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Examining Learning Styles, Creative Thinking Skills, and Academic Success of Eighth-Grade Students in Middle School

Ortaokul Sekizinci Sınıf Öğrencilerinin Öğrenme Stilleri, Yaratıcı Düşünme Becerileri ve Akademik Başarılarının İncelenmesi

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ABSTRACT

The purpose of this research was to investigate learning styles, creative thinking skills, and academic achievement of students. The participants were 71 students from lower socioeconomic backgrounds and studying in the eighth grade of a secondary school in a central district of Gaziantep. In this study, Grasha–Reichmann Learning Style Scale, Torrance Test of Creative Thinking, and the lecture notes of the students were used as data collection tools. The data collected from the participants were transferred to the Statistical Package for Social Sciences 22 program and analyzed using descriptive analysis, analysis of variance, and Pearson correlation analysis. It was observed that the students mostly had participant learning style, it was followed by competitive and dependent learning styles. It was also found that the highest of the students' arithmetic means of creative thinking aspects belonged to fluency, followed by originality, and the lowest belonged to flexibility. It was determined that there was a significant difference among the students' academic achievements in terms of learning styles. According to this, the students with participant learning style had significantly higher grades than the students with dependent learning style. It was also found that there are significant, positive correlations between creative thinking scores and academic achievement of students.

Keywords: Academic achievement, creative thinking, learning styles.

ÖZ

Bu araştırmanın amacı; öğrencilerin öğrenme stillerini, yaratıcı düşünme becerilerini ve akademik başarılarını incelemektir. Katılımcılar, Gaziantep'in merkez ilçesindeki bir ortaokulun sekizinci sınıfında öğrenim gören, alt sosyoekonomik düzeyden 71 öğrencidir. Bu çalışmada veri toplama aracı olarak Grasha-Reichmann Öğrenme Stili Ölçeği, Torrance Yaratıcı Düşünme Testi ve öğrencilerin ders notları kullanılmıştır. Katılımcılardan toplanan veriler; SPSS 22 programına aktarılarak betimsel analiz, Anova ve Pearson korelasyon analizi kullanılarak çözümlenmiştir. Öğrencilerin en çok paylaşımcı öğrenme stiline sahip oldukları, bunu rekabetçi ve bağımlı öğrenme stillerinin izlediği görülmüştür. Öğrencilerin yaratıcı düşünme boyutlarından aritmetik ortalamalarının en yükseğinin akıcılığa ait olduğu, bunu özgünlüğün izlediği ve en düşüğünün ise esnekliğe ait olduğu bulunmuştur. Öğrencilerin öğrenme stillerine göre akademik başarıları arasında anlamlı bir fark olduğu belirlenmiştir. Buna göre; paylaşımcı öğrenme stiline sahip öğrenciler, bağımlı öğrenme stiline sahip öğrencilere göre anlamlı olarak daha yüksek notlara sahiptir. Ayrıca öğrencilerin yaratıcı düşünme puanları ile akademik başarıları arasında anlamlı, pozitif korelasyonlar olduğu bulunmuştur.

Anahtar Kelimeler: Akademik başarı, öğrenme stilleri, yaratıcı düşünme.

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Introduction

In our age where information is produced, renewed, and changed at great speed and in quantities, the interactions of individuals with this information also change. Rather than having so much knowledge, individuals need to use effective ways to access and evaluate this information. Learning styles and

thinking skills of individuals play a very decisive role in accessing and using information.

The roles and skills expected from individuals in the Ministry of National Education (MEB) Curriculum (2019, p. 3) are explained as follows: "To be able to produce knowledge, to use it functionally in life, to contribute to society and culture, to have communication skills, to be entrepreneurial and decisive; abilities of problem solving, critical thinking and empathy." In this context, it has been determined as an important goal in MEB programs to provide students with thinking skills and to train individuals who know the ways to access information (Akbıyık & Seferoğlu, 2006, p. 91).

Reaching and using information effectively and developing various thinking skills are possible with realization of effective learning processes. Effective learning processes can be achieved by knowing and evaluating the factors affecting learning, learner characteristics, and preferences. Students who go through the same educational processes in the same class have different levels of success. This makes it a necessity to investigate the factors affecting or related to success and learning (Arslan & Babadoğan, 2005). Although there are many factors that affect learning, these items will eventually show their effect on the learner and in the context of learning; it can be said that all these elements are gathered within the scope of learning styles. According to Cornett (1983, p. 9), "Styles are all constructs that determine the overall direction of the learning process." According to this statement, it can be said that learning styles affect all elements of the learning process in general. According to Dunn et al. (2002), learning styles are the set of biological and developmental personal characteristics that make the same teaching method effective for some and ineffective for others. A student's learning style profile bears the signs of his potential strengths and tendencies that cause difficulties in an academic context (Felder & Soloman, 2000). Each student has their own learning style, and these differences in styles affect students' motivation, attitude toward the lesson, and therefore their effectiveness in their studies. Training teachers who take into account the learning style characteristics in the classroom provides the most important service to the goals of education (Kazu, 2009).

There are many approaches, theories, models and scales developed on learning styles. In these models and scales, the effects of various factors affecting learning can be observed and these models are according to the factors that researchers deal with. Learning styles were first studied by Dunn and Dunn and later developed by Price. This model includes environmental, sociological, emotional, and physical variables and their sub-factors (Jonassen & Grabowski, 1993). One of the most common models about learning styles is Kolb learning styles model. Kolb defines learning styles as the methods preferred by the individual in acquiring and processing information. Accordingly, there are continuities between concrete experience and abstract conceptualization in acquiring knowledge, and continuities between active experience and reflective observation in information processing. By crossing these two perceptions and processing continuities, Kolb differentiated four learning styles (Kolb & Kolb, 2013). One of the models frequently encountered in the literature on learning styles is the Gregorc Learning Style Model. This model positions people on two continuities: the concrete and the abstract, the linear and the diffuse. By crossing these two continuum types, each of which has two polar ends, four basic learning styles are formed in this model (Reid, 2005).

One of the models developed with a different approach to learning styles is Grasha–Reichmann Learning Style Model, which was also used in this study. Grasha (1990), explains the concept of learning style as: students' preferences for thinking, relating different things, and various classroom environments and experiences. Grasha and Reichmann examined students' learning styles from a social and emotional perspective, and their theory is based on students' different ways of expressing their approaches to the learning environment (Aydemir et al2016). The classification of learning styles developed by Grasha and Reichmann is based on students' attitudes toward real classroom activities. By increasing teachers' awareness of styles based on these attitudes, it aims to make the learning process more effective by designing learning activities that appeal to various learning styles (Montgomery & Groat, 1998).

Another concept that comes up when the most important goals of education and training are mentioned is creative thinking. "The need for innovations and inventions in today's information societies increases the use of mental resources in production activities. This situation prepares the place of creativity as a required program in all branches of education" (Kapu & Baştürk, 2009, p. 524). Today, creative thinking is used not only in education, but also in many different professions and is transformed into a necessity for success; this fact clearly proves how important this phenomenon is (Öncü, 2015). According to Akarsu (2018, p. 4), "Creative thinking is also defined as among the skills of this century." The concept of creative thinking is the focus of attention in many different fields, and today it has become a concept at the top of the list in the personnel selection of many large organizations and at the forefront of national education goals. This puts raising people who can demonstrate their creative thinking skills among the goals of education (Aslan, 2001).

Today, in the transition of students to a higher education level, at the end of their education process, in determining profession and career processes of individuals and their employment; academic achievement is highly decisive in evaluating individual, local, regional, or national success levels. Although it is not a factor to be considered alone in the evaluation of the extent to which individuals benefit from the educational processes, the impact of academic achievement in planning and evaluating our life processes is of considerable importance. Increasing academic achievement, one of the educational results, in ensuring the success of schools is one of the most important aims of education (Keçeli-Kaysılı, 2008). When it comes to the goal of increasing academic achievement, there are many factors that should be evaluated by all concerned. According to Yerxa; "Just being aware of the different ways of approaching teaching and education can make a difference" (cited in Cassidy, 2004, p. 420). Understanding each dimension of learners' characteristics will not only improve teaching, but will improve the entire learning process (Moussa, 2014).

There are many studies supporting that learning level and academic achievement are related to learning styles: According to Felder and Silverman (1988), how much a given student will learn in a classroom depends not only in part on that student's natural ability and preparation, but also on the compatibility of his or her learning style and the teacher's teaching style. Determining how to determine the methods and techniques to be used for the learning process to be effective indicates its importance in this process, and in this process, it is important to reveal the

learning styles by paying attention to the original characteristics and differences of the individuals and to give the necessary education in this direction (Sarıtaş & Süral, 2010). There is a general acceptance that learning styles, which can be explained as an individual's approach to a learning situation, have an impact on realization and success of learning goals (Cassidy, 2004). According to Sternberg and Zhang (2014), matching learning styles with teaching methods increases academic achievement. Progressing with appropriate learning styles will help students achieve a good academic score on any concept they have learned (Omar et al., 2015).

Sternberg (2003), argued that creative thinking is relatively different from the analytical and practical thinking that educational institutions give priority to develop and evaluate. Sternberg contributed to this discussion with the view that schools tend to value memory and analytical skills first, but that creative skills are just as important to success in life as memory and analytical skills, and may even be more important especially after formal education is over; he developed the suggestion that teaching creative thinking in schools can improve children's academic performance.

Based on all these explanations, today in many areas and stages of individuals' lives, it is seen that they should have high academic success, be able to conduct effective learning processes, and develop their creative thinking skills. These skills are shown in the first place among the educational goals as well as being decisive in the lives of individuals. In order to obtain results that will be used in the evaluation and improvement of both the level of development of individuals and achievement of educational goals, it seems quite necessary to examine these concepts, which are so decisive in achieving individual life and educational goals.

This study was conducted to examine the distribution of students according to their academic achievement, creative thinking levels, and learning styles. With this way, it was aimed to create a resource that would be used to evaluate the degree of achievement of educational goals, to determine the learner characteristics to be considered in designing education and learning activities for the development and success of students, and to determine the areas that need to be developed. Furthermore, by investigating the relationship between academic achievement and learning styles, and determining the learner characteristics related to success, it could be possible to shed light on the characteristics that should be developed in all students and included in learning activities. By revealing the characteristics of students with learning styles associated with low achievement that would be addressed in the planning process, these students could contribute to their active participation and learning. Learning styles that would have positive and negative relationship with the success could also reveal important results for the evaluation of teaching activities. Also, by investigating the relationship between academic achievement and creativity, the level of realization of these two basic goals together could be evaluated. This relationship might reveal the extent to which creative thinking skills are included in the evaluation of students' success. Based on the relevant data, the effect of creativity on success and the effect of success on creativity could be discussed.

In line with the explanations above, this study tried to find the answer to the question "What are the academic achievement, learning styles, and creative thinking tendencies of the eighth grade students in the secondary school." The sub-problems of the research are as follows:

For eighth-grade students,

1. What is their distribution according to learning styles?
2. What are their levels of creative thinking skills?
3. What are their levels of academic achievement?
4. Is there a significant relationship between their learning styles and academic achievements?
5. Is there a significant relationship between their creative thinking skills and academic achievements?
6. Is there a significant relationship between their learning styles and creative thinking skills?

In the study, apart from the problems, the variable of socioeconomic background was detected and this variable could also contribute to interpretation of the results. In the literature, there have been many studies investigating and finding relationships between socioeconomic background and learning, creative thinking, and academic achievement. While some find and suggest that socioeconomic level and the variables had positive correlation, others suggest just the opposite (Castillo et al., 2018; Heong et al., 2011; Jamadar & Sindhu, 2015; Swan & Stavros, 1973). Therefore, it could be stated that the findings of the research would be also compared to the previous research and help understanding the impact of the socioeconomic background on the creative thinking and learning.

Methods

Model of the Research

This research was designed according to the relational survey model, which is one of the quantitative research methods. In the study, distribution of students according to their dominant learning styles, creative thinking skills, and academic achievements in different courses were analyzed and described. In relational survey model, it is aimed to determine the existence and degree of co-change between two or more variables (Karasar, 2018, pp. 109–114). In this study, the relationship between the three variables mentioned above was examined.

The Study Group

The study group of the research consisted of eighth-grade students who continued their education in 2020–2021 academic year of a secondary school located in the central district of Gaziantep province and who had low socioeconomic backgrounds. The research was carried out with the participation of 71 students. The participants were the students of one of the researchers. Because the participants, their school, and district were which the researcher worked within, the socioeconomic background was defined as "low" by them.

Since the data collection phase of this research was carried out during the COVID-19 pandemic, only the reachable group was studied. For various reasons, it may be necessary to work with groups that are not sure that they can adequately represent the study population, and in this case, it would be more appropriate to call the participants as the study group instead of the sample (Karasar, 2018). For the reason stated in the explanation, the participants of this study did not constitute a sample group; therefore, the study group was not subject to sampling from a population and the group did not have a sample type.

According to Vehovar et al. (2016); non-probability sampling could be defined as a deviation from probability sampling principles and it means that units are included with unknown probabilities. They also define an illustration, which matches with the situation of this study: "the prevailing non-probability approach where units at hand are selected; the notion overlaps with availability, opportunity, or accidental sampling." Because during the COVID-19 pandemic, the researchers could reach to only those participants who were also students of the researcher, only "availability" and "opportunity" criterion were considered. On all these explanations, the notion of non-probability approach could be appropriate for determining participants of this study.

Data Collection Tools

In the research, in order to collect the data on the academic achievement of the students, 2020–2021 academic year, the end of the first semester course averages and the grade point averages (GPA) were used. Torrance Test of Creative Thinking Verbal A Form (1974) was used to measure students' creative thinking skills; Grasha–Reichmann Learning Style Scale (GRLSS, 1974) was used to measure their learning styles.

School Grade Records

In this study, in order to collect data on students' academic success, GPA for Turkish, mathematics, science, social studies, and English courses in the end of the first semester of 2020–2021 academic year were used.

Torrance Test of Creative Thinking

Torrance Test of Creative Thinking (TTCT) was first developed by E. Paul Torrance in 1966. This test, which has been the most widely used in the field of creative thinking and highly recommended in the field of education, has been translated into more than 35 languages. It consists of TTCT-Verbal and TTCT-Shape tests, and each test has A and B forms (Kim, 2006). In this study, TTCT-Verbal Form A was used. Torrance Test of Creative Thinking-Verbal Form provides three different norm-based measures of creativity: fluency, flexibility, and originality.

A study was conducted by Aslan (2001) to analyze the Turkish linguistic equivalence, reliability, and validity of the Turkish translation of TTCT. According to the research findings; the correlation coefficients between all subtest scores obtained from the application of the English and Turkish forms of TTCT to the same group were found to be significant at the $p < .01$ level. Correlation coefficients between ($r = .38$) and ($r = .89$) were obtained in the internal consistency analyses which were got with the scores of primary school, high school, and university groups for verbal creativity. It was concluded that the test is reliable for all age groups and all score types. In the analyses performed to measure internal validity, significant results were obtained at the $p < .01$ level for all age groups and for all score types of the verbal creativity test. According to the results of this analysis; It was concluded that TTCT Turkish form verbal creativity subtests measure expected creative thinking dimensions.

In this study, to examine the reliability of scoring TTCT, 15 tests randomly selected from 71 tests were re-evaluated by a second expert with scoring authority. Pearson correlation coefficients were calculated between these two scores. According to this, Pearson correlation coefficients between the two scores were calculated as .92 in the total creativity dimension, .99 in the fluency dimension, .81 in the flexibility dimension, and .83 in the originality dimension ($p < .01$). Considering that the correlation coefficient between .70 and 1.00 defines a high level of relationship (Büyüköztürk, 2018). It could be stated that the data obtained from this test are reliable. In addition, according to the internal consistency analysis; The Cronbach Alpha reliability coefficient of the data obtained from TTCT was found to be .92 ($p < .01$). A calculated reliability coefficient of .70 and above is generally considered sufficient for the reliability of test scores (Büyüköztürk, 2018). According to this it could be said that the data obtained meet the internal consistency assumption.

Grasha–Reichmann Learning Style Scale

The Learning Style Scale developed by Grasha–Reichmann (GRLSS, 1974) and adapted into Turkish by Sarıtaş and Süral (2010) was used to measure the learning styles of the students participating in this research. It was aimed to evaluate this scale in six different categories. Social learning preferences of students are tried to be determined within the categories of independent, dependent, avoidant, participant, collaborative and competitive learning styles. Grasha–Reichmann Learning Style Scale consists of 60 items, 10 items belonging to each of the six sub-dimensions, and each item measures the degree of participation of students with a five-point Likert-type scale.

Grasha and Reichmann (1974), in their study to examine the construct validity of the Learning Style Scale, stated that the reliability coefficients between the scales ranged from .76 to .83 ($N = 269$) and that there were many significant correlations between the criterion items and the scale scores.

The adaptation studies of the GRLSS scale into Turkish were carried out by Emel Sarıtaş and Serhat Süral (2010). To calculate the language validity of the study, the relationship between Turkish and English applications of the scale was examined. The significance level calculated by applying the Pearson Correlation test between the two applications was determined to be .62 (pp. 2166–2167). In order to determine the validity and reliability of the adapted scale, the scale was applied to 440 university students. According to the findings of this application, the reliability coefficient was found to be .80, the correlation of the GRLSS scale in language validity as a result of the actual application was .80, and the reliability coefficient was .88; from the findings, it was concluded that the scale can be used in sample groups in Turkey (pp. 2166–2171).

Application

After the data collection tools were prepared, respectively, GRLSS and TTCT were administered by the researcher on the day agreed with the students. Before the students started to answer, the instructions about the scale and the test, verbal and necessary explanations were made. The application was administered in two sessions of 30 minutes for GRLSS and 75 minutes for the TTCT.

Ethic

During the application process of the study, the principles of scientific research and publication ethics were taken into consideration. Before the tests were administered, the consent of the students and their families was obtained. No school or student names were included in the study. In addition, the ethics committee approval of this study was obtained from Çukurova University, Scientific Research and Publication Ethics Committee in the Field of Social and Human Sciences 10/06/2021-E.114210 document date and numbered.

Analysis of the Data

After applying the data collection tools and calculating the survey scores that should be evaluated by the researcher, the data obtained were entered into the SPSS 22 program. Before the data analysis on the findings, GPA data belonging to the academic achievement variable of the students and the TTCT total score data; since they are continuous variables, their conformity to the normal distribution was tested in order to make the necessary analyses. For this, the skewness and kurtosis coefficients of the GPA and total TTCT scores were calculated; these values were found to be between -1.5 and +1.5. According to these values, it was determined that the data obtained in the study met the assumption of normal distribution (Can, 2013); the relevant analyses were put into practice.

In order to determine the distribution of students according to academic achievement, learning styles and creative thinking variables; arithmetic mean, frequency distribution and descriptive analysis were used. One-way analysis of variance (ANOVA) analysis was used to examine the relationships between students' academic achievement and learning styles, creative thinking skills and learning styles. Simple correlation: Pearson correlation coefficient analyses were used to examine the relationship between students' academic achievement and creative thinking scores.

Findings

In this section, the findings that emerged as a result of the analysis of the data obtained from the data collection tools applied to the students participating in the research are included.

In line with the aim of examining the learning styles, creative thinking skills and academic achievements of secondary school eighth-grade students and the relationships between these variables, findings within the scope of the questions that this research was expected to answer are given in order.

Findings Regarding Students' Distribution According to Their Learning Styles

The distribution of the students participating in the research according to their learning styles is shown in Table 1.

As stated in Table 1, it could be seen that the participants had the participant learning style most (32.4%). This style was followed by competitive (23.9%), dependent (21.1%); and cooperative (16.9%) learning styles. The style the participants had as the least; independent (2.8%) and avoidant (2.8%) learning styles.

Findings Regarding the Creative Thinking Levels of the Students

The results of the descriptive statistics about the creative thinking levels of the students are shown in Table 2.

Table 1.
Frequency Distribution for Students' Learning Styles

Learning Style	*F*	%
Independent	2	2.80
Avoidant	2	2.80
Collaborative	12	16.90
Dependent	15	21.10
Competitive	17	23.90
Participant	23	32.40
Total	71	100

Table 2.
Descriptive Statistics for Students' Creative Thinking Scores

Dimensions	*N*	Minimum	Maximum	$\bar{X}$	SD
Fluency	71	4.00	81.00	37.37	17.02
Flexibility	71	4.00	46.00	22.69	8.08
Originality	71	1.00	72.00	24.36	14.84
Total	71	13.00	189.00	84.54	37.17

According to Table 2; the arithmetic means of the students' scores on the sub-dimensions of creative thinking were listed as follows, from the highest to the lowest as: fluency ($\bar{X}$ = 37.37), originality ($\bar{X}$ = 24.36), and flexibility ($\bar{X}$ = 22.69). The total creative thinking scores of the students were found between 13.00 and 189.00, and the arithmetic mean of this score was determined as 84.54.

Findings Related to Academic Achievement of Students

The results of the descriptive statistics about the course grades showing the academic success of the students in the courses are shown in Table 3.

When Table 3 is examined, it could be seen that the arithmetic means of the students' course grades were listed from the highest to the lowest as; English ($\bar{X}$ = 88.21), social studies ($\bar{X}$ = 88.06), mathematics ($\bar{X}$ = 87.76), Turkish ($\bar{X}$ = 82.13) and science ($\bar{X}$ = 69.72). The arithmetic average of the students' GPA was calculated as 83.17.

Findings Regarding the Relationship Between Academic Achievement and Learning Styles of Students

In this section, the relationship between students' course grades and GPAs and their learning styles is examined.

Findings Regarding the Relationship Between Students' Academic Achievement in Turkish and Learning Styles

The descriptive distribution of Turkish course scores according to the learning styles of the students is given in Table 4.

Table 3.
Descriptive Statistics for Students' Course Grades

Course	$\bar{X}$	SD
Turkish	82.13	12.10
Maths	87.76	12.46
Science	69.72	17.20
Social Sciences	88.06	9.84
English	88.21	10.32
GPA	83.17	10.47

Table 4.
Descriptive Distribution of Turkish Course Grades According to Learning Styles

Learning Style	*N*	$\bar{X}$	SD
Independent	2	77.00	18.38
Avoidant	2	86.00	1.41
Collaborative	12	85.25	12.01
Dependent	15	75.20	11.38
Cooperative	17	77.82	13.97
Participant	23	88.30	7.59
Total	71	82.13	12.10

Table 5.
One-Way ANOVA Results for Turkish Course Grades According to Learning Styles

Source of Variance	Sum of Squares	SD	Mean Squares	*F*	*p*	Significant Difference (Scheffé)	η^2
Between groups	2111.869	5	422.374	3.377	.009	Participant dependent	.21
Within groups	8129.990	65	125.077				
Total	10,241.859	70					

Table 6.
Descriptive Distribution of Maths Course Grades According to Learning Styles

Learning Style	*N*	$\bar{X}$	SD
Independent	2	92.50	10.61
Avoidant	2	78.00	25.46
Collaborative	12	90.67	8.57
Dependent	15	83.60	10.70
Cooperative	17	83.65	12.92
Participant	23	92.43	12.87
Total	71	87.76	12.46

Table 4 shows that, according to learning styles of the students, the arithmetic means of Turkish from the highest to the lowest was found that 88.30 for students with participant, 86.00 with avoidant, 85.25 with collaborative, 77.82 with competitive, 77.00 for independent, and 75.20 for with dependent learners.

According to the data in Table 4, it was found that there were differences between the average scores of Turkish lessons according to the learning styles of the students. One-way ANOVA analysis was applied to determine the significance level of this difference, and the results are shown in Table 5.

The results of the analysis given in Table 5 show that there was a significant difference between the students' Turkish course grades in terms of learning styles [$F(5–65) = 3.38$, $p < .01$). In order to determine which learning styles this difference was between, Scheffe multiple comparison test was performed and it was seen that the difference was between the scores of students in participant learning style and students in dependent learning style. According to this; It can be said that the students with the participant style had significantly higher Turkish course grades than the students with the dependent learning style. When the partial eta square value is considered, it could be understood that learning style had a high effect on Turkish course success ($\eta^2 = 0.21$).

Findings Regarding the Relationship Between Students' Academic Achievement in Maths and Learning Styles

The descriptive distribution of mathematics course grades according to the learning styles of the students is given in Table 6.

When Table 6 is examined, the arithmetic means of the mathematics course grades of the students according to their learning styles were listed from the highest to the lowest as; 92.50 for students with independent, 92.43 for those with participant, 90.67 for those with collaborative, 83.65 for those with competitive, 83.60 for those with dependent, and 78.00 for those with avoidant learning style.

According to the data in Table 6; there were differences between the averages of mathematics course grades according to the learning styles of the students. One-way ANOVA analysis was applied to determine the significance level of this difference, and the results are shown in Table 7.

The results of the analysis given in Table 7 show that there was no significant difference between the mathematics course grades of the students in terms of learning styles [$F(5–65) = 1.90$, $p > .05$).

Table 8.
Descriptive Distribution of Science Grades According to Learning Styles

Learning Style	*N*	$\bar{X}$	SD
Independent	2	73.50	2.12
Avoidant	2	54.00	5.66
Collaborative	12	76.58	18.32
Dependent	15	61.40	16.09
Competitive	17	66.00	18.08
Participant	23	75.35	15.11
Total	71	69.72	17.20

Findings Regarding the Relationship Between Students' Academic Achievement in Science and Learning Styles

The descriptive distribution of science course grades according to the learning styles of the students is given in Table 8.

When Table 8 is examined, according to the learning styles of the students, the arithmetic means of the science grades were ordered from the highest to the lowest as 76.58 for collaborative, 75.35 for participant, 73.50 for independent, 66.00 for competitive, 61.40 for dependent, and 54.00 for avoidant learners.

The data in Table 8 shows that according to the learning styles of the students, there were differences between the means of

Table 7.
One-Way ANOVA Results for Maths Course Grades According to Learning Styles

Source of Variance	Sum of Squares	SD	Mean Squares	*F*	*p*	Significant Difference (Scheffé)
Between groups	1386.628	5	277.326	1.900	.106	—
Within groups	9486.301	65	145.943			
Total	10,872.930	70				

Note: ANOVA = analysis of variance.

Table 9.
One-Way ANOVA Results for Science Course Grades According to Learning Styles

Source of Variance	Sum of Squares	SD	Mean Squares	*F*	*p*	Significant Difference (Scheffé)
Between groups	3090.132	5	618.026	2.281	.057	—
Within groups	17,610.234	65	270.927			
Total	20,700.366	70				

Note: ANOVA = analysis if variance.

Table 10.
Descriptive Distribution of Social Sciences Grades According to Learning Styles

Learning Style	*N*	$\bar{X}$	SD
Independent	2	90.00	14.14
Avoidant	2	69.00	8.49
Collaborative	12	88.42	9.69
Dependent	15	85.67	10.15
Cooperative	17	87.47	9.37
Participant	23	91.35	8.39
Total	71	88.06	9.84

Table 12.
Descriptive Distribution of English Course Grades According to Learning Styles

Learning Style	*N*	$\bar{X}$	SD
Independent	2	82.50	17.68
Avoidant	2	81.50	23.33
Collaborative	12	90.58	8.85
Dependent	15	86.20	8.99
Competitive	17	83.18	12.19
Participant	23	93.09	6.64
Total	71	88.21	10.32

science grades. One-way ANOVA analysis was applied to determine the significance level of this difference, and the results are shown in Table 9.

The analysis results given in Table 9 show that there was no significant difference between the science course grades of the students in terms of learning styles [$F(5–65) = 2.28$, $p > .05$).

Findings Regarding the Relationship Between Students' Academic Achievement in Social Sciences and Learning Styles
The descriptive distribution of social sciences course grades according to the learning styles of the students is given in Table 10.

According to Table 10, the arithmetic means of the social studies grades of the students according to their learning styles were listed from the highest to the lowest as 91.35 for participant, 90.00 for independent, 88.42 for collaborative, 87.47 for competitive, 85.67 for dependent, and 69.00 for avoidant learners.

According to the data in Table 10, there were differences between the means of social studies grades according to the learning styles of the students. One-way ANOVA analysis was applied to determine the significance level of this difference, and the results are shown in Table 11.

The results of the analysis given in Table 11 show that there was a significant difference between the social studies course scores of the students in terms of learning styles [$F(5–65) = 2.46$, $p < .05$). In order to determine which learning styles this difference was between, Scheffe multiple comparison test was performed, and no difference in social studies grades was found between any two learning styles. Looking at the partial eta square value, it is understood that learning style had a high effect on social studies course success ($\eta^2 = .16$).

Findings Regarding the Relationship Between Students' Academic Achievement in English and Learning Styles
The descriptive distribution of English course grades according to the learning styles of the students is given in Table 12.

According to Table 12, the arithmetic averages of the English course scores of the students according to their learning styles were listed from the highest to the lowest as 93.09 for the participant, 90.58 for collaborative, 86.20 for dependent, 83.18 for competitive, 82.50 for independent, and 81.50 for avoidant learners .

According to the data in Table 12, there were differences between the mean scores of English lessons according to the learning styles of the students. One-way ANOVA analysis was applied to determine the significance level of this difference, and the results are shown in Table 13.

The results of the analysis given in Table 13 show that there was a significant difference between the English grades of the students in terms of learning styles [$F(5–65) = 2.65$, $p < .05$). In order to determine which learning styles this difference was between, Scheffe multiple comparison test was performed and no difference in English grades was found between any two learning styles. Looking at the partial eta square value, it is understood

Table 11.
One-Way ANOVA Results for Social Sciences Course Grades According to Learning Styles

Source of Variance	Sum of Squares	SD	Mean Squares	*F*	*p*	Significant Difference (Scheffé)	η^2
Between groups	1076.072	5	215.214	2.455	.042	—	.16
Within groups	5697.703	65	87.657				
Total	6773.775	70					

Note: ANOVA = analysis of variance.

Table 13.
One-Way ANOVA Results for English Course Grades According to Learning Styles

Source of Variance	Sum of Squares	SD	Mean Squares	*F*	*p*	Significant Difference (Scheffé)	η^2
Between groups	1261.218	5	252.244	2.646	.031	—	.17
Within groups	6196.613	65	95.333				
Total	7457.831	70					

Note: ANOVA = analysis of variance.

that learning style had a high effect on English course success (η^2 = .17).

Findings Regarding the Relationship Between Students' General Academic Achievement and Learning Styles

The descriptive distribution of GPA scores according to the learning styles of the students is given in Table 14.

According to Table 14, the arithmetic mean of GPA scores of the students according to their learning styles is ordered from the highest to the lowest as 88.13 for the participant, 86.33 for collaborative, 83.00 for independent, 79.65 for competitive, 78.33 for dependent, and 73.50 for avoidant learners.

According to the data in Table 14, there were differences between the means of GPA scores according to the learning styles of the students. One-way ANOVA analysis was applied to determine the significance level of this difference, and the results are shown in Table 15.

The analysis results given in Table 15 show that there was a significant difference between the students' GPA scores in terms of learning styles [$F(5–65) = 2.99$, $p < .05$). In order to determine between which learning styles this difference was, Scheffe multiple comparison test was performed, and it was seen that the difference was between the students in the participant learning style and the students in the dependent learning style. According to this, it could be said that the students with the participant learning style had significantly higher GPA scores than the students with the dependent learning style. Looking at the partial eta square value, it is understood that learning style had a high effect on general academic achievement (η^2 = .19).

Findings Regarding the Relationship Between Academic Achievement and Creative Thinking Skills of Students

In this section, the relationship between students' course grades and GPA, and creative thinking sub-dimensions and creative thinking test total scores are examined.

Findings Regarding the Relationship Between Students' Academic Achievement in Turkish Course and Creative Thinking Skills

Pairwise correlation analyses were performed to examine the relationships between students' Turkish course grades and the fluency, flexibility, and originality and total test scores, and the results are shown in Table 16.

Table 14.
Descriptive Distribution of GPAs According to Learning Styles

Learning Style	*N*	$\bar{X}$	SD
Independent	2	83.00	12.73
Avoidant	2	73.50	9.19
Collaborative	12	86.33	10.16
Dependent	15	78.33	9.37
Competitive	17	79.65	11.34
Participant	23	88.13	8.43
Total	71	83.17	10.47

Note: GPA = grade point averages.

According to Table 16; correlations between the students' Turkish course grades and their fluency scores were found at a weak, positive, and significant level (r = .29, $p < .05$); correlations between the grades and flexibility scores were weak, positive, and significant (r = .29, $p < .05$). It was also seen that the grades had moderate, positive and significant (r = .32, $p < .01$) correlation with originality scores and moderate, positive, and significant (r = .32, $p < .01$) correlation with the total scores obtained from the creative thinking tests.

Findings Regarding the Relationship Between Students' Academic Achievement in Maths Course and Creative Thinking Skills

Pairwise correlation analyses were performed to examine the relationships between students' Maths grades and the fluency, flexibility and originality and total test scores, and the results are shown in Table 17.

According to Table 17, the correlations between students' mathematics course grades and their fluency scores were found at a weak, positive, and significant level (r = .27, $p < .05$). It was also seen that grades had moderate, positive, and significant (r = .34, $p < .01$) correlation with originality scores and moderate, positive and significant (r = .30, $p < .05$) correlation with total creative thinking scores. It was discovered that there was a weak level positive correlation between students' mathematics course

Table 15.
One-Way ANOVA Results for GPAs According to Learning Styles

Source of Variance	Sum of Squares	SD	Mean Squares	*F*	*p*	Significant Difference (Scheffé)	η^2
Between groups	1434.981	5	286.996	2.993	.017	Participant dependent	.19
Within groups	6232.991	65	95.892				
Total	7667.972	70					

Note: ANOVA = analysis of variance; GPA = grade point averages.

Table 16.
Correlation Values of the Relationship Between Turkish Grades and Creative Thinking Scores

	Fluency	Flexibility	Originality	Total
r	.29	.29	.32	.32
p	.015	.013	.007	.007
N	71	71	71	71

Table 17.
Correlation Values of the Relationship Between Maths Grades and Creative Thinking Scores

	Fluency	Flexibility	Originality	Total
r	.27	.19	.34	.30
p	.023	.117	.004	.011
N	71	71	71	71

grades and flexibility scores, but not at a significant level ($r = .19$, $p > .05$).

Findings Regarding the Relationship Between Students' Academic Achievement in Science Course and Creative Thinking Skills

Pairwise correlation analyses were performed to examine the relationships between students' Science grades and the fluency, flexibility and originality and total test scores, and the results are shown in Table 18.

According to Table 18; the correlation between students' science grades and fluency scores were found at moderate, positive and significant level ($r = .31$, $p < .01$). It was also seen that grades had moderate, positive and significant correlation with originality ($r = .40$, $p < .01$) and with total creative thinking scores ($r = .35$, $p < .01$). It was found that at the weak level, positive correlation between the students' grades and their flexibility scores was not at a significant level ($r = .22$, $p > .05$).

Findings Regarding the Relationship Between Students' Academic Achievement in Social Sciences Course and Creative Thinking Skills

Pairwise correlation analyses were performed to examine the relationships between students' social sciences grades and the fluency, flexibility and originality and total test scores, and the results are shown in Table 19.

According to Table 19; it was found that there was a weak, positive and significant correlation ($r = .27$, $p < .05$) between the students' social studies grades and their fluency scores; the correlation between grades and flexibility scores were weak, positive and significant level ($r = .25$, $p < .05$). It was seen that grades had moderate, positive and significant ($r = .32$, $p < .01$) correlation with originality and with total creative thinking scores ($r = .32$, $p < .05$).

Findings Regarding the Relationship Between Students' Academic Achievement in English Course and Creative Thinking Skills

Pairwise correlation analyses were performed to examine the relationships between students' English grades and the fluency, flexibility and originality and total test scores, and the results are shown in Table 20.

Table 18.
Correlation Values of the Relationship Between Science Grades and Creative Thinking Scores

	Fluency	Flexibility	Originality	Total
r	.31	.22	.40	.35
p	.008	.065	.000	.003
N	71	71	71	71

Table 19.
Correlation Values of the Relationship Between Social Sciences Grades and Creative Thinking Scores

	Fluency	Flexibility	Originality	Total
r	.27	.25	.32	.30
p	.023	.034	.007	.011
N	71	71	71	71

Table 20.
Correlation Values of the Relationship Between English Grades and Creative Thinking Scores

	Fluency	Flexibility	Originality	Total
r	.34	.28	.35	.36
p	.003	.021	.002	.002
N	71	71	71	71

According to Table 20, the students' English course grades were correlated moderately positive and significant with their fluency scores ($r = .34$, $p < .01$); the correlation between the grades and flexibility scores were low, positive and significant ($r = .28$, $p < .05$). It was also seen that grades had moderate, positive and significant correlations with originality scores ($r = .35$, $p < .01$) and with total creative thinking scores ($r = .36$, $p < .01$).

Findings Regarding the Relationship Between Students' Academic Achievement in General and Creative Thinking Skills

Pairwise correlation analyses were performed to examine the relationships between students' GPAs and the fluency, flexibility and originality and total test scores, and the results are shown in Table 21.

According to Table 21; the students' GPAs were correlated moderately, positive and significant level with their fluency scores ($r = .36$, $p < .01$); the correlation between the grades and flexibility scores were at a weak positive and significant level ($r = .29$, $p < .05$). It was also found that there were moderate, positive and significant correlations with originality scores ($r = .42$, $p < .01$) and with total creative thinking scores ($r = .39$, $p < .01$).

Findings Regarding the Relationship Between Students' Learning Styles and Creative Thinking Skills

The descriptive statistics of the students' total scores from the creative thinking test according to their learning styles are given in Table 22.

When Table 22 is examined, it could be seen that the arithmetic means of the students, total scores from the creative thinking test were listed from the highest to the lowest as 104.50 for collaborative, 88.70 for participant, 79.65 for competitive, 76.67 for dependent, 61.50 for independent, and 40.50 for avoidant students.

Table 21.
Correlation Values of the Relationship Between GPAs and Creative Thinking Scores

	Fluency	Flexibility	Originality	Total
r	.36	.29	.42	.39
p	.002	.014	.000	.001
N	71	71	71	71

Note: GPA = grade point averages.

According to the data in Table 22; there were differences between total creative thinking scores according to learning styles. One-way ANOVA analysis was applied to determine the significance level of this difference, and the results are shown in Table 23.

Analysis results given in Table 23 show that there was no significant difference between students' total creative thinking scores in terms of learning styles [$F(5–65) = 3{,}76$, $p > .05$].

Discussion and Conclusion and Recommendations

Discussion Regarding Students' Distribution According to Their Learning Styles

It was concluded that the students of the research had the participant learning style as the most, followed by competitive, dependent, and collaborative learning styles, respectively. The styles that students had the least are; independent and avoidant learning styles.

The distributions of students in participant and competitive learning styles in studies conducted in Turkey on the subject support the results of this research (Bayrak, 2014; İkikardeş & Şentürk, 2011; Karamustafaoğlu et al., 2016; Şen, 2018; Tüysüz, 2013). However, according to the results of the mentioned studies, the findings that collaborative and independent learning styles are among students' dominant styles differ from the results of this study. According to the results of the relevant research conducted abroad, it could be said that collaborative learning style stands out among the learning styles most possessed by students (Azarkhordad & Mehdinezhad, 2016; Corbin, 2017; Khalid et al., 2013).

Students with the participant learning style like to take responsibility for learning in the classroom and are more enthusiastic than others in fulfilling the requirements of the lesson (Vural, 2013). In line with the aims of the new curricula that have been changed since 2005 in Turkey, students are expected to be individuals who actively participate in the learning process (Özmantar et al., 2009). Also, it is stated in the MEB Turkish Curriculum (2019) that students should be actively involved in the learning-teaching process. Accordingly, in this study, students mostly had the participant learning style, which has features such as being willing to participate in lesson activities: It may be a result that has emerged in line with the relevant purposes of our teaching programs.

Table 22.
Descriptive Distribution of Total Creative Thinking Scores by Learning Styles

Learning Styles	*N*	$\bar{X}$	SD
Independent	2	61.50	7.78
Avoidant	2	40.50	38.90
Collaborative	12	104.50	18.86
Dependent	15	76.67	25.09
Cooperative	17	79.65	35.07
Participant	23	88.70	48.27
Total	71	84.54	37.17

Among the dominant learning styles of the students participating in the research, it was determined that the second style with the highest rate was the competitive learning style. The fact that these students were at the education level where they prepared for the high school entrance exams may have developed their competitive learning style characteristics. The views of Büyüköztürk (2016) on this subject support this situation: "The centrally administered exams are used for the purpose of evaluating students, teachers, classes, schools, districts, and even provinces in a competitive race with each other, apart from the purpose of placing students in schools by ordering them and these exams can result in a student seeing his peers in his class or school as his competitor in general."

Among the dominant learning styles of the students participating in the research, the third style with the highest rate was found as the dependent learning style. Dependent learners are characterized as who have little mental interest, learn only what is necessary, see the teacher as the source of the structure, support, and seek authority figures to guide what they need to do (Grasha & Yangarber-Hicks, 2000). In 2005–2006, the Turkish MEB decided that the educational activities in the programs to be implemented in schools should be carried out in accordance with the constructivist approach, and the programs prepared in this direction began to be implemented in schools in the country. According to the constructivist approach, the teacher, in the teaching-learning process, rather than transmitting information or a stimulus that will provide effect and reaction; they are present in the classroom by taking roles such as guiding, organizing, supporting, and consultant during the construction of knowledge process of students (Gür et al., 2013). According to all these explanations about dependent learning style, it could be interpreted that the students cannot sufficiently adopt the learner roles required by the constructivist approach, and that they continue to be dependent on the teacher for authority figure and guidance. In a study examining teachers' perceptions of the constructivist

Table 23.
One-Way ANOVA Results for Total Creative Thinking Scores by Learning Styles

Source of Variance	Sum of Squares	SD	Mean Squares	*F*	*p*	Significant Difference (Scheffé)
Between groups	11,455.577	5	2291.115	1.747	.136	—
Within groups	85,238.085	65	1,311.355			
Total	96,693.662	70				

Note: ANOVA = analysis of variance.

learning environment and constructivist approach practices (Mertoğlu et al., 2019), although the teachers stated that they generally created a constructivist learning environment in their classrooms, according to the observations, it was concluded that all but one of the five teachers were teaching with the traditional approach. The result of this study that students have dependent learning style might be related to teachers' use of traditional teaching methods rather than student-centered approach, as expressed in the study of Mertoğlu.

The collaborative learning style was not found among the dominant learning styles of the students participating in the research, unlike the results of the relevant studies conducted in Turkey and abroad. Learners with collaborative learning style are the ones who like sharing and collaboration; and according to them, the class is a place for learning and interacting with others (Jonassen & Grabowski, 1993). Collaborative learning method develops cooperation in students, increases their social skills, maintains individual responsibilities, develops leadership skills, and enables communication. It is understood that it develops the characteristics expected from individuals in our age and is suitable for the constructivist curriculum and the education programs of our country (Tunç & Geçit, 2016). In this context, according to the results of this study, it could be thought that the objectives of the curricula in developing collaborative learning and employing the constructivist approach have not been completely achieved.

Independent learning style was determined as one of the two learning styles that the students participating in the research had as the least. Independent learning style is characterized by features such as working on one's own, having self-confidence, creating independent learning goals, not seeking authority figures, and preferring student-centered methods (Kamışlı & Özonur, 2019). As can be understood from all these explanations, the students participating in the study didn't have features of constructivist approach such as taking their own learning responsibilities and adopting student-centered methods, but rather showed dependent learning style features.

The other style that the students had the least was determined as the avoidant learning style. This learning style is defined by features such as not being willing to participate in the lesson and not participating (Jonassen & Grabowski, 1993). The students did not show the characteristics of this style and it can also be explained by the fact that the participant learning style, which is the opposite of this style, was found as the most dominant style of the students.

Discussion Regarding Students' Levels of Creative Thinking

The arithmetic means of the scores obtained from the creative thinking sub-dimensions of the students participating in the research ranged from the highest to the lowest as; fluency, originality and flexibility.

Fluency is the first step in problem solving and all creative endeavors is to generate as many ideas as possible to be selected, played with, researched or evaluated (Shively, 2011). In this study, the highest average of the scores obtained by the students belongs to the fluency dimension. It could be interpreted that the students participating in the research were good at generating ideas in a quantitative context. Flexibility is defined as the ability to produce diverse ideas and to have different approaches while producing ideas (Torrance, 1977). The lowest average score of the students participating in the research belonged to the flexibility dimension. It might be interpreted that students did not think in a wide range while generating ideas, did not tend to deal with events in a multidimensional way and did not process them from different angles. Originality is related to how innovative and different the solution, response or ideas are, and how specific they are (Kaufman & Sternberg, 2007). From the results of this research, it was seen that the average of the scores obtained by the students in the originality sub-dimension was higher than the average in the flexibility sub-dimension, but it was significantly lower than the fluency sub-dimension. Accordingly, although students were good at generating a large number of ideas, it could be interpreted that these ideas should be developed in terms of their unique, unconventional, and innovative qualities.

As in the result of this study, there have been many studies conducted in our country that reveal that students' flexibility skills are low (Demirtaş & Baltaoğlu, 2010; İşleyen & Küçük, 2013; Karakuş, 2000; Sonmaz, 2002). It could be associated with religious and moral taboos, family structure, political dogmas, and gender roles (Karakuş, 2000). Ability to think flexibly is influenced by sociocultural, socioeconomic characteristics, having different opportunities and interests (Dilek, 2013; Özer & Polat, 2019). According to this, students, who are advantageous in terms of social, cultural, and economic characteristics, have a higher level of creative thinking skills such as flexibility. Based on this statement, the fact that the participants of the study were educated in a school with a low socioeconomic profile may be associated with their weak ability to think flexibly. Learning activities that involve impressive and motivating questions, open-ended situations and answers that require deeper thinking play an important role in the development of flexible thinking (Vidal, 2005). Due to the fact that the students participating in this research were in the process of preparing for the secondary education transition exam, they were subject to evaluations consisting of multiple-choice questions and that learning-teaching methods and activities were aimed at ensuring that students receive information directly rather than open-ended situations. All of these might be associated with their weak flexible thinking skills.

Discussion Related to Academic Achievement of the Students

The arithmetic means of the course grades of the students participating in the research were listed from the highest to the lowest as English, social studies, mathematics, Turkish, and science.

According to the high school entrance exam (LGS) evaluation reports in which the success of the students in different courses were examined and the data of the related studies, it could be said that the results are quite different from each other (Akbıyık & Seferoğlu, 2006; MEB, 2018, 2019, 2020). However, as a common result of these researches, it could be said that the course in which the students were found generally successful was Turkish, and the course in which they showed the lowest success was Mathematics.

The reasons why the result of this research is not consistent with the relevant literature might be using school grades for data on academic achievement in this research, that standardized tests were not used in the assessment-evaluation practices at school and that the validity and reliability of teacher-made tests were low. Çakan (2004), who made a research on this subject, stated that his findings showed that most of the teachers find themselves inadequate or deficient in assessment and evaluation.

According to the results of the studies of Benzer and Eldem (2013), it was determined that the teachers participating in the study had low level of knowledge and use of assessment and evaluation methods.

Discussion Regarding the Relationship Between Academic Achievement and Learning Styles of the Students

It was observed that there was a significant difference in terms of learning styles between Turkish, social studies, and English grades and GPA. It was determined that this difference was in favor of the participant learning style between the participant and dependent learning styles.

When the literature is examined, it could be seen that there are many study results in which academic achievement differed according to learning styles. According to the results of these studies, it can be concluded that students with participant, collaborative and independent learning styles had high; students with avoidant learning styles had low achievement (Arquero & Tejero Rioja, 2011; Bakır & Mete, 2014; Cimermanová, 2018; Corbin, 2017; İkikardeş & Şentürk, 2011; Karamustafaoğlu, et al., 2016; Khalid et al., 2013; Şen, 2018; Tüysüz & Tatar, 2008).

According to the results of this research, the achievement of students with a participant learning style was found to be significantly higher. It is similar to the results of studies conducted both in our country and abroad. Students in the participant learning style are defined by their characteristics such as being a harmonious individual in the classroom, taking pleasure in attending classes and participating in class activities, taking responsibility for the lesson, and the desire to gain as much experience as possible from each lesson (Bilgin & Bahar, 2002). There are various research results supporting the positive relationship between the characteristics of students with a participant learning style and high academic achievement. In the mentioned studies; responsibility, adaptability, developing a positive attitude toward the lesson, participating in classes, active learning, social skills, doing homework, and effort were found to be positively correlated with high academic achievement (Amrai, et al., 2011; Ergün & Kurnaz, 2019; Kazazoğlu, 2013; Özçelik, 1998; Parker et al., 2004; Sığrı & Gürbüz, 2011) and it is seen that these characteristics are also found in students with a participant learning style. It can be interpreted that these characteristics of students in the participant learning style might be effective in their high level of achievement. Determining whether these characteristics are predictive of the success of participant learners is another suggestion of research. It is known that participant learners are versatile and do not have any special inadequacies regarding the classroom environment (Jonassen & Grabowski, 1993). The success of participant learners in the classroom environment can be interpreted as the existence or provision of situations and activities for the preferences of these students. However, the fact that these students are already willing to participate in the course, do not come forward with special needs regarding the classroom environment may have enabled them to succeed as a result of their own characteristics.

Learners with dependent learning style is defined by the characteristics of learning only what is necessary, showing little intellectual curiosity, seeing the teacher as a source of information, wanting to be guided about what to do, and seeking authority for this (Bilgin & Bahar, 2002). The preferences of these students regarding the learning environment are explained with the activities and assignments, the boundaries of which are drawn by the teacher and teacher-centered methods. Independent studies, self-paced assignments, student-designed projects are the methods that students have difficulty with. For the needs of these students and their development, it is recommended that the student determines his/her own duties and responsibilities and his/her own standards under the guidance of the teacher (Jonassen & Grabowski, 1993). While it is another research topic whether these characteristics of students with dependent learning style are effective in their lower achievements, the needs of these students regarding the learning environment need to be evaluated in order to improve their success.

According to the results of the research conducted by Kumar et al. (2004), at the end of the period in which collaborative teaching methods were used, an increase was observed in the average of collaborative and participant learning styles of the students. As can be understood from the results of this research, with some changes to be made in learning-teaching methods, it is possible that there will be some changes in the learning styles of the students. Considering that the success of participant and collaborative students is higher, teaching other students the characteristics of these learning styles can be effective in increasing the success. According to the results of a study conducted by Dikmen and Tuncer (2020), it was found that the academic achievement of the students in the experimental group taught based on learning styles was significantly higher than the control group in the traditional education. The results of this research are a suggestion that considering the preferences and needs of students regarding their learning styles can be effective in increasing their success. Thus, students with the dependent and avoidant learning styles, who are less successful than other students, have needs for evaluation and development.

Discussion Regarding the Relationship Between Academic Achievement and Creative Thinking Skills of the Students

Students' total creative thinking scores and GPA of all courses had a moderate, positive, and significant correlations.

When the studies carried out both in our country and abroad are examined, it is seen that there are many studies revealing that there was a positive relationship between creative thinking and academic achievement (Ai, 1999; Erdoğdu, 2006; Erdoğdu & Şirin, 2018; McCabe, 1991; Nami et al., 2014). There are also studies related to creative thinking that can be discussed in interpreting the relationship between academic achievement and creative thinking (Durnacı & Ültay, 2020; Sonmaz, 2002; Wang, 2012; Yenilmez & Çalışkan, 2011). According to the results of these studies, the features positively related to creative thinking can be summarized as problem-solving skills, types of intelligence, critical thinking, and spending time on reading and writing. The assumption that these features, which have positive relations with creative thinking, may be effective in the relationship between academic achievement and creative thinking is a suggestion that should be evaluated for both researchers and all education professionals.

It was determined that there were moderate, positive, and significant correlations between the originality scores and all course grades of the students. According to this, it could be said that the originality was included at a certain level in the evaluations of all courses. There was a weak level of correlation between the students' scores on the fluency and Turkish, mathematics, and social studies grades. It was also calculated that there were moderate, positive, and significant correlations between fluency scores

and science and English grades. According to this result, it can be said that generating more ideas was given place and importance in the evaluation of science and English courses rather than other courses. It was found that there were weak-level, positive and significant correlations between the flexibility scores and Turkish, social studies, and English grades. According to this; the flexibility skill, which is defined as dealing with events from different perspectives, was placed at a weak level in the evaluation of student success in the aforementioned courses, this skill was not included in the assessment of success in mathematics and science courses. İncebacak and Ersoy (2019), according to the results of their research in which they examined the creative problem-solving skills of secondary school students, they stated that the fluency and flexibility dimension were more successful than the originality dimension among the students who solved the problem correctly. To this conclusion, they commented that students who have stereotypical thoughts will have difficulties in generating ideas, and students who are allowed to think differently will be successful. According to the results of Erdoğdu's research (2006) on this subject, there is a negative correlation between students' academic achievement and flexibility skills. According to this result of the researcher, the academic success of students who demonstrate different thinking skills is lower. It can be said that these two studies on the subject have opened the following truth to discussion: The ability to think flexible can support the development of many skills such as problem solving. However; the extent to which teachers attach importance to this skill in their teaching and evaluation is an issue that needs to be investigated and evaluated. Thus, according to the results of the research mentioned earlier, this issue should be discussed among the reasons why mathematics is the subject in which students show the lowest success. The fact that the flexibility skill is not placed in evaluation of math might be related to the low levels of success in math. According to Yeşilyurt (2020); teachers who express different ideas, make experiments freely, seek solutions out of the ordinary, organize flexible teaching-learning environments, and seek alternative solutions can further develop students' creative thinking.

According to the results of experimental studies on the subject, it was understood that creative thinking-based practices improve creative thinking skills and academic success (Bulut & Aktepe, 2015; Koray et al., 2007; Özerbaş, 2011; Ulubey & Toraman, 2015). Looking at the results of these studies, it could be said that including creative thinking skills in educational practices, evaluating these skills, and designing teaching activities in a way that requires and develops creative thinking in students is necessary to improve both creative thinking and academic success.

Discussion Regarding the Relationship Between the Students' Learning Styles and Creative Thinking Skills

Students with collaborative learning style got the highest means of creative thinking scores, it was followed by participant, competitive, dependent, independent, and avoidant students as from the highest to the lowest. However; these differences between students' creative thinking scores were not statistically significant.

When the results of the studies on the subject are examined, in most of them, there was a relationship between learning styles and creative thinking skills (Baykal & Karakuş, 2019; Demirtaş & Baltaoğlu, 2010; Eishani et al., 2014; Friedel & Rudd, 2006; Sitar et al., 2016; Tsai & Shirley, 2013). With this, in these studies, it could be seen that different scales were used both from each other and from the learning style scale used in this research. Among these studies, according to the results of the research conducted using the Grasha–Reichmann Learning Style Scale (Sitar et al., 2016), independent and collaborative learning style were found to be associated with the high level of creative thinking.

The reason why such a relationship was not found in this study might be the small size of study group and the learning style scale. In this study; the number of the participants was small and GRLSS have six categories, which caused not reaching to adequate participant size for all the categories to run statistically significant analyses.

Creative thinking is a concept that rejects a precise definition, infinite, difficult to see and has a wide scope (Torrance, 1988). This feature of the concept of creative thinking not only complicates its association with other variables, but also makes it necessary to examine these relationships in order to better understand it. There are many definitions of the characteristics of creative individuals and these definitions combine quite different characteristics (Fisher, 2004; Guilford, 1973; Sternberg, 2006; Torrance, 1988); however, these definitions generally emphasize cognitive features. To define the features that creativity brings with it in the social dimension and within the context of learning environment preferences, it will be very effective and useful in designing conditions and methods that can develop these skills. As a matter of fact, the studies carried out shows that all kinds of people with different skills and in different environments solve many different problems every day. Creative thinking or problem-solving styles require a combination of traditional personality theories, environmental influences and attention to the creative and problem-solving efforts of all individuals (Selby et al., 2005). In this context; research on the relationship between creative thinking skills and preferences for learning environments is necessary and should be sustained for designs aimed at improving the creative thinking skills of individuals.

The results of this research could be summarized as follows:

- Competitive and dependent learning styles associated with traditional learning-teaching methods were found among the dominant learning styles of students. In return for this, collaborative and independent learning styles, which are more related to the constructivist approach, were not found among the dominant styles of the students.
- While students' fluent thinking skills were relatively better, their original and especially flexible thinking skills were at lower level.
- Students' academic achievement levels in different courses was not similar to the results of the central exams.
- Academic achievement of the students with the participant learning style was significantly higher than the students with the dependent learning style.
- There were positive and significant correlations between students' creative thinking skills and academic achievement.

In the light of the results obtained from the research, the following suggestions were developed:

- More research should be conducted on the extent to which teachers design and maintain their teaching activities according to the constructivist approach. In order teachers to adopt the constructivist approach and reflect it on their attitudes, more compulsory in-service training on this subject could be

planned, more collaborative work be included in the acquisitions of curricula and in school or classroom activities.

- It is important for students to develop a collaborative learning style as well as a competitive learning style. Collaborative learning style improves academic success in students, it is a style that can also develop the skills they need to have at the end of and outside of the educational processes. Therefore, teachers should include collaborative activities in their teaching activities and pay attention to developing collaborative learning in their students.
- In order to develop students' independent learning style characteristics, studies should be conducted in which students will design and maintain their own learning goals, plans and responsibilities.
- To improve students' original and especially flexible thinking skills, more space should be given to activities that require open-ended responses and feedback, enable them to think in different ways, and handle situations from different perspectives.
- In-service trainings that will increase teachers' knowledge and use of assessment and evaluation methods should be more widespread.
- The research should be conducted on the extent to which teachers include fluent, flexible, and original thinking in their assessment and evaluation activities.
- Studies should be conducted to investigate the effects of flexible thinking skills on students' low achievement in mathematics and science courses. Through these studies, it might be possible to shed light on the ways and methods to be followed in increasing the success of students in these courses.
- Studies should be conducted with a larger and more heterogeneous sample group to examine the relationship between students' creative thinking skills and learning styles that reveal social learning skills. Thus, more valid, reliable, and meaningful results can be achieved in this regard, and the scope of the concepts of learning styles and creative thinking skills can be developed.

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Extended Abstract

Purpose: Active learning and creative thinking play very decisive role in an individual's entry into many educational, professional or personal fields; in their development; in increasing the quality of life and satisfaction with life. Especially in our age where knowledge, production and innovation are rapidly advancing; individuals need to maintain their learning and creative thinking processes effectively throughout their lives.

Maintaining effective learning processes depends on how a person learns and how they organize their learning processes accordingly. The way an individual learns most effectively is his learning style. In addition to these features, it can be said that academic success is the most frequently evaluated criterion in monitoring the education processes of individuals, hiring them and accordingly their lifestyles.

The purpose of this research is to examine the learning styles, creative thinking skills and academic achievement of eighth grade students. In line with this main purpose, the questions expected to be answered by the research are as follows:

For eighth grade students;

1. What is their distribution according to learning styles?
2. What are their creative thinking levels?
3. What are their academic achievement levels?
4. Is there a significant relationship between their academic achievement levels and learning styles?
5. Is there a significant relationship between their academic achievement levels and creative thinking levels?
6. Is there a significant relationship between their learning styles and creative thinking skills?

Identifying students' learning styles can shed light on the design and evaluation of learning activities and teaching methods. In addition, the extent to which the current education-teaching processes improve students' creative thinking skills can be discussed with the results of this research. By examining the relationship between students' academic achievement level, learning styles and creative thinking skills; the development of success in students could be guided.

Method: This research was designed according to the relational survey model, which is one of the quantitative research methods.

The study group of the research consisted of eighth grade students who continued their education in the 2020-2021 academic year of a secondary school in one of the central districts of Gaziantep, where students from low socio-economic levels were educated. The research was carried out with the participation of 71 students. In this study, Grasha–Reichmann Learning Style Scale, Torrance Creative Thinking Test, and students' course grades and overall grade point averages were used as data collection tools. The tools were applied by the researcher to the participants in two sessions. The collected data were transferred to the SPSS 22 program and analyzed using arithmetic mean, frequency distribution, descriptive analysis, Anova, t-test analysis and simple correlation: Pearson Correlation Coefficient Analysis. To examine the reliability of Torrance Creative Thinking Test scores; 15 tests randomly selected from 71 tests were evaluated by a second expert with scoring authority. Pearson correlation coefficients between these two scores ranged from .81 to .99 ($p < .01$). In addition, according to the internal consistency analysis, the Cronbach Alpha reliability coefficient of the data obtained from this test was found to be .92 ($p < .01$).

Results: According to the findings, it was seen that the learning styles of the participants were listed as follows from the most to the least: participant, competitive, dependent, cooperative, independent and avoidant learning styles. It was found that the arithmetic averages of the creative thinking dimensions of the students were the highest in fluency, followed by originality and the lowest in flexibility.

It was observed that the arithmetic averages of the students' course grades were ranked from the highest to the lowest: English, social studies, mathematics, Turkish and science. It was observed that students with the participant learning style had a significantly higher grade point average than students with the dependent learning style. In addition, it was observed that there were positive and significant relationships between the academic achievements of the participants and their creative thinking scores. There was no significant relationship between students' learning styles and their creative thinking skills.

Discussion and Conclusion and Recommendations: While dependent and competitive learning styles are the styles that students have more, independent and cooperative learning styles were not found among the dominant styles. This distribution shows that the students cannot adopt the attitudes, preferences and characteristics of the constructivist approach sufficiently. Collaborative work can be done with teachers, parents and students to develop the characteristics of students such as taking their own learning responsibilities, creating learning interests and goals independently of authority, and working collaboratively.

The low level of flexible and original thinking skills of students may be related to not giving enough importance to these skills in both in-school and central evaluations. Teachers' inclusion of activities in which students will examine events from different perspectives and produce more innovative ideas can help develop this skill. Considering that students with a collaborative learning style have higher academic success, designing learning-teaching activities in a way that enables students to participate more effectively and developing the characteristics of this style in students can increase the success of all students. Recognition of learning styles and including these styles in learning processes will be effective in increasing student success.

It has been observed that the academic success of students with high creative thinking skills is also high. Accordingly, giving more space to this skill in practices based on creative thinking and education processes will both improve this skill and increase the success of students.