BUEFAD | 2021, Volume 10, Issue 1, 1-17
Bartın University Journal of Faculty of Education
dergipark.org.tr/buefad
DOI: 10.14686/buefad.754599

A Study of Eight-Grade Students' Science Learning Styles in Terms of Some Variables

Nazlıcan Durukan [a], Oktay Kızkapan [b*], & Oktay Bektaş [c]

a, Science Teacher, Ministry of National Education, (http://orcid.org/0000-0001-7865-458X)
b, Asst. Prof. Dr., Nevşehir Hacı Bektaş Veli University, (http://orcid.org/0000-0001-6781-9879) *okizkapan@nevsehir.edu.tr
c, Assoc. Prof. Dr., Erciyes University, (http://orcid.org/0000-0002-2562-2864)

Research article | Received: 18.6.2020 | Revised: 1.10.2020 | Accepted: 2.10.2020

Abstract

The aim of this study is to examine the science learning styles of eighth grade students in terms of gender, having a study room, having internet access and future expectation variables. For this purpose, survey design was used. The sample of the study consisted of 584 eighth grade students in Kayseri. Grasha Reichmann Learning Styles Scale developed in 1996 and adapted to Turkish by Vural (2013) was used as a data collection tool. In the analysis of the data, descriptive statistical techniques and cross-table analysis were performed. It has been found that the students use collaborative and competitive learning styles at a high level and they use independent, dependent, avoidant, and participative learning styles at moderate level. In addition, while the dominant learning style of most of the students is dependent learning style. In terms of demographic variables, students' learning style preferences differ in terms of gender, having internet access, and future expectation, but it does not differ in terms of having an independent study room variable.

Keywords: Science learning styles, science education, elementary students

Sekizinci Sınıf Öğrencilerinin Fen Öğrenme Stillerinin Bazı Değişkenler Açısından İncelenmesi

Öz

Bu çalışmanın amacı sekizinci sınıf öğrencilerinin fen öğrenme stillerini bazı değişkenler açısından incelemektir. Bu amaçla tarama deseni kullanılmıştır. Araştırmanın örneklemini Kayseri'deki 584 sekizinci sınıf öğrencisi oluşturmuştur. Veri toplama aracı olarak Grasha Reichmann Öğrenme Stilleri Ölçeği kullanılmıştır. Verilerin analizinde tanımlayıcı istatistiksel teknikler ve çapraz tablo analizi yapılmıştır. Öğrencilerin işbirlikçi ve rekabetçi öğrenme stillerini yüksek düzeyde kullandıkları ve bağımsız, bağımlı, çekingen ve katılımcı öğrenme stillerini orta düzeyde kullandıkları bulunmuştur. Buna ek olarak, öğrencilerin çoğunun baskın öğrenme stili bağımlı öğrenme stilidir. Demografik değişkenler açısından öğrencilerin öğrenme stili tercihleri cinsiyete, internet erişimine ve geleceğe yönelik beklentilere göre farklılık gösterirken, bağımsız bir çalışma odası değişkenine sahip olmaları açısından farklılık göstermemektedir.

Anahtar kelimeler: Fen öğrenme stilleri, fen eğitimi, ortaokul öğrencileri

To cite this article in APA Style:
Durukan, N., Kizkapan, O., & Bektas, O. (2021). Investigation of Eight-Grade Students Science Learning Styles in Terms of Some Variables. *Bartın University Journal of Faculty of Education, 10*(1), 1-17. https://doi.org/10.1016/buefad.754599

1 | INTRODUCTION

Education plays many important roles for a country to develop and reach the level of contemporary civilizations. Today's education systems are expected to bring up individuals who know how to learn in the information age. If this expectation is not met adequately, the contribution of education to the development of the country may decrease. In other words, as expressed in the Alvin Toffler's famous phrase "The illiterate of the 21st century will not be those who cannot read or write, but those who cannot learn, unlearn and relearn" (as cited in Bennett, 2015:389), if people are not learned how to learn, the contribution of education to development will reduce significantly (Balay, 2004; Toffler, Toffler, & Gibson, 2011). The first question that comes to mind in terms of how learners will learn is whether people have different learning styles. Since each person is unique, people's learning styles may also differ from each other (Pashler, McDaniel, Rohrer & Bjork, 2008). At this point, it is important to understand the learning styles of individuals (Boydak, 2015).

Knowing how to learn is also necessary for students to eliminate the obstacles they may face in their lives (Pashler et al., 2008; Toffler et al., 2011). At this point, it is very important what kind of learning philosophy students will be adopted at schools. Considering the Turkish education system, constructivist philosophy is taken as a base for active learning (Çelik, 2006). In this learning approach, considering the individual differences, knowledge is expected to be created actively by students. At the same time, teachers are expected to know their students' learning styles and plan their teaching processes accordingly (Pritchard, 2013). In parallel to this, number of researches conducted on learning styles has increased in Turkey after adopting constructivist learning approach in 2004. The reason of this increase is that constructivism puts forward an understanding that takes into account the learner characteristics. Learning style is one of these characteristics (Cevher & Yıldırım, 2020). Therefore, this study is important as it will provide information to teachers who want to apply the constructivist philosophy in their lessons effectively. According to the constructivist philosophy, students must functionalize their brains to be active in learning processes because the right and left lobes of the brain affect learning and learning styles. The right and left lobes of the brain are interconnected, and these lobes instantly know what each other is doing. These lobes generally have different tasks such as speaking, understanding, counting, reasoning, imagining, finding complex connections, and perceiving patterns. Thus, an education system should not prioritize a teaching process in such a way as to activate only one lobe. When this happens, students' differences are ignored. Also, studies show that teaching based on learning styles increases the academic success of students more than teaching without considering learning styles (Dikmen & Tuncer, 2020). For this reason, lessons should be planned according to students' learning styles to support brain development and increase achievement (Çift & Canan, 2017; Santrock, 2018). Therefore, this study is expected to shed light on the teachers who want to carry out their teaching effectively.

It is believed that learning styles of individuals will provide them with lifelong contributions that will not only be limited to school. Individuals who are aware of their learning styles can construct knowledge and make effective plans for their goals (Carroll, 2001). However, at the point we have reached today, students cannot recognize themselves. They go to schools that are not suitable for them and become unhappy individuals who do the jobs they do not like. If this cycle can be prevented, efficient, productive, and happy individuals can be brought up (Güven & Kürüm, 2006; Toffler, Toffler, & Gibson, 2011). In this respect, this study is expected to guide parents, teachers, and researchers who want to raise effective and happy individuals.

In the literature, some different models and approaches explain the learning styles of individuals (Bayırlı, Orkun & Bayırlı, 2019). Some of these are Dunn and Dunn (1978) model, Honey and Mumford (1986) model, Felder and Silverman (1988) model, Grasha and Reichmann (1982) model, Gregorc and Butler (1984) model, and Kolb's (1984) model. This study was carried out based on the Grasha-Reichmann model as it is more suitable for the target population of the research. Grasha and Riechmann

(1982) have identified six different learning styles. These styles were named as "independent", "dependent", "avoidant", "participative", "collaborative" and "competitive" (Grasha, 2002). Students with the independent learning style prefer to study alone and to learn on their own. They want to do their lesson projects and activities independently rather than with other students (Diaz & Cartnal, 1999). They are good at directing themselves and maybe inadequate in group works (Koçak, 2007). Students using dependent learning style rely on authorities and guidelines. Instead of creating their own ideas, they want to search for specific answers and directions. Their curiosity is at a very low level. They cannot overcome the uncertainty. They only do what they are asked to do. However, they can cope with anxious and stressful situations (Öztekin, 2012). Students using avoidant learning style rarely participate in the activities (Amira & Jelas, 2010). Feedback to avoidant individuals may remind them of their failures. Since they do not set high goals for themselves, they cannot be in a productive position. They avoid stress (Öztekin, 2012). Students with the participative learning style want to take an active part in the learning process. They like to share their ideas and talents with their friends. They prefer to be in the group and cooperate with their teachers (McColgin, 2000). They want to take the highest level in activities and group work in the classroom. They are willing to succeed, respect authority. They can put their own needs in the background for others (Mete, 2013). Students who have the collaborative learning style believe that they can learn by sharing their ideas and opinions with others. They are in communication with their teachers. They can take part in small group works (Baneshi, Karamdoust, & Hakimzadeh, 2013). These students learn with fun and are aware of their responsibilities. They have difficulty in individual studies (Yılmaz, 2014). Students with competitive learning styles strive to perform better than their friends. They like to lead the discussions (Malik, Shaheen, & Aurangzeb, 2019). These students' motivation level and desire for success are high. It is difficult for them to work and collaborate with a group. They may have problems with non-competitive students (Koçak, 2007).

Learning styles of students may be affected by a variety of variables directly or indirectly. One of these variables is gender. It is seen in the literature that researches are conducted to examine the change of learning styles by gender. In these studies, there are some results reporting that learning styles differ according to gender (Aktürk, 2014; Mete 2013; Öztekin, 2012), as well as results showing that learning styles are gender independent (Alaçayır, 2011; Bagav, 2015; Kaleci, 2012; Koçyiğit, 2011 ; Köroğlu, 2015; Özer, 2008). According to results of a literature review conducted by Cevher and Yıldırım (2020), among 54 studies on the relation between learning styles and gender, 21 of them reported a relation between gender and learning styles and 33 of them reported no relation. Therefore, considering that differences such as perception and interest arising from gender will also affect learning style, it can be said that new studies are needed to eliminate the ambiguity in this issue. Another variable that may have an impact on learning styles may be socio-economic levels. The learning styles of students who continue their education life in an environment with rich educational opportunities may also differ. In some studies on this aspect (Keleşoğlu; 2011; Toğrul, 2014), it is stated that students who have an independent study room, for example, have improved learning styles. There are also results that there is no significant relationship between learning styles and socio-economic level (Kural; 2009). Another variable that may have an impact on learning styles is to have internet access. As a matter of fact, Keleşoğlu (2011) concluded that there is a significant difference in the learning styles of students with internet access in their homes compared to those who do not. In addition, individuals' future expectations may also be a variable that affects their learning styles because they plan and organize their work according to the goals they set. Future expectation can be defined as the thoughts, attitudes and concerns about the future that individuals expect to realize in their future lives (Güngör, 2020). Adolescents' future expectations of can be examined under three dimensions. These dimensions can be listed as career expectations, expectations for family and expectations for emotional relationships (Greene, 1986; as cited in Yavuzer, Demir, Meşeci & Sertelin, 2005). The focus of this study is educational expectations of eight grades students which is a sub-dimension of career expectation. It is stated in the literature that

students who aim to continue higher education have expectations about the choice of profession. However, others who do not aim to continue higher education are more concerned about finding a job and making money. Thus, whether students continue their higher education or not is very effective in shaping their perspective on life (Kandiko & Mawer, 2013; as cited in Güngör, 2020). Therefore, we think that future expectation in education can affect students' learning styles. However, no study investigating how the learning styles of students change according to the future expectation in education was found in the literature review. In addition, a study examining the learning styles of students in science classes has not been found with a measurement tools developed or adapted specifically for the science course. Therefore, it can be said that the study will contribute to the literature, as it will provide experimental evidence both for the different results in the literature and the learning styles used in the science course.

This study was carried out for the stated reasons. It was aimed to determine the science learning styles of 8th-grade students according to certain demographic variables (gender, having their own study room, having internet access, future expectation). For this purpose, answers to the following questions were sought.

1. At what level are science learning styles used by eighth grade students?
2. What are the dominant science learning styles of the eighth grade students?
3. Do the eighth-grade students' science learning styles differ by gender?
4. Do the eighth-grade students' science learning styles differ by having a study room?
5. Do the eighth-grade students' science learning styles differ by having internet access?
6. Do the eighth-grade students' science learning styles differ from their future expectation in education?

2 | METHOD

RESEARCH DESIGN

In this study, survey design, which is one of the quantitative research method designs, was used. In survey research, researchers are interested in distribution of a certain thought or a feature (Fraenkel & Wallen, 2006). Survey design is used in the research since the aim is to examine the eighth-grade students' science learning styles.

POPULATION AND SAMPLE

The accessible population of the research is the eighth-grade students studying in Melikgazi district of Kayseri. The sample of the study consisted of 584 eighth grade students who were determined by taking into account the 10% of the population and the number of items in the scale. The sampling unit in the research is the schools in the Melikgazi district, and the observation unit is the students studying in these schools. Therefore, cluster sampling was used in the research (Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2011). The reason for the study to be carried out with the eighth grade students is that they are in the transition phase from primary to secondary education. In this way, it is aimed to provide information about the science learning styles of students who are in the transition from primary to secondary education.

DATA COLLECTION TOOLS

Grasha-Reichmann Learning Style Scale was used. This scale was developed by Anthony F. Grasha and Sherly W. Reichmann (Grasha, 1996). The scale was preferred because this scale was used in studies conducted with similar age groups with the current research (Koçak, 2007). The adaptation studies of the Grasha-Reichmann Learning Style Scale to Turkish were carried out by different researchers (Cengizhan,

2006; Koçak, 2007; Sarıtaş and Süral, 2010, Vural, 2013; Zereyak, 2005). In this study, the form of the scale adapted to Turkish by Vural (2013) was used. The Grasha-Reichmann Learning Style Scale is prepared on six different learning styles and consists of six dimensions as independent, avoidant, collaborative, dependent, competitive, and participative. The original scale consists of a five-point Likert-type 60 item with ten items measuring each dimension (Sarıtaş & Süral, 2010). In an adaptation study conducted by Vural (2013), the six-dimensional structure of the scale was preserved, but some items were removed from the scale. Vural (2013) revealed a structure consisting of six dimensions and 32 items. Confirmatory factor analysis (CFA) was performed to verify the structure revealed by Vural (2013) before using it in the current study. As a result of the CFA, three items were removed from the scale and the scale structure consisting of 29 items was confirmed. The fit indexes of the scale (x2 / sd = 1.64; GFI = .912; AGFI = .893; CFI = .896; RMSEA = .039) are at an acceptable level (Seçer, 2018).

After the scale structure was confirmed, interviews were conducted with two experts who had scale development studies in science education in order to increase the content validity of the scale. In these interviews, it was decided to adapt the items in the scale to the science course. Thus, the word "in lessons" in each item has been changed to "in science lessons". After the adaptation, the scale was presented to the opinions of an expert in science education, two science teachers and one school counselor. As a result of the expert evaluation, it was decided that the scale is suitable for eighth grade students and can be used to determine the science learning styles. Thus, the face validity of the scale was also provided.

Within the scope of the criterion validity, the original version of the scale was applied to 186 individuals corresponding approximately to one third of the sample. Based on the data obtained, the correlation between the two scales was examined. As a result of Pearson correlation analysis, it was observed that there was a positive and significant correlation between the scale used in the research and the original scale ($r = 0.789$ and $p < 0.05$). Therefore, the criterion validity of the scale was provided.

After the validity studies, reliability was checked. In this context, the Cronbach Alpha coefficient was calculated as 0.780. Cronbach's alpha value varies from 0 to 1, and as this value approaches 1, the reliability of the scale increases (Fraenkel & Wallen, 2006). Accordingly, considering the value obtained in the study, it can be said that the scale is reliable. The scale dimensions in the final form and the items in each dimension are given in Table 1. Although there are 29 items in the scale, the original scale numbers were preserved in the item numbering for the researchers who wanted to compare the scale with the original form.

Table 1. Information about the data collection tool

Dimensions	Items
Independent	7, 25, 37
Avoidant	2, 20, 26, 32, 38, 50
Cooperative	3, 27, 39, 57
Dependent	4, 34, 46, 52, 58
Competitive	5, 11, 17, 29, 35, 47, 53
Participative	6, 42, 48, 54

DATA COLLECTION

In the research, firstly, the literature was reviewed and the purpose of the study was determined by a consensus of all three researchers. The measurement tool to be used in line with the purpose was determined as a result of the opinions of the first and third researchers. In the research, it was decided to use the Grasha-Reichmann learning styles scale. After choosing the scale, it was decided to adapt the scale to the science course. For content validity, researchers consulted science education expert, two science teachers, and one school counselor.

The accessible population of the study has been determined as 4th educational region of Melikgazi District in Kayseri. While determining the sample from the accessible population, the first researcher conducted interviews with school administrators in all schools in the 4th education region of Melikgazi district. School administrators and science teachers did not let the researchers to collect data during some courses (e.g. science, mathematics.). Therefore, the data were collected by the first researcher during visual arts, technology design, and physical education courses. Therefore, data collection continued for four weeks.

During the collection of the data, the participants were told that the scale did not measure their achievement, had no effect on their school scores. Also, they are asked to be sincere, reflect their ideas truly, and answer all the items in the scale.

The collected data was transferred to the SPSS analysis program. In the context of research questions, the data were analyzed by the second and third researchers and the findings were reported. Then, the findings were compared with the results of the studies in the related literature and discussed in terms of similarities and differences.

DATA ANALYSIS

Frequency, mean, and percentage values were calculated to analyze the data to answer the first and second sub-problems of the study. In order to answer other sub-problems, despite the normal distribution of data, the data were analyzed using chi-square and cross tables. By analyzing cross tables, it was investigated whether science learning styles differ by gender, internet access, having an independent study room and educational future expectation variables.

ASSUMPTIONS AND LIMITATIONS

The study was conducted based on the assumption that the students answered the items in the scales sincerely and truly. In addition, the data of the research is limited to the data collected by using Grasha-Reichmann Learning Styles Scale from 584 people studying in the eighth grade in Melikgazi district of Kayseri.

RESEARCH ETHICS

Ethical principles and rules were followed during the planning, data collection, analysis, and reporting of the research. Ethical compliance approval was obtained for this research in accordance with the decision of Nevşehir Hacı Bektaş Veli University Ethics Committee dated 08.06.2020 and numbered 12.

3 | FINDINGS

In the study, firstly, it was aimed to determine which science learning styles the eighth-grade students used. For this purpose, the average of the participants' points from the items in each dimension was calculated. These averages were then compared with reference values.

Table 2. Students' Levels of Science Learning Styles

Learning Styles	Degree of Learning Styles			Value Obtained	Evaluation
	Low	Moderate	High		
Independent	(1.0 - 2.7)	(2.8 - 3.8)	(3.9 - 5.0)	3.47	Moderate
Avoidant	(1.0 - 1.8)	(1.9 - 3.1)	(3.2 - 5.0)	2.56	Moderate
Cooperative	(1.0 - 2.7)	(2.8 - 3.4)	(3.5 - 5.0)	3.64	High
Dependent	(1.0 - 2.9)	(3.0 - 4.0)	(4.1 - 5.0)	3.98	Moderate
Competitive	(1.0 - 1.7)	(1.8 - 2.8)	(2.9 - 5.0)	3.58	High
Participative	(1.0 - 3.0)	(3.1 - 4.1)	(4.2 - 5.0)	3.87	Moderate

As shown in Table 2, the science learning style of the eighth-grade students with the highest average was "dependent" and the learning style with the lowest average was "avoidant". When the average values obtained in the research were compared with the critical values determined by Grasha-Reichmann, it was determined that the students used the cooperative and competitive learning styles at a high level and the other learning styles at the moderate level.

In the research, the learning style of each student was determined individually. While determining the learning styles, the style with the highest average of each student was determined as the students' dominant learning style. In cases where the averages are equal, the learning style with a smaller range is accepted as the dominant style. The dominant learning styles of students are shown in Table 3.

Table 3. Dominant Science Learning Styles of Students

Dimension	Frequency	Percent	Cumulative Percent
Dependent	179	30.7	30.7
Participative	177	30.3	61.0
Cooperative	76	13.0	74.0
Competitive	72	12.3	86.3
Independent	56	9.6	95.9
Avoidant	24	4.1	100
Total	584	100.0	

As seen in Table 3, students mostly have dependent (30.7%) and participative (30.3%) learning styles. These two learning styles are fallowed by collaborative (13%), competitive (12.3%), independent (9.6%), and avoidant (4.1%) science learning styles. In other words, the dominant learning style of most of the students is dependent. Chi-square analysis was conducted to examine whether the science learning styles of the eighth-grade students differ by gender. The results of the chi-square analysis are given in Table 4.

Table 4. Chi-Square Results Regarding Distribution of Science Learning Styles by Gender

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.433	5	.000
Likelihood Ratio	25.823	5	.000
Linear-by-Linear Association	3.949	1	.047
N of Valid Cases	584		

As seen in Table 4, the learning styles of the students differ significantly by gender (p = .000 <.05). Findings regarding the learning styles of boys and girls are given in Table 5.

Table 5. Distribution of Science Learning Styles by Gender

		Science Learning Style						
		Independent	Avoidant	Cooperative	Dependent	Competitive	Participative	Total
Girls	Count	18	8	34	114	31	89	294
	% within gender	6.1%	2.7%	11.6%	38.8%	10.5%	30.3%	100.0%
	% within style	32.1%	33.3%	44.7%	63.7%	43.1%	50.3%	50.3%
	% of Total	3.1%	1.4%	5.8%	19.5%	5.3%	15.2%	50.3%
Boys	Count	38	16	42	65	41	88	290
	% within gender	13.1%	5.5%	14.5%	22.4%	14.1%	30.3%	100.0%
	% within style	67.9%	66.7%	55.3%	36.3%	56.9%	49.7%	49.7%
	% of Total	6.5%	2.7%	7.2%	11.1%	7.0%	15.1%	49.7%

When Table 5 is examined, girls' most preferred learning style is dependent, and the least preferred is avoidant learning style. On the other hand, the boys' most preferred learning style is participative and the least preferred style is avoidant. Also, independent, avoidant, collaborative, and competitive learning styles are preferred by boys more than girls, and dependent learning style is preferred by girls more than boys. The participatory learning style is preferred equally by boys and girls.

After the gender variable, it was investigated whether the science learning styles of the eighth grade students differ by the variable of having in an independent study room. Chi-square analysis was conducted and the results are given in Table 6.

Table 6. Chi-Square Results Regarding Distribution of Science Learning Styles by Having an Independent Study Room

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.374a	5	.065
Likelihood Ratio	10.000	5	.075
Linear-by-Linear Association	.032	1	.857
N of Valid Cases	584		

As seen in Table 6, students' science learning styles do not differ by the variable of having an independent study room (p = .065> .05). In other words, eighth grade students with and without a private study room use similar learning styles in science lessons.

For the fifth sub-problem of the research, an answer was sought to determine whether the science learning styles of the eighth-grade students differ by the variable of having internet access. The findings obtained from the chi-square analysis to answer this question are presented in Table 7.

Table 7. Chi-Square Results Regarding Distribution of Science Learning Styles by Having Internet Access

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.512[a]	5	.019
Likelihood Ratio	14.651	5	.012
Linear-by-Linear Association	6.861	1	.009
N of Valid Cases	584		

As can be seen in Table 7, students' science learning styles differ by having internet access (p = .019 <.05). Findings of science learning styles of students with and without internet access are provided in Table 8.

Table 8. Chi-Square Results Regarding Distribution of Science Learning Styles by Having Internet Access

		Science Learning Style						
		Independent	Avoidant	Cooperative	Dependent	Competitive	Participative	Total
With internet access	Count	51	21	54	143	58	127	454
	% within internet	11.2%	4.6%	11.9%	31.5%	12.8%	28.0%	100.0%
	% within style	91.1%	87.5%	71.1%	79.9%	80.6%	71.8%	77.7%
	% of Total	8.7%	3.6%	9.2%	24.5%	9.9%	21.7%	77.7%
Without internet access	Count	5	3	22	36	14	50	130
	% within internet	3.8%	2.3%	16.9%	27.7%	10.8%	38.5%	100.0%
	% within style	8.9%	12.5%	28.9%	20.1%	19.4%	28.2%	22.3%
	% of Total	0.9%	0.5%	3.8%	6.2%	2.4%	8.6%	22.3%

As seen in Table 8, students' most preferred learning style with internet access is dependent (31.5%), and the least preferred one is avoidant (4.6%). While students who do not have internet access mostly prefer the participative science learning style, the least preferred style of these students is the avoidant learning style. In addition, students have internet access use each learning style more than students who don't. For example, 91.1% of students using an independent learning style are students with internet access, and 8.9% are students without internet access. Similarly, while 80.6% of students using the competitive learning style have internet access, 19.4% do not have internet access.

Lastly, it was investigated whether the science learning styles of the eighth grade students differ by their future expectations. The results of the chi-square analysis made within the scope of this review are given in Table 9.

Table 9. Chi-Square Results Regarding Distribution of Science Learning Styles by Future Expectation

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	28.799[a]	15	.017
Likelihood Ratio	23.022	15	.084
Linear-by-Linear Association	1.376	1	.241
N of Valid Cases	584		

a. 3 cells (12.5%) have expected count less than 5. The minimum expected count is 1.77.

As seen in Table 9, science learning styles of eighth grade students differ significantly according to their future expectations (p = .017 <.05). Findings regarding how students' science learning styles change according to their future expectations are given in Table 10.

Table 10. Distribution of Science Learning Styles by Students' Future Expectations

		Science Learning Styles						
		Independent	Avoidant	Cooperative	Dependent	Competitive	Participative	Total
Finish High School	Count	4	7	6	12	2	12	43
	% within expectation	9.3%	16.3%	14.0%	27.9%	4.7%	27.9%	100 %
	% within style	7.1%	29.2%	7.9%	6.7%	2.8%	6.8%	7.4%
Finish University	Count	31	11	36	96	42	93	309
	% within expectation	10.0%	3.6%	11.7%	31.1%	13.6%	30.1%	100 %
	% within style	55.4%	45.8%	47.4%	53.6%	58.3%	52.5%	52.9%
Starting Your Own Business	Count	13	2	15	21	11	25	87
	% within expectation	14.9%	2.3%	17.2%	24.1%	12.6%	28.7%	100 %
	% within style	23.2%	8.3%	19.7%	11.7%	15.3%	14.1%	14.9%
Working in the Public Sector	Count	8	4	19	50	17	47	145
	% within expectation	5.5%	2.8%	13.1%	34.5%	11.7%	32.4%	100 %
	% within style	14.3%	16.7%	25.0%	27.9%	23.6%	26.6%	24.8%

As seen in Table 10, students whose future expectations are to finish the university and work in the public sector mostly prefer dependent learning style. The most preferred learning style of the students aiming to start their own business is participative science learning style. The students who aim to graduate from high school mostly use dependent and participative learning styles. In addition, the students who aim to finish university use all learning styles more than other groups. For example, 55.4% of students using an independent learning style and 58.3% of students using competitive learning style aim to graduate from the university.

4 | Discussion and Conclusion

In this study, it was aimed to examine the science learning styles of eighth-grade students. In this context, it was found that the eighth-grade students use collaborative and competitive learning styles at a high level and other learning styles at a moderate level. In addition, it was found that students mostly use dependent and participative learning styles as the dominant learning style. The science learning style, which was the least preferred by students, was the avoidant learning style. When the literature on learning styles is examined, it was seen that there are studies conducted on different groups and

reaching similar results with our research (Aydemir, Koçoğlu & Karali, 2016; Elban, 2018; Öztürk, 2019; Kamışlı & Özonur, 2019; Şentürk & Yıldız İkikardeş, 2011, Tatar, Tuysuz, and Ilhan, 2008). On the other hand, there are some other studies reaching different results from our results in terms of level of learning style and dominant learning styles (Kaleci, 2012; Sidekli & Akdoğdu, 2018). In the literature, there are studies at which Grasha- Reichmann learning styles scale is used and conducted with students from different levels. It is an important result that collaborative and competitive learning styles come to the fore in these studies. There may be several reasons for this. The first may be reference values, which are taken into account in the evaluation of the findings. Therefore, while adopting the scale, reference values may also need to be adapted for different samples and cultures. The second reason may be the group activities conducted in science lessons (Kamışlı & Özonur, 2019). In group studies, students can learn by cooperating within the group while competing with other groups. Therefore, students may have developed both collaborative and competitive learning styles.

The reason for using a competitive learning style at a high level can be the large-scale tests in Turkey (Kamışlı & Özonur, 2019). Students go through a strict competition process to stay ahead of their competitors in preparation for these exams. Thus, this may be the reason why students use the competitive learning style at a high level.

The reasons why the largest number of students who prefer dependent and participative learning styles should be evaluated separately. Students with dependent learning style need guidance and support while learning (Grasha, 2002). Therefore, these students can get support from other students in the learning environments they cooperate and thus participate in the learning processes. Therefore, it is not surprising that students using dependent learning style also use the participative learning style. Supporting this inference, it is found in the study that dependent and participative learning styles are the most common dominant learning styles. Thus, it can be said that students with dependent learning style are not avoidant in the classroom, participate in learning processes, and can search for support from their teachers or friends.

Another finding of the study is that students' science learning styles were affected by gender. In this context, female students use the dependent learning style and male students use the participative learning style. In related literature, there are some results that students' learning styles do not differ by gender (Arslan & Babadoğan, 2005; Elban, 2918; Kaleci, 2012). There are also other studies reported that male students use avoidant (Süral, 2008; Sidekli & Akdoğdu, 2018), and collaborative learning styles (Yılmaz, 2014); while female students use dependent, participative (Sidekli & Akdoğdu, 2018; Süral, 2008), and competitive learning styles (Yılmaz, 2014). According to Kolb (1984), differences in individuals' experiences cause changes in their learning styles. These differences can be explained by the fact that female and male students come with different school experiences due to their developmental differences and their environment outside the school.

The study showed that the eighth-grade students' science learning styles did not differ by having an independent study room. There are similar results in the literature that having an independent study room does not affect the learning styles of students (Adatepe, 2014, Gül, 2011; Keleşoğlu, 2011). On the other hand, it is stated that students who have an independent study room will look for alternative ways of learning and the students who do not have a room will prefer social learning environments (Toğrul, 2014). Therefore, it can be expected that the students who have their own study room will use the independent learning style and the students who do not have the room will use the participative and dependent learning styles. However, this expectation was not emerged in the results of the study. According to the results of our study, having an independent room is not an effective variable that will cause a significant difference in students learning styles.

The distribution of science learning styles of students by having internet access was examined. According to the findings of the research, students with internet access prefer mostly dependent learning style of (31.5%), while students without internet access prefer mostly participative learning style. The least preferred learning style of both groups is the avoidant learning style. In addition, students with internet access use each learning style more than students who don't have internet access. Considering the role of the internet in the learning process, it is thought that students with internet access will have high access to information and develop independent learning skills (Kurbanoğlu & Akkoyunlu, 2001). Moreover, it can be said that students who use the internet to do their homework will gain expertise (Livingstone & Bober (2004), so independent learning styles will develop. On the contrary, according to findings of the current study, students with internet access use dependent learning style. Based on this finding, it can be said that students do not use the internet as a learning tool. Indeed, there are results in the literature that students use the internet for non-educational purposes such as playing games, listening to music, and chatting (Sarı & Kunt, 2014; Tarı, Taşdemir, Özcan & Tarı, 2018; Yan, 2005). Therefore, it can be said that students cannot use the internet efficiently. On the other hand, students who do not have internet access mostly use dependent learning style. In this case, it can be said that students see authorities and experts as a resource of knowledge (Grasha, 2002). The use of dependent learning style by these students can be explained in this context.

As the last finding of the research, it was seen that the learning styles of students differ by their future expectations. In this context, it has been found that students who aim to finish university and work in public institutions use dependent learning style while students who want to start their own business use the participative learning style. Students whose future goal is to finish high school use dependent and participative learning styles. In addition, students aiming to finish university use all learning styles more than others. When the literature is examined, there is no study examining the learning styles in the context of future expectation in education. In connection with this issue, it can be said that there is a relationship between students' future expectations and their attitudes towards school and the tasks required at school (Beal & Crockett, 2010). Considering that education is the dynamo of social mobility (Celkan, 2018), it can be said that students aiming to go to the upper classes in the society will work more in line with this goal (MacLeod & Byrne, 1996). Therefore, these students are more likely to use student-centered learning styles (independent, participative and, collaborative). This expectation is partly seen in the research findings. For example, students who aim to finish university and work in public institutions use the participative learning style more and students who aim to complete the university use all learning styles more than other students. Thus, it can be said that students' future expectation in education can be an effective variable for students' science learning styles.

Based on the results of the research, the suggestions for teachers, students and researchers are as follows;

1. It can be recommended that teachers should be aware of their students' learning styles and plan their lessons considering the students with different learning styles.
2. Being aware of the fact that girls and boys can have different learning styles, appropriate arrangements in classroom activities, classroom seating plans, and group work should be made.
3. According to the results of our research, students do not use the internet as an opportunity to learn independently. Therefore, it is recommended that especially information technology teachers and school counselors should conduct studies towards students and other teachers to develop their digital literacy.
4. As a result of the research, it was seen that the future expectations of the students were influential in science learning styles. Therefore, guidance activities should be included to enable students to realize that education has an important role in promoting society.

5. In this study, the science learning styles of the eighth-grade students were investigated in terms of some variables on students selected from Melikgazi district of Kayseri using the adapted version of Grasha-Reichmann Learning Style Scale to Turkish by Vural (2013). Similar studies can be done for different courses in terms of different samples and different variables, using different methods and scales.

5 | Statement of Publication Ethics

As authors of the research, we declare that the study has no unethical problem and we observed research and publication ethics. Ethical principles and rules were followed during the planning, data collection, analysis and reporting of the research. Ethical compliance approval was obtained for this research in accordance with the decision of Nevşehir Hacı Bektaş Veli University Ethics Committee dated 08.06.2020 and numbered 12.

6 | Researchers' Contribution Rate

The data of the research is collected by the first author. In planning, organizing, data analyzing and rest of the study the three authors involved in the research contributed equally.

7 | Conflict of Interest

There is no conflict of interest for this study.

References

Adatepe, E. (2014). *Ortaokul 7. ve 8. sınıf öğrencilerinin öğrenme stilleri ile çalışma alışkanlıkları ve akademik başarıları arasındaki ilişkinin incelenmesi [The investigation of the relationship between the learning styles wıth study habits and the academic achievement of the 7Th and 8Th grade secondary school students].* Unpublished Master's Thesis, Fatih University, İstanbul.

Akturk, S. (2014). *İlkokul 4. sınıf öğrencilerinin öğrenme stillerinin demografik açıdan incelenmesi (Bilfen örneği) [Demographic analysis of primary school 4th grade students' learning styles (Bilfen example)].* Unpublished Master's Thesis, Yeditepe University, İstanbul.

Alaçayır, S. (2011). *Zihin engelliler öğretmeni adaylarının yeterlik algıları ile öğrenme stilleri arasındaki ilişkinin incelenmesi [The investigation of the relation between self efficacy perceptions and learning styles of teachers of intellectual disabilities candidates].* Unpublished Master's Thesis, Marmara University, İstanbul.

Amira, R., & Jelas, Z. M. (2010). Teaching and learning styles in higher education institutions: Do they match? *Procedia-Social and Behavioral Sciences*, *7*, 680-684.

Arslan, B. & Babadoğan, C. (2005). İlköğretim 7. ve 8. sınıf öğrencilerinin öğrenme sitillerinin akademik basari düzeyi, cinsiyet ve yas ile ilişkisi [Relationships between learning style preferences and gender, age and success level at 7th and 8th Grade]. *Eurasian Journal of Educational Research*, *21*, 35–48.

Aydemir, H., Koçoğlu, E., & Karalı, Y. (2016). Grasha-Reichmann ölçeğine göre öğretmen adaylarinin öğrenme stillerinin değerlendirilmesi [Grasha-Reichmann Scale Evaluatıon of Learning Styles by Teacher Candidates]. *Kastamonu Education Journal*, *24*(4).

Bagav, M. (2015), *Üstün Yetenekli Öğrencilerde Öğrenme Stilleri [Learning styles for high talented students].* Unpublished Master's Thesis. Yeditepe University, İstanbul.

Balay, R. (2004). Küreselleşme, bilgi toplumu ve eğitim [Globalization, Information Society and Education]. *Ankara University*, *Journal of Faculty of Educational Sciences*, *37*(2), 61-82.

Baneshi, A. R., Karamdoust, N. A., & Hakimzadeh, R. (2013). Validity & reliability of the Persian version of Grasha-Richmann student learning styles scale. *Journal of Advances in Medical Education & Professionalism*, *1*(4), 119-124.

Bayırlı,I A., Orkun, M. A., & Bayırlı, S. (2019). Öğrenme stilleri modellerinin incelenmesi [Investigation of Learning Styles Model]. *Maarif Mektepleri International Journal of Educational Sciences*, *3*(1). 71-83.

Beal S.J. & Crockett, L.J., (2010). Adolescents' occupational and educational aspiration sand expectations: links to high school activities and adult educational attainment, *Developmental Psychology*, *46*(1), 258-265

Bennett, M. (2015). The invisible hand of inquiry-based learning. *Childhood Education*, *91*(5), 388-389, DOI:10.1080/00094056.2015.1090854

Boydak, H. A. (2015). *Öğrenme stilleri [Learning styles]* (Vol. 136). İstanbul: Beyaz Publishing.

Büyüköztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2011). *Bilimsel araştırma yöntemleri [Scientific research methods]*. Ankara: Pegem Publishing.

Carroll, A. M. (2001). *How to study better and faster*. Portland, USA: Walch Publishing.

Celkan, H. Y. (2018). *Eğitim sosyolojisi [Educational sociology]*, Elazığ: Asos Publishing.

Cengizhan, S. (2006). *Bilgisayar destekli ve proje temelli öğretim tasarımlarının bağımsız ve işbirlikli öğrenme stillerine sahip öğrencilerin akademik başarısına ve öğrenme kalıcılığına etkisinin incelenmesi [The effects of computer-assisted and project-based instructional designs on student' academic achievement and learning retention in terms of independent and collaborative learning styles]*. Unpublished Doctoral Dissertation, Yıldız Teknik University, İstanbul.

Cevher, A.Y., Yıldırım, S. (2020). Investigation of Academic Studies on Learning Styles: Systematic Review. *HAYEF: Journal of Education*, *17*(1); 20-50.

Çelik, F. (2006). Türk eğitim sisteminde hedefler ve hedef belirlemede yeni yönelimler [Goals and new trends in goal setting in the Turkish education system]. *Journal of Süleyman Demirel University Burdur Education Faculty*, *6*(11), 1-15.

Çift, P & Canan, S. (2017). *Beynin Sırları [Secrets of Brain]*. İstanbul: Destek Publishing

Diaz, D. P., & Cartnal, R. B. (1999). Students' learning styles in two classes: Online distance learning and equivalent on-campus. *College teaching*, *47*(4), 130-135.

Dikmen, M. & Tuncer, M. (2020). Öğrenme stiline dayalı eğitimin akademik başarıya etkisi [The Effect of Education Based on Learning Style on Academic Achievement]. *Ege Journal of Education*, *21*(1), 71-88. doi:10.12984/egeefd.695452

Dunn, R., & Dunn, K. (1978). *Teaching students through their individual learning styles: A practical approach*. Reston, VA: Pearson College Division

Elban, M. (2018). Learning styles as the predictor of academic success of the pre-service history teachers. *European Journal of Educational Research*, *7*(3), 659-665.

Felder, R., & Silverman, L. (1988). Learning and teaching styles in engineering education. *Engineering Education*, *78*(7), 674–681

Fraenkel, J. R., & Wallen, N. E. (2006). *How to design and evaluate research in education*, (6th ed.). New York, NY: McGraw-Hill.

Grasha, A. F. (1996). *Teaching with style: Enhancing learning by understanding teaching and learning styles*. Pittsburgh, Pa.: Alliance Publishers.

Grasha, A. F. (2002). The dynamics of one-on-one teaching. *College Teaching*, *50*(4), 139-146.

Grasha, A.F and Riechmann, S. (1982). The Grasha-Riechmann Student Learning Style Scales: Research Findings and Applications. In: Keefe, J. (ed.), *Student Learning Styles and Brain Behavior*, Reston, VA: NASSP.

Gregorc, A. F. & Butler, K. A. (1984). Learning is a matter of style. *Vocational Education Journal*, *59*(3), 27–29.

Gül, B. (2011). *Ortaöğretim öğrencilerinin öğrenme stilleri ile ders çalışma stratejileri arasındaki ilişkinin incelenmesi (Beşiktaş İlçesi Örneği)[The relation analysis between learning styles and studying strategies of secondary education students]*. Unpublished Master Thesis, Yeditepe University, İstanbul.

Güngör, H. (2020). *Yükseköğretime hazırlanırken 12. sınıf öğrencilerinin okullarında akademik başarılarıyla gelecek beklentilerini etkileyen faktörler [Factors affecting academic success and future expectations of 12. grade students' preparation for higher education in schools]*. Unpublished Doctoral Dissertation, Hacettepe University, Ankara.

Güven, M., & Kürüm, D. (2006). Öğrenme stilleri ve eleştirel düşünme arasındaki ilişkiye genel bir bakış [An overview of the relationship between learning styles and critical thinking]. Journal of Social Sciences, *1*, 75-90.

Honey, P. & Mumford, A. (1986) *The Manual of Learning Styles*, Peter Honey Associates.

Kaleci, F. (2012). *Matematik öğretmen adaylarının epistemolojik inançları ile öğrenme ve öğretim stilleri arasındaki ilişki [The relationship between pre?service mathematics teacher's epistemological beliefs and their learning and teaching styles]*. Unpublished Master Thesis. Necmettin Erbakan University, Konya.

Kamisli, H., & Ozonur, M. (2019). Students' learning styles in vocational education. *International Journal of Curriculum and Instruction*, *11*(1), 209-220.

Keleşoğlu, Ş. (2011). *Öğrenme stilleri, akademik özyeterlik, seviye belirleme sınavı puanları ve öğrenci özellikleri değişkenlerinin lise 1. sınıf akademik başarısını yordama gücü üzerine bir araştırma [A study on the predictive power of the variables of learning styles, academic self- efficacy, the scores of level determination exams and student characteristics in predicting the academic success of 1st grade of high school]*. Unpublished Master Thesis. Ankara University, Ankara.

Koçak, T. (2007). *İlköğretim 6. 7. 8. sınıf öğrencilerinin öğrenme stilleri ve akademik başarıları arasındaki ilişkinin incelenmesi(Gaziantep ili merkez ilçeleri örneği) [An analysis of the relationship between learning styles and the academic achievement of the 6th 7th 8th grade primary school students (a case study in greater Gaziantep area)]*, Unpublished Master Thesis, Gaziantep University, Gaziantep.

Koçyiğit, M. (2011). *Üniversite öğrencilerinin nedensel yüklemeleri ve öğrenme stilleri [Causal attributions and learning styles of university students]*. Unpublished Master Thesis, Afyon Kocatepe University, Afyon.

Kolb, D. (1984), *Experiential learning: Experience as the source of learning and development*, London: Prentice Hall.

Köroğlu, M. (2015). *Öğretmen adaylarının özel alan yeterlikleri ile öğrenme stilleri arasındaki ilişkinin incelenmesi [Analyzing the relationship between learning styles and specific field competencies of prospective teachers]*. Unpublished Master Thesis, Ahi Evran University, Kırşehir.

Kural, H. (2009). *Öğrencilerin öğrenme stillerinin fen ve teknoloji dersi akademik başarılarına ve sosyo-demografik özelliklerine göre incelenmesi [Investigating students' learning styles according to the academic success in science and technology lesson and social-demographic variables]*. Unpublished Master Thesis, Adnan Menders University, Aydın.

Kurbanoğlu, S., & Akkoyunlu, B. (2001). Öğrencilere bilgi okuryazarlığı becerilerinin kazandırılması üzerine bir çalışma [A study on equipping students with information literacy skills]. *Hacettepe University Journal of Education, 21*(21).

Livingstone, S., & Bober, M. (2004). Taking up online opportunities? Children's uses of the Internet for education, communication and participation. *E-Learning and Digital Media*, *1*(3), 395-419.

MacLeod, A. K., & Byrne, A. (1996). Anxiety, depression, and the anticipation of future positive and negative experiences. *Journal of abnormal psychology*, *105*(2), 286.

Malik, H., Shaheen, H., & Aurangzeb, W. (2019). Learning styles preferences and diagnostics at higher education level: A comparative perspective among three faculties. *Review of Economics and Development Studies*, *4*(2), 313-320.

Mc Colgin, C.C. (2000). *Match between learning styles and teaching methods: an exploratory study of the effects on nursing students' academic performance, perceived learning and course evaluation*. Bell & Howell Information and Learning Company. United States.

Mete, H. (2013). *İlköğretim ikinci kademe öğrencilerinin öğrenme stillerinin farklı değişkenler açısından incelenmesi [Investigate secondary school students learning styles in terms of different variables]*. Unpublished Master Thesis, Mehmet Akif Ersoy University, Burdur.

Özer, A. (2008). *İlköğretim ikinci kademe Özbek asıllı Afgan göçmeni öğrenciler ile Türk öğrencilerin öğrenme stillerinin akademik başarı ve cinsiyete göre karşılaştırılması [The comparison of Uzbek originated Afghan immigrant secondary student with Turkish students according to the learning styles regard to gender and accademic achievement]*. Unpublished Master Thesis, Yıldız Technical University, İstanbul.

Öztekin, Z. (2012). *Lise öğrencilerinin öğrenme stillerinin, lise türü, akademik başarı ve cinsiyete göre karşılaştırılması [The comparison of high school students learning styles according to high school type, academic achievement and gender]*. Unpublished Master Thesis, Yıldız Technical University, İstanbul.

Öztürk, D. (2019). *Dokuzuncu sınıf öğrencilerinin öğrenme stilleri ile matematik dersi akademik başarıları ve ders çalışma alışkanlıkları arasındaki ilişki [The relationship between learning styles and mathematics achievements of 9th grade students and course study habits]*. Unpublished Master Thesis, Pamukkale University, Denizli.

Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: Concepts and evidence. *Psychological science in the public interest*, *9*(3), 105-119.

Pritchard, A. (2013). *Ways of learning: Learning theories and learning styles in the classroom*. New York: Routledge.

Santrock, J.W. (2018). *Eğitim Psikolojisi [Education psychology]*. (Trans. Ed.: Siyez, D. M., 5. press). Ankara: Nobel Publishing.

Sarı, S., & Kunt, H. (2014). İlkokul ve ortaokul öğrencilerinin sınıf düzeylerine göre internet kullanım durumlarının belirlenmesi [Determining the internet usage of primary and secondary school students according to their grade]. *Dumlupinar University Journal of Social Science*, *40*, 263-280.

Sarıtaş, E. & Süral, S. (2010). Grasha - Reichmann Öğrenme ve Öğretme Stili Ölçeklerinin Türkçe uyarlama çalışması [Grasha - Reichmann learning and teaching style of the scale study Turkish adaptation]. *e-Journal of New World Sciences Academy Education Sciences, 5*(4), 2162-2177.

Seçer, İ. (2018). *Psikolojik test geliştirme ve uyarlama süreci: SPSS ve LISREL uygulamaları [Psychological test development and adaptation process: SPSS and LISREL applications]*. İstanbul: Anı Publishing.

Sidekli, S. & Akdoğdu, E. (2018). Öğrenme stillerinin sınıf öğretmeni adaylarının akademik başarılarını yordama gücü [Predictive power of learning styles on primary school pre-service teachers' academic achievement]. *Hacettepe University Journal of Education*, *33*(2), 503-517.

Süral, S. (2008). *Sınıf öğretmenliği öğretmen adaylarının öğrenme stilleri ile fen ve teknoloji öğretimi dersindeki akademik başarıları arasındaki ilişki [The relationship between learning styles and academic achievements of primary candidate teachers in science and technology teaching lesson]*. Unpublished Master Thesis, Pamukkale University, Denizli.

Şentürk, F. & Yıldız İkikardeş, N. (2011). Öğrenme ve öğretme stillerinin 7. sınıf öğrencilerinin matematik başarısı üzerine etkisi [The Effect of Learning and Teaching Styles on the 7th Grade Students' Mathematical Success]. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education*, *5*(1), 250-276.

Tarı, M., Taşdemir, Ş., Özcan, C., & Tarı, A. (2018). Kırsal kesimdeki ilköğretim öğrencilerinin internet kullanımlarının TÜİK verileriyle karşılaştırılması ve güvenlik incelemesi [Internet usage of elementary school students in rural area comparison with TUIK Data and security review]. *International Journal of Multidisciplinary Studies and Innovative Technologies*, *2*(1), 21-25.

Tatar, E. Tüysüz, C. & İlhan, N. (2008). Kimya öğretmeni adaylarının öğrenme stillerinin akademik başarılarıyla ilişkisi [Correlation Between Chemistry Pre-Service Teachers' Learning Style and Academic Achievement]. *Mustafa Kemal University Journal of Social Sciences Institute*, 5(10). 187-192.

Toffler, A., Toffler, H., & Gibson, R. (2011). *Rethinking the Future: Rethinking Business Principles, Competition, Control and Complexity, Leadership, Markets and the World*. Hachette UK.

Toğrul, H. (2014). *İlköğretim öğrencilerinin öğrenme stilleri ile bazı derslerdeki akademik başarıları arasındaki ilişkinin incelenmesi [An investigation on the relationship between primary education students' learning styles and academic achievement at some lessons]*. Unpublished Master Thesis, Çukurova University, Adana.

Vural, L. (2013). Grasha-Riechmann Öğrenme Stili Ölçeği'nin yapı geçerliği çalışmaları [Construct validatıon of grasha-riechmann learning style scale]. *Journal of Theory and Practice in Education*, *9*(4), 481-496.

Yan, Z. (2005). Age differences in children's understanding of the complexity of the Internet. *Journal of Applied Developmental Psychology*, *26*(4), 385-396.

Yavuzer, H., Demir, İ., Meşeci, F., & Sertelin, Ç. (2005). Günümüz gençliğinin gelecek beklentileri [Future expectations of today's youth]. *HAYEF: Journal of Education*, 2, 93-103

Yılmaz, M. (2014). *Öğretmen adaylarının öğrenme stillerinin öğrenme öğretme anlayışları ve fen öğretimine yönelik özyeterlik inançları ile ilişkisi [The relationship between teacher candidates' learning styles and their conceptions about teaching and learning and their science teaching efficacy beliefs]*. Unpublished Master Thesis, Abant İzzet Baysal University, Bolu.

Zereyak, E. (2005). Grasha-Riechmann öğrenci öğrenme stilleri ölçeğinin Türkçe uyarlaması [Adoption Grasha – Riechmann student learning style survey into the Turkish]. *Journal of Educational Sciences & Practices*, *4*(8), 117-138