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Original article

Contribution of Mobile Design Applications to Creativity in Visual Arts Education

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Abstract

The unstoppable progress of technology affects all aspects of our lives, including education. Today, researchers are looking to include digital applications and virtual environments in education and instruction processes. This research concerns using digital tools called mobile design applications in visual arts education courses. This research aims to reveal the effect of mobile design applications in the visual arts education course on the creativity of secondary school students. Data were collected through Creativity Level Analytical Rubric (CLAR), which the researchers developed. The study sample consisted of 38 students studying in the 11th grade of a public school in Ankara and was selected randomly. The study lasted 14 weeks. The designs made by the participants using mobile design applications were evaluated using CLAR by three experts who had at least Ph.D. education in the field of visual arts. Obtained scores were interpreted, and as a result, it was concluded that mobile design applications positively affect the participants' creativity.

Keywords: Creativity, Mobile Design Applications, Rubric, Visual Arts Education.

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INTRODUCTION

Integrating technology into education and the arts is not a new phenomenon. The significant impact of the socio-cultural shift created by the industrial revolution on society (Dolunay & Boyraz, 2013) and the rapid developments in information and communication technologies, especially after 1980, have significantly affected all systems of society, from science to art (Göktaş, Yıldırım & Yıldırım, 2008). These developments have diversified education systems, educational approaches, and teaching methods. Visual arts education has also benefited from this diversity and incorporated many new media and materials into its tools and equipment. Therefore, the ability to use digital tools and technology is defined among the skills expected from individuals in the 21st century and is called 21st-century skills. The general framework of the 21st-century skills that students should have to adapt to the era they live in is shown in Figure 1.

Figure 1. The general framework of 21st-century skills for 21st-century learning (P21, 2007).

The core subjects of 21st-century skills consist of three main skill areas classified as 1) learning and innovation skills (critical thinking, communication, collaboration, creativity), 2) information, media, and technology skills, and 3) life and career skills. The following are included in the field-specific skills of the Visual Arts course curriculum; perception, using information technologies, multidimensional thinking, hand-eye-brain coordination, visual literacy, artistic ethics, design, observation, synthesis, analysis, evaluation, critical thinking, aesthetic sensitivity, cultural heritage, self-awareness, media reader- writing, using materials and creative thinking (Visual Arts Curriculum, 2018). When these contents are examined, it is seen that creativity and the ability to use technology are included in both the 21st-century skills and the objectives of the Visual Arts course. In addition, it is predicted that critical thinking and creativity skills will move to the top of the 21st-century skills in the coming years (Keleşoğlu & Kalaycı, 2017, p.71). From this point of view, this study focuses on the relationship between technology and artistic creativity. Examining the effect of mobile design applications on student products, which are evaluated within the scope of digital design tools, on the students' creativity

by using them in visual arts education, constitutes the problem of this research. In the following sections, after mentioning the basic definitions of "creativity," artistic creativity and the use of technology in art education are examined conceptually.

Creativity

Whatever the impact on society, people and culture, creativity is a multifaceted phenomenon valued, meaningful, and researched. It is impossible to talk about the existence of a generally accepted definition in the field of creativity. For example, Lowenfeld described creativity as a basic instinct that all people are born with (Lowenfeld & Brittain, 1964). Guilford (1967) defines creativity as the key to education and solving humanity's most serious problems. Creativity is accepted (Conrad,1990, p.103);

> *"A motive according to S. E. Golann (1962), a process according to M. I. Stein (1956), a pattern of personality traits according to R. B. Cattell and J. E. Drevdahl (1955), a cognitive trait according to JP Guilford (1963). The term has been associated with various concepts, including exaltation by S. Freud (1908/1924), regression by E Kris (1952), self-actualization by A. H. Maslow (1959), and a result or resolution of destructive impulses by H. B. Lee (1947). C. R. Rogers (1959) defined creativity as a typical trait, A. V. Busse and A. S. Mansfield (1980) defined it as a domain-specific ability and B. F. Skinner (1976) defined it as a learned behavior."*

With J. P. Guilford's attention to creativity in the middle of the 20th century, interest in research on the nature of creativity in psychology increased (Ayden & İşgüzar, 2016). Guilford was the first scientist to approach the subject with educational psychology methods (Razik, 1970, as cited in Bulduk, 2012). According to Guilford, creativity is associated with intelligence. In addition, divergent and convergent thinking plays an essential role in the emergence of creativity, and creativity can show itself in divergent thinking (San, 1979). In his approach to creativity, Csikszentmihalyi (1996, p.23) said, "Creativity does not occur in people's heads, but the interaction between one's thoughts and the socio-cultural context." Amabile et al. (1996) define creativity as producing new and valuable ideas in every field. Traditionally, creativity has been seen as a mental process, the insight of an individual genius. Creativity can also be defined as an original, valuable, practical idea or product. Nobel Prize-winning economist and psychologist Herbert Simon claimed that all creative achievements result from problem-solving (Csikszentmihalyi & Wolfe, 2014). May (2007) sees creativity as a concentrated person's encounter with their world. He states that creativity should be seen in the work of the scientist and the artist, the thinker, as much as in aesthetics. Creativity can emerge in many areas, from technological developments to daily life.

Creative thinking is generally divided into scientific and artistic creative thinking (Kutlu, Doğan & Karakaya, 2014, p.25). There are various views on the emergence of artistic creativity. Fromm

mentions two types of creativity in the field of art. The first is the activities that depend on the ability, such as painting, composing music, writing novels, and poetry, which can be learned and developed with various methods and exercises. At the end of this process, the product is revealed. The second is; creative attitude and behavior, which is the basis of all kinds of creativity. While the first type can be defined as a talent, the second is the character trait that can be developed by processing the abilities to see, perceive and react (San, 2008, p.15). In this type of creativity, there may not be any products. Eisner, an American visual arts educator, proposed four types of artistic creativity in 1972. These; include pushing the limits, breaking the limits, and making inventions and aesthetic arrangements (Kırışoğlu, 2005, p.172).

Dewey defined artistic creation as a process in his "Art as Experience." He stated that artistic creation is not a situation that suddenly appears in the artist's mind. Instead, he pointed out that the artist's experiences and the results of these experiences play a role in forming the artwork (Rasmussen & Glăveanu, 2020). Amabile defined creativity in the arts as the result of expertise developed through education and life experience and essential motivation, intelligence, talent, and field-related skills (Pelowski et al., 2017, p. 90). Kırışoğlu (2005, p.175) defined the artistic creation process as a problem-solving process. He expressed problem-solving as creating a composition by considering the relationships between artistic arrangement elements and principles such as color, line, texture, and contrast to achieve the quality work desired to be designed. Thus, he expressed that achieving a qualified result is realizing artistic creation by solving the creative problem. According to Conrad (1990), artistic creation is the birth of a compelling and harmonious metaphor in the research-finding process, including sensation, perception, emotion, and imagination (as cited in San, 2008, p.26).

Rhodes (1961) conceptualized creativity in a person, process, product, and press and created the 4P model. Tinio (2019, p. 692) evaluated the 4P model in aesthetics and argued that artistic creativity coincides with creativity in general. According to Tinio, a product results from a creative effort, a creative idea, or any other result. The product has been the most studied 4Ps in creativity and aesthetic research. Visual artworks have been the most widely studied genre in the product context. In general, creativity covers the tools for producing innovative products and includes cognitive processes such as problem posing, idea generation, and evaluation. The corresponding process in aesthetics is concerned with the perceptual and cognitive processing of works of art, including composition, style, and meaning. In aesthetics, the person refers to the characteristics of those who perceive the art. It may include their knowledge, personality traits, motivations, cultural backgrounds, and life histories. Finally, in aesthetics, press refers to aspects of the context of viewing art that can directly affect the aesthetic experience of art. Press can include broader influences, such as the physical characteristics of the museum space or the social and cultural aspects of the art experience. Tinio (2019, p. 691) explains artistic creation in his

Mirror Model as a process that reflects the progress from the initial idea or motivation leading to the creation of a work to its completion.

When these definitions are examined, the relationship between art education and creativity draws attention. The importance of creativity in art education and the development of creativity through art were emphasized in many publications, from children's creativity to the creativity of artists. "Creativity" as a counterpart of free expression in art first emerged with Franz Çizek's romantic thoughts in the 1950s and started to be accepted in visual arts education (Özsoy & Mamur, 2019). San (2008) argues that the most appropriate field to develop children's creativity starting from a young age is the artistic field, so art education is a discipline that should be extensively and widely included in general education. Another researcher, Kırışoğlu (2005), who has researched art education and creativity, states that creativity exists more or less in every individual and can be developed. Kırışoğlu stated that creativity is related to the multifaceted readiness of the mind by arguing that a person cannot be creative without essential knowledge on some issues related to art, without gaining new knowledge about art, and without knowing how to use this knowledge. He defined the readiness of the mind in artistic creation as a skill acquired, learned, and developed in a specific process at or outside of school. He also states that developing creative behavior in classroom situations is the basis of art education. Creativity is also defined as social reasoning between art educators and students in the cultural context of art classrooms (Thomas, 2009, as cited in Zimmerman, 2010).

While the idea that creativity is based on a single process or method in today's art education is rapidly disappearing (Zimmerman, 2010, p. 88), digital tools and applications used in art education are increasingly diversified. Considering that the innovations brought by digitalization are reshaping our lives (Tuğal, 2018, p.62), it is argued that the inclusion of new technologies in education can make room for creativity in education (Livingston, 2010). Fox & Schirrmacher (2014, p.260) suggested that digital art activities are enjoyable for students who are not interested in traditional art activities. They stated that peer interaction could be strengthened through artistic works made with digital tools. Many technical conveniences (text addition, color options, cutting, undoing, pasting, adding effects) can be provided in artworks and offer various opportunities to express creative thinking.

Technology can improve students' problem-solving ability, reason visually, and explore and express creative thinking. Students who complete creative digital assignments can learn how to use technology creatively. Students can improve their self-esteem during digital creation and approach their digital art education assignments more confidently (Black & Browning, 2011, p.21). Taylor and Parsons (2011) argue that students learn many 21st-century skills by using technology in their work. Today, since science and technology are included in the artistic process, digital technologies are considered an efficient tool that can help students realize the creations in their minds. Students can discover and experience their creativity through digital technologies. Digital natives, born into a completely digital

world, spend most of their time in a virtual environment and frequently use digital/mobile applications. For this reason, educators should be able to include new learning tools, applications, or new learning environments in education to the characteristics of the new generation called "Digital natives ."The mobile design applications used in this research are also included.

Measuring creativity

While addressing artistic creativity has generally been the subject of philosophy, studies on making art emerged as a branch of psychology in the late 19th century. The establishment of the field is attributed to Fechner, who also guided the aesthetic preferences in the same period and emphasized the "production method" by investigating general laws. Art production subsequently became a topic in the United States and Europe in the 1920s-30s, which led to several standardized drawing assessments. However, after Fechner, very little work has been done on visual arts and artistic production creativity. The indescribable nature of making art is one of the reasons why such research is challenging. Despite the difficulties, most studies on creativity in the art are based on the discoveries of visual creativity. These studies are generally divided into four main areas: creative person, product, process, and press (Pelowski et al., 2017, p. 82).

Guilford's famous speech at the American Psychological Association in 1950 is the official start date for scientific creativity research within psychology. The ideas produced in the quarter-century after this speech had a tremendous and continuous impact on the field, and most of the studies of this period were conducted from a psychometric point of view. Besides, psychometric work has gone beyond traditional cognitive and personality approaches over the past three decades. This expansion is largely based on T. M. Amabile and researchers and theorists such as Mihalyi Csikszentmihalyi, Vlad Petre Glăveanu, Robert J. Sternberg, and Todd I. Lubart. They support broader systems and socio-cultural theories of creative development. It can be said that the field of evaluating creativity has never been as active and dynamic as it is now (Plucker et al., 2019, p. 44).

Various personality checklists have often been used to identify highly creative individuals and personality traits or cognitive attributes associated with creative performance. Other creativity indexes focused on behavioral factors. These behavioral assessments, such as the Torrance Test of Creative Thinking (TTCT), are typically built on Guilford's theory of divergent thinking, with participants' verbal, written, and drawn responses. Many creativity tests can correctly use one or more creative abilities or dispositions. However, it is doubtful that a single test will be developed to capture all the creativity components (Hennessey et al., 2020).

Baer, Kaufman, and Gentile (2004) believe that product reviews are probably the most appropriate assessments of creativity. Some researchers have referred to such assessments as the "gold standard" of creativity assessment. In the field of advanced techniques for evaluating innovative products, after the

stagnation of the mid-to-late 1990s, several efficient results have been produced in recent years. The most active area in evaluating creativity is the Consensus Assessment Technique (CAT). This technique (CAT), which Amabile put forward in 1983, is used to evaluate creativity based on expert opinions (Türkman, 2018). Amabile assumed that a product or response is creative to the extent that observers/evaluators agree (as cited in Plucker et al., 2019, p.54). According to Hennessey et al. (2020), being aware of the difficulties inherent in creativity tests, many researchers think creativity judgments can only be subjective. Rather than objectifying the creativity rating process, these researchers rely on evaluating people or products. Studies have shown that product creativity can be evaluated reliably and validly. Although it is challenging to characterize a product's specific characteristics, creativity is something people can recognize and agree on when they see it (Hennessey et al., 2020).

Although many techniques are used to measure creativity, each research provides an incomplete or different picture of creative processes (Zimmerman, 2009, p. 387). According to researchers, creativity is defined in different ways from various perspectives. Yaratıcılık birçok araştırmacıya göre çeşitli açılardan farklı şekillerde tanımlanmaktadır. According to some, creativity is a process; for some, it is a product, and for some, it is a whole that includes both. Researchers often conceptualize and explore creativity through one or more dimensions of creative person, process, product, and press, based on Rhodes's (1961) 4P model. More recent models (Amabile et al., 1996; Csíkszentmihalyi, 1996) include all 4Ps that presuppose the emergence of creativity. Therefore, he proposes that students' creative development in the classroom will result from a combination of their factors, including their characteristics, knowledge, skills, dispositions, and the physical, social and pedagogical environment that surrounds them (Cropley, 2011, as cited in Bereczki & Kárpáti, 2021). The expression of creativity used in this research has a unifying quality and appeals to the process, product, person, and press based on Rhodes's (1961)'s 4P model. In addition, the expression of creativity is defined as thinking with values, problem-solving process (Kırışoğlu, 2005, p.175) and problem-solving with the use of technology, visual reasoning, exploring and expressing creative thinking (Black & Browning, 2011, p. 20). Therefore, creativity is related to "problem finding, problem-solving, divergent and convergent thinking, self-expression and adapting to new situations" (Zimmerman, 2009, pp. 386-392). This study evaluates critical thinking, problem-solving, risk-taking, information technologies, self-criticism, and originality. For these reasons, creativity has been evaluated through the reinterpretation of works of art through mobile design applications.

The Purpose and Importance of the Research

It is predicted that mobile devices, which have many advantages in art education and every field of education and are frequently preferred by students in the research and application stages, will make art lessons easier, cheaper, and more creative. When the literature was examined, some studies were found that overlapped with our research. For example, studies by Tepecik and Zor (2014) and Taşkesen

and Yılmaz (2018) can be cited as examples of studies examining the effect of technology on academic achievement. In addition, a study was conducted by Meriçelli and Uluyol (2016), examining the effects of web and mobile-assisted education on students' motivation and success. The studies of Aydemir, Küçük, and Karaman (2012), Taşkesen (2020), Ceylan-Dadakoğlu, and Bakar-Fındıkcı (2020) can be cited as examples of studies in which opinions about the use of technological tools in education are evaluated. It is possible to show the research of Zor and Tepecik (2015) and Ünalan (2016) among the studies that address the possibilities provided by technology in education. In the literature, it is seen that much research has been done on technology-supported educational environments/applications/tools. Our research is necessary because it examines the creative dimension of visual designs. Therefore, it is thought that our research will contribute to the literature with other studies in this field.

This study investigates the effect of the mobile design applications that high school students use in the visual arts course on their artistic creativity. Nowadays, mobile design applications are used in education and training processes and can serve the purpose of education. The starting point of this research is the possibility of using mobile design applications/tools we frequently use in daily life in art classes. Using mobile design applications/tools in art classes can provide convenience regarding both material use and creativity. This situation has led us to how mobile design applications/tools can be included in art classes. This study aims to evaluate the use of these applications, frequently used by students, as a design tool in the Visual Arts Education course regarding artistic creativity. This study is considered necessary in investigating how technology can be included in art classes in line with the overlapping objectives of the 21st-century skills and visual arts course.

MATERIALS and METHODS

This research is a descriptive study conducted in a survey model. According to Büyüköztürk et al. (2008), survey studies aim to collect data to determine some characteristics of a group. Since it aims to determine secondary school students' creative artistic skills, this study is classified as a survey study. Using the collected data, the current situation regarding the creative artistic skills of secondary school students was evaluated.

Study Group

The research study group consists of 38 students studying in a public school in the city center of Ankara. The study group was determined by the convenience sampling method, one of the purposive sampling methods. With this sampling method, the situation that is close and easy to access (Yıldırım & Şimşek, 2016) was chosen. Since the study group must have taken an art history course, 11th-grade students were included in the research. The distribution of students according to their gender is presented in Table 1.

Table 1. Distribution of students according to their gender

Gender	**f**	**%**
Female	25	66
Male	13	34
Total	38	100

The students participating in the research were asked to reinterpret the works related to Art History in the 11th grade Visual Arts curriculum using mobile design applications. Afterward, the products designed by the students were independently scored by three educators who are experts in the field of visual arts, with the Creativity Level Analytical Rubric (CLAR) prepared by the researchers. The research is limited to the students studying in the 11th grade and the use of mobile design applications.

Data Collection Tool

In the study, mobile design products (Appendix 1) were created by the students, and a rubric for the level of creativity was prepared by the researchers (Ceylan Dadakoğlu & Özdemir, 2021) (Appendix 2) were used as data collection tools. The criteria included were determined by examining the students' artistic creativity and using the literature on scoring keys. For this, five different criteria were determined ("Knowledge and Perception Capacity," "Technical Skills," "Design," "Research and Working Approach," and "Self-Assessment") and scored as five different degrees of success (Poor-0, Minimal-1, Sufficient-2, Above Average-3, Excellent-4). In addition, scores obtained from the creativity level analytical rubric score are qualified as; scores between 0 and 5 are "Needs improvement," scores between 6-10 are "Satisfactory," scores between 11-15 are "Accomplished," scores between 16-20 are "Excellent." While determining these qualifications, the rubric qualifications of "The Harriet W. Sheridan Center for Teaching and Learning" were taken as a basis (Brown University, 2020).

Reliability of Data Collected From The Rubric

Three experts scored the students' products using mobile design applications independently according to the five criteria in the rubric. Kendall's W coefficient, which shows the consistency between the scores given to 38 students by three raters for each criterion, is presented in Table 2.

Table 2. Kendall's coefficient of concordance for criteria

Coefficient Of Concordance	Criteria				
	Knowledge and Perception Capacity	Technical Skills	Design	Research and Working Approach	Self-Assessment
Kendall's W	0.842*	0.862*	0.857*	0.994*	0.994*

*p<0,01

When Table 2 is examined, it is seen that the coefficients of concordance between the raters' scores for each criterion were between 0.842 and 0.994, and all values were statistically significant. Therefore, when the values are interpreted in general, it can be said that there is a high level of agreement between the raters according to the criteria of Von Eye and Mun (2005).

The agreement between raters regarding the total scores obtained from the rubric is presented in Table 3.

Table 3. Kendall's W coefficient to measure agreement among raters for total scores

Coefficient Of Concordance	**CLAR Total Score**
Kendall's W	0.952*

*p<0.01

When Table 3 is examined, the coefficient of concordance between the three raters was calculated as 0.952 according to the total scores obtained from the rubric. This value was found to be significant. This value shows that the agreement between raters is high. In addition, Kendall's fit statistics, a technique in which agreement is calculated by considering rank differences, was highly significant for three raters in both tables (Table 2-3). This finding can be interpreted as the raters showing a high similarity in ranking the individuals. The results show that the rubric is sufficiently reliable.

Research Procedure

The study lasted 14 weeks. Figure 2 displays the flow chart of the study.

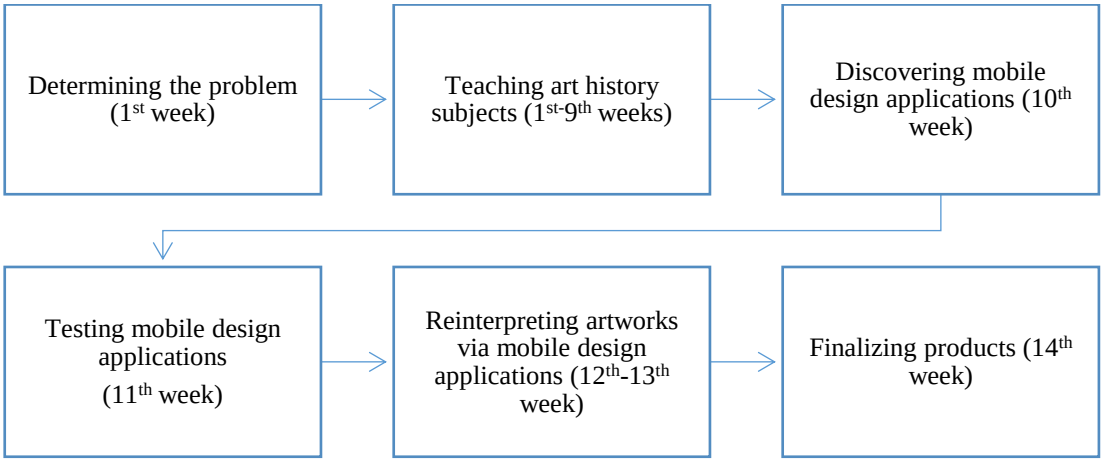


Figure 2. Research Procedure

After determining the problem, art history subjects were taught in the 11th-grade Visual Arts course. These nine-week courses examined art movements, leading artists of Western art, and works of art. After the art history subjects were finished, students explored mobile design applications. Applications that provide design experiences for free were scanned, and each student started to work on the application they felt comfortable with. Over the next few weeks, students constantly experimented with mobile design applications. In this process, students also clarified the stages of generating ideas and compositions for the work. Finally, in the 14th week, the experiments were finalized.

Data Analysis

In the research, the mobile design products created by the students were examined one by one by three experts from the visual arts field. A rubric was created to evaluate students' mobile design applications. The rubric consists of five parts: "Knowledge and Perception Capacity," "Technical Skills," "Design," "Research and Working Approach," and "Self-Assessment ."Each section was prepared with equal points in determining student success, and success levels were graded as "Poor-0, Minimal-1, Sufficient-2, Above Average-3, Excellent-4". The sum of the scores obtained from each criterion constitutes the student's artistic creativity skills. Since there are five criteria and four success levels in the key, the highest score obtained is 20, and the lowest obtainable score is 0. The rubric is given in Appendix 2. In addition, reliability studies of the scores obtained from the prepared rubric were conducted. For this purpose, the mobile design products created by the students were evaluated by three different raters using the rubric. Data obtained regarding the results were evaluated in the Jamovi statistical program, a free program.

Frequency (f) and percentage (%) were calculated regarding the scores obtained from the mobile design products of the students participating in the research. In addition, Kendall's coefficient of concordance was used for the reliability studies of the scores obtained from the rubric.

RESULTS, DISCUSSION, and CONCLUSION

First, data and analyses related to the rubric, which was developed to evaluate the products created by the students using mobile design applications, were included in the results. After this process, descriptive statistics about artistic creativity skills were included according to the scores of the students from the rubric. Therefore, the validity and reliability studies of the scores obtained from the "Creativity Level Analytical Rubric (CLAR)" were carried out.

Descriptive Statistics Results Regarding Students' Mobile Design Products

Table 4 shows the descriptive statistics expressing the arithmetic mean, standard deviation, minimum and maximum values for the scores students got from the sub-dimensions of the rubric regarding artistic creativity.

Table 4. Descriptive statistics results of students' scores from mobile design products according to sub-dimensions

	N	$\bar{X}$	Sd	Min.	Max.
Knowledge and Perception Capacity	38	3.6	0.754	0	4
Technical Skills	38	3.05	0.733	0	4
Design	38	3.08	0.818	0	4
Research and Working Approach	38	3.39	0.638	0	4
Self-Assessment	38	3.37	0.633	0	4
Total	38	16.03	3.071	0	20

As shown in Table 4, the averages of the students' scores received from the rubric sub-dimensions differ in each dimension. For example, considering the scores that students got from mobile design products, it is seen that the highest arithmetic average is 3.39 in the dimension of "research study approach," and the lowest arithmetic average is in the sub-dimension of "technical skills" with 3.05. The percentage and frequency values of the students' scores from the mobile design products according to the sub-dimensions are given in Table 5.

Table 5. Percentage and frequency values of the scores students get from their mobile design products

Score	Knowledge and Perception Capacity		Technical Skills		Design		Research and Working Approach		Self-Assessment	
	N	%	N	%	N	%	N	%	N	%
0	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-
2	8	21.1	9	23.7	11	28.9	3	7.9	3	7.9
3	16	42.1	18	47.4	13	34.2	17	44.7	18	47.4
4	14	36.8	11	28.9	14	36.8	18	47.4	17	44.7
Total	38	100	38	100	38	100	38	100	38	100

As Table 5 shows, the percentage values of the scores obtained by the students participating in the study from mobile design products differ in each sub-dimension. It is seen that nearly half of the participants (47.4%; 47.4%) received "3 points" in the "Technical Skills" and "Self-Assessment" sub-dimensions. The lowest score obtained (2 points) was received from the "Design" sub-dimension (11 people). When examined in terms of the highest possible score (4 points), we see that the sub-dimension that received this least is "Technical Skills." Only 11 students were able to get the highest score in this dimension. In this case, it can be said that the sub-dimension that the students participating in the study are most open to improvement is "Technical Skills." When we look at all dimensions in general, we see that most participants are in the "3 points" range.

The total scores obtained from the rubric were divided into four categories. The scores of the students were categorized according to the determined ranges, and analysis was applied according to the quality criterion. These categories and scores are determined as follows; between 0 and 5 are "Needs improvement," scores between 6-10 are "Satisfactory," scores between 11-15 are "Accomplished," and scores between 16-20 are "Excellent." The distribution of the students according to the determined qualifications is as in Table 6.

Table 6. Expert Evaluation Qualification Table

Qualification	Frequency	Percentage (%)	Cumulative Percentage
Needs improvement	0	0	0
Satisfactory	0	0	0
Accomplished	15	39	39
Excellent	23	61	100
Toplam	38	100	

According to Table 6; Sum of Expert Evaluation Creativity Level Analytical Rubric Scores;

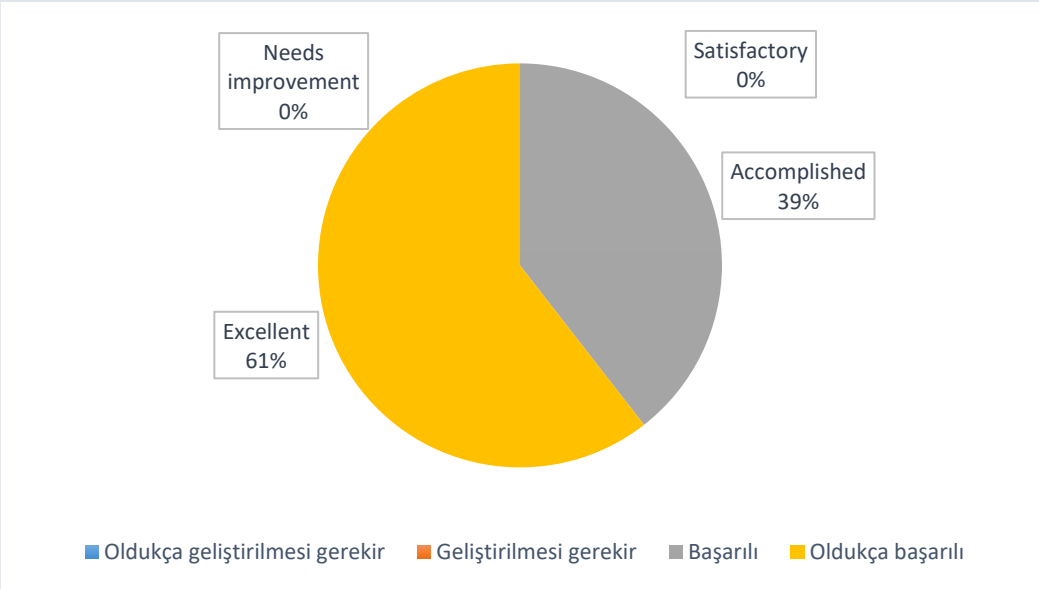
Zero (0) students with a score of 0-5 are in the “Needs improvement” category,

Zero (0) students with 6-10 scores in the “Satisfactory” category,

15 students (39%) with 11-15 scores are in the “Accomplished” category,

23 students (61%) with scores between 16-20 are in the “Excellent” category.

The rubric results showed that most students successfully used mobile design applications in artistic creativity. Obtained results are visually presented in Graph 1.



Graphic 1. Expert Evaluation CLAR Total Score Analysis

When the findings are examined in general, it can be said that using mobile design applications in the visual arts education course positively affects their creativity.

Discussion and Conclusion

Sandrine Han, who conducts much research in areas such as art education in virtual environments and digital visual culture, asks art educators the following questions: "What do we "teach" our students that they cannot find on Google? Do educators handle changes in the digital world? (Han, 2017, p.80). As can be understood from these questions, subjects such as creative thinking, critical thinking, and the use of technology in education are necessary for the education system of this age. Students should be prepared to think creatively and develop appropriate skills and abilities in a rapidly changing world where technological innovations, new products, and ideas are valued worldwide (Zimmerman, 2009, p. 395). These skills, which can also be defined as 21st-century skills (see Figure 1), formed the starting point of this study. This research focuses on the relationship between creativity and digital tools through the designs made by the participants using digital tools. Therefore, it has tried to put forward a perspective on how arts education can benefit from technology and contribute to students' creativity.

Creativity occurs in all emotional and mental activities, work, and occupations. Creativity forms the basis of all aspects of human life and development (San, 1979, p.18). According to Zimmerman (2010), creativity is a complex process involving the relationships between people, processes, products, and social and cultural contexts related to a field of knowledge. This research is based on the relationship between artworks, mobile design applications, and creativity. It was observed that the participating students could develop a critical perspective and reflect on this situation in their designs by connecting various experiences in their lives and works of art. Furthermore, it was observed that the students could associate the works they chose with different, current, and individual subjects. Therefore, it is thought that the participating students can raise awareness about these issues.

The concept of creativity is a situation that emerges as a result of the unity of the person, process, product, and press. The creative person, the process, and the resulting product; enriches with knowledge and experience (Onur and Zorlu, 2017, p. 1546). Creativity based on models developed in art education and other fields can be increased, and teaching strategies can be developed to encourage creativity (Zimmerman, 2010, p. 84). Multimedia-assisted teaching methods have proven to be one of the most effective educational tools that can be used to create a stimulating learning environment for students and provide context and opportunities for greater creativity in the classroom and all aspects of life (Al Hashimi et al., 2019). Participants were able to research and explore mobile design applications, try them out, and make designs using their discovered applications. It is thought that all participants developed their skills to bring a new interpretation to works of art, to select, combine and reorganize images. Therefore, participants could reflect on their technological experiences in their creative designs.

From Marcel Duchamp's depiction of the Mona Lisa with a mustache to Andy Warhol's Campbell's Soup Cans painting, it is known that artists use their creativity to make or modify the work of others for their interpretation (Han, 2019, p. 1). From this point of view, it can be stated that the participants reinterpret the works of art using digital tools and attribute meanings for their purposes by using their creativity. According to Freedman (2010), creativity includes critical thinking, is based on curiosity, is a learning process, functional, social activity, leadership style, and depends on reproduction. In addition, creativity in visual arts requires taking risks, thinking differently or taking action, creating new meanings, and being brave to bring concepts and skills together. Therefore, today's arts education, which is more diverse in theory and practice, should offer students the opportunity to try all kinds of media and encourage them (Han, Wright, Martinyuk & Ott, 2017). Furthermore, researchers provided motivational support for all participants during the production process. It has been observed that the participants express themselves more efficiently by taking a more active role in the art education lesson, taking risks, and experimenting, thanks to the convenience provided by mobile design applications.

Many of the most popular methods for assessing creativity rely heavily on human judgment. Often, professionals (e.g., artists) or other experts are asked to judge creative work (Csikzentmihalyi & Getzels, 1971; Runco, 1989, as cited in Türkman, 2018). In this study, the evaluation of creativity was made by experts using a graded scoring tool (rubric). As a result of the evaluation of the participants' designs according to the criteria in the rubric by art and design education experts, it is seen that they are qualified as "Accomplished" (61%) in terms of creativity. Therefore, it can be stated that there is a positive relationship between the use of digital tools in art education and creativity. However, although the link between creativity and technology is often discussed in education, previous literature reviews and meta-analyses prove that few studies have investigated the effects of technology-enhanced learning interventions on creativity.

Additionally, empirical evidence on technology-based development shows that digital tools can increase creativity (Lai et al., 2018, as cited in Bereczki & Kárpáti, 2021). The results shown in this section coincide with the statements of Bereczki and Kárpáti. Therefore, it is thought that art and design education should be intertwined with digital tools and applications and technological developments.

Recommendation

There is no single creative teaching method to positively impact a student's creativity in art classes as in other subjects. Instead, educators must choose meaningful methods for them, their students, and the context in which their teaching occurs. Creating a supportive educational environment where creativity can occur involves emphasizing student meaning-making through long-term engagement with the problem. Encouraging playing while working, encouraging risk-taking by experimenting with materials and ideas without fear of sanction against wrong solutions and mistakes, and fostering deep participation, passion, and imagination are also the requirements of a supportive educational

environment (Bastos & Zimmerman,2017, p.389). Therefore, choosing materials or tools that students can apply with pleasure is recommended.

Including digital tools in curriculum and learning areas is considered necessary. Additionally, learning to incorporate technology into educational practices is among the needs of today's educators. In this regard, it is thought that in-service teacher training related to the topic should be provided. There is also a need for accessible applications and suggestions for teachers' use.

Future Studies

The relationship between creativity and digital applications needs more extensive research. This research aimed to evaluate creativity through a comprehensive rubric called CLAR. For more reliable results, self-peer-process evaluation, observation, and interviews can be examined.

This research is limited to only 11th-grade students and mobile design applications. In future studies, different grade levels can be included in the research within the scope of different curriculum topics. Therefore, comparisons can be made between research results.

In the future, digital technologies will be seen as the core of contemporary teaching practices and creativity in education. However, little known research examines the creativity-technology relationship in the classroom or from the perspective of teachers and students. The primary research need may be an emic perspective, in which both practices are experienced and knowledge is given, which can assist in developing knowledge (Henriksen et al., 2021).

Limitations

There are several limitations to the generalizability of the results of this study. First, this study was conducted only with 11th-grade students of a high school in Turkey. In addition, this research was carried out only on art-historical subjects. Therefore, these limitations should be taken into account when generalizing. Second, the research was analyzed only from the perspective of the criteria in the rubric. Different variables were not examined.

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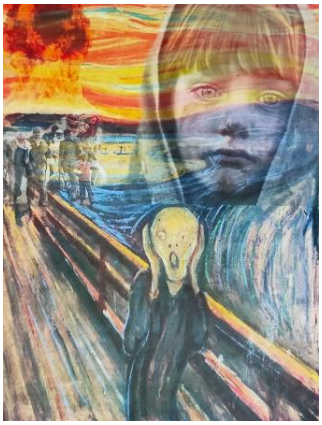
Student number 36



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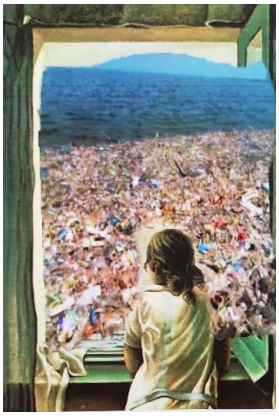

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APPENDIX 2. Creativity Level Analytical Rubric (CLAR)

Ölçütler	**Zayıf (Poor)** **0**	**Minimal (Minimal)** **1**	**Yeterli (Sufficient)** **2**	**Ortalamanın üzerinde (Above Average)** **3**	**Mükemmel (Excellent)** **4**	**Puan**
Bilgi ve Algılama Kapasitesi	Mobil tasarım uygulamaları konusunda hiç bilgisi yoktur. Mobil tasarım uygulamaları kullanarak tasarım oluşturmaya yönelik teknik ve yöntemleri uygulamaz.	Mobil tasarım uygulamaları konusunda yeterli bilgiye sahip değildir. Mobil tasarım uygulamaları kullanarak tasarım oluşturmaya yönelik teknik ve yöntemleri yeterli derecede uygulayamaz.	Mobil tasarım uygulamalarından çok azını bilir. Mobil tasarım uygulamalarını kullanarak tasarım oluşturmaya yönelik teknik ve yöntemlerden çok azını bilir.	Mobil tasarım uygulamalarından bazılarını bilir. Mobil tasarım uygulamalarını kullanarak tasarım oluşturmaya yönelik teknik ve yöntemlerden birazını bilir.	Mobil tasarım uygulamalarını bilir. Mobil tasarım uygulamalarını kullanarak tasarım oluşturmaya yönelik teknik ve yöntemleri bilir.	
Dijital araçları kullanabilme	Tasarımın anlamını güçlendirmek için materyal ve tekniği analiz etmez. Tekniğe ilişkin problemlere çözüm üretmez ve çözüme yönelik risk almaz. Mobil tasarım uygulamalarını kullanmaz. Mobil tasarım uygulamaları ile özgün tasarımlar yapmaz.	Tasarımın anlamını güçlendirmek için materyal ve tekniği analiz etmede yeterli değildir. Tekniğe ilişkin problemlere çözüm üretmede zorlanmakta ve çözüme yönelik risk almamaktadır. Mobil tasarım uygulamaları kullanamaz ve uygulamada sıkıntılar yaşamaktadır. Mobil tasarım uygulamaları ile özgün tasarımlar yapma konusunda yeterli değildir.	Tasarımın anlamını güçlendirmek için materyal ve tekniği nadiren analiz edip kullanır. Tekniğe ilişkin problemlere zorlukla çözüm üretir, nadiren risk alır. Mobil tasarım uygulamalarını nadiren kullanır ve uygulamada sıkıntılar yaşamaktadır. Mobil tasarım uygulamaları ile kısmen özgün tasarımlar yapar.	Tasarımın anlamını güçlendirmek için materyal ve tekniği analiz edip kullanır. Tekniğe ilişkin problemlere bazen çözüm üretir, bazen risk alır. Mobil tasarım uygulamalarını kullanır ve uygulamada nadiren sıkıntılar yaşamaktadır. Mobil tasarım uygulamaları ile özgün tasarımlar yapar.	Tasarımın anlamını güçlendirmek için materyal ve tekniği analiz edip etkili bir biçimde kullanır. Tekniğe ilişkin problemlere çözüm üretir, gerektiğinde risk alır. Mobil tasarım uygulamalarını kullanır ve uygulamada sorun yaşamaz. Mobil tasarım uygulamaları ile özgün tasarımlar yapar.	
Tasarım	Görsel tasarım öge ve ilkeleri ile duyuşsal nitelikleri bir arada kullanamaz. Fikirlerini karşı tarafa yansıtacak şekilde geliştirip, görsel bir düzen oluşturamaz. Görsel bütünlüğü sağlamak için deneme yapmaz ve mobil tasarım uygulamaları ile	Görsel tasarım öge ve ilkeleri ile duyuşsal nitelikleri bir arada kullanma konusunda sıkıntı yaşar. Fikirlerini karşı tarafa yansıtacak şekilde geliştirip, görsel bir düzen oluşturma konusunda yeterli değildir. Görsel bütünlüğü sağlamak için	Görsel tasarım öge ve ilkeleri ile duyuşsal nitelikleri bir arada kullanır. Fikirlerini karşı tarafa çok az yansıtacak şekilde geliştirip, görsel bir düzen oluşturur. Görsel bütünlüğü sağlamak için çok az deneme yapar. Mobil tasarım uygulamaları ile	Görsel tasarım öge ve ilkeleri ile duyuşsal nitelikleri etkili bir biçimde kullanır. Fikirlerini karşı tarafa yansıtacak şekilde geliştirip, görsel bir düzen oluşturur. Görsel bütünlüğü sağlamak için denemeler yapar. Mobil tasarım	Görsel tasarım öge ve ilkeleri ile duyuşsal nitelikleri alışılmadık ve etkili bir biçimde kullanır. Fikirlerini karşı tarafa yansıtacak şekilde geliştirip, özgün görsel bir düzen oluşturur. Görsel bütünlüğü sağlamak için sürekli denemeler	

	tasarım oluşturamaz.	deneme yapmada ve mobil tasarım uygulamaları ile tasarım oluşturma yeterli değildir.	orta düzeyde tasarımlar oluşturur.	uygulamaları ile tasarımlar oluşturur.	yapar. Mobil tasarım uygulamaları ile özgün, sıra dışı tasarımlar oluşturur.	
Araştırma çalışma yaklaşımı	Bilgi edinmede dışa dönük, meraklı ve araştırmacı tavır sergilemez. Kendisine verilen konu üzerine ayrıntılı düşünmez, farklı çözümler aramaz ve alternatif fikirler geliştirmez. Fikirleri yeni yöntemlerle birleştirmez. Alışılmışın dışında çözümler bulmak için risk almaz. Öğrenme sürecine ilişkin sorumluluklarını kendisine verilen süre içerisinde eksiksiz yerine getirmez. Arkadaşlarının çalışmalarına katkıda bulunmaz.	Bilgi edinmede dışa dönük, meraklı ve araştırmacı tavır sergilemeye çalışmaz. Kendisine verilen konu üzerine ayrıntılı düşünme, farklı çözümler arama ve alternatif fikirler geliştirmede istekli değildir. Fikirleri yeni yöntemlerle birleştiremez. Alışılmışın dışında çözümler bulmak için gerektiğinde risk alamaz. Öğrenme sürecine ilişkin sorumluluklarını kendisine verilen süre içerisinde eksiksiz yerine getiremez. Zorluklar karşında çekimser kalır. Arkadaşlarının çalışmalarına katkıda bulunamaz.	Bilgi edinmede nadiren meraklı ve araştırmacı tavır sergiler. Kendisine verilen konu üzerine ayrıntılı düşünme, sorunlara farklı çözümler arama, alternatif fikirler geliştirmede nadiren isteklidir. Fikirleri yeni yöntemlerle birleştirme, alışılmışın dışında çözümler bulmada nadiren risk alır. Öğrenme sürecine ilişkin sorumluluklarını kendisine verilen süre içerisinde bazen yerine getirir. Zorluklar karşında sıklıkla tereddüt edebilir. Arkadaşlarının çalışmalarına nadiren katkıda bulunur.	Bilgi edinmede bazen dışa dönük, meraklı ve araştırmacı tavır sergiler. Kendisine verilen konu üzerine düşünür. Bazen farklı çözümler arar ve alternatif fikirler geliştirir. Fikirleri bazen yeni yöntemlerle birleştirir. Alışılmışın dışında çözümler bulmak için bazen risk alır. Öğrenme sürecine ilişkin sorumluluklarını kendisine verilen süre içerisinde yerine getirir. Zorluklar karşında tereddüt edebilir. Arkadaşlarının çalışmalarına bazen katkıda bulunur.	Bilgi edinmede dışa dönük, meraklı ve araştırmacı tavır sergiler. Kendisine verilen konu üzerine ayrıntılı düşünür. Farklı çözümler arar, alternatif fikirler geliştirir. Fikirleri yeni yöntemlerle birleştirir. Alışılmışın dışında çözümler bulmak için gerektiğinde risk alır. Öğrenme sürecine ilişkin sorumluluklarını kendisine verilen süre içerisinde eksiksiz yerine getirir. Zorluklar karşında yılmaz. Arkadaşlarının çalışmalarına katkıda bulunur.	
Öz değerlendirme	Kendi tasarımı ve teknik becerisi ile ilgili çok yönlü eleştirel bir tavır sergilemez. Öğrenme eksikliklerini çözümlemez.	Kendi tasarımı ve teknik becerisi ile ilgili çok yönlü eleştirel bir tavır sergileyemez. Öğrenme eksikliklerini yeterince çözümleyemez.	Kendi tasarımını /çalışmasını ve teknik becerisini birkaç ölçüt çerçevesinde değerlendirebilir. Öğrenme eksikliklerini çözümlemekte zorlanır.	Kendi tasarımını /çalışmasını ve teknik becerisini belli ölçütler çerçevesinde değerlendirebilir. Öğrenme eksiklikleri çerçevesinde bazı ihtiyaçlarının farkındadır.	Kendi tasarımı ve teknik becerisi ile ilgili çok yönlü eleştirel bir tavır sergiler. Öğrenme eksiklikleri çerçevesinde ihtiyaçlarının farkındadır.	