.24	2920.50	670.500	.014	.03
4th grade	34	37.22	1265.50			
3rd grade	39	39.31	1533.00	573.000	.319	.01
4th grade	34	34.35	1168.00			

$p < .001$

According to the Table 2, the difference between the 1st and 2nd grades was in favor of the 2nd grades ($U = 757.500$; $p < .05$), a significant difference was determined between 1st and 3rd grades in favor of 3rd grades ($U = 671.500$; $p < .05$) and between 2nd and 4th grades in favor of 2nd grades ($U = 670.500$; $p < .05$). Accordingly, to better understand in which question the learning styles of the PSTs at which grade level were more dominant, the analyses made on the basis of the

question were tabulated and interpretations were made according to this table. The analyses are given in Table 3.

Table 3.
VARK scale question analysis

Questions	Grade	Visual (f, %)	Aural (f, %)	Read- Write (f, %)	Kinesthetic (f, %)
1	1st grade	11 (22,9)	22 (45,8)	13 (27,1)	2 (4,2)
	2nd grade	11 (19,3)	29 (50,9)	18 (31,8)	8 (14)
	3rd grade	6 (15,4)	24 (61,5)	10 (25,6)	3 (7,7)
	4th grade	5 (14,7)	14 (41,2)	14 (41,2)	3 (8,8)
2	1st grade	6 (12,5)	11 (22,9)	6 (12,5)	26 (54,2)
	2nd grade	11 (19,3)	12 (21,1)	8 (14)	34 (59,6)
	3rd grade	3 (7,7)	8 (20,5)	3 (7,7)	29 (74,4)
	4th grade	5 (14,7)	11 (32,4)	1 (2,9)	19 (55,9)
3	1st grade	3 (6,3)	10 (20,8)	8 (16,7)	29 (60,4)
	2nd grade	8 (14)	14 (24,6)	6 (10,5)	37 (64,9)
	3rd grade	8 (20,5)	6 (15,4)	1 (2,6)	25 (64,1)
	4th grade	4 (11,8)	4 (11,8)	2 (5,9)	24 (70,6)
4	1st grade	17 (35,4)	14 (29,2)	1 (2,1)	17 (35,4)
	2nd grade	15 (26,3)	20 (35,1)	5 (8,8)	29 (50,9)
	3rd grade	11 (28,2)	11 (28,2)	0	21 (53,8)
	4th grade	14 (41,2)	9 (26,5)	2 (5,9)	14 (41,2)
5	1st grade	8 (16,7)	29 (60,4)	5 (10,4)	7 (14,6)
	2nd grade	18 (31,8)	29 (50,9)	6 (10,5)	7 (12,3)
	3rd grade	10 (25,6)	28 (71,8)	1 (2,6)	4 (10,3)
	4th grade	10 (29,4)	23 (67,6)	2 (5,9)	1 (2,9)
6	1st grade	10 (20,8)	2 (4,2)	25 (52,1)	12 (25)
	2nd grade	16 (28,1)	6 (10,5)	32 (56,1)	6 (10,5)
	3rd grade	8 (20,5)	8 (20,5)	24 (61,5)	2 (5,1)
	4th grade	6 (17,6)	4 (11,8)	22 (64,7)	4 (11,8)
7	1st grade	8 (16,7)	10 (20,8)	23 (47,9)	7 (14,6)
	2nd grade	6 (10,5)	15 (26,3)	25 (43,9)	15 (26,3)
	3rd grade	7 (17,9)	16 (41)	13 (33,3)	7 (17,9)
	4th grade	8 (23,5)	9 (26,5)	13 (38,2)	6 (17,6)
8	1st grade	18 (37,5)	11 (22,9)	10 (20,8)	9 (18,8)
	2nd grade	18 (31,8)	18 (31,8)	18 (31,8)	10 (17,5)
	3rd grade	13 (33,3)	7 (17,9)	7 (17,9)	16 (41)
	4th grade	14 (41,2)	10 (29,4)	7 (20,6)	8 (23,5)
9	1st grade	18 (37,5)	4 (8,3)	13 (27,1)	13 (27,1)
	2nd grade	17 (29,8)	6 (10,5)	29 (50,9)	18 (31,8)
	3rd grade	10 (25,6)	2 (5,1)	21 (53,8)	9 (23,1)
	4th grade	13 (38,2)	4 (11,8)	16 (47,1)	8 (23,5)
10	1st grade	7 (14,6)	31 (64,6)	6 (12,5)	4 (8,3)
	2nd grade	14 (24,6)	27 (47,4)	13 (22,8)	16 (28,1)
	3rd grade	7 (17,9)	22 (56,4)	7 (17,9)	4 (10,3)
	4th grade	5 (14,7)	20 (58,8)	2 (5,9)	8 (23,5)
11	1st grade	6 (12,5)	28 (58,3)	7 (14,6)	7 (14,6)
	2nd grade	9 (15,8)	30 (52,6)	6 (10,5)	22 (38,6)
	3rd grade	5 (12,8)	20 (51,3)	4 (10,3)	15 (38,5)
	4th grade	4 (11,8)	16 (47,1)	9 (26,5)	8 (23,5)
12	1st grade	7 (14,6)	9 (18,8)	15 (31,3)	19 (39,6)
	2nd grade	5 (8,8)	5 (8,8)	15 (26,3)	37 (64,9)
	3rd grade	5 (12,8)	7 (17,9)	13 (33,3)	15 (38,5)
	4th grade	7 (20,6)	4 (11,8)	10 (29,4)	15 (44,1)

Questions	Grade	Visual (f, %)	Aural (f, %)	Read- Write (f, %)	Kinesthetic (f, %)
13	1st grade	7 (14,6)	14 (29,2)	12 (25)	15 (31,3)
	2nd grade	16 (28,1)	15 (26,3)	18 (31,8)	17 (29,8)
	3rd grade	6 (15,4)	15 (38,5)	12 (30,8)	11 (28,2)
	4th grade	6 (17,6)	7 (20,6)	11 (32,4)	13 (38,2)
14	1st grade	9 (18,8)	11 (22,9)	2 (4,2)	23 (47,9)
	2nd grade	19 (33,3)	8 (14)	8 (14)	35 (61,4)
	3rd grade	4 (10,3)	4 (10,3)	9 (23,1)	23 (59)
	4th grade	9 (26,5)	4 (11,8)	5 (14,7)	19 (55,9)
15	1st grade	9 (18,8)	9 (18,8)	10 (20,8)	19 (39,6)
	2nd grade	22 (38,6)	16 (28,1)	16 (28,1)	23 (40,4)
	3rd grade	15 (38,5)	4 (10,3)	8 (20,5)	16 (41)
	4th grade	12 (35,3)	7 (20,6)	4 (11,8)	14 (41,2)
16	1st grade	11 (22,9)	8 (16,7)	8 (16,7)	20 (41,7)
	2nd grade	17 (29,8)	8 (14)	10 (17,5)	39 (68,4)
	3rd grade	10 (25,6)	5 (12,8)	9 (23,1)	19 (48,7)
	4th grade	5 (14,7)	6 (17,6)	5 (14,7)	23 (67,6)

*In some questions, PSTs marked more than one option.

According to the Table 3, kinesthetic learning style is dominant in all grade levels. The reason for the difference in the grades where there is a difference is that the PSTs made preferences for more than one learning style in the questions. Accordingly, the reason for the significant difference between 1st and 2nd grades is that 2nd graders preferred read/write, aural and visual learning styles as well as kinesthetic learning style in the questions in the VARK scale. The reason why there is a significant difference between 1st and 3rd grades is that 3rd graders prefer aural, visual and read/write learning styles more in addition to kinesthetic learning style to the questions in the VARK scale. The reason for the significant difference between 2nd and 4th grades is that 2nd graders prefer read/write, aural and visual learning styles more in addition to kinesthetic learning style in the questions in the VARK scale.

Mann Whitney U test was performed for the comparison of VARK learning styles of the PSTs in terms of gender variable. The test results are given in Table 4.

Table 4.
Mann Whitney U test results (gender)

Groups	n	Mean rank	Sum of Ranks	U	p	η^2
Woman	144	90,04	12965,50	2370,500	,774	,001
Male	34	87,22	2965,50			

According to the Table 4, there was no difference between groups in the VARK learning styles in terms of gender ($p > .05$).

Findings Obtained from Semi-Structured Interviews

In semi-structured interviews, the PSTs were asked four questions and sub-questions about learning styles. The answers of the PSTs were subjected to descriptive analysis and learning styles were classified in visual, aural, verbal and kinesthetic areas.

In the first question, the PSTs were asked three sub-questions:

"a. How do you learn a subject better? Explain."

"b. What the teacher does in the lesson makes you understand the subject better? Explain."

"c. How do you study for an exam? By reading? By writing? By reading and writing? By listening to someone else? By solving examples? Or in different ways? Do you follow more than one way? Explain."

The answers of the PSTs are presented in Table 5.

Table 5.
Analysis of the first question

Question 1	Visual (f)	Aural (f)	Read- Write (f)	Kinesthetic (f)
Part A	PST6, PST7 (2)	-	PST1, PST3, PST4, PST6, PST7, PST8 (6)	PST2, PST5, PST6 (3)
Part B	PST1, PST6, PST7 (3)	PST1, PST7 (3)	-	PST1, PST2, PST3, PST4, PST5, PST6, PST8 (7)
Part C	PST5, PST7 (2)	PST7 (1)	PST1, PST3, PST4, PST5, PST6, PST8 (6)	PST2, PST4 (2)

According to the Table 5, the PSTs stated that they preferred to learn a subject by reading and writing the most, that the teacher's use of actions that require movement to make the students active while lecturing helped them understand the lesson better, and that they learnt mostly through reading and writing activities while studying for an exam.

Examples of the PSTs' answers related to part A of Question 1 are given.

PST6: "Firstly, I read, then I write, then I read it again and put it in my head."

PST3: "I learn more by writing a subject."

Examples of the PSTs' answers related to part B of Question 1 are given.

PST2: "Explaining the subject by solving questions helps me to understand the subject better."

PST3: "I think it would be more effective if they organize activities in which we can be active and increase our participation in the lesson."

Examples of the PSTs' answers related to part C of Question 1 are given.

PST1: "I study for exams both by reading and writing."

PST4: "In verbal courses, I prepare for exams by first reading, then writing and reinforcing by reading, writing and reinforcing; in numerical courses, I prepare for exams by listening to others, plus solving lots of questions."

In the second question, the PSTs were asked five sub-questions:

"a. How is your visual memory? Can you go to a place without a guide later? Explain."

"b. Do you easily forget things you hear? Explain."

"c. Do you easily forget information you read? Explain."

"d. Do you easily forget information you write? Explain."

"e. When you do a job yourself, do you easily remember how to do that job later? Explain."

The answers of the PSTs are presented in Table 6.

Table 6.
Analysis of the second question

Question 2	Visual (f)	Aural (f)	Read- Write (f)	Kinesthetic (f)
Part A	PST1, PST2, PST3, PST4, PST5, PST6, PST8 (7)			
Part B		PST2, PST3, PST8 (3)		
Part C			PST1, PST2, PST5 (3)	
Part D			PST2, PST3, PST6, PST7 (4)	
Part E				PST1, PST2, PST3, PST4, PST5, PST6, PST7, PST8 (8)

According to the Table 6, the PSTs' visual memory was generally good, their tendency to forget what they heard, read and wrote was high, and they learnt better when they did a task themselves.

Examples of the PSTs' answers related to part A of Question 2 are given.

PST6: "I have a good visual memory. I mean, I am telling you. When I go somewhere, for example to a different city, I think it would be enough for me to go to that city once. I have a good eye."

PST4: "I think that my visual memory is good. I observe that I can move easily even in cities I have visited once before."

Examples of the PSTs' answers related to part B of Question 2 are given.

PST1: "Sometimes I forget."

PST2: "No, I do not forget."

Examples of the PSTs' answers related to part C of Question 2 are given.

PST3: "I can forget something I read, but I do not forget what I write."

PST4: "While the information that I have reinforced is permanent, the information that is only for one reading is usually not permanent. For example, I do not remember almost any author of any book I have read."

Examples of the PSTs' answers related to part D of Question 2 are given.

PST5: "I can forget the information I wrote down. However, if we write something directly and, for example, we only wrote something down, we can forget it, of course, if we write it down and study it again and take notes on it, it will not come out easily. We can say that the information we wrote is incomplete. We need to read a little more."

PST5: "Less, I forget less than what I read."

Examples of the PSTs' answers related to part E of Question 2 are given.

PST2: "No, I will not forget."

PST7: "Definitely."

In the third question, the PSTs were asked three sub-questions:

"a. How much does the information you read from a source help you understand the subject? Is it enough alone? Explain."

"b. Is writing a way you use to express your ideas? Why?"

"c. Do you learn a job better by reading from the source, observing the person doing it, listening to the description of the job or doing it? Explain."

The answers of the PSTs are presented in Table 7.

Table 7.

Analysis of the third question

Question 3	Visual (f)	Aural (f)	Read- Write (f)	Kinesthetic (f)
Part A	PST1 (1)	PST1, PST4 (2)	PST2, PST3, PST4, PST5, PST6, PST7, PST8 (7)	PST4 (1)
Part B		PST3 (1)	PST1, PST2, PST3, PST5, PST6, PST7, PST8 (7)	
Part C	PST1, PST5, PST7 (3)	PST7 (1)	PST5 (1)	PST2, PST3, PST5, PST6, PST7, PST8 (5)

According to the Table 7, the PSTs understand a subject more easily by reading from a source, they benefit from writing while expressing their ideas and they learn better by doing a task personally.

Examples of the PSTs' answers related to part A of Question 3 are given.

PST4: "It will be enough for verbal courses, but for numerical courses it will be good to listen and solve a lot of questions about that subject."

PST8: "No, it is not enough on its own. In order for me to understand it better, I understand it better by writing it down, so I need to write it down."

Examples of the PSTs' answers related to part B of Question 3 are given.

PST6: "Definitely, writing is enough for me to explain my ideas in all aspects, positive and negative."

PST7: "It is a way I use because it is not for nothing that they say that words fly and writing remains. Later, when these people read the writings, they can be more memorable."

Examples of the PSTs' answers related to part C of Question 3 are given.

PST3: "By doing."

PST4: "I learn better by learning by doing for science courses, by listening for math courses and by reading for verbal courses."

In the fourth question, the PSTs were asked two sub-questions:

"a. Which learning style do you feel more dominant: Visual? Auditory? Reading and writing? Kinesthetic? Explain."

"b. Are you dominant in more than one learning style? Explain."

The answers of the PSTs are presented in Table 8.

Table 8.

Analysis of the third question

Question 4	Visual (f)	Aural (f)	Read- Write (f)	Kinesthetic (f)
Part A	PST1, PST3, PST6, PST7, PST8 (5)	PST3, PST6 (2)	PST4, PST7 (2)	PST2, PST4, PST5, PST6, PST7, PST8 (6)
Part B	PST3, PST6, PST8 (3)	PST6 (1)	PST1, PST4 (1)	PST2, PST4, PST6, PST7, PST8 (5)

According to the Table 8, the PSTs have kinesthetic and visual learning styles more. Examples of the PSTs' answers related to part A of Question 4 are given.

PST2: "Kinesthetic."

PST3: "Visual and auditory."

Examples of the PSTs' answers related to part B of Question 4 are given.

PST6: "Visual, auditory, kinesthetic. I think that if these three are blended, learning will be more permanent and better."

PST7: "I can say that I am more dominant in kinesthetic."

Conclusion and Discussion

In the VARK scale, there was a significant difference among the groups in terms of grade level variable ($p < .05$). Accordingly, especially 2nd graders had more than one learning style. A significant difference was determined between 1st and 2nd grades in favor of 2nd grades, between 1st and 3rd grades in favor of 3rd grades and between 2nd and 4th grades in favor of 2nd grades. In addition, kinesthetic learning style was the most dominant in all grade levels. With this result, it can be inferred that the PSTs are more prone to learning by doing and experiencing and that they

can use this style in their own lectures. Looking at Dale's experience topic, it is stated that sense organs are essential in learning, but that something is more permanent when it is learned by doing and experiencing it personally. In this respect, the fact that learning by doing and experiencing is at the forefront among learning styles can be associated with this situation.

In some grades, there was a difference in the preference of learning styles. It is thought that the reason for the difference in the grades where there was a difference was that the PSTs preferred more than one learning style in the questions. According to the theory of multiple intelligences, a person can learn in many different ways. Every type of intelligence is present in every person, but some are more dominant (Gardner, 1983). In this context, if we associate learning styles with intelligence, it is not surprising that multiple ways of learning are preferred. Different styles can be used according to the learned subject and the learner's characteristics. Therefore, the results support this situation. There are studies suggesting that multiple intelligences can be associated with learning styles (Ahmadian & Hosseini, 2012; Klein, 2003; McMahon et al., 2004; Şener & Çokçalışkan, 2018). Accordingly, the reason for the significant difference between the 1st and 2nd grades is that the 2nd grades responded to the questions in the VARK scale. The first year of undergraduate education is a year of adjustment for students. In this respect, while trying to adapt to university life, students also try to understand the courses offered in the department. Again, students in the first year encounter more field courses and still need to go into detail in education-related courses. It is thought that this situation affects their self-evaluation regarding learning styles. When they move to the 2nd grade, they take some of the applied courses, learn the field courses at the primary level, and see more education-related courses. This situation makes it easier for them to realize their learning styles.

In addition to kinesthetic learning style, they also prefer read/write, aural and visual learning styles. Reading is the first step in the learning process, and reading from the source is necessary to realize other stages, such as writing and practice. In this respect, learning by reading is expected to be at the forefront. Learning by writing is especially important in the Turkish education system. Writing is used at the K-12 level, especially in numerical courses such as mathematics and science and in courses that require language skills such as Turkish. This situation affects students' learning styles and may cause them to prefer writing as a learning style when they reach the undergraduate level. In the study, it was accepted that individuals who prefer reading and writing learn by reading and taking the necessary notes to increase the retention of information in their minds and to better comprehend it. Learning by hearing is the most common learning style, especially in countries where teacher-centered practices are more common. This is because individuals who are used to learning by listening to a source will want to continue their habits in their subsequent learning. When the PSTs who prefer visual learning style learn information, they learn more meaningfully when the information is expressed with figures, graphics, pictures and videos. It was concluded that the PSTs who prefer aural learning style comprehend better with voice recordings, verbal expression, etc. while learning information.

Grade 2 PSTs also include these characteristics and the significant difference is in line with the scope of the study. The fact that 1st grade PSTs do not prefer different learning styles besides kinesthetic learning style suggests that they use some styles more dominantly while learning subjects. The reason for the significant difference between 1st and 3rd grades is thought to be that 3rd graders prefer aural, visual and read/write learning styles more than kinesthetic learning style in the questions in the VARK scale. Again, 3rd grade PSTs are more dominant than 1st grade PSTs in different learning diversities that are thought to be used in realizing their learning and in their future lectures. The reason for the significant difference between 2nd and 4th grades is thought to be that 2nd graders prefer read/write, aural and visual learning styles more than kinesthetic learning style in the questions in the VARK scale. In addition to visual, read/write and aural learning styles; it was understood that the PSTs at all grade levels learn better by learning by doing - experiencing, experimenting, making models and making their learning permanent. It was concluded that 1st and 4th grade PSTs did not prefer different learning styles very much. Within

these results, 2nd and 3rd grade PSTs will be providing permanent learning with different materials and different sensory organs.

There was no difference between groups in terms gender ($p > .05$). The fact that the styles preferred by both women and men PSTs at each grade level to learn the subjects better were similar did not significantly change the learning preferences required to understand and explain the subjects in the future. It is thought that the emotional, hormonal, etc. characteristics they have due to their gender may be due to the fact that VARK does not cause a change in learning styles. Therefore, in this study, it is shown that the PSTs can have similar learning styles regardless of their gender. Similar to the results of this study, Sünbül & Yağışan (2009) concluded that the differences of both departments and class level affected the learning styles of the pre service teachers. It was concluded that gender had no effect. Again, Bahar & Sülün (2011) found no connection between gender and learning style in their study. In addition, no significant difference was found between students' academic achievement in terms of their learning style. In the study conducted by Usta (2019), the participants mostly preferred kinesthetic learning style. At the same time, pre service teachers also preferred multiple learning styles. It was concluded that the most preferred learning style in multiple learning styles was VARK, which covers all of them with the most preferred scope.

In the study of Düzgün & Kaşkaya (2023), in which they examined the attitudes of pre-service teachers towards online learning and the relationship of these attitudes with their achievements, department, grade level, gender and learning styles, a significant difference was found between the pre-service teachers who preferred visual and reading-writing styles in favor of the pre-service teachers with kinesthetic preference and throughout the online learning scale. Generally, studies have been conducted in different departments or teaching fields, multiple intelligence learning styles, combining online learning with VARK learning style and Kolb learning style inventory are used in the studies. Again, in the field of science, Kolb learning inventory and multiple learning styles were used, but a study on VARK learning styles with VARK learning style scale was not found in the literature. In this respect, this study is different from the literature. This study will be contributing to the related literature. At the same time, when compared with other studies in the literature, kinesthetic learning style is dominant in other studies and there is no difference between groups in terms of gender.

The findings of the semi-structured interviews were interpreted as follows: In the first question of the interview, the PSTs mostly preferred "learning by reading and writing and teaching the lesson with actions that will make the student active" in learning a subject. According to this, both read/write and kinesthetic learning styles of the PSTs are dominant and according to these styles, they understand the lessons better and make them permanent. It is thought that the preference for learning by reading and writing over learning by doing is due to the fact that these practices more actively involve individuals in the process. In the second question, the PSTs' visual memory is generally good, but the rate of forgetting information by hearing, reading or writing is high. At the same time, when they do the work themselves, better and permanent learning is provided. According to this, the predominance of visual learning styles of the PSTs strengthens their memory and reduces the possibility of forgetting, and the predominance of kinesthetic learning styles can lead to healthy learning with their own experiences. The literature also states that people remember more what they see and hear (Dale, 1969; Yanpar, 2012; Yılmaz ve Tuncer, 2020). In the third question, the PSTs understand a subject more easily by reading from the source, benefit from writing while expressing their ideas and learn better by doing a job personally. According to this, it would be in favor of the PSTs with dominant read/write learning style to deal with a subject or situation that needs to be learnt in a comprehensive way and to scan the sources to learn both well and easily. Again, the use of write learning style to relieve oneself and make explanations without speech or figures while expressing opinions facilitates the work of the PSTs. According to this, kinesthetic learning styles are predominant in doing the work and they can make healthy learning with their own experiences. In the fourth question, the PSTs stated that they were more dominant in kinesthetic and visual learning. What is noteworthy here is that

the 1st -3rd grade PSTs expressed themselves better than the 4th grade PSTs at the end of the study, gave more clear and understandable answers, used their language knowledge well, realized the dominant learning styles in themselves and concluded that they could use them in the future.

As a result, the PSTs prefer kinesthetic learning, which is one of the VARK learning types, more in science learning in this study. The gender variable did not affect learning style preferences. According to the interview results, the PSTs prefer to learn a subject by reading and writing and to teach the lesson with actions that will make the student active and that they learn more through reading and writing activities while studying for an exam; that their visual memory is generally good, that they have a high tendency to forget what they hear, read and write and that they learn better when they do a job themselves; that they understand a subject more easily by reading from a source, that they benefit from writing while expressing their ideas and that they learn better by doing a job themselves; and that they have kinesthetic and visual learning styles more.

Although these results are limited to 178 PSTs studying at the faculty of education of a state university, it is thought that the results obtained are different from the literature and will contribute to the related literature. In addition, this study will contribute to the PSTs to be aware of their own learning styles and to provide education by considering the learning styles of themselves and their students when they start to work.

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Extended Abstract

Giriş

Öğrenme stilleri, bireyden bireye öğrenme farklılığı gösterebilmektedir. Kimi bireyler dokunarak daha iyi öğrenirken, kimi bireyler gözleyerek kimileri de işiterek daha iyi öğrenirler (Erden ve Altun, 2006). Bu bağlamda, öğrenme stili kavramına değinmek gerekmektedir. Kolb'a (1984) göre, öğrenme stili bilgiyi algılama ve işlemede bireyin tercih ettiği yöntem olarak tanımlanırken, Dunn ve Dunn (1993) ise öğrenme stilini ortam farklılıklarından kaynaklanan bir süreç olarak tanımlamaktadırlar. Öğrenme stillerine uygun bir öğretim ortamı sağlandığında bireylerin konuları daha kolay öğrendikleri ve öğrenme sürecinin daha etkili olduğu ifade edilmektedir (Felder, 1996). Bu bağlamda, öğrenme stillerinin dikkate alınmasının eğitim-öğretim sürecini iyileştireceği söylenebilir.

Öğrenme stilleri kavramı ile ilgili farklı görüşler olmakla birlikte, Coffield ve arkadaşları 70'den fazla öğrenme stili olduğunu ifade etmektedir. Bunlardan biri de yaklaşım stildir. Bu stile göre bireylerin doğuştan gelen ya da sabit özellikleri olduğu ve bireylerin tercih ettikleri yaklaşıma uygun öğrenme stratejilerini kullanmalarının daha etkili öğrenmeler sağlayacağı farz edilmektedir. Yaklaşım stiline göre görsel (visual), işitsel (auditory), okuma-yazma (read) ve kinestetik (kinesthetic) olmak üzere dört türde öğrenme stili vardır (Rolfe ve Cheek, 2012). Yaklaşım stiline göre öğrenme stillerini belirlemek için geliştirilen en önemli ölçeklerden biri de Fleming (1987) tarafından geliştirilen ve 2012 yılında güncellenen VARK ölçeğidir (Düzgün, 2018). VARK'a göre bireylerin bilgi alışverişlerinin yanı sıra bilgiyi zihinsel süreçte işleme tercihleri de belirlenmeye çalışılmaktadır (Düzgün, 2018; Hawk ve Shah, 2007). VARK'da bireylerin görsel, işitsel, okuma-yazma ve kinestetik öğrenme tercihlerini ölçmek mümkündür. VARK modelinde görsel öğrenen bireyler bilgi görsel ve yazılı bir şekilde sunulduğunda en iyi şekilde öğrenirler. İşitsel öğrenen bireyler bilgi sözel olarak sunulduğu zaman en iyi şekilde öğrenirler. Okuma-yazma ile daha iyi öğrenen bireyler bilgileri yazarak ve okuyarak öğrendiklerinde daha etkili olur. Kinestetik öğrenen bireyler ise bir faaliyeti fiziksel olarak yaptıkları zaman en iyi şekilde öğrenirler (Yeşilyurt, 2019). VARK ile öğrencilerin öğrenme stillerinin belirlenmesi, onlara daha sağlıklı bir eğitim-öğretim süreci açısından katkı sağlayacaktır. Öğretmenlerin ve öğretmen adaylarının öğrenme stillerinin ölçülmesi ise kendilerini tanımaları ve farkındalıklarının artmasına yardımcı olacak, derslerini yürütürken öğrenme stillerinin farkında olarak bir eğitim-öğretim süreci geçirmelerine katkı sağlayacaktır (Düzgün, 2018). Bu bağlamda öğretmenlerin ve öğretmen adaylarının VARK öğrenme stillerinin tespiti önemlidir.

VARK öğrenme stillerinin tespiti ve uygulamasına dönük çalışmalara bakıldığında, sınıf öğretmenleri (Düzgün ve Selçuk, 2018), okul öncesi öğrencileri (Güneş ve Erkan, 2017), farklı fakültelerdeki üniversite öğrencileri (Baykan ve Naçar, 2007; Husmann ve O'Loughlin, 2019; Karabörklü Argut, Mustafaoğlu, Kuş ve RazakÖzdinçler, 2016; Katırcı Kırmacı, vd., 2019; Koçak Büyükdere, 2018; Kurgun ve Işıldar, 2016; Marcy, 2001; Thepsatitporn ve Pichitpornchai, 2016), tezsiz yüksek lisans öğrencileri (Usta, 2019), Türkçe dersinde ortaokul öğrencileri (Ömeroğlu, 2021) ve bilgisayar öğretmen adayları (Ateş ve Altun, 2008) ile yürütüldüğü görülmüştür. Fen bilgisi öğretmen adaylarının öğrenme stillerinin VARK'a göre belirlendiği ve farklı değişkenlere göre incelendiği bir çalışmaya rastlanmamıştır. Literatürde genellikle fen öğretmen adayları ve ortaokul öğrencilerinin öğrenme stillerinin belirlenmesinde Kolb öğrenme stiline yönelik çalışmalar olduğu görülmektedir (Biçer, 2010; Bike, 2020; Çoban, 2019; Denizoğlu, 2008; Güçlü, 2020; İpekşen, 2019; Köse, 2010; Sokur, 2018). Bu bakımdan bu çalışmanın ilgili literatüre katkı sağlayacağı düşünülmektedir. Bu çalışmada fen bilgisi öğretmenliği programında öğrenim gören

öğretmen adaylarının VARK öğrenme stillerinin ortaya çıkarılması, sınıf seviyesi ile cinsiyet değişkenine göre incelenmesi ve VARK'la ilgili görüşlerinin alınması amaçlanmıştır.

Yöntem

Bu çalışmada karma araştırma yaklaşımlarından çeşitleme deseni kullanılmıştır. Araştırmanın örneklemini bir üniversitenin fen bilgisi öğretmenliği programında öğrenim gören 178 (144 kadın, 34 erkek) öğretmen adayı oluşturmuştur. Ayrıca 8 fen bilgisi öğretmen adayı ile yarı yapılandırılmış görüşmeler gerçekleştirilmiştir. Verileri Fleming tarafından 1987'de oluşturulan ve 2012'de güncellenen VARK ölçeği ve yarı yapılandırılmış görüşmeler ile toplanmıştır. Veri analizinde Kruskal Wallis ve Mann Whitney U testi ile içerik analizi kullanılmıştır.

Bulgular

VARK öğrenme stillerinde sınıf seviyesi bakımından 1. ve 2. sınıflar arasında 2. sınıflar lehine, 1. ve 3. sınıflar arasında 3. sınıflar lehine ve 2. ve 4. sınıflara arasında 2. sınıflar lehine anlamlı farklılık belirlenmiştir ($p < .05$). VARK ölçeği soru analizine göre; tüm sınıf seviyelerinde en çok kinestetik öğrenme stiline baskın olduğu görülmüştür. Bununla birlikte, cinsiyete göre bir farklılaşma belirlenmemiştir ($p > .05$). Yarı yapılandırılmış görüşmelere göre; fen bilgisi öğretmen adaylarının bir konuyu öğrenmede en çok okuyup yazarak öğrenmeyi ve dersin öğrenciyi aktif kılacak eylemlerle işlenmesini tercih ettikleri ve bir sınava çalışırken daha çok okuma yazma aktiviteleri sayesinde öğrendikleri; görsel hafızalarının genelde iyi olduğu, duydukları şeyleri, okudukları ve yazdıkları bilgileri unutma eğilimlerinin yüksek olduğu ve bir işi bizzat kendileri yaptıklarında daha iyi öğrendikleri; bir konuyu kaynaktan okuyarak daha kolay anladıkları, fikirlerini ifade ederken yazmadan faydalandıkları ve bir işi bizzat yaparak daha iyi öğrendikleri; kinestetik ve görsel öğrenme stillerine daha çok sahip oldukları ortaya konmuştur.

Sonuç ve Tartışma

Sonuç olarak, sınıf seviyesi bakımından farklılıklar görülmüştür. Fark görülen sınıflarda farkın nedeni, öğretmen adaylarının sorularda birden çok öğrenme stiline yönelik tercih yapmış olmaları düşünülmektedir. Ayrıca bu çalışmaya göre fen bilgisi öğretmen adayları VARK öğrenme türlerinden kinestetik öğrenmeyi daha fazla tercih etmektedir. Bu sonuca göre öğretmen adaylarının yaparak yaşayarak öğrenmeye daha yatkın oldukları, kendi ders anlatımlarında da bu stili kullanabilecekleri çıkarımında bulunulabilir. Usta (2019) tarafından yapılan çalışmada katılımcıların tercihini en çok kinestetik öğrenme stiline yana kullandıkları görülmüştür. Cinsiyet değişkeni öğrenme stili tercihlerini etkilememiştir. Her sınıf seviyesinde hem kadın hem de erkek öğretmen adaylarının konuları daha iyi öğrenmek için tercih ettikleri stillerin benzer şekilde olması, cinsiyetlerinin konuları anlamak ve ileride anlatmak için gereken öğrenme tercihlerini anlamlı şekilde değiştirmemiştir. Cinsiyetleri gereği sahip oldukları duygusal, hormonal vb. özellikler VARK öğrenme stilleri üzerinde değişmeye sebep olmamasından kaynaklı olabileceği düşünülmektedir. Sünbül ve Yağışan (2009) da sınıf seviyesinin öğretmen adaylarının öğrenme stillerini etkilediği, cinsiyetin ise bir etkisinin olmadığı sonucuna ulaşmışlardır. Görüşme sonuçlarına göre, öğretmen adayları bir konuyu okuyarak ve yazarak öğrenmeyi ve dersin öğrenciyi aktif kılacak eylemlerle işlenmesini tercih etmekte ve sınava çalışırken okuma ve yazma etkinlikleriyle daha çok öğrendiklerini belirtmektedirler; Görsel hafızalarının genellikle iyi olduğunu, duyduklarını, okuduklarını ve yazdıklarını unutma eğilimlerinin yüksek olduğunu ve bir işi kendileri yaptıklarında daha iyi öğrendiklerini; bir konuyu kaynaktan okuyarak daha kolay anladıklarını, fikirlerini ifade ederken yazmaktan faydalandıklarını ve bir işi kendileri yaparak daha iyi öğrendiklerini; daha çok kinestetik ve görsel öğrenme stillerine sahip olduklarını belirtmişlerdir.