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Impact of Out-of-School Educational Environments on the Creative and Spatial Thinking Skills of Gifted Students*

Okul Dışı Eğitim Ortamlarının Üstün Yetenekli Öğrencilerin Yaratıcı ve Uzamsal Düşünme Becerileri Üzerindeki Etkisi

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Abstract

The importance of educating gifted children is steadily increasing. The education of these pupils, who are seen as future of the societies, should be encounter to meet their needs. Our study aims to provide the desired learning oucomes without getting bored in fun environments with activities that will attract the attention and increase the motivation of gifted pupils in different locations outside the school. Additionally, it was studied whether there were differences about their creative and spatial thinking abilities with the activities prepared for this education. Our study was conducted using the 'Pre-Test and Post-Test Experimental Design with Control Group'. Our sample involves experimental group of 21 pupils and control group of 21 pupils in the 6th grade studying at Konya Science and Art Center. The lesson plan of 8-week (32 hours) about museum-based art education was prepared and implemented for experimental group for 4 hours in a week. The control group was trained based on the National Education curriculum. The "Torrance Creativity Test" to decide creativity abilities and the "Mental Rotation Test and Paper Folding Test" to decide spatial thinking abilities were appealed before and after the experimental process for the experimental group, before and after curriculum works for the control group. The comparative effects of the discrepancies between the post-test and the pre-test results were examined to determine whether or not the program applied was effective in the development of students with the collected data. In our study, it was observed that museum visits and activities prepared by enriching the creative and spatial thinking abilities of gifted students were effective in improving students' creative and spatial thinking abilities. When the experimental group students had fun with museum visits and activities, they concretized

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objects and reached the application area by seeing and touching. It was observed that the creativity abilities and spatial thinking abilities of the control group pupils could not be developed with classical educational plans.

Keywords: Gifted education, art education, museum education, creative thinking, spatial thinking.

Öz

Üstün yetenekli çocukların eğitiminin önemi giderek artmaktadır. Bu çocuklar toplumun geleceği olarak görüldüğünden, eğitimleri özel ihtiyaçlarını karşılayacak şekilde düzenlenmelidir. Çalışmamız, üstün yetenekli öğrencilerin dikkatini çekmek ve geleneksel okul ortamları dışında motivasyonlarını artırmak için tasarlanmış etkinlikler kullanarak ilgi çekici ve eğlenceli ortamlarda istenen sonuçları sağlamayı amaçlamaktadır. Ayrıca, bu amaçla uygulanan etkinliklerin ardından yaratıcı ve uzamsal düşünme becerilerinde farklılıklar olup olmadığını inceledik. 'Ön Test-Son Test Kontrol Gruplu Deneysel Desen' yönteminin kullanıldığı çalışmamıza Konya'da Bilim ve Sanat Merkezi'nde öğrenim gören 6. sınıf düzeyindeki 21 kişilik deney ve 21 kişilik de kontrol grubu öğrencisi katılmıştır. Deney grubu için bir haftada 4 saat olmak üzere 8 haftalık (32 saat) müze temelli sanat eğitimi ders planı geliştirilmiş ve uygulanmış, kontrol grubunda ise Milli Eğitim müfredatı takip edilmiştir. Her iki gruba da yaratıcılık becerilerini ölçmek için "Torrance Yaratıcılık Testi" ve uzamsal düşünme becerilerini ölçmek için "Zihinsel Çevirme Testi ve Kağıt Katlama Testi" deney grubuna denel işlemden önce ve sonra, kontrol grubuna ise müfredat etkinliklerinden önce ve sonra uygulanmıştır. Programın öğrenci gelişimindeki etkililiğini belirlemek için ön test ve son test farklarının karşılaştırmalı analizi yapılmıştır. Sonuçlar, tüm seviyelerde deney grubu lehine anlamlı farklılıklar ortaya koymuştur. Çalışmamız, üstün yetenekli öğrencilerin yaratıcı ve uzamsal düşünme becerilerini geliştirmek için tasarlanan müze gezileri ve ilgili etkinliklerin, onların gelişimine etkili bir şekilde katkıda bulunduğunu göstermektedir. Deney grubu, müze gezilerinden ve nesnelerle etkileşime girmelerine ve onları bozmaya olanak tanıyan etkinliklerden keyif alırken, kontrol grubu geleneksel eğitim yöntemleriyle yaratıcılık ve uzamsal düşünme becerilerinde benzer bir gelişim yaşamamıştır.

Anahtar Kelimeler: Üstün yetenekliler eğitimi, sanat eğitimi, müze eğitimi, yaratıcı düşünme, uzamsal düşünme.

Introduction:

Education is the work done to provide knowledge, skills, and habits to create desired gains in people's behavior and experiences from an early age (Ertürk, 1972). The goal of education is not only to prepare pupils for the future by providing them with knowledge and abilities, but also to confirm that they become good and reliable individuals within society. Students who have the ability to learn quickly and process what they learn effectively during the education process are considered to be the gifted. These students are appreciated as a driving force in economic, political, military and technological developments in societies (Kulaksızoğlu, 2004).

Contemporary education is student-centered, technology-supported, collaborative and encourages critical thinking. This education model aims to raise questioning, thinking and creative individuals. It focuses on developing observation, questioning and various thinking skills during the active learning process. The educational environment supported by practical activities offers students the opportunity to use practical knowledge in their daily lives. Moreover, the understanding of this education takes place both at school and in out-of-school learning environments, such as active education tapes place through art activities held in museums (Kuruoğlu Maccarıo, 2002).

When education is accepted as a continuous process for individuals at every moment and everywhere in life, this concept should not be limited only into schools; It should also be supported in environments outside of school (Erdoğan, 1995). Museums are one of the leading areas of out-of-school learning. The learning environment in museums not only transcends an abstract learning experience, but also encourages seeing,

touching, examining artifacts from past periods and researching the learned topics (Seidel and Hudson, 1999).

Museums are environments that combine the process of accumulating information and objects with education, function like a school, and create historical and cultural awareness through the works they present to their visitors. While museum education undertakes the task of understanding, protecting and preserving the cultural assets of societies, it also offers people the opportunity to get to know their culture and different cultures by a diverse and the tolerant approach. This brings with it the museum's aims such as progressing intercultural understanding and common feelings (San, 2008).

Museums provide pupils with opportunity to work with objects of their own interest and choice by creating programs that are interesting, object-oriented, entertaining, participatory and enriched with games, accompanied by a qualified lesson plan within the scope of their educational function (Abacı 2005). When the materials and tools in museums are used well, they will make an important contribution, especially for the development of students' metacognitive abilities. In this sense, it is a matter of curiosity to what extent gifted students with high metacognitive skills benefit from museums and their contribution to their creativity and spatial thinking. While the effects of museum-based art education on their creativity and spatial skills are investigated in our study, "art and art education", "museums in general in out-of-school training environments", "gifted students" and "creative and spatial thinking abilities" are included in the literature.

Art is a concept as old as human history. Societies from past to present have also created their own unique art. Wherever humanity exists, it sees itself in art through intuition, subconsciousness and instinct, as well as all kinds of vital tools required for life (Artut, 2009). Art is the most general area of social life for the individual. No other field can provide the gains that art can provide to the individual. While art analyzes human life down to the smallest detail, people have always needed to understand something. Through art, people associate soul and body, intelligence and emotion, perception of time and space, and the events they experience (Özsoy, 2003; Özsoy and Şahan, 2009). Art is undoubtedly a tool that serves the purpose of pleasure, but also serves the function of acquiring knowledge. It functions as a part of the processes of perceiving, thinking, understanding and making sense of the world (Oktay, 1995; Erzen, 1990).

Art education provides an environment where the child can easily express himself without external intervention as well as providing the child with skills in many areas such as self-esteem, self-control, vision, quick conception, understanding, thinking ability and aesthetics. Self-confidence is also important in the development of the child's egoity. While he is sharing, responsible and organized in the workshop lessons, he also becomes conscious in the use of materials. Art education is a process in which children can easily express their creative ideas, understand their inner world and express themselves freely while developing their cultural, artistic and historical values (Buyurgan, 2007; San, 1979; San, 1984; Artut, 2009; Gel, 1993; Aykaç, 2016; Yıldız, 2000; Ersoy, 1993; Yurteri Öztürk, 2021; Kahraman, 2007; Erinç, 2004; Erinç, 1995; Dikici, 2002).

Art education is a field that strengthens aesthetic values, increases the ability to understand and interpret visual arts, and develops creativity, spatial thinking and critical thinking. This training contributes to the development of students by combining their thought and physical activities. At the same time, it provides students with opportunities to develop their manual skills, express their feelings and thoughts, and experience a sense of success, which increases their self-confidence.

Today, art education is enriched with informal learning opportunities, especially offered through museums. Museums create one of the most effective informal education models by adopting the modern communication-oriented message language. In this way, students and visitors have an enjoyable learning experience while exploring various aspects of art. In their educational processes, museums attach importance to informal education, which aims to reinforce knowledge through activities such as games, drama, workshops, and discussion sessions and provides the opportunity to repeat in a comfortable environment (Tezcan Akmehmet, 2005; Denizci and Mirza, 2015). Many students who do not actively participate in school find the opportunity to be creative, innovative, imaginative, energetic and learn by experience in problem solving and coping with problems by actively participating and constantly learning in out-of-class environments such as museums or nature, without being limited to books and school. (Buyurgan and Mercin, 2005; Seidel and Hudson, 1999; Freeman, 2000, cited in Tuna, 2013; Erbay, 2001; Bülbül, 2016; Kiraz, 2009).

Museums, which are at the forefront of out-of-school education environments in art education, allow them to establish a connection with the past and compare their own culture with foreign cultures while presenting their products to the students and the society.

As regards the definition of ICOM (International Council of Museums), a museum is "an institution that protects cultural works and processes these products for the benefit of society by exhibiting them collectively with the aim of increasing study, education and aesthetic appreciation, and keeps collections of art, science, health and technology" (ICOM, 1970; Buyurgan and Mercin, 2005). Museums are permanent institutions where objects containing cultural values are brought together, preserved, examined and evaluated. Museums, which especially aim to contribute to public education, encourage teaching and generally enrich the world view, engage in continuous exhibition and activities for the benefit of the majority (Mercin, 2003; Tezcan Akmehmet and Ödekan, 2006; Abacı, 2005; İlhan Çakır et al., 2016; KTB , 1976; KTB, 1990; KTB, 2010).

It is seen that art, which has been shaped by aesthetic concerns since the beginning of history, was initially used as a means of communication and expression, then decorated space, tools and craft products, appeared as cultural values by turning into independent products of art and in time. Art and educational institutions established to create a link between past and future, preserve and exhibit the cultural values that have reached the present day during this historical process are called museums. According to Yücel (2015), who states that gifted children should also benefit from museums, individuals who examine art products, tools, and everyday life materials with curious questions and find the opportunity to examine these artifacts find answers to all their questions in museums.

Gifted individual is defined in "an individual learning faster than his/her peers, is ahead in creativity, art and leader capacities, has special academic abilities, can realize abstract ideas, enjoys to act independently in his/her areas of interest and performs high level" in the Special Education Services Regulation (MEB, 2018) refers to a situation that is shaped by innate genetic characteristics and environmental factors, and is at a higher level than its peers in the areas of cognitive development, skill to understand and state language, and social, emotional and aesthetic advance (Baykoç Dönmez, 2010; Clark, 2002; Saranlı and Metin, 2012; Davaslıgil, 2004; Bilgili, 2000; Sak et al., 2015; Sak, 2014; Kalem and Şentürk, 2019; Ataman, 2012).

The education of gifted people, whose importance is increasing day by day, is provided through joint education instead of separate education. Gifted children's education of is continued in Science and Art Centers with an approach that goals to

educate them together with their peers without separating them from their peers (Genç, 2013). Students registered to BİLSEM are included in adaptation, support training, awareness of individual talents, development of the gifted, project production and management programs. At BİLSEM, an enriched and differentiated, interdisciplinary, project-based education program appropriate to the skills of the students is implemented and educational studies are organized to realize original products, projects and outputs. The programs are designed by differentiating and enriching according to their interests, abilities and potentials in a way that will enable students to acquire the high-level mental, social, personal and academic skills they will need in adulthood, such as effective problem solving, decision-making and creativity, under the guidance of relevant teachers, in a student-centered and interdisciplinary structure, suitable for individual learning (MEB, 2019).

The fact that gifted individuals play important roles in shaping the future has made the education to be given to gifted people a very important issue. Some of the countries have considered the gifted students' education as a national priority. Special education programs are needed to be successful or to fully use their potential for these students who have different developments and different potentials compared to their peers in many areas like creativity skills, spatial thinking skills, critical thinking skills, problem-solving skills (Genç, 2016; Renzulli and Reis, 1985; Saranlı and Metin, 2012; Renzulli, 1999; Sak, 2011).

Creativity is a cognitive ability that involves a unique problem-solving stage where a person uses intellect elements, originality and skills are at the forefront, in the process of creating a new product (Aslan, 2001; Tuna, 2013). The ability to approach new and different ideas, to communicate effectively, and to create useful ideas, opportunities or alternatives by using creative thinking skills for their own development while individuals solve the problems they encounter constitutes an important skill area (Karlıdağ, 2018; Kaya, 2008; Üstündağ, 2014; Özden, 2005).

Torrance (1984) defines creativity as "being sensitive to difficulties, inadequacies, lack of knowledge, unavailable elements, divergences, identifying difficulties, researching for solutions, guessing and establishing hypotheses about deficiencies or changing hypotheses, choosing one of the solutions and trying it, trying again, and then presenting the results." In the studies, he developed the Creative Thinking Test, which is based on fluency, flexibility, originality and elaboration (cit: Aslan, 2001).

Creativity and creative thinking skills developed through education are among the general education goals of our country. There are many factors that impact the development of students' creativity and creative thinking skills; family, school, curriculum, teachers, social and physical environment play an important role among these factors (Yeşilyurt, 2020).

Spatial thinking skill is expressed as the ability to mentally visualize an object, shape or image, to mentally manipulate and complete its missing parts, also as the ability to mentally imagine how the relevant object, shape or image looks from a different perspective (Olkun, 2003; Kozhevnikov et al. 2007; Turgut, 2015).

The affective and cognitive capacities of gifted students make them stand out with their creative thinking, spatial thinking and abstract thinking skills. These students also attract attention with their fast learning abilities. Museums offer students learning experiences using their senses to further develop their skills with interactive displays and rich content.

Learning in museums, where deep learning is discovered and cognitive thinking is encouraged, contributes to permanent learning in students. However, when looking at both domestic and international literature, it is seen that museums are used in the teaching of many learning areas and in the development of the general characteristics of gifted students. Studies have investigated the effect of specially designed museum science programs and activities as a differentiated curriculum on academically gifted students and found an increase in the participants' learning levels in content knowledge and understanding of scientific work (Melber, 2023; Haensly, 1999). Another study shows that it was conducted on parents' participation and course content activity planning (Zhou, 2024). Vialle et al. (2005) emphasize the importance of challenging gifted students intellectually in preventing them from disengaging from classes and failing in their research in their study. The type of observation in experimental learning through a science museum for gifted students was examined in their studies of Kim et al. (2015) and found that it would have an impact on their observation capacity. When we look at these studies, although there are studies on gifted students in the field of museum science, there is no study on their specific characteristics such as general creativity and spatial thinking skills, which led us to this study.

The starting point of the research is what museum activities are prepared by differentiating and enriching the studies and what the differences and achievements of gifted children aren't known. In addition, the fact that it is not known whether the instructions used while differentiating and enriching activities and plans have an effect on students' creative and spatial thinking abilities reveals the problem. It is important to look at this aspect and add it to the literature.

The problem sentence of the search was decided as "What is the effect of museum-based art education for creative and spatial thinking abilities of gifted students?". The following hypotheses that we put forward while searching for an answer to our problem sentence were taken into consideration.

1. Museum-based art education applied to gifted students has an impact on students' creativity skills.

2. Museum-based art education applied to gifted students has an impact on students' spatial thinking skills.

In this study, it was purposed to examine the impact of artistic activities carried out in the museum environment on the creative and spatial thinking skills of gifted children.

1.Method

Quantitative research method has been used in our study. Quantitative research phenomena based on the positivism paradigm are objectified by abstracting from the processes and factors in their environment, and are used to measure attitudes, opinions, behaviors and other defined variables and to generalize numerical data. It is converted into observable and measurable properties. In this way, it is supposed that reality can be defined and understood through exact measurements and careful quantifications (Erdoğan, 2003; Garip, 2023; Mohajan, 2020).

1.1.Research Model

"Pre-test – Post-test Experiment Design with Control Group" was preferred as the experimental method within the scope of this research. Our purpose in using an experimental model is to show the research results with numerical data and gain meaning

with measurable values (Büyüköztürk, 2010; Yıldırım and Şimşek, 2005). Putting study results into numerical data provides the researcher with a more precise description according to Kaptan (1995). Additionally, using a control group in the experimental model significantly increases the property of the research in question as a controlled study (Taşpınar, 2017).

In the application aspect of our research, the application method in which one group was formed as an experimental group and the other as a control group was preferred. In research, the control group is the group in which no different intervention is made and is used only for data collection, while the experimental group is the group that encounters a different application or intervention whose effect is tried to be determined. While the experimental group undergoes experimental intervention, no special intervention is given to the control group. A pretest is administered before the application, and a posttest is administered after the application to both groups. Providing the opportunity to compare with statistical methods led us to use the experimental model in our study.

1.2.Research Group

The sample consisted of experimental group of 21 students and control group of 21 students in the 6th grade attending Konya Science and Art Center in 2020-2021 academic year. It was indicated that participation in this study was voluntary and students were informed before the study. Students were involved in the study with parental consent. In our study, in which the experimental design method was used, they were determined according to some criteria such as their age levels, developmental characteristics and the students' readiness level instead of randomly selecting students into experimental and control groups. As regards the data in Table 1, it can be observed that the number of male and female students is equal.

Table 1. Information About The Research Group

Groups	Grade	Girls		Boys		Total	
		N	%	N	%	N	%
Experiment	6th	12	57.1	9	42.9	21	100
Control	6th	12	57.1	9	42.9	21	100

1.3. Data Collection Instruments

The following quantitative data collection methods were determined to be appealed to the experimental and control groups to find answers to the problem sentence and hypotheses of the research.

1.3.1. Creativity Scale

Torrance Test of Creative Thinking was first published in 1966. This measurement tool was developed by E. Paul Torrance to evaluate verbal and figural creativity. The four skills included in the test are: fluency (number of relevant answers), flexibility (variety of answers), originality (something remarkable or surprising), and elaboration (identifying how to use ideas) (Aslan, 2001; Aslan, 2013).

The test battery consists of two parts: 'verbal' and 'figural'. The Figural Test A form of the Torrance Test of Creative Thinking was used as the pre-test and the Figural Test B form was used as the post-test for the Creativity Scale within the scope of our

research. Subtests in the figural section include picture creation, picture completion and parallel lines; these subtests are completed within a certain period of time.

a) Picture Creation: Figural A and B tests ask participants to think of and draw the shapes given on paper as part of an interesting and exciting thing or object, and then write an unusual and catchy title under this creative design.

b) Picture Completion: Both figural A and B tests contain different, incomplete shapes created with unfamiliar lines within 10 frames. The working group is asked to complete these shapes as if they were part of a thing or an object. They are expected to draw in the most interesting and exciting way, and then they are asked to write an unusual and catchy title under the completed design during this process.

c) Lines/Circles In the Figural A test, there are straight parallel lines, and in B test, there are circles. For both tests, participants are asked to draw the shapes as part of a picture or object within 10 minutes. How many pictures and objects are they expected to draw during this time? They are then asked to write a unique title describing their drawing.

Language equivalence, reliability and validity studies were carried out for the A and B forms of the test for kindergarten, primary school, high school and adults. Test-retest and internal consistency calculations were made in the field of reliability studies of the Turkish form of the test. Cronbach Alpha Correlation Coefficients ranging from (.89 to (.86) for primary school, (.71) to (.62) for high school, and (.68) to (.81) for adult form were obtained (Aslan, 2001; Aslan, 2013).

Criterion validity analyzes were carried out with Wonderlic and Wais tests within the scope of validity studies. A significant relationship was found between Wais's piece assembly subtest (.66) and similarity subtest (r=-.73) at the p<.01 level. Additionally, a significant relationship was found with the reasoning subtest (r=-.67) at p<.01 level. In the comparisons made between the Personality Test and TTCT, the relationship between them and the Adjective Test was compared. A negative relationship at the 0.05 level was found between readiness to consult and originality (r=-.34). There was a negative relationship between the fluency score and the order subscale (r=-.34). In addition, item analysis was conducted. That there were important differences in all sub-score types of the verbal and figural test in item total, item remainder and discrimination analyzes was observed (Aslan, 2001; Aslan, 2013).

1.3.2. Spatial Thinking Scale:

Strong and Smith (2002) defined spatial thinking ability as the skill to visualize various movements of objects in three-dimensional space and to move objects with imagination and play them. Clements (1998) defined the spatial thinking skill as moving and understanding two- and three-dimensional objects in the world of thought. Spatial thinking is the skill to imagine ourselves in a different location, to think about what this location looks like, and to understand the situation that occurs when we do not change the posture of objects.

It is observed that spatial thinking skill has at least two different sub-dimensions. These sub-dimensions include spatial visualization and rotation skills in thinking. Spatial visualization skill is defined as the skill to change and use a depicted object or a part of this object in the mind. The skill to rotate in the mind refers the relationship between the parts of a spatial order and the skill to understand the new arrangement that occurs when the rotation of these parts or the individual changes (Kakmacı, 2009).

In this study, the Paper Folding Test developed by Ekstrom et al. (1976) and adapted into Turkish by Delialioğlu (1996) and the Mental Test developed by Vanderberg and Kuse (1978) and adapted into Turkish by Yıldız (2009) were used to measure children's spatial thinking skills. Conversion Test was used (cit: Yurt, 2014). Also paper Folding and Mental Flipping Tests are speed tests.

The application time of the Paper Folding Test is 6 minutes and there are 20 questions. Each question involves folding the paper, punching it, and then unfolding it. Children are asked to think about the shapes that will emerge when paper folded in different ways and pierced in different places is opened. The test is scored by giving one point for each of the correct answers and 0 point for each of the incorrect answers. Validity and reliability practices of the Paper Folding Test were carried out at various education levels, and the reliability coefficient was found to be 0.72 (N = 70) (Delialioğlu, 1996; Fennema and Tartre, 1985; quoted in Yurt, 2014).

The application time of the Mental Rotation Test is 16 minutes and involves of 24 questions. The qualification of each question is the same. In each question, the ability to find a new form of a three-dimensional shape rotated in different directions and at different angles is tested. Children are expected to visualize different views of the three-dimensional shapes presented to solve the questions and determine the correct transformation. The scoring system gives one point for every two correct answers in the question and 0 points for only one of the correct answers. He calculated the reliability coefficient of the Mental Rotation Test as 0.712 (n=161) in its first application and 0.661 (n=108) in its second application (Yıldız 2009, cited in: Yurt, 2014).

1.4. Data Collection

The data was obtained in accordance with the time intervals in the work calendar determined within the framework of the educational goals, principles and achievements of the Ministry of National Education. The plans, consisting of pre-trip, trip and post-trip activities to be held at Konya Archeology Museum and Konya Ethnography Museum for 8 weeks, 4 hours in a week for the experimental group consisting of 21 gifted pupils in the 6th grade at Konya Science and Art Center within the scope of this study, were prepared and implemented successfully. While activity plans were applied to the experimental group, educational plans compatible with the curriculum were applied to the control group, consisting of 21 gifted students at the same level, for 8 weeks, 4 hours a week.

1.5. Data Analysis

The data obtained from pre-test results of Torrance Creativity Test, which measures creativity abilities, and the Paper Folding and Mental Flipping Tests, which measure spatial thinking skills, were analyzed using the IBM SPSS statistical package program to evaluate the equality in the readiness levels of the experimental and control groups quantitatively with the scope of this study.

Before comparing whether the experimental and control groups were equal, normality analyzes were performed to determine the equality in the distributions of the groups. Skewness and kurtosis values were calculated using pre-test data to decide whether or not the data were normally distributed. When skewness values are between ±1 and kurtosis values are between ±1 these data are considered suitable for parametric analysis. These values show that the data distribution is symmetrical and close to normal distribution, that parametric analyzes can give reliable results (Tabachnick and Fidell, 2013; George and Mallery, 2010; Hair et al., 2010; Hasıloğlu and Hasıloğlu Çiftçiler, 2023).

It was determined according to the results of normality analysis whether or not the experimental and control groups were equally distributed. If the pre-test scores were normally shared, t-test was used to compare whether the groups were equal, and if they were not normally distributed, the Mann-Whitney U test was used. Independent groups t-test, a parametric test, was used to test whether there was an important difference between the dependent quantitative variable means of two independent groups. If the assumptions of the Independent Groups t-test are not met, the Mann-Whitney U-test compares the rank means and consequently tests whether there is an important difference between the scores of the two groups statistically. If the results of both tests are $p > 0.05$, the H0 hypothesis is accepted and indicates that there isn't any difference between the averages of the two groups in this value range (Büyüköztürk et al., 2014).

T-test and Mann-Whitney U test were applied to the pre-test scores of the experimental and control groups. If it was determined that there was no important difference in the equivalence levels between the groups, the success levels between the groups were analyzed comparatively. Gain value defines the consistent difference between the inputs and outputs of the objectives of the examined educational program (Demirel and Ün, 1987).

If there was a statistically important difference in the analysis of the success values of all tests applied to the experimental and control groups, the effect size of the studies was examined. Because the hypothesis test tells us whether or not there is a statistically important difference between the rank averages of the two groups; however, if there is a difference, it does not give knowledge about the effect or magnitude of this difference. The effect size is useful because it provides an objective standard of the importance of the effect (Field, 2009). There are different effect size values calculated for hypothesis testing. Cohen's d value allows us to interpret how many standard deviations away from each other the averages being compared are (Büyüköztürk, 2010). Cohen's d value of 0.2 is a small impact, 0.5 means medium impact, 0.8 is considered a large impact (Cohen, 1992). The effect size used for Mann-Whitney U Test is the effect size "r value": Pearson correlation coefficient "r" is an effect size coefficient. The Pearson correlation coefficient "r value" takes a value between 0 (no effect) and 1 (perfect effect). The "r" value of 0.1 is considered a small impact, 0.3 is considered a medium impact, and 0.5 is considered a large impact. (Field, 2009).

In summary, normality analyzes were investigated to decide the equivalence levels between the experimental group and the control group of museum-based art education, which is the independent variable of our research, and t-Test analysis or Mann Whitney U analysis was applied to detect differentiation according to the obtained values, and it was searched whether the differentiation was at a significant level. According to the results, the gain levels and effect sizes were analyzed.

2. Findings

2.1. Findings for Determining the Equivalence of Experimental and Control Groups

Comparison of the pre-test results of the experimental group and control groups was made to determine the equivalence levels between both groups. For this purpose, a normality analysis study was conducted on the experimental and control groups pre-test scores of the students' creativity and spatial thinking scales. The furthest values of the Skewness value of the Pre-Test Scores compared to their normal values are; Torrance Creativity Test (1.30), the highest values are; Spatial Thinking Mental Rotation Test (-.03), Spatial Thinking Paper Folding Test (.07). For the kurtosis value, there were no values far

from the normal range values; The highest values were obtained in the Spatial Thinking Paper Folding Test (.01).

While t-Test was applied to the pre-test scores of the Spatial Thinking Paper Folding Test and the Mental Rotation Test; It was decided to apply the Torrance Creativity Test Mann Whitney U to determine the equivalence levels of the experimental group and control group pupils as regards the Normality Analysis Results.

It is seen that there is no important difference (p>.05) between the pre-test scores they received from the pre-tests of the Torance Creativity Test (.589) which was used to determine the creativity levels of the pupils in the experimental group and the control group, and the Paper Folding Test (.87) which was used to determine the Spatial Thinking Skills and the Mental Rotation Test (.87) when the scores of the t-Test and Mann Whitney U analysis performed to match the study groups in terms of pre-test scores were examined. Therefore, it was concluded that the experimental group and control group were equivalent to each other.

2.2. Findings Related to the First Hypothesis

In the first hypothesis of the research, the difference in gain levels and effect sizes were examined to analyze the effect of museum-based art education on the creative thinking abilities of gifted students. The Skewness Coefficient (.10) and the Kurtosis Coefficient (-.38) were determined for the experimental group and the control group was determined as the Skewness Coefficient (-.77) and Kurtosis Coefficient (-.32) in the normality analysis performed to determine the parametric or nonparametric levels of the Torrance Creativity Test, According to this result, the results obtained from the Torrance Creativity Test are normally distributed. Therefore, t test analysis was used. According to this result, the results obtained from the Torrance Creativity Test gain values are normally distributed. Thus, t-test analysis was used.

Torrance Creativity Test gain levels and effect size scores of experimental and control group students were examined with the T Test. The data obtained are shown in Table 2.

Table 2. Analysis Scores for Torrance Creativity Test Achievement Values

Groups	n	Pre-Test Ort.	Son-Test Ort.	$\bar{X}$	Ss	t and p Value Difference Between Scores Mean.			d
						t	df	p	
Experiment	21	-.33	1.64	1.98	2.97	4.28	40	.000*	1.32
Control	21	.33	-1.64	-1.98	3.00				

p<.05

As seen in Table 2., an important difference was found between the creativity score post-test and pre-test score differences between the experimental group and control group (T (1.98) = 4.28, p <.05). That the effect size of this detected difference is d = 1.32 shows that the difference has a large impact. When the arithmetic means are examined, it is seen that the difference is in favor of the experimental group. While the average post-test – pre-test score difference of the experimental group creativity score is 1.98, the average of the control group is -1.98. It can be said that the creativity post-test-pre-test differences of the experimental group were higher than the control group.

An important difference was found between the Torrance Creativity Test (.000) post-test - pre-test score differences to the experimental group and control group as regards the obtained values of this analysis result.

2.3. Findings Related to the Second Hypothesis

In the second hypothesis of the research, the difference in achievement levels and effect sizes were examined to analyze the impact of museum-based art education on the spatial thinking abilities of gifted students. For this, according to the Paper Folding Test applied to determine the parametric or nonparametric levels of the experimental and control groups, the Skewness Coefficient (.25) and the Kurtosis Coefficient (.75) of the experimental group; the Skewness Coefficient (-.05) and Kurtosis Coefficient (-.67 of the control group) has been determined. The Skewness Coefficient (1.41*) and the Kurtosis Coefficient (1.68) of the experimental group of the Mental Rotation Test was determined and as the Skewness Coefficient (-.13) and Kurtosis Coefficient (.21) of the control group was determined. In consequence of the normality analysis, the Mental Rotation Test values are not normally distributed while the Paper Folding Test values applied to decide spatial thinking skills are normally distributed. For this reason, while the difference in the achievement level and effect size in the Paper Folding Test was analyzed with t Test, the difference in the achievement level in the Mental Rotation Test was examined with the Mann-Whitney U test.

Gain results of the Paper Folding Test and Mental Rotation Test and their effect sizes were examined with the analysis methods determined for spatial thinking skills. The data obtained are shown in Table 3 and Table 4.

Table 3. Spatial Thinking Skill Paper Folding Test Analysis Results

Groups	n	Pre-Test Ort.	Son-Test Ort.	X̄	Ss	t and p Value Difference Between Scores Mean.			d
						t	df	p	
Experiment	21	10.67	13.48	2.81	1.36	4.86	46	.000*	1.50
Control	21	10.52	11.38	.86	1.23				

p<.05

As seen in Table 3., an important difference was found between the spatial thinking skill Paper Folding Test score post-test - pre-test score difference means according to the experimental and control groups (T(2.81) = 4.86, p <.05. That the impact size of this detected difference is d = 1.50 shows that the difference has a large impact. When the arithmetic means are examined, it is seen that the difference is in favor of the experimental group. While the experimental group's spatial thinking skill Paper Folding Test score post-test - pre-test score difference mean is 2.81, the control group mean is .86. It can be said that the spatial thinking skill Paper Folding Test post-test - pre-test differences of the experimental group were higher than the control group.

Table 4. Spatial Thinking Skill Mental Rotation Test Analysis Results

Groups	n	Rank Average	Ss	U		r
Experiment	21	28.00	1.55	84.00	0.000*	.52

Control	21	15.00	1.43			

*p<.05

As seen in Table 4, an important difference was found between the experimental group and control group according to the Spatial Thinking Skill Mental Rotation Test scores ($p < .05$). The impact size of this difference was $r = .52$, indicating that the difference had a large effect. When the rank averages are examined, the difference favors the experimental group. The mean rank of the experimental group in the mental rotation test was 28.00, whereas the mean rank of the control group was 15.00. the mental rotation test results of the experimental group are higher.

According to the gain values of the results of this analysis, an important difference was found between the post-test and pre-test mean score differences in the Paper Folding Test (.000) and the Mental Rotation Test (0.000).

3. Conclusion, Dissusion and Recommendations

In this section, in line with our research, the effects of museum-based art education activities on students' creative and spatial thinking abilities on gifted students were examined, suggestions were made by considering that the results with discussions.

3.1. Conclusion and Discussion

The knowledge and skills acquired during primary school years are transformed into attitudes and behaviors that are exhibited in various areas of life. It has been observed that education-oriented activities in museums contribute to shaping and enriching children's new knowledge and experiences more effectively, helping them understand abstract concepts.

It was observed that all of our students were happy, excited, and willing to participate in the museum visits and activities planned in line with our research. This program also contributed to the processes of acquiring knowledge, creative thinking, spatial thinking, developing imagination, and esthetic feelings by increasing students' observation skills. Children especially enjoyed the ramified activities in the museums.

An enriched museum tour and activity program has been prepared by aiming to develop the creative thinking skills and spatial thinking skills of gifted students. These activities were applied to the students in the experimental group. Torrance Creativity Figural Test battery and Mental Translation Test and Paper Folding Tests were used for both groups in order to decide the change in the creative thinking skills and spatial thinking abilities of the students in the experimental group and to compare them with the control group.

While most people have the innate ability to think creatively, practice and positive feedback has a key role in realizing and developing this potential. Using and supporting your innate creative ability can strengthen and develop this ability. Similarly, neglecting or discouraging this ability can weaken or dull it. (Gartenhaus, 2000; Aini *et al*., 2020). In a study conducted by Batdal Karaduman in 2012, research was conducted on the impacts of a geometry program developed for gifted pupils. This study shows that the program increases students' achievement levels, improves their creative thinking skills in learning geometry, and also increases their spatial ability levels. Clark and Zimmerman (2002) included the curriculum context, educational arrangements, acceleration and enrichment practices of gifted students and stated that students should generally be directed to arts and all science studies, and that an exciting and challenging program created that allows

them to lead scientific, artistic and social life should be created in their study published. In the article published by Renzulli in 1968, a study was conducted to decide the characteristics of programs for thegifted students that were deemed necessary and sufficient by the authorities for a comprehensive programming.

As can be seen from the above research, activities designed by enriching to increase the creative thinking skills of gifted students are effective on students. In our study, it was seen that activities enriched with museum trips and museum activities were effective in developing creative thinking skills in the experimental group students. While students had fun with the museum tour and museum activities, they concretized the objects and reached the application area by seeing and touching. It has been observed that the creativity skills of the control group students could not be developed with classical education plans.

According to Yurt's 2011 research, modeling-based activities were implemented in a virtual environment and with the use of real objects, and their effects on pupils' spatial thinking and mental translation skills were examined. This study revealed that activities carried out with virtual environments and physical objects are effective in developing pupils' spatial thinking and mental translation skills. In their research, Lakin and Wai (2020) revealed that spatially gifted pupils experience more academic difficulties than other gifted pupils, have problems completing their schooling, and need more services for these gifted students.

In our research, it was observed that gifted pupils' spatial thinking skills improved with the educational plans made with activities prepared for museum-based art education. With the activities, students were helped to concretize the spatial ideas they were asked to imagine, and they had the opportunity to practice them while having fun. It was observed that the spatial skills of the control group students could not be improved with classical education plans.

3.2. Recommendations

3.2.1. Recommendations for Practitioners

While designing museum-based art education activities for gifted students, instructions that encourage creative and spatial thinking were included in the activities in order to achieve the desired outcomes. Gamified activities implemented to strengthen creative and spatial thinking skills can be diversified and increased.

Gifted students followed the instructions given to them unknowingly while performing the tasks, in the museum where art activities were held, like a game. In this way, students have achieved the targeted gains in the field of art education. Likewise, enriched educational experiences can be planned by providing students with environments where they will enjoy and feel free, not only in the field of arts, but also in other areas of education such as science, social sciences, mathematics and technology.

Museums are recommended as places where they can travel to different time periods and get inspired in order to reveal gifted students' imagination. These experiences are not limited to museums, but can be diversified through places such as galleries and art exhibitions. In this way, students have the chance to participate in events where they can find inspiration in different fields besides art.

3.2.2. Recommendations for Researchers

In the study, it was observed that museum-based art activities designed to increase the creative thinking and spatial thinking abilities of gifted students had a positive impact

on the development of pupils. Designing and diversifying activities that support creative and spatial thinking can further enrich the educational plans of gifted students.

Students' creative and spatial thinking skill levels were investigated through museum education activities prepared for gifted students. In addition, enriched enriched activities can be planned on life and career skills, entrepreneurship, self-direction, productivity, responsibility, leadership, critical thinking skills and social skills, which are called 21st century abilities for gifted pupils.

In our study, it was examined whether the art activities organized in museums, which are among the out-of-school educational environments, had any effects on gifted students. Another research topic could be investigating the effects of art activities organized in other out-of-school educational environments such as archaeological sites, galleries and exhibition halls on students.

In our research, museum-based art education activities designed specially for gifted students were implemented in the visual arts course and their effects on the students' creative and spatial thinking skills were examined adhering on the basic achievements of the course. The same approach can be sustained by creating museum-based activities by adhering to the basic achievements of field courses such as science, social sciences, mathematics and technology. In this way, students' success levels and the effects on their creative and spatial thinking skills for the course can be investigated in detail.

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