

Investigation of the Relationship Between Learning Styles and Creativity of Middle School Science and Art Centres Students

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Abstract

The current study, which uses a survey approach, aims to identify middle school students who visit BILSEMs (Science and Art Centers) in terms of their creativity and learning preferences and to look into the impact of various factors on these traits. In the 2021–2022 academic year, 214 fifth, sixth, and seventh graders were chosen using the purposive sampling technique. The "How Creative Are You?" scale, "Kolb Learning Style Inventory," and a personal information form were used as data gathering tools. The study's findings indicate that the creativity of the participating students is above medium, and the majority have "converging" learning styles. At the same time, the minority has "diverging" learning styles, that gender, grade level, type of school, BILSEM program, and family income level have no bearing on the children's creativity, and learning styles vary significantly depending on these factors. Additionally, there was no discernible link between the students' learning preferences and creativity.

Keywords: Learning style, creativity, Science and Art Centre, gifted student, quantitative analysis

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Introduction

High-quality education is believed to be the fundamental building block of progress, particularly economic development. Through education, it is intended to produce creative people capable of thinking critically about things like knowledge, ideas, goods, etc. This qualification is particularly sought after in the twenty-first century. Gardner argues that qualified individuals possess 21st-century talents or the ability to perform tasks that machines cannot perform (Akgündüz et al., 2015). Creativity is one of the essential abilities among these abilities. Since it helps individuals and governments formulate policies to address present and potential issues, creativity and creative thinking in society have long been among the most hotly debated subjects. According to Parnes (2004), creativity is the ability to react to distinguishing external and internal inputs like words, pictures, symbols, and drawings. According to Torrance (1962), the fundamental components of creativity include sensing a problem or something missing, differentiating the problem's elements, formulating ideas or solutions for the problem or the missing pieces, making educated guesses, testing out the proposals for an answer, and ultimately arriving at a solution. Wallas (1926) asserted that the creation process consists of four stages: preparation, incubation, illumination, and verification, which also includes the problem-solving stage. When creativity is viewed as a personality characteristic, it can be claimed that creative people are curious, love dealing with difficult situations, have a high tendency to take chances, are original and flexible thinkers, and are introverted, independent, and inquisitive (Guilford, 1968). Csikszentmihalyi (2004) asserts that creative people can accomplish their goals through more excellent environmental adaptation skills than their counterparts, regardless of the circumstances. Specific requirements must be met to foster, define, and assess creativity in people. These requirements include redefining problems, analyzing and defending ideas, two-sided information flow, overcoming obstacles, taking risks, being willing to grow, believing in oneself, resisting uncertainty, and engaging in one's passions (Sternberg, 2006).

The results of the intelligence tests used to identify giftedness have started to be insufficient due to current intelligence research, and numerous evaluations to gauge creativity, problem-solving skills, situational awareness, etc., have become necessary (Arseven and Yeşiltaş, 2016). When the literature is examined, it becomes clear that the definition of a gifted person is someone prolific, has strong leadership qualities and can perform at a high level in various artistic fields (Marland Report, 1972). On the other hand, Renzulli (1978) defined giftedness as possessing both strong drive and above-average creative ability in any skill area. According to Cropley (1992), having a high IQ is not enough for someone gifted to succeed. Originality, consistency, and the ability to effectively communicate outcomes to others are among the requirements for true talent. This suggests that the success of gifted people depends on elements frequently linked to creativity and psychological traits typically recognized to be connected with intelligence. A thorough approach in these areas must foster creativity, giftedness, divergent thinking instruction, and learning-style-specific educational materials. Rita Dunn established

the idea of learning styles in 1960, and it became widely employed in the years that followed (Scales, 2000). In reality, finding disparate terms in the literature is feasible, such as learning styles, cognitive styles, sensory preferences, and personality traits. Many of these concepts are interchangeable, although in certain situations, they have developed their meanings (Cassidy, 2004). Learning styles are the methods a learner uses to process, store, and retain information (James and Gardner, 1995). The three main categories of learning styles are generally cognitive (including the dichotomies of analytic and global, dependent and independent fields, impulsive and reflective); personality (including the dichotomies of extrovert and introvert, random-intuitive and concrete-sequential, as well as closure-oriented and open-ended with sensory including visual, tactile, kinaesthetic, and auditory); and personality (including the dichotomies of random-intuitive and concrete). In light of intelligence theories, Karabey and Yürümezoğlu (2015) analyzed the notions of creativity and giftedness. Research on creativity and bipolar disorder was collated by Maçkal, Gülöksüz, and Oral (2014). The teaching environments should be planned by the learning characteristics of the individuals in a way that will permit the efficient learning process to occur, particularly from the perspective of the efficiency of the learning process of gifted students and the development of their innate skills (Kürüm, 2008). It is possible to plan the entire process—from the materials to be used in the lessons to the evaluation tools—for talented children by being aware of the different learning styles that the students exhibit and then designing the teaching environment, method, technique, and strategies accordingly. Students go through a quicker and easier learning process than they did in the past when they become aware of their learning preferences. In doing so, people come up with solutions to problems they run into in daily life faster, which boosts their creativity (Biggs, 2001; Entwistle, McCune, and Walker, 2001). Kolb (1984) asserts that people gain from their experiences as they learn. Through physical experiences and abstract ideas, information is gleaned from the environment. Reflective observation and active experiences process the knowledge learned through environmental experiences. There are four fundamental learning styles, according to Kolb (1984). People with differing learning styles demonstrate behaviors from the fusion of significant experience and reflective observation. They enjoy and favor learning that considers their senses, especially their sense of sight. Their feelings and intuitions are dominant. Individuals with the assimilation learning style/type exhibit behaviors that mix abstract conceptualization with reflective observation. They focus on the finer points and nuances. Individuals with the convergent learning style/type prioritize behaviors from active experience and abstract conceptualization. These people are cautious and don't make quick decisions. People with an accommodating learning style/type display behaviors that merge active experiences with concrete experiences. These people make snap decisions and act quickly. They enjoy trying and creating new things while working on a project. Another well-known learning style model is the one created by Grasha and Riechmann. Instead of the Kolb learning style, six alternative learning styles were identified in this paradigm (Grasha, 2002). Outperforming the other students in their class is the top priority for kids with a competitive learning style. They enjoy

being the center of attention and receiving praise for their achievements in the classroom. They believe they must compete with other pupils to win the awards in the classroom. Students who learn cooperatively love collaborating with teachers and other students and think that learning can be accomplished through sharing information and abilities. On the other hand, students with the avoidant learning style are not interested in what is happening in the classroom. They are not excited about learning the subjects and engaging in the lesson. They are also easily bored. On the other hand, students who learn by learning, like taking part in courses and in-class activities, consider themselves part of the group. They try to participate as much as possible in all mandatory and elective class activities. On the other hand, students who learn dependently are uninterested in what they are learning and only retain the learning that is pertinent to them. They look to their professors and peers for encouragement and seek someone to give them direction. On the other hand, students who prefer autonomous learning choose to work alone to study the material they believe to be crucial. They enjoy independent learning and thinking (Grasha, 2002).

Learning a gifted person's potential and critical thinking abilities is made more accessible by structuring their learning environments and processes to differentiate them from their peers with typical development. It is tailored to their learning preferences and interests (Bildiren, 2013). It is believed that the ideas of creativity and learning preferences are essential elements of a jigsaw puzzle (Levine, 2002). When studies from previous years are analyzed, it becomes clear that gifted students have superior spatial perception and attentional control skills to their peers with typical development, that they enjoy taking an active part in the learning process, and that they are more eager to collaborate in groups with other gifted students (Aşkar, 2006). In their study, Köksal, Göksu, and Kılıç (2017) polled 1116 individuals from three different groups—teachers, students, and parents—to determine which traits should be encouraged in the growth of gifted individuals. Most participants (80.6%) agreed that talented children must strengthen their creative thinking skills. According to the study by Tüysüz, Karakuyu, and Aydın (2008), which looked into the learning styles of talented kids, these students are more likely to exhibit participant and collaborative learning styles than others. Another study by Demirtaş and Baltaoğlu (2010) revealed that students with the visual learning style had better levels of creativity than those with the other learning styles.

Apaydın and Güven's research aims to assess undergraduate education processes in developing and using creativity abilities and determine the prospective teachers' creativity level.

In this context, the purpose of this research is to investigate the link between the degree of creativity and styles of learning of middle school BILSEM students by examining the effects of gender, school type, grade level, the program the student is enrolled in at BILSEM, and family income on both the general level of creativity and learning styles. There are multiple learning styles represented in each class of pupils. In this regard, enriching learning environments is crucial. It is anticipated that students

who have the chance to collaborate with peers who have various learning styles will develop their problem-solving and creative thinking abilities. The learning process is more effective and engaged in groups with diverse learning preferences. Each student adds something to the group. Students can benefit from this situation by being encouraged to consider other people's viewpoints from various angles. The learning process can be made more efficient and successful by knowing about the learning preferences of gifted students, including them in active learning, and carrying out activities to boost their creativity. This study is expected to help teachers organize and assess the educational environment and actions by their awareness of their students' preferred learning styles to make the teaching process more effective.

In this instance, with the purpose of the current study, replies to the undermentioned questions will be sought:

1. What is the middle school BILSEM students' creativity level?
2. Does the level of creativity of middle school BILSEM students change significantly according to;
 - a) Gender,
 - b) Grade level,
 - c) School type,
 - d) The program the student is attending in BILSEM,
 - e) Monthly income level of the families?
3. What are the learning styles of BILSEM students?
4. Does the learning styles of BILSEM students change significantly according to;
 - a) Gender,
 - b) Grade level,
 - c) School type,
 - d) The program the student is attending in BILSEM,
 - e) Monthly income level of the families?
5. Is there a significant correlation between the creativity level of middle school BILSEM students and their learning styles?

Method

Sample

This study was designed as descriptive research using a survey approach, and the sample consisted of 214 gifted middle school students randomly chosen from seven different BILSEMs in four other Turkish regions during the 2021–2022 academic year. Among the pupils taking part, 117 are in fifth grade, 53 are in sixth grade, and 44 are in seventh grade. Among the sample's students, 86 are girls, and 128 are boys; 106 attend public schools, and 108 participate in private ones. The following are the

programs offered in BILSEMs and the number of students enrolled in each program: 53 kids are enrolled in the Special Talent Development program, while 161 students are enrolled in the Recognizing Individual Talents (RIT) program (STD). It can be seen that the monthly income of the sample's three families with students is less than the minimum wage, while the monthly payment of the 36 families with students is between the minimum wage and 7500 TL, the 103 families with students is between 7501 and 15000 TL, and the 72 families with students is between 15001 and higher.

Data Collection Tools

The "How Creative Are You?" scale, created by Whetten and Cameron in 2002 and translated into Turkish by Aksoy in 2004, was used to gauge general creativity among middle school pupils at BILSEM. This one-dimensional scale, a three-point Likert scale, has 39 items. It was created to assess people's creativity levels and perceptions of that creativity by letting them select the adjectives that best characterize who they are. People are asked to choose ten adjectives to represent themselves in the category area of the 40th item of the scale. Students who receive a score between 116 and 95 on the scale are considered to be exceptionally creative; those who receive 94 to 65 are superior creative; those who receive 64 to 40 are above average creative; those who receive 39 to 20 are average creative, those who receive 19 to 10 are below average creative, and those who receive less than 10 are not creative. The reliability coefficient (Cronbach's Alpha coefficient) was found to be 0.95 in the study done to translate the "How Creative Are You?" scale into Turkish, and it was therefore determined that the scale is appropriate for usage in Turkey. The "How Creative Are You?" scale's reliability coefficient was found to be 0.89 in the current study.

The study's sample of students was assessed using the Kolb Learning Style Inventory, created by David Kolb in 1971, refined in 1984, and translated into Turkish by Aşkar and Akkoyunlu (1993). The Kolb Learning Style Questionnaire was developed to help people better understand the learning process and their particular learning preferences. Abstract conceptualization (AC), reflective observation (RO), active experimentation (AE), and concrete experience (CE) are the four learning styles that make up the Kolb Learning Style Inventory (Kolb, 2005, as referenced in Genç and Kocaarslan, 2013). The questionnaire asks participants to rank the four statements most accurately representing their learning styles out of 12 items with four options. The primary learning style of each person is identified based on their scores on the inventory items. The following Cronbach Alpha reliability values were obtained from Aşkar and Akkoyunlu's (1993) Analysis of the Kolb Learning Style Inventory's validity and reliability shows that abstract conceptualization scores are 0.71, concrete experience scores are 0.58, active experimentation scores are 0.65, reflective observation scores are 0.70, abstract-concrete scores are 0.77, and active-reflective scores are 0.76. (as cited in Denizoğlu, 2008).

Because all of the Cronbach Alpha reliability values obtained were higher than 0.70, it can be claimed that the inventory is sufficiently reliable for the current investigation.

The Cronbach Alpha reliability ratings for tangible experience were 0.79, reflective observation was 0.72, abstract conceptualization was 0.76, and active experimentation was 0.79, according to the current study's findings. In the reliability values of the combined scores, Cronbach Alpha was found to be 0.78 for abstract-concrete and 0.71 for the active-reflective. A "Personal Information Form" that the researchers developed was also used in the study to collect information on the sociodemographic characteristics of middle school BILSEM students, such as gender, school type, grade level, the BILSEM program the child is engaged in, and family income level. The "Kolb Learning Style Inventory" and the "How creative are you?" scale were handed to the pupils simultaneously with the personal information form.

Data Analysis

SPSS 20.0 statistic software was employed to analyze all the student-provided data. Frequency and percentage calculations were utilized in the general distribution calculations using the information gathered from the "How creative are you?" scale and the Kolb Learning Style Inventory. The assumption of normality for the data was checked using the Kolmogorov-Smirnov test and the Skewness and Kurtosis coefficients. Tables 1 and 2 present the results and coefficients.

Table 1. Skewness and Kurtosis Values

	Statistic	Standard deviation
Skewness	-0.06	0.14
Kurtosis	-0.45	0.27

Table 2. Normality Values

	Kolmogorov- Smirnov		
	Statistic	df	Significance
Total	0.03	213	0.20

We can say that the data with a skewness value of -0.42 and a kurtosis value of -1.66 are typically distributed, given that the distribution is considered to be expected if the values obtained when the skewness and kurtosis coefficients are divided by the skewness and kurtosis standard errors, respectively, are between -1.96 and +1.96. In addition, normalcy is attained when the Kolmogorov-Smirnov ($p=0.20$) value is higher than 0.05. (Can, 2014).

Since the data had a normal distribution, a one-way ANOVA was performed to determine whether there were any significant differences in the creative levels of middle school BILSEM students according to their gender, kind of school, and program of study. The independent samples t-test was

also performed to see whether there were significant differences in the pupils' creative levels according to grade level and monthly median family income. The available responses There are three options for each of the 39 statements on the scale "How creative are you?" that rate people's levels of creativity and perceptions of their invention: "I agree," "I am undecided," and "I disagree." The final element of the scale also includes a separate section where participants can choose the words that best describe them. The scale's items are graded from lowest (-2) to highest (4) points.

Data from the BILSEM students' responses to the statements on a scale were entered into a digital environment by coding them CE, RO, AC, and AE in that sequence. At the top of the scale, the combined scores for the CE, RO, AC, and AE total scores were determined. The formulas were used to get the combined scores;

both (AE) and (AC) less (CE) and (RO) points, respectively. A score over zero in AC minus CE points indicates abstract learning, and a score below zero in AC minus CE points indicates concrete education. Similar to how positive and negative scores obtained in AE minus RO points demonstrate active or reflective understanding, respectively. Based on the combined results, the intersection of the two scores in the graphic offers the individual the most suitable learning style/type. Following these procedures, scores between -36 and +36 were produced, and the participant's learning styles/types were identified in Figure 3.1. The relationships between the learning preferences of middle school BILSEM students and their gender, grade level, school type, the program they are enrolled in at BILSEM, and family income level were examined using chi-square test analysis. The Chi-square test was used to investigate the relationship between the creative class and the learning preferences of middle school BILSEM students.

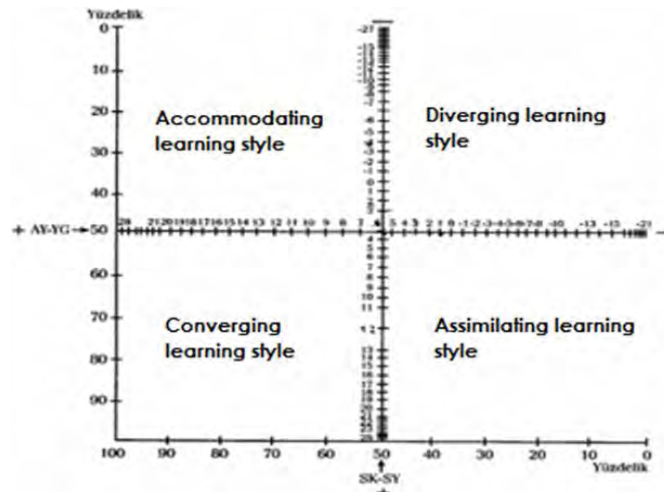


Figure 1. Kolb learning style diagram (Öztuna, 2013)

Findings

The research questions of the study's findings are displayed in tables and explained in the findings section.

Findings for the 1st Sub-Problem

The 1st sub-problem of this research is related to the specification of the creativity level of the middle school BILSEM students. In this context, in Table 3, the creativity level of BILSEM students is given with descriptive statistics.

Table 3. Distribution of the creativity level of the middle school BILSEM students

Extraordinary creative		Superior creative		Creativity level						Scale general			
				Above average creative		Average creative		Below average creative		Not creative		\bar{X}	S
N	%	N	%	N	%	N	%	N	%	N	%		
23	10.7	74	34.6	114	53.3	3	1.4	0	0	0	0	67.93	18.18

As shown in Table 3, 10.7% (N:23) of the middle school BILSEM students are extraordinarily creative, 34.6% (N:74) are superior creative, 53.3% (N:114) are above average creative, 1.4% (N:3) are average creative, no student is below average imaginative or not creative. Therefore, it was concluded that the creativity level of the middle school BILSEM students is mainly above the average.

Findings for the 2nd Sub-Problem

Determining how the gender variable influences the degree of creativity among BILSEM students is the second problem with this study. Table 4 shows the findings of the independent samples t-test carried out in this situation to ascertain the association between the gender of the students' inventiveness.

Table 4. The independent samples t-test results of the correlation between BILSEM students' creativity and gender

The scale "How creative are you?"	Gender	N	\bar{X}	S	t	p
Whole scale	Girl	86	67.74	18.71	-0.13	0.90
	Boy	128	68.06	17.88		

Table 4 shows that there is no discernible gender difference in the middle school BILSEM students' overall creativity score [$t_{(214)} = -0.13, p > 0.05$]. The 214 pupils in the sample consist of 128 boys and 86 girls, and it can be noted that the mean originality score for boys is more significant than that for girls (67.74 vs. 68.06). Therefore, it might be argued that gender does not statistically significantly affect talented students' inventiveness.

Findings for the 3rd Sub-Problem

The third sub-problem of the study is concerned with figuring out how the grade level variable affects how creative the middle school BILSEM students are. The results are shown in Tables 5 and 6. A one-way analysis of variance (ANOVA) was conducted to see whether there is a significant link

between the middle school BILSEM students' scores on the scale "How creative are you?" and their grade level.

Table 5. Arithmetic means and standard deviations of the scores taken by the middle school BILSEM students from the scale "How creative are you?" across the grade levels

The scale "How creative are you?"	Grade Level	N	\bar{X}	S
Whole scale	5 th grade	117	68.22	18.74
	6 th grade	53	68.00	17.99
	7 th grade	44	67.09	17.25
	Total	214	67.94	18.18

Table 5 shows 117 middle school BILSEM students in fifth grade, 53 in sixth grade, and 44 in seventh grade. Table 6 displays the findings of the one-way analysis of variance (ANOVA) performed to assess whether the difference between the arithmetic means is statistically significant.

Table 6. Results of the One-way ANOVA conducted to determine the correlation between the scores taken by the middle school BILSEM students from the "How creative are you?" scale and grade level

Source of the variance	Sum of squares	Sd	Mean square	F	p
Between-groups	41.22	2	20.61	0.06	0.94
Within-groups	70365.86	211	333.49		
Total	70407.09	213			

According to the analysis's results, which are shown in Table 6, there is no statistically significant correlation between the middle school BILSEM students' degree of originality and their grade [$F_{(2,211)} = 0.06, p > 0.05$]. This demonstrates how grade level has no bearing on the creativity of gifted middle school students.

Findings for the 4th Sub-Problem

The fourth sub-problem of this research is to determine how the school type variable affects how creative the middle school BILSEM students are. The findings of the independent samples t-test analysis performed in this context to ascertain the influence of the school type variable on the scores of the middle school BILSEM students obtained from the "How creative are you" scale are presented in Table 7.

Table 7. The independent samples t-test results of the correlation between BILSEM students' creativity and school-type

The scale "How creative are you?"	School type	N	\bar{X}	S	t	p
Whole scale	Public	106	68.01	18.36	0.68	0.95
	Private	108	67.85	18.09		

As shown in Table 7 [$t_{(214)} = 0.68, p > 0.05$], the results of the independent samples t-test analysis conducted to ascertain the impact of the school type variable on the scores of the middle school BILSEM students on the "How creative are you?" scale. Of the 214 participants in the sample, 106 attend a public school, and 108 follow a private one for their academic studies. When Table 7 is looked at, it can be observed that the mean score of the BILSEM students studying in public schools ($X:68.01$) is higher than the mean score of the BILSEM students studying in private schools ($X:67.85$) on the scale of "How creative are you?" However, the school type variable does not statistically significantly affect the level of originality among middle school BILSEM students, as shown by the fact that the p-value is more significant than 0.05.

Findings for the 5th Sub-Problem

The study's fifth sub-problem concerns figuring out how the student's BILSEM program affects how creative the middle school BILSEM pupils are. Table 8 provides the findings of the independent samples t-test analysis carried out in this context to ascertain the impact of the program the student is enrolled in at BILSEM on the scores of the middle school BILSEM students obtained from the "How creative are you" scale.

Table 8. The independent samples t-test results of the correlation between BILSEM students' creativity and the program the student is attending in BILSEM

The scale "How creative are you?"	The program the student is attending in BILSEM	N	\bar{X}	S	t	p
Whole scale	Exceptional Talent Development (STD)	53	67.47	17.66	0.05	0.83
	Recognizing Individual Talents (RIT)	161	68.09	18.40		

Table 8 shows that there is no discernible difference in the inventiveness of middle school BILSEM students according to the program they are enrolled in [$t_{(214)} = 0.05, p > 0.05$]. Of the talented middle schoolers enlisted in BILSEMs, 161 are trained in the program of Recognizing Individual Talents and 53 in the program of Special Talent Development. When Table 8 is studied, it becomes clear that the talented students enrolled in the Special Talent Development in BILSEMs program had higher mean creativity scores than the gifted students enrolled in the Recognizing Individual Talents in BILSEMs program ($X: 67.47$). Since the p-significance value is more significant than 0.05, it can be concluded that the program the student attends in BILSEM does not have any statistically significant effect on the creativity level of the middle school BILSEM students.

Findings for the 6th Sub-Problem

The sixth sub-problem of the study is concerned with figuring out how the family income variable affects the degree of creativity among middle school BILSEM students. The results of a one-way analysis of variance (ANOVA) used to determine whether there is a significant relationship

between the average monthly income of the family and the scores of middle school BILSEM students taken from the scale "How creative are you?" are shown in Tables 9 and 10.

Table 9. Arithmetic means and standard deviations of the scores taken by the middle school BILSEM students from the scale "How creative are you?" across the family income levels

The scale "How creative are you?"	Family income levels	N	\bar{X}	S
Whole scale	Below the minimum wage	3	59.00	13.31
	Minimum wage-7500 TL	36	69.31	3.01
	7501 TL- 15000 TL	103	69.66	1.81
	15001 TL and higher	72	65.15	2.07
	Total	214	67.94	18.18

As seen in Table 9, the average monthly income of the sample's three families with students is less than the minimum wage, while that of the 36 families with students is between the minimum wage and 7500 TL, the 103 families with students is between 7501 and 15000 TL, and that of the 72 families with students is between 15001 and higher. Table 10 displays the findings of the one-way analysis of variance (One-way ANOVA) carried out to ascertain whether the conflict between the arithmetic means is statistically significant.

Table 10. Results of the One-way ANOVA conducted to determine the correlation between the scores taken by the BILSEM students from the scale "How creative are you?" and family income

Source of the variance	Sum of squares	Sd	Mean square	F	p
Between-groups	19.20	39	00.50	0.89	0.67
Within-groups	96.60	174	00.56		
Total	115.80	213			

According to the analysis's findings, which are presented in Table 10, there is no statistically significant relationship between middle school BILSEM students' levels of creativity and their family's wealth [$F_{(39-174)} = 0.89, p > 0.05$]. This suggests that the inventiveness of the middle school BILSEM students is unaffected by their family's income status.

Findings for the 7th Sub-Problem

Identifying the middle school BILSEM students' learning preferences is the subject of the study's seventh sub-problem. The frequency and percentage distribution of the middle school BILSEM students' learning styles are shown in Table 11 in this context.

Table 11. Distribution of the middle school BILSEM students across the learning styles

Learning styles	f	%
Diverging	37	17.3
Assimilating	40	18.7
Converging	81	37.9
Accommodating	56	26.1
Total	214	100.0

When the learning styles of the BILSEM students participating in the study are examined in Table 11, it is understood that the highest percentage of the students have the converging learning style (37.9%) and that the lowest rate of the students has the diverging learning style (17.3%).

Findings for the 8th Sub-Problem

Finding out how the gender variable affects the learning styles of the gifted middle school BILSEM students is the eighth sub-problem of the study. The results of the Chi-square test, which was used to ascertain the impact of the gender variable on the learning styles of the gifted middle school BILSEM students, are presented in Table 12 in this context.

Table 12. Correlation between the learning styles of the middle school BILSEM students and their gender

Gender		Learning Style				TOTAL
		Diverging	Assimilating	Converging	Accommodating	
Boy	N (%)	21 (16.4)	32 (25.0)	51 (39.8)	24 (18.8)	128 (100.0)
Girl	N (%)	16 (18.6)	8 (9.3)	30 (34.9)	32 (37.2)	86 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81 (37.8)	56 (26.2)	214 (100.0)

$$\chi^2 = 13.96; \text{sd} = 3; p = 0.03; p < 0.05$$

According to Table 12, there is a statistically significant relationship between the gender and the learning preferences of middle school BILSEM students ($\chi^2(3) = 13.96; p < 0.05$). To put it another way, it may be claimed that the gender variable statistically impacts how the BILSEM students learn. When the study participants' results, boys and girls, are compared, most boys prefer the converging learning style (39.8%). In comparison, the accommodating learning style is selected by the majority of girls (37.2%). The diverging learning style is preferred by a minority of boys (16.4%), while the assimilating learning style is selected by a minority of girls (9.3%).

Findings for the 9th Sub-Problem

The study's ninth sub-problem focuses on figuring out how the grade level variable affects the learning preferences of middle school BILSEM students. The results of the Chi-square test, which was used to ascertain the impact of the grade level variable on the learning preferences of the middle school BILSEM students, are presented in Table 13 in this context.

Table 13. Correlation between the learning styles of the middle school BILSEM students and their grade level

Grade Level		Learning Styles				TOTAL
		Diverging	Assimilating	Converging	Accommodating	
5	N (%)	21 (17.9)	4 (3.4)	50 (42.7)	42 (35.9)	117 (100.0)
6	N (%)	13 (24.5)	33 (62.3)	4 (7.5)	3 (5.7)	53 (100.0)
7	N (%)	3 (6.8)	3 (6.8)	27 (61.4)	11 (25.0)	44 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81 (37.9)	56 (26.2)	214 (100.0)

$$\chi^2 = 108.98; \text{sd} = 6; p = 0.00; p < 0.05$$

Table 13 shows a statistically significant relationship between grade level and learning preferences for middle school BILSEM students ($\chi^2(6) = 108.98; p < 0.05$). According to the grade level variable, the majority of fifth-graders (42.7%) who took part in the study's data analysis have convergent learning styles. Assimilation is the preferred learning approach for the majority of sixth graders (62.3%) and the majority of seventh graders (61.4%). Assimilation is the least common learning style among students in the fifth grade (3.4%), accommodating learning is least common among students in the sixth grade (5.7%), and diverging and assimilating learning styles are least common among students in the seventh grade (6.8%).

Findings for the 10th Sub-Problem

The determination of the influence of the school type variable on the learning styles of middle school BILSEM students is the subject of the study's tenth sub-problem. Table 14 displays the results of the Chi-square test that was used to ascertain the impact of the school-type variable on the learning preferences of middle school BILSEM students in this context.

Table 14. Correlation between the learning styles of the middle school BILSEM students and the school type variable

School type	N (%)	Learning styles				TOTAL
		Diverging	Assimilating	Converging	Accommodating	
Public	N (%)	22 (20.8)	11 (10.4)	50 (47.2)	23 (21.7)	106 (100.0)
Private	N (%)	15 (13.9)	29 (26.9)	31 (28.7)	33 (30.6)	108 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81 (37.9)	56 (26.2)	214 (100.0)

$\chi^2 = 15.65; sd = 3; p = 0.00; p < 0.05$

The middle school BILSEM students' learning preferences and the school type variable have a statistically significant link, as shown in Table 14 ($\chi^2(3) = 15.65; p < 0.05$). When the data of BILSEM students are examined in terms of the school type variable, it is seen that the highest percentage of students attending a public school have the converging learning style (47.2%), and the lowest rate of students attending a public school have the assimilating learning style (10.4%). In comparison, the highest percentage of students attending a private school have an accommodating learning style (30.6%), and the lowest rate of students attending a private school has an assimilation learning style (10.1%).

Findings for the 11th Sub-Problem

The study's eleventh sub-problem deals with determining the impact of the curriculum the student is enrolled in at BILSEM on the learning preferences of middle school BILSEM students. The results of the Chi-square test, which was used to ascertain the impact of the variable of the program the student is enrolled in at BILSEM on the learning preferences of the middle school BILSEM students, are presented in Table 15 in this context.

Table 15. Correlation between the learning styles of the middle school BILSEM students and the variable of the program the student is attending in BILSEM

The program the student is attending in BILSEM	Learning styles					
	Diverging	Assimilating	Converging	Accommodating	TOTAL	
Exceptional Talent Development (STD)	N (%)	5 (9.4)	13 (24.5)	23 (43.4)	12 (22.6)	53 (100.0)
Recognizing Individual Talents (RIT)	N (%)	32 (19.9)	27 (16.8)	58 (36.0)	44 (27.3)	161 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81(37.9)	56 (26.2)	214 (100.0)

$\chi^2 = 4.71$; $sd = 3$; $p = 0.19$; $p > 0.05$

Table 15 demonstrates that there is no statistically significant relationship between the middle school BILSEM students' learning preferences and the variable of the program they are enrolled in at BILSEM ($\chi^2 (3) = 4.71$; $p > 0.05$). When the data of the BILSEM students are examined in terms of the program the student is attending, it is understood that the highest percentage of the students attending the Special Talent Development (STD) program have the converging learning style (43.4%) and the lowest rate of the students attending the Special Talent Development program have the diverging learning style (9.4%). In comparison, the highest percentage of the students attending the Recognizing Individual Differences (RISD) program have the diverging learning style (10.1%).

Findings for the 12th Sub-Problem

Determining the impact of the family income variable on the learning preferences of middle school BILSEM students is the subject of the study's twelfth sub-problem. The results of the Chi-square test, which was used to ascertain the impact of the family income variable on the learning preferences of middle school BILSEM students, are presented in Table 16 in this context.

Table 16. Correlation between the learning styles of the middle school BILSEM students and the family income variable

Family income level	Learning styles					
	Diverging	Assimilating	Converging	Accommodating	TOTAL	
Below the minimum wage	N (%)	0 (0.0)	0 (0.0)	2 (66.7)	1 (33.3)	3 (100.0)
Minimum wage-7500 TL	N (%)	7 (19.4)	16 (44.4)	3 (8.3)	10 (27.8)	36 (100.0)
7501 TL-15000 TL	N (%)	27 (26.2)	9 (8.7)	40 (38.8)	27 (26.2)	103 (100.0)
15001 TL and higher	N (%)	3 (4.2)	15 (20.8)	36 (50.0)	18 (25.0)	72 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81 (37.9)	56 (26.2)	214 (100.0)

$\chi^2 = 43.41$; $sd = 9$; $p = 0.00$, $p < 0.05$

As shown in Table 16, there is a statistically significant correlation between the learning styles of middle school BILSEM students and the family income variable ($X^2_{(9)}= 43.41$; $p<0.05$). When the data of the BILSEM students are examined in terms of the family income variable, it is seen that the highest percentage of the students whose families' monthly income is below the minimum wage have the converging learning style (66.7%) and the lowest rate of them have the diverging and assimilating learning styles (% 0.0), that the highest rate of the students whose families' monthly income is in the range of minimum wage - 7500 TL have the assimilating learning style (44.4%) and the lowest percentage of them have the converging learning style (8.3%), that the highest rate of the students whose families' monthly income is in the range of 7501 TL- 15000 TL have the converging learning style (38.8%) and the lowest percentage of them have the assimilating learning style (8.7%) and that the highest rate of the students whose families' monthly income is in the range of 15001 and higher have the converging learning style (50.0%) and the lowest rate of them have the diverging learning style (4.2%).

Findings for the 13th Sub-Problem

The examination of whether there is a statistically significant association between the middle school BILSEM students' learning preferences and their level of creativity constitutes the study's thirteenth sub-problem. In this respect, Table 17 displays the results of the Chi-square test that was performed to ascertain the relationship between the middle school BILSEM students' preferred learning styles and their level of creativity.

Table 17. Correlation between the learning Styles and creativity level of the middle school BILSEM Students

Creativity level	Learning styles					TOTAL
	Diverging	Assimilating	Converging	Accommodating		
Average creative	N (%)	0 (0.0)	0 (0.0)	2 (66.7)	1 (33.3)	3 (100.0)
Above average creative	N (%)	19 (16.7)	24 (21.1)	41 (36.0)	30 (26.3)	114 (100.0)
Superior creative	N (%)	14 (18.9)	12 (16.2)	32 (43.2)	16 (21.6)	74 (100.0)
Extraordinary creative	N (%)	4 (17.4)	4 (17.4)	6 (26.1)	9 (39.1)	23 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81 (37.9)	56 (26.2)	214 (100.0)

$\chi^2= 6.11$; $sd = 9$; Cramer's $V= 0.10$; $p = 0.73$; $p>0.05$

Table 17 demonstrates no statistically significant relationship between the middle school BILSEM students' learning preferences and their level of creativity ($\chi^2= 6.11$; $p>0.05$). When the data from the middle school BILSEM students who took part in the current study are examined, it is clear that most of the average creative students have a converging learning style (66.7%). The minority of them have a diverging and assimilating learning styles (0.0%), that the converging learning style is used by the highest percentage of students who are above average creative (36.0%) and the lowest percentage of students who have diverging learning styles (16.7%); the converging learning style is used by the highest percentage of students who are superior creative (43.2%) and the lowest percentage of students

who have assimilation learning styles (16.2%); and the converging learning style is used by the highest percentage of students who are extraordinary creative.

Discussion, Conclusion and Recommendations

Discussion

This study examined the links between the student's gender, grade level, school type, program they were enrolled in at BILSEM, family income level, and the level of creativity and learning preferences of the middle school BILSEM students. The relationship between students' creativity levels and preferred learning methods was also examined. According to the current study, most of the middle school BILSEM students showed above-average inventiveness. A review of the literature reveals that there have been many studies on creatively gifted students. For instance, a survey by Hacıoğlu and Türk (2018) that aimed to uncover talented students' opinions of their creativity revealed that gifted students studying in BILSEMs are conscious of their creativity and perceive themselves as creative. According to Petruzzi (1984), who also concluded that they had an above-average level of creativity, the creativity scores of clever children are higher than those of children with average intelligence. On the other hand, Sternberg and Lubart (1993) concluded that creativity is a type of giftedness after comparing the creative talents of gifted and undiagnosed students. This research supports the current study's conclusion that talented individuals have above-average levels of creative talent. According to the findings of the present study, gender, grade level, school type, the BILSEM program a student is enrolled in, and family economic level, had no discernible effects on middle school BILSEM students' levels of creativity. While some of the research in this field made arguments that were comparable to the findings of this investigation, other studies made contrary claims. Koçak and İçmenoğlu (2012) examined independent variables to determine the creativity levels of gifted kids, and it was concluded that there was no discernible difference in creativity levels based on gender, perceived economic position, or birth order. Gender did not significantly affect high school students' originality, according to a study that looked into the relationship between gender and creativity. The study included 95 males and 116 girls (Torrance, 2002). There are studies in the literature as well with various outcomes. The study's findings by Öztunç (1999) led to the conclusion that female students' mean creativity is higher than male students'. According to Davaslıgil (2007), there is no clear-cut relationship between creativity and age. However, he highlights that the dramatic rise in creativity in the first few years of life will persist, with a little decline around the seventh grade. To compare the levels of creativity and critical thinking in gifted and typical kids, as well as to examine the impact of various demographic factors on these skills, Bapoğlu (2010) studied students in the fifth, sixth, seventh, and eighth grades who were enrolled in science and art centers and primary schools. It was discovered that age, grade level, the number of siblings, and achievement perception are all useful predictors of creativity scores and that gender does not significantly affect creativity scores. Students from middle socioeconomic status also scored higher on creativity.

This study discovered that most middle school BILSEM students had a converging learning style, which means that they prioritize actions based on active experience and abstract conceptualization and do not act without first thinking. The minority of the students, on the other hand, were found to have a diverging learning style, which means that they enjoy learning that appeals to their sense organs, particularly their sense of sight and that they give less importance to abstract concepts. Students' learning preferences were found to differ significantly depending on their gender, grade level, type of school, and monthly average family income, but not depending on the BILSEM program they are enrolled in. The study's findings also led to the conclusion that no discernible link exists between the BILSEM students' learning preferences and their creative abilities.

In a study by Alkan, Nacaroğlu, and Mutlu (2020) comparing the most effective learning styles of gifted children with those of their non-gifted classmates, it was discovered that "accommodating" (35.3%) was the most prevalent learning style among the gifted students who participated in the survey. Students' learning styles were found to be significantly influenced by their gender, grade level, and age. However, after completing a study to identify the learning styles of talented students, Tüysüz (2013) found that gifted children displayed high degrees of independent, cooperative, competitive, and participative learning styles. While studying at the secondary school level, gifted students exhibited a high level of "independent," "competitive," and "collaborative" learning styles, as well as a moderate level of "passive," "dependent," and "participant" learning styles, according to a study by Arseven (2016). Additionally, neither the student's gender, grade level, mother's education level, nor father's education level significantly affect the student's scores on the learning styles scale. In addition, Arseven and Yeşiltaş (2016) found that gifted students primarily favor "independent" and "competitive" learning styles in their study, which sought to ascertain the differences in learning styles between students who were identified as gifted and those who were not, as well as the influence of various variables on learning styles.

Conclusion

The findings of this research, in which the creativity level and learning styles of middle school BILSEM students were determined, and the relationships between their creativity level and learning styles and the variables of student's biological sex, participant's current grade, student's type of school, the program the student is enrolled in at BILSEM, and student's family income level were investigated,

According to the findings of this study, gender, grade level, type of school, the BILSEM program a student is enrolled in, and family income level had no impact on the students' creative levels, which were shown to be mainly above average for middle school BILSEM students.

It was revealed that most middle school BILSEM students have a converging learning style, while the fewest have a diverging one. It was determined that learning styles vary significantly depending on the student's gender, grade level, school type, and monthly family income, but not on the

program the student is attending in BILSEM. In addition, no statistically significant correlation was found between the creativity level of the middle school BILSEM students and their learning styles.

Additionally, the current study is limited to;

1. The 2021–2022 academic year, two, seven BILSEMs spread throughout four different provinces, three.
2. The information gathered via the study's data collection methods,
3. The information gathered from gifted students in grades 5, 6, and 7,
4. 214 students who were receiving BILSEM training made up the sample.

Recommendations

The following suggestions can be made in light of the study's findings:

1) This study only included middle school BILSEM students. Studies on the subject at various grade levels may make it feasible for knowledge to be accessible on a grander scale. 2) According to this study, gifted students primarily exhibit convergent learning styles/types. Planning studies that employ qualitative research techniques will allow for a thorough examination of learning styles/types.

3) The current study examined how factors such as student gender, grade level, school type, BILSEM program, and family income level affected middle school BILSEM students' creativity. Research involving various variables that are thought to influence students' creativity can add to the body of knowledge.

4) It is believed that tailoring the curriculum of instruction provided in the Science and Art Centers (BILSEM), which is crucial in fostering the development of creativity skills in gifted students, by the students' learning styles/types, will have a positive impact on the students' learning and self-actualization processes.

Policy Implications

The rapid change in science and technology has led to the differentiation of skills and competencies expected from individuals. In parallel with this, with the rapid increase in knowledge, it is an undeniable fact that individuals should have skills and competencies appropriate to the age, both socially and academically. Today, it is aimed to raise not individuals who memorize information, but individuals with 21st century skills who have quick access to information, share it, have the ability to use it effectively, and can analyze problems and produce solutions. Therefore, organizing education policies according to the current conditions and time will provide maximum efficiency in achieving the targeted goal. Creativity and creative thinking, which are among 21st century skills, will contribute to both individuals and educational policies in producing solutions to existing or future problems.

Individuals' ability to transfer knowledge correctly depends on the learning situation. Today, learning can be expressed as the collaborative, critical and creative co-production of knowledge by individuals rather than being a one-way receiver of information. Therefore, knowing the learning styles that individuals have based on their learning characteristics will enable the planning of the appropriate educational environment, the organization of appropriate methods, techniques and strategies, and the use of appropriate measurement and evaluation tools, thus raising individuals who can construct knowledge and use it effectively. In this context, in this study, the creativity level and learning styles of middle school Science and Art Center (in Turkish BİLSEM is the acronym for this term) students were determined and the effect of demographic characteristics was investigated and the relationship between the creativity level and learning styles of the students was revealed. As a result of the research, it was seen that the creativity level of the students was above average and that they had a "decomposing" learning style, which acts by thinking and shows cautious behavior. It was concluded that there was no statistical relationship between students' learning styles and creativity.

In Science and Art Centers (BİLSEM), which are opened to contribute to the development of creativity skills of gifted students and continue their activities in our country, the planning and implementation of educational activities according to students' learning styles will have a positive impact on students' learning situations and the development of their creativity. It is thought that this research will contribute to current educational problems and future educational practices in both national and international contexts.

Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Credit Author Statement

Author 1: Writing – original draft, Conceptualization, Investigation, Methodology, Formal analysis, Visualization

Author 2: Writing – review & editing, Conceptualization, Supervision, Methodology, Investigation.

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