yedi
SANAT, TASARIM VE BİLİM DERGİSİ
JOURNAL OF ART, DESIGN & SCIENCE

Research Article
Araştırma Makalesi

SANATTA DİJİTALİZM ÖZEL SAYISI 2024
DIGITALISM IN ART SPECIAL ISSUE 2024

DEÜ GSF

Özaltun, G. ve Kahraman, M. E. (2024). Academic opinions on the use of augmented reality in basic design education. yedi: Journal of Art, Design and Science, Digitalism in Art Special Issue, 281-292. doi: 10.17484/yedi.1502671

Academic Opinions on the Use of Augmented Reality in Basic Design Education*

Artırılmış Gerçekliğin Temel Tasarım Eğitiminde Kullanımına Yönelik Akademisyen Görüşleri

Gözde Özaltun, *Department of Design, Istanbul University-Cerrahpasa,* 0000-0001-9616-6782
Mehmet Emin Kahraman, *Department of Arts, Yildiz Technical University*, 0000-0002-2089-3067

Abstract

With the advancement of technology, educational materials have also undergone a period of development and change. This situation has been inevitable as a result of both Generation Z students' familiarity with technology and the change in their thought structures. In this study, research was conducted on the integration of the basic design education course, which has been carried out with traditional methods since the Bauhaus School period, with innovative technology. In this context, the opinions of expert academics on the integration of augmented reality (AR) technology into basic design education were analyzed. The effects of the inclusion of AR technology in learning processes on students' design skills and development processes are discussed. In the study, semi-structured interviews were conducted with 10 academics who are experts in their fields using in-depth interview technique from qualitative research methods. It was concluded that academics agreed that AR technology should be integrated with traditional teaching methods. In addition, the advantages and disadvantages of integration and possible concerns that may affect the expected learning outcomes when using traditional methods due to the use of AR technology are emphasized. In line with the findings obtained from the interviews, suggestions on how basic design courses can be transformed into a more interactive and efficient way are given.

Keywords: Augmented reality technology, basic design education, academic opinions, semi-structured interview.

Academical Disciplines/Fields: Art, education, design.

Özet

Gelişen teknolojiyle paralel olarak eğitim materyalleri de gelişim ve değişim içerisine girmiştir. Z kuşağı öğrencilerinin gerek teknolojiyle yakınlıklıkları gerekse düşünce yapılarının değişmesi sonucunda bu durum kaçınılmaz olmuştur. Bu çalışmada da Bauhaus Okulu döneminden bu yana yayın olarak geleneksel yöntemlerle sürdürülen temel tasarım eğitimi dersinin yenilikçi teknolojiyle entegrasyonu üzerine bir araştırma yapılmıştır. Bu kapsamda artırılmış gerçeklik (AG) teknolojisinin temel tasarım eğitimine entegrasyonuna yönelik uzman akademisyenlerin görüşleri analiz edilmiştir. AG teknolojisinin öğrenme süreçlerine dahil edilmesinin, öğrencilerin tasarım yetenekleri ve gelişim süreçleri üzerindeki etkileri tartışılmıştır. Araştırmada nitel araştırma yöntemlerinden derinlemesine mülakat tekniği kullanılarak alanında uzman 10 akademisyen ile yarı yapılandırılmış görüşmeler gerçekleştirilmiştir. Akademisyenler, AR teknolojisinin geleneksel öğretim yöntemleriyle entegre edilmesi gerektiği konusunda hemfikir oldukları sonucuna varılmıştır. Ayrıca, entegrasyonun avantajları, dezavantajları ve AG teknolojisinin uygulanması sonucunda geleneksel yöntemlerin kullanımında beklenen öğrenme çıktılarına etki edebilecek olası endişeler üzerinde durulmuştur. Görüşmelerden elde edilen bulgular doğrultusunda, temel tasarım derslerinin daha etkileşimli ve verimli bir şekilde nasıl dönüştürülebileceğine dair önerilere yer verilmiştir.

Anahtar Sözcükler: Artırılmış gerçeklik teknolojisi, temel tasarım eğitimi, akademisyen görüşleri, yarı yapılandırılmış görüşme.

Akademik Disiplin(ler)/Alan(lar): Sanat, eğitim tasarım.

*This study was produced from Gözde Özaltun's doctoral thesis titled 'The Effect of the Use of Augmented Reality in Basic Design Education on the Creativity Process' completed in 2023 in the Department of Art and Design.

- **Corresponding Author:** Gözde Özaltun Department of Design, Istanbul University-Cerrahpasa.
- **Adress:** İstanbul Üniversitesi-Cerrahpaşa Teknik Bilimler Meslek Yüksekokulu Alkent 2000 Mahallesi Yiğittürk Caddesi No:5/9/1 Büyükçekmece Yerleşkesi Büyükçekmece/İstanbul.
- **E-mail:** gozde.ozaltun@iuc.edu.tr
- **Published Online:** 25.11.2024 **Date of Arrival:** 19.06.2024/ **Date of Admission:** 04.11.2024
- **doi:** 10.17484/yedi.1502671

Introduction

Basic design education enables designers to find practical and creative solutions to problems by focusing on the principles and concepts of visual organization. It ensures the integration of intelligence and artistic talents along with visual perception and visual culture developed during the education process. It affects individuals' lives with a holistic approach by improving their social change and communication skills. For this reason, basic design education not only develops the individual's artistic and technical skills, but also strengthens their ability to express themselves in a social and cultural context and to communicate effectively with their environment. Therefore, basic design education can be defined as a holistic discipline that increases the intellectual, emotional and creative potential of the individual and can produce solutions to the complex problems of the contemporary world.

Basic design education aims to train designers who can think flexibly and generate alternative solutions by developing critical thinking and problem-solving skills. It focuses on the processes of experimentation, creation and research. It is based on theoretical, practical and pedagogical foundations; it is transferred to students through pedagogical methods that encourage creativity. Students are enabled to reach the freedom of original thinking by removing their mental barriers and to plan the learning process by recognizing their own needs. This process strengthens the individual's ability to express themselves creatively (Akbulut, 2014; Akdeniz and Aksel, 1989; Özderin, 2019).

Basic design education, which encourages creativity, has a visually oriented system of thinking that stimulates students' mental and emotional activity. Visual thinking and visual reasoning are the way the mind collects and processes information. Information is first perceived visually and then mentally processed. The processed information is comprehended and transformed into a visual expression. The development of visual expression skills and the shaping of visual thinking and visual language are facilitated by conveying the connection between visual thinking and shaping to students in basic design education courses. Experimental applications following the comprehension of this information are transferred to students' experiences and help the emergence of original forms of expression (Alakuş, 2002; Erim, 2020; Gökaydın, 2010; Hurwitz and Day, 2007; Kahraman, 2020; Karabay, 2020; Karaçalı, 2018; Rand, 1993).

These practices to achieve the goals of basic design education have been carried out using various traditional methods to develop students' artistic and design skills since the Bauhaus period. However, the rapidly changing world with technological advances has included the education system and teaching materials in a transformation as it affects our daily lives (Meggs, 2012; Özderin, 2019). In other words, it has become inevitable that educational methods change along with our changing needs. As Özsoy (2015) states, education plays a vital role for our future as societies keep pace with innovations and contemporary civilizations. At the same time, education enables individuals to express themselves in the best way by revealing their creativity and talents and guides them to communicate correctly. In this context, it is thought that applications using augmented reality, which is an innovative technology, will make significantly benefit the student because of using it together with the traditional methods of basic design education.

AR technology offers various benefits in learning environments such as visualizing abstract concepts, reducing cognitive load, increasing student motivation and learning level. Students can overcome their difficulties in visualizing abstract concepts by making them concrete with this technology. They can carry out design projects in a virtual environment and comprehend complex design processes in depth. Augmented reality technology can significantly contribute to the development of students' creative thinking, problem-solving and critical thinking skills. Thanks to these features, it is predicted that AR technology can improve students' advanced thinking and spatial intelligence skills in design-oriented learning methods. Therefore, today's technology should be used as supportive materials along with traditional methods to support students' free expression of ideas and solving design problems. Tools that support visual creativity such as AR technology can significantly contribute to design and product development (Chang et al., 2014; Chen et al., 2021; Gün and Atasoy, 2017; Hung et al., 2016; Liu et al., 2011; Martín-Gutiérrez et al., 2010; Obeid and Demirkan, 2020; Özaltun and Kahraman, 2023; Saidin et al., 2015; Wang and Nickerson, 2017).

As a result of studies on the use of AR technology in education, positive attitudinal changes were generally observed in students. One of these studies is Di Serio et al. (2013) who integrated AR technology into a traditional Italian Renaissance Art course and compared the two courses with the classical method. It was found that students in AR classes achieved higher levels of concentration during the implementation and were able to remember the learning content more easily. It was also concluded that the positive effect of AR technology on motivation led to higher levels of student engagement in learning activities and less cognitive

effort. Another study on the use of technology in the basic design course was conducted for 1st and 2nd year basic design students. It showed that students were more motivated to bring solutions to advanced design problems because of using technology early in the education process. It was also observed that they participated more willingly in the process. The results obtained revealed an important result that students' effective use of technology in basic design education can both improve their design skills and take a more active role in the creative process (Varınlıoğlu et al., 2015). Again, one of the results of another study conducted with 1st and 2nd grade basic design students to make the course more efficient was that the use of technology in the course positively affected the course process (Enhos, 2007).

One of the positive aspects of using technology in learning environments is that students have easier access to information. It also allows students to structure information more effectively. Thus, students' cognitive load is reduced, allowing them to focus on the content more easily. It can contribute to the development of students' affective competencies such as interest, attitude and motivation and increase their academic achievement.

Given Generation Z students' familiarity with technology in their daily lives, technology-supported multiple learning environments can create engaging and intriguing pedagogical atmospheres. In visual-based courses such as basic design education, 2D and 3D virtual objects provided by augmented reality (AR) technology enrich the educational process. In addition to these, various multimedia materials such as sound, music and animation that appeal to different senses can be integrated, thus creating a much more interactive and rich learning environment. In this process, meeting the expectations of the student within their individual characteristics helps them feel more productive by enabling them to see themselves in a student-centered structure. At the same time, students can realize themselves (Ayaydın, 2010; Billinghurst and Duenser, 2012; Cao and Yu, 2023; Cheng and Tsai, 2013; DiSerio et al., 2013; Özaltun and Kahraman, 2023; Prensky, 2001; Seymen, 2017; Somyürek, 2014; Wang et al., 2013; Wu et al., 2017).

Multimedia learning theory is a learning theory developed by Richard Mayer. He argues that the use of visual and auditory elements accompanying the text during the learning process increases the effect and permanence of learning. In particular, he argues that multimedia materials such as pictures, videos, music and animations increase students' comprehension levels and support learning (Mayer, 2002). The use of augmented reality (AR) technology in basic design education is in line with Mayer's theory. Multimedia materials that appeal to various senses transform students into active participants, provide interaction opportunities and support learning success. The interaction of students helps them to create an emotional bond by providing a vivid experience in the learning process. Active participation and bonding in such an environment increase students' creativity. In this way, AR technologies engage students in a more effective learning process.

In China, traditional teaching methods in design courses have been found to be unable to sustain students' interest in the courses, lowering their self-confidence and motivation for creative design. To find a solution to this problem, some research has been conducted on the integration of AR technology into traditional methods to increase the impact and attractiveness of design courses on students. Two different AR-based curricula were developed to address the problem. One program explains theoretical knowledge of creative design and the other one helps students to create real AR scenes. The pilot results showed that AR technology significantly increased students' motivation and attention in learning creative design. Moreover, in AR-based learning environments, students' engagement and willingness to learn increased as they had the opportunity to express their creativity (Wei et al., 2015). This is because AR not only supports the learning process but also provides new avenues for the development of creativity (Petrov et al., 2021).

Meta-analysis studies on the impact of augmented reality on student attitudes, motivation and learning achievement also reveal positive attitudes on students. As a result of 28 studies analyzed in a study based on the period between 2016 and 2023, it was stated that AR-supported education created more positive attitudes among students and provided higher learning achievements than traditional methods (Cao and Yu, 2023). In another meta-analysis study, 396 articles were analyzed. Again here, it was revealed that AR technology had positive reflections on students' academic achievement, interest and attitudes towards the course. It was also emphasized that it enriches the learning process and makes the lesson interesting (Çiloğlu et al., 2021).

Studies show that the use of AR technology in basic design education in cooperation with traditional methods has the potential to enrich the learning experience by bringing it to a contemporary and interactive dimension. In this study, the opinions of academics specialized in the field of basic design education, on the use of technology in courses and the applicability of AR technology were collected. In addition to the

possible effects of AR technology on students, the advantages and limitations of the course and the technology itself were revealed.

1. Purpose of the Study

The aim of the research is to examine in depth how the integration of augmented reality (AR) technology into basic design education is evaluated by expert academics. In this context, the potential effects, advantages and limitations of AR on students will be identified. While innovative technologies are rapidly developing, the predominant use of traditional methods in basic design education still forms the basis of this study.

This study, aims to develop approaches on how to make basic design courses more interactive and efficient, considering the suggestions, expectations and concerns of academics. Since technological developments constantly update the educational content, it is important that basic design education is made compatible with these trends. In this context, the problem statement of the research was determined as *what are the opinions of academics on the updating of basic design education course applications by supporting them with technology and the use of augmented reality technology in basic design education course?* Within the scope of this question, the following sub-hypotheses were put forward.

Sub-Hypothesis 1: Academics are of the opinion that basic design education practices carried out with traditional methods should be updated in relation to technology.

Sub-Hypothesis 2: Academics think that augmented reality technology should be used in basic design education.

2. Method

This section explains how academics view the integration of augmented reality technology into traditional teaching methods used in basic design education and how they handle it with qualitative research methods. The model, study group, data collection, and data analysis processes used in the research are explained.

2.1. Research model

For the research, the opinions of academics were collected regarding updating the basic design education conducted using traditional methods by integrating technology and augmented reality in basic design courses. To measure the opinions of academics, in-depth interview technique, which is a qualitative research method, was used.

> In-depth interview is a data collection technique frequently used in qualitative research. This technique gives the interviewees the opportunity to express themselves from their own mouths, while providing the researchers with the opportunity to deeply understand their perspectives, feelings, thoughts and experiences on the interviewed subject through their own expressions. (Gürbüz and Şahin, 2014)

In the in-depth interview, the researcher used a semi-structured interview form. The qualitative data obtained were evaluated by content analysis method.

2.2. Study group

The study group consists of 10 academics who are experts in the field of basic design education and who have taught basic design courses. The academics included in the study consisted of 3 professors, 2 associate professors, 3 doctoral faculty members and 2 lecturers.

2.3. Data collection

In the study, a 9-item interview form consisting of open-ended questions was used to enable the participants to express their thoughts freely. The questions were specifically designed to elicit diverse and rich data sets from the participants. To increase the depth and flexibility of the data collection process, semi-structured interviews were conducted with additional questions posed to the participants when necessary. The first draft of the questionnaire was developed after a comprehensive literature review on the topic. The form was finalized after revisions in line with the opinions of experts. The interviews were conducted face-to-face with 10 academics and synchronously on online platforms.

2.4. Data analysis

Semi-structured interviews guide the participants with predetermined questions while leaving space for in-depth discussion and freedom of expression. In this type of interview, the interviewer ensures consistency through a systematic approach and allows for more detailed information to be elicited from participants when necessary. This method stands out in qualitative research for its flexibility and capacity for dialog. It also offers the researcher a wide space for creativity in the process of presenting the findings. In the analysis phase, data protection, organization, simultaneous analysis with the collection process and detailed description are important steps to be taken into consideration (Büyüköztürk 2016; İlhan et al., 2020; Patton, 2018; Sözer and Aydın, 2020).

In the analysis processes, the data obtained from the interviews were first digitized and secured. In the editing phase, the data set was prepared by reviewing the notes, completing the deficiencies and revising the labeling. The full texts of the interviews were also reviewed in detail. The collected data were analyzed in parallel with the collection process. Commonalities and differences in the participants' responses were identified and reported in detail. In the analysis process, descriptive and content analysis methods were used. While descriptive analysis summarizes the overall data set and reveals descriptive information such as participant profiles, content analysis examines the data in depth and identifies underlying concepts and themes. These two methods enable participants' views and responses to be systematically defined, grouped into meaningful clusters and interpreted (Yıldırım and Şimşek, 2016; Altunışık et al., 2010).

3. Findings and Interpretation

An interview was conducted with 10 academics to obtain the opinions of academics on updating the course curriculum in basic design education and the use of augmented reality technology. The interview form prepared for this interview consists of 9 questions. The questions were designed to focus on the sub-problems of the research after the literature review. The responses received from the academics are evaluated and interpreted in the following sections.

3.1. Academics' opinions on basic design education

Academics were asked the question, *what are your general views on basic design education?* to learn their views on basic design education. Academics emphasized the historical and pedagogical importance of basic design education. They stated that this education plays a critical role in art and design education and develops students' artistic thinking skills, their ability to create 2D and 3D compositions, and their capacity to recognize different materials. They also emphasized that basic design provides students with multifaceted contributions such as comprehending the basic principles and elements of design, developing thinking and creativity, and increasing their visual perception skills. It has been stated that basic design education, which has a deep-rooted tradition dating back to Bauhaus school, has a highly effective and interdisciplinary structure in the process of building and applying students' design knowledge.

At the same time, basic design education is defined as a process that develops the ability to make aesthetic and ergonomic designs as well as putting theoretical knowledge into practice and strengthens students' consciousness and hand coordination. Its importance was emphasized by stating that it is a basic preparatory course in organizing the metacognitive activities and design thought processes of design students.

3.2. Opinions on the traditional methodology used in basic design education

The academics were asked the question, *what are your general opinions on the use of traditional methods in Basic Design education?* Academics emphasized that traditional methods play a critical role in teaching the basic principles and elements of art, provide hand-eye-brain coordination and improve students' manual skills. Basic design education is the foundation of art and design education. For this reason, it was stated that traditional methods allow students to grow in a disciplined manner. However, academics pointed out that traditional methods have some limitations under present-day conditions and emphasized the importance of technology. They stated that classical pedagogical approaches need to be updated with contemporary contexts and that in some cases these methodologies are insufficient to achieve educational goals. Therefore, the basic principles of traditional methods are universal and unchanging, but these methods need to be supported by technological innovations.

As a result, the academics stated that basic design education is an indispensable part of art and design education and that traditional methods develop students' basic skills. In addition, they agreed that

developing technologies should be integrated into education and used together with traditional methods. They think that the integration of traditional and modern methods will make it possible for students to both benefit from the knowledge of the past and adapt to the innovations of the future.

3.3. Opinions on updating the content and practices of basic design education

The academics were asked the question, *do you think that the basic design course should be updated in terms of content and applications with regard to advancements in technology?* and they were asked to explain the reasons for their answers. All but one of the academics surveyed agree that it is a necessity to update the basic design course with the developing technologies based on practice. The idea that course practices should continue with a hybrid approach while preserving the basic principles has gained weight.

Academics state that the reflection of technological development in education is inevitable. Increasing technological opportunities and the integration of new learning tools into course content are seen as compatible with the understanding of contemporary education. It was emphasized that the expectations of today's Generation Z students have changed, and educational methodologies should be reshaped in line with the requirements of age. In this context, they believe that the inclusion of new technologies such as augmented reality in course content is important to make education more interactive and effective. They also believe that augmented reality technology will be used more widely in the future and will offer serious opportunities in education.

In summary, academics agree that the content and practices of the basic design course need to be updated. However, it is emphasized that this should be realized without ignoring the values of traditional teachings and methodologies. It is thought that the course, which provides students with manual skills, observation skills, critical perspective, basic design principles and disciplined working habits, can be made more effective by supporting it with new technologies. In line with these answers, hypothesis number 1 was confirmed by the academics.

3.4. Academics' views on AR technology

When the answers to the question, *what are your general views on Augmented Reality technology?* are analyzed, it is understood that the majority of academics see augmented reality as a useful technology. The academics stated that augmented reality has a wide potential for use in many fields from education to entertainment, from medicine to marketing, and that users can experience a unique interaction between the real world and the virtual world. However, two academics expressed concerns about the future of augmented reality technology and how it might evolve. They also emphasized the need to be careful about the proper integration of this technology into education and minimizing the risk of misuse. Therefore, it was stated that the disadvantages as well as the advantages of augmented reality technology should be considered. In this context, it is recommended that augmented reality technology should be used in a conscious and controlled manner by considering the balance between the potential benefits and possible risks of augmented reality technology and by providing appropriate infrastructure.

3.5. Opinions on the advantages of using AR technology in classes

*Are there any advantages of using Augmented Reality technology in lessons? If yes, what are they***?** The academics generally agree that this technology can make significant contributions to the education process. They think that AR technology can increase students' motivation, enrich their learning processes and increase their academic achievement. In addition, it was emphasized that AR technology helps students to establish a link between technology and traditional methods by increasing their motivation. In this way, it will make learning processes more interactive and interesting, and students will show more interest in the lesson. It was stated that AR applications increase retention in learning because they support learning by doing and multiple learning. In addition, it was stated that AR technology provides students with 3D and simulation environments, giving them an idea about the professional environments they will encounter in the future and enabling them to prepare professionally.

Since AR technology is built on visuality, it is thought that it can improve students' creativity and reasoning skills in the implementation and versions of designs. At the same time, by saving time, it will make it possible for students to access more information in a short time and have a more effective learning experience. One of the academics also stated that it has become possible to physically and mentally enter artworks and move them out of museums with innovative technologies. He emphasized that individuals receiving art and design education should not be deprived of such experiences. Another academic is of the opinion that it would be more beneficial to apply AR technology to 3rd and 4th grade students after they receive basic education.

3.6. Opinions on the Disadvantages of Using AR Technology in Lessons

Are there any disadvantages of using augmented reality technology in lessons? If yes, what are they? The academics identified various disadvantages. However, economic and technical problems were the most frequently mentioned issues. They agreed that the insufficient infrastructure required for the use of AR technology and the inability of students to afford devices that can use the constantly updated technology may cause disruptions in the education process. The academics stated that especially students with poor financial status may have difficulty in accessing these technologies and students who do not have powerful devices may have difficulties in creating AR content. In addition, the fact that the devices purchased for AR technology rapidly become outdated will increase the economic cost of investments made in this field. Furthermore, technical issues include incompatibility of software platforms, and version differences can cause problems as well. Therefore, software needs to be updated and compatible. This process requires that the people who use AR technology, i.e. the course instructors, have sufficient technical knowledge.

From another point of view, they think that students' insufficient level of readiness may cause difficulties in using the technology and that the application process may be seen as a game and distract from the seriousness of the educational process. In addition, the misuse of AR technology is also among the concerns that students see this technology only as a fictional world and do not focus enough on the educational process. From a psychological point of view, it is thought that the fact that the errors experienced in the virtual environment do not have the same effects as the errors encountered in real life may cause students to perceive these two situations differently and develop different reactions.

The use of AR technology at the beginning of the course is among the opinions of the academics that the motivation caused by over-motivation may be likely to decrease after a few weeks of high motivation. It can reduce the effect of environmental factors by appealing to various senses. This may cause a decrease in motivation. To prevent this situation, it was emphasized that it would be useful to organize the practices expected from the students in a way to create a bridge between AR technology and traditional methods. In addition, the fact that the environments left to the student's imagination can be presented predefined with AR technology is also considered to have a negative impact on the creativity process by fostering conditioning.

In conclusion, the use of AR technology in the classroom has some economic, technical and psychological disadvantages. Therefore, to use this technology effectively and efficiently in education, disadvantages should be taken into consideration, and necessary precautions should be taken.

3.7. Opinions on the use of AR technology in basic design education

In response to the question, *what are your views on the use of augmented reality technology in basic design courses?* the academics agreed that this technology can make significant contributions to the educational process. It is thought that the use of AR technologies will positively change motivation by increasing students' interest and creativity in the course. They also stated that it would be more effective in transferring knowledge.

It was stated that AR technology should be used as a superstructure of traditional practices and that it would contribute to the richness of practices supported by computer programs. However, it is emphasized that the use of traditional methods in a synchronized and coordinated manner with AR technologies without ignoring them will enable students to receive a more comprehensive education by using both traditional and modern technologies. One of the academics stated that although Generation Z adapts to digital technologies, the sense of excitement and curiosity provided by hand and eye coordination is important. Although 2D drawing tablets and 3D hologram applications provide important gains in the later stages, he thinks that it is necessary to start with traditional methods at the beginning. However, it is thought that AR technology is mandatory and will make a great contribution in the age of technology, which is in constant transformation. Another academic expressed his views on this issue as follows: *There is a need for a learning and education model that supports classical education based on traditional teachings in synchronization and coordination with new technological advancements, without ignoring them, and that enables the individual to use and be comfortable with these technologies both as a product of their education and their time.*

It is widely believed that AR technology will be effective in helping students acquire three-dimensional thinking skills and increase their academic achievement by providing multifaceted learning experiences. In addition, one of the advantages of AR technology is that it allows students to experiment many times, act courageously and try different designs. It is predicted that AR technology will play an important role in education in the future by improving students' reasoning skills by presenting the environments they imagine concretely. Academics have also stated that AR technology can be extremely effective in

transferring three-dimensional thinking skills, which are gaining importance today, to students. They also added that using only traditional teaching methods is insufficient to meet the needs of the current era. In this context, the academics confirmed hypothesis number 2 by thinking that augmented reality technology should be used in the basic design education course.

3.8. Opinions on the contribution of AR technology to cognitive and affective development

The academics generally had positive opinions in response to the question**,** *what are your opinions about the contribution of augmented reality technologies to students' cognitive and affective development?* but they also had some reservations and neutral approaches. In particular, it was stated that augmented reality technology allows students to develop three-dimensional thinking skills, increase their problem-solving skills and evaluate their environment from different perspectives. AR technology is thought to make learning more effective by providing real-time feedback and support. In this way, it is stated that students will have an interactive and immersive learning experience that increases retention by better comprehending the information.

From an affective perspective, it was stated that AR technology makes the learning experience more fun and interesting by increasing students' motivation to learn. It was stated that it can enable students to think creatively and experience emotional engagement by interacting with objects in a digital environment. However, one of the academics expressed reservations about the negative effects of AR technology such as digital addiction and ignoring manual dexterity. It was also stated that more scientific studies are needed to measure the effects of this technology.

In conclusion, there is a consensus that AR technology can make significant contributions to students' cognitive and affective development. However, it was emphasized that more research is needed to fully understand these contributions and to minimize potential negative effects.

3.9. Opinions on the effect of AR technology on learning motivation in basic design education

The answers given to the question; do you think that basic design education with augmented reality (AR) technology will provide learning motivation? show that the academics generally believe that AR technology will positively affect learning motivation in basic design courses. However, they also emphasized the need to be careful about whether this effect will be sustainable and how the technology will be used.

They suggested that as students are more inclined to work in digital environments, AR technologies that provide an interactive and immersive experience will increase their engagement in learning. By providing students with an interactive and visually rich learning experience, AR technology makes course content more engaging and can make learning more enjoyable and effective. For this reason, they think that the use of AR technologies in basic design courses will support the belief that it can have a positive effect on their motivation.

However, while acknowledging that it may initially increase students' motivation, they caution that this effect may not be sustainable. Over time, students' motivation and interest may decline. It is underlined that the learning effectiveness of AR technology depends on the specific design of the educational program and how it is implemented. It is important that educational materials are well designed and aligned with learning objectives. It was stated that the medium- and long-term effects should be examined through scientific research. In addition, the importance of establishing a technological infrastructure was emphasized and it was stated that students should be prepared to use AR technology and training should be provided on this subject.

In conclusion, the use of AR technology in basic design courses can increase students' motivation to learn by providing them with new and engaging learning experiences. However, the sustainability and long-term consequences of this effect should be carefully monitored in light of scientific research.

4. Conclusion and recommendations

When the opinions of the academics on the use of AR technology-supported materials in basic design education were examined, it was concluded that the educational process can be made more effective with the integration of AR technology while preserving traditional methods and principles.

Basic design, the art education model of the Bauhaus School, is a course that develops students' hand, brain and eye coordination, creativity and critical thinking skills. It offers a basic learning experience that teaches working with a variety of materials and the principles of visual composition. Therefore, this education

should remain in conjunction with traditional methods as it forms the basis of artistic and technical skills. However, updating course materials in line with groundbreaking technological advances will better prepare students for the modern world and make the learning process more interactive and engaging. Adopting a hybrid education model will provide students with a richer learning experience by using both traditional methods and new technologies together. Thus, the collaboration of traditional methods and AR technology will provide an ideal balance for students to develop their creative thinking skills and technical competencies. Students will be given the opportunity to develop their technological skills while learning and applying basic design principles through traditional methods. This will further develop their creativity and problem-solving skills and help them to think in multiple ways.

Augmented reality technology saves students time by allowing them to manipulate 3D objects in a virtual environment and experience them in a real-world environment. It offers the opportunity to compensate for possible mistakes during exercises more quickly and to practice more. The fact that Generation Z students tend to interact more with digital environments will enable them to adapt quickly and realize themselves. At the same time, it will increase students' interest in the lesson and increase their motivation. Since it supports the principles of learning by experience, it is inevitable that it will increase the retention of learning and academic success. It will help them understand complex concepts more easily and strengthen their problem-solving skills. With these features of AR technology, the cognitive load of students can be alleviated, and students can have a visually enriched learning experience. In addition, AR technology will provide students with the opportunity to interact with artifacts physically and mentally in depth, in fields such as art and design education where visuality is at the forefront. However, to improve students' learning processes and increase their motivation, AR applications should be designed to ensure students' active participation and real-time feedback should be provided. For the applications to be used effectively and sustainably, some important factors and disadvantages should be taken into consideration.

Adequate technological infrastructure and easy access for students are important for the effective use of AR technology. Inadequate economic and technical infrastructure can limit the effective use of AR technology, especially in disadvantaged areas and among students. Educational institutions should provide appropriate hardware and software infrastructure for the successful integration of this technology. Course instructors should also have a thorough knowledge of the pedagogical and technical aspects of AR technology. Thus, they will ensure that the educational content is designed correctly. If educators and students use the technology consciously and correctly, they will be able to make the best use of the advantages offered by AR.

Although AR technology provides high motivation at first, it is possible that this motivation may not be sustained in the long run. For this, more research is needed to measure its effects on students in the medium and long term, especially in basic design education. However, by inferring from the characteristics of Generation Z students, the use of popular gamification techniques can create a sustainable effect so that the applications do not turn into a monotonous structure. Applications can be designed by creating levels for each new subject and stages of the subject with weekly or semester plans in accordance with the curricula of basic design courses. At the same time, it can be ensured that the ready-made objects used can be developed by the student so as not to limit creative thinking. Thus, students' motivation and creativity can continue to develop. It may be useful to plan in-group applications by imposing limitations on individual work so that students do not break away from social relations in the use of technology. In addition, a feedback system can be established where students can directly communicate problems and suggestions encountered during the use of the application. Access to applications can be provided to students by offering free or low-cost alternatives and license discounts.

The effective use of augmented reality technology in basic design education can be possible with a careful and planned approach. On the solid foundations of traditional methods, innovative tools and methods provided by AR technology can enrich the educational process and support students' artistic development. In the meantime, it is important that the educational materials are of high quality and compatible with the learning objectives. Presenting teaching methods in an interactive and student-centered structure will increase the effectiveness of AR technology in education. By carefully evaluating the opportunities and potential risks offered by AR technology, basic design education can become more comprehensive and contemporary. Establishing this balance will maximize the creative and critical thinking skills of future designers by equipping them with both traditional and modern methods.

References

Akbulut, D. (2014). Tasarımda temel etkileşim: Temel tasarım eğitiminde bütünleşik ortak zemin [Basic interaction in design: Integrated common ground in basic design education]. *Art and Design Journal, 1*(13), 23-40. https://dergipark.org.tr/tr/pub/sanatvetasarim/issue/20654/220356

Akdeniz, H., & Aksel, E. (1989). *Güzel sanatlar fakültelerinde temel sanat eğitimi üzerine düşünceler ve bir bakış açısı [Thoughts and a perspective on basic art education in fine arts faculties].* Hacettepe University Faculty of Fine Arts Publications.

Alakuş, A. O. (2002). *İlköğretim okulları 6. sınıf resim-iş dersi öğretim programındaki grafik tasarımı konularının çok alanlı sanat eğitimi yöntemiyle ve bu yönteme uygun düzenlenmiş ortamda uygulanması* [Implementation of graphic design subjects in the 6th grade art-work course curriculum of primary schools with the multidisciplinary art education method and in an environment designed in accordance with this method] [Published doctoral thesis]. Gazi University.

Altunışık, R., Coşkun, R., Bayraktaroğlu, S., & Yıldırım, E. (2010). *Sosyal bilimlerde araştırma yöntemleri SPSS uygulamalı [Research methods in social sciences with SPSS application]* (6th Edition), Sakarya Publishing.

Ayaydın, A. (2010). Temel tasarım eğitiminde bilgisayar teknolojisinin gerekliliği ve geleceği [The necessity and future of computer technology in basic design education]. J*ournal of Dicle University Ziya Gökalp Faculty of Education,* (15), 52-62.

Billinghurst, M. & Duenser, A. (2012). Augmented reality in the classroom, *IEEE Computer Society, 45*(7), 56- 63. https://doi.org/10.1109/MC.2012.111

Büyüköztürk, Ş. (2016). *Deneysel desenler öntest-sontest kontrol grubu desen ve veri analizi [Experimental designs pretest-posttest control group design and data analysis]***,** Pegem Academy.

Cao, W., Yu, Z. The impact of augmented reality on student attitudes, motivation, and learning achievements—a meta-analysis (2016–2023**).** *Humanities & Social Sciences Communications,* 10(352). https://doi.org/10.1057/s41599-023-01852-2

Chang, K. E., Chang, C. T., Hou, H. T., Sung, Y. T., Chao, H. L. & Lee, C. M. (2014). Development and behavioral pattern analysis of a mobile guide system with augmented reality for painting appreciation instruction in an art museum, *Computers & Education, 71*(1), 185–197.

Chen, J. J., Hsu, Y., Wei, W. & Yang, C. (2021). Continuance intention of augmented reality textbooks in basic design course, *Education Science, 11*(5), 1-16. https://doi.org/10.3390/educsci11050208

Cheng, K.H., & Tsai, C.C. (2013). Affordances of augmented reality in science learning: suggestions for future research, *Journal of Science Education and Technology, 22*(4), 449-462. http://dx.doi.org/10.1007/s10956-012-9405-9

Çiloğlu, T., Yılmaz, Ö., Yılmaz, A., & Karaoğlan, F. (2021). Eğitimde artırılmış gerçeklik konulu makalelerin incelenmesi [Examining articles on augmented reality in education]. *Journal of Ahmet Keleşoğlu Faculty of Education, 3*(2), 147-158.

DiSerio, Á., Ibáñez, M. B. & Kloos, C. D. (2013). Impact of an augmented reality system on students' motivation for a visual art course, *Computers & Education,* 68, 586-596. https://doi.org/10.1016/j.compedu.2012.03.002

Enhos, H. (2007). *Temel tasarım I ve II derslerinin öğretme-öğrenme süreçlerine ilişkin öğrenci görüşleri [Student views on the teaching-learning processes of basic design I and II courses]* [Published master's thesis]. Anadolu University.

Erim, U. Ö. (2020). Günümüz sanat /tasarım eğitiminde tekstil ve moda bölümlerine ilişkin yeni yaklaşımlar [New approaches to textile and fashion departments in contemporary art/design education]. *In Proceedings of Textile, Fashion, Art, Design Symposium* (p. 456 467). Aydın University.

Gökaydın, N. (2010). *Temel sanat eğitimi sanat eğitimi öğretim sistemi ve bilgi kapsamı [Basic art education art education teaching system and scope of knowledge].* MOSS Education.

Gün, E. T., & Atasoy, B. (2017). Artırılmış gerçeklik uygulamalarının ilköğretim öğrencilerinin uzamsal yeteneklerine ve akademik başarılarına etkisi [The effect of augmented reality applications on elementary school students' spatial abilities and academic achievement]. *Education and Science, 42*(191), 31-51

Gürbüz, S., & Şahin, F. (2014). *Sosyal bilimlerde araştırma yöntemleri* [Research methods in social sciences]. Seçkin Publishing.

Hung, Y. H., Chen, C. H., & Huang, S. W. (2016). Applying augmented reality to enhance learning: a study of different teaching materials. *Journal of Computer Assisted Learning, 33*(3), 252–266. https://doi.org/10.1111/jcal.12173

Hurwitz, A. & Day, M. (2007). *Children and their art: Methods for the elementary school.* Thomson Wadsworth.

İlhan M., Güler, N., & Taşdelen, T. G. (2020). Nicel veri toplama araçları [Quantitative data collection tools]. In Behçet Oral, Ahmet Çoban (Ed.) *Kuramdan uygulamaya eğitimde bilimsel araştırma yöntemleri [Scientific research methods in education from theory to practice]* (p. 77-114). Pegem Academy.

Kahraman, M. E. (2020). COVID-19 salgınının uygulamalı derslere etkisi ve bu derslerin uzaktan eğitimle yürütülmesi: Temel tasarım dersi örneği [The impact of the COVID-19 pandemic on applied courses and conducting these courses with distance education: The case of a basic design course]. *Journal of Medeniyet Art, 6*(1), 44-56. https://doi.org/10.46641/medeniyetsanat.741737

Karabay, Ö. (2020). Güzel sanatlar öğrencilerinin tasarım gücünü geliştirmede (eleştirel bakma-merak etme-hayal kurma-yaratma bağlamında) temel sanat/tasarım dersinin gerekliliği [The necessity of the basic art / design course in developing the design power of fine arts students (in the context of critical looking-curiosity-imagination-creation)], *İnonu University Journal of Art and Design, 10*(22), 108-120. https://doi.org/10.16950/iujad.845899

Karaçalı, B. (2018). Temel sanat, tasarım olgusu-yeni yaklaşımlar [Basic art, design phenomenon-new approaches]. *Journal of Art and Design, 8*(1), 170-185. https://doi.org/10.20488/sanattasarim.510313

Liu, X., Li, Y., Pan, P., & Li, W. (2011). Research on computer-aided creative design platform based on creativity model, *Expert Systems with Applications, 38*(8), 9973–9990. https://doi.org/10.1016/j.eswa.2011.02.032

Martín-Gutiérrez, J., Saorín, J. L., Contero, M., Alcañiz, M., Pérez-López, D. C. ve Ortega, M. (2010). Design and validation of an augmented book for spatial abilities development in engineering students. *Computers & Graphics, 34*(1), 77-91.

Mayer, R. E. (2002). Multimedia learning. *Psychology of Learning and Motivation,* (41), 85- 139. https://doi.org/10.1016/S0079-7421(02)80005-6

Meggs, B. P. (2012) *A history of graphic design*, (5th Edition). John Wiley & Sons.

Obeid, S., & Demirkan, H. (2020). The influence of virtual reality on design process creativity in basic design studios, *Interactive Learning Environments,* (31), 1841-1859. https://doi.org/10.1080/10494820.2020.1858116

Özaltun, G., & Kahraman, M. E. (2023). Artırılmış gerçeklik (AG) teknolojisinin tasarım eğitiminde etkileşimli öğrenmeye katkısı [The contribution of augmented reality (AR) technology to interactive learning in design education]. *ART-E Faculty of Fine Arts Art Journal, 16*(32), 110-141.

Özderin, S. (2019). Bir yöntem önerisi kapsamında: grafik sanatlarda temel sanat ve tasarım eğitiminde analitik düşünme ve sistematik biçimlendirme [Within the scope of a method proposal: analytical thinking and systematic formalization in basic art and design education in graphic arts], *Journal of Socıal and Humanities Sciences Research, 6*(42), 2823–2847. https://doi.org/10.26450/jshsr.1431

Özsoy, V. (2015). *Görsel sanatlar eğitimi Resim-İş eğitiminin tarihsel ve düşünsel temelleri [Visual arts education Historical and intellectual foundations of painting and art education]***.** Pegem Academy.

Patton, M. Q. (2018) *Nitel araştırma ve değerlendirme yöntemleri [Qualitative research and evaluation methods]* (Trans., Mesut Bütün & Selçuk Beşir Demir). Pegem Academy.

Petrov, P., Atanasova, T., & Kostadinov, G. (2021). Enhancing art education in school through augmented reality. *In 7th SWS International Scientific Conferences on Social Sciences – ISCSS* (p. 99-106). https://doi.org/10.5593/sws.iscss.v2020.7.2/s13.12

Prensky, M. (2001). Digital natives, digital immigrants, on the horizon, *MCB University Press, 9*(5), 1-6. https://doi.org/10.1108/10748120110424816

Rand, P. (1993). *Design, form, and chaos.* Yale University Press.

Saidin, F. N., Halim, A. D. N., & Yahaya, N. (2015). A review of research on augmented reality in education: Advantages and applications. *Canadian Center of Science and Education, 8*(13), 1-8. https://doi.org/10.5539/ies.v8n13p1

Seymen, A. F. (2017). Y ve Z kuşak insanı özelliklerinin Millî Eğitim Bakanlığı 2014-2019 stratejik programı ve TÜBİTAK Vizyon 2023 öngörüleri ile ilişkilendirilmesi [Associating the characteristics of Generation Y and Generation Z people with the Ministry of National Education 2014-2019 strategic program and TÜBİTAK Vision 2023 predictions], *Kent Akademisi, 10*(32), 467–489.

Somyürek, S. (2014). Öğretim sürecinde Z kuşağının dikkatini çekme: Artırılmış gerçeklik, *Eğitim Teknolojisi Kuram ve Uygulama [Attracting the attention of Generation Z in the teaching process: Augmented reality, Educational Technology Theory and Practice], 4*(1), 63-80. https://dergipark.org.tr/tr/pub/etku/issue/6268/84211

Sözer, Y., Aydın, M. (2020). Nitel veri toplama teknikleri ve nitel veri analiz süreci [Qualitative data collection techniques and qualitative data analysis process]. B. Oral & A. Çoban (Ed.) *In Kuramdan uygulamaya eğitimde bilimsel araştırma yöntemleri [Kuramdan uygulamaya eğitimde bilimsel araştırma yöntemleri]* (p. 249-284). Pegem Academy.

Varinlioglu, G., Halıcı, S., & Alaçam, S. (2015). Computational approaches for basic design education. *In Pedagogical Notes Based on an Intense Student Workshop* (p. 576-580). https://doi.org/10.5151/despro-sigradi2015-100267

Wang, K., & Nickerson, J. V. (2017). A literature review on individual creativity support systems, *Computers in Human Behavior,* (74), 139–151. https://doi.org/10.1016/j.chb.2017.04.035

Wang, X., Kim, M. J., Love, P. E., & Kang, S. C. (2013). Augmented Reality in built environment: Classification and implications for future research. *Automation in construction,* 32, 1-13.

Wei, X., Weng, D., Liu, Y., & Wang, Y. (2015). Teaching based on augmented reality for a technical creative design course, *Computers & Education,* (81), 221-234. https://doi.org/10.1016/j.compedu.2014.10.017

Wu, P. H., Hwang, G. J., Yang, M. L., & Chen, C. H. (2017). Impacts of integrating the repertory grid into an augmented reality-based learning design on students' learning achievements, cognitive load and degree of satisfaction. *Interactive Learning Environments, 26*(2), 221–234. https://doi.org/10.1080/10494820.2017.1294608

Yıldırım, A. & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in social sciences]* (10th Edition). Seçkin Publishing.