

The Effect of Artificial Intelligence Applications in 6th Grade Visual Arts Course on Student Attitudes and Course Outcomes

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Abstract:

The aim of this study is to investigate the effects of artificial intelligence-supported teaching practices on students' attitudes and course outcomes in the visual arts course at the 6th grade level of secondary school. The research was conducted in a private middle school in Mersin province, Turkey, in the second semester of the 2023-2024 academic year. A total of 40 students participated in the study, which was designed as a quasi-experimental design with an experimental-control group. The experimental group used teaching methods enriched with artificial intelligence tools, while the control group continued with the traditional curriculum. Quantitative data were collected using the Attitude Scale Towards Visual Arts Lesson and Course Outcome Scale as pre-test -post-test. The results of the application showed that there was a significant increase in the attitude towards the course of the students who received the artificial intelligence-based instruction. Similarly, the course acquisition scores of the students in the experimental group were found to be statistically higher than those of the control group. The research results provide important insights into how student-centered and AI-based approaches can be effective in achieving course objectives.

Keywords: Artificial intelligence, visual arts teaching, attitude, attainment

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INTRODUCTION

Artificial Intelligence, one of the fastest developing technologies today, draws attention with its new and effective applications in the field of education. Artificial intelligence-based applications, which offer many advantages such as supporting students' learning processes, increasing the variety of teaching materials, and reducing teachers' workload, are shaping the future of education. The low quality of learning outcomes in courses taught with traditional methods necessitates research into artificial intelligence-based teaching methods. The need to use artificial intelligence-based applications to provide students with a more engaging and interactive educational environment is becoming increasingly apparent (Grájeda et al., 2024; Kim, 2023). Artificial intelligence tools provide personalized learning content, allowing students to engage in activities that suit their learning pace and interests (Aliabadi, 2023; Alshammari & Al-Enezi, 2024; Makeleni et al., 2023). In addition, AI-based feedback mechanisms allow students to instantly track their progress and identify the points they are missing. In educational research, several studies have emphasized that artificial intelligence has a positive impact on learning outcomes (Lin & Chen, 2024; Yılmaz, Erdem & Uygün, 2024). In light of these studies, it is believed that artificial intelligence technologies can be effectively used in the visual arts course.

The contribution of visual arts activities to the development of students in the cognitive, affective, and psychomotor domains can be further emphasized with artificial intelligence-supported methods (Su & Mokmin, 2024). At the same time, since art education supports the development of students' original thinking and aesthetic sensitivity, the potential of artificial intelligence applications in this field should not be ignored. Thus, in addition to traditional approaches, visual arts education supported by artificial intelligence-based applications provides a student-centered and interactive learning experience. The visual arts course in secondary school programs is important for developing students' imagination and supporting their critical thinking skills. However, traditional methods can sometimes be insufficient to keep students engaged in the classroom (Kibici, 2022; Özkan, 2022). At this point, personalized learning opportunities provided by artificial intelligence applications increase students' motivation for the course (Asio & Gadia, 2024; Xie, Lin & Yu, 2024). Thanks to artificial intelligence software, students can be directed to activities that match their interests and learning styles. In some visual arts activities, AI-powered digital drawing or design programs allow students to create tangible products (Black & Chaput, 2024). This increases students' sense of accomplishment and helps them develop positive attitudes toward the course (Ren, Edwards & Jamiat, 2024).

The role of AI in education also requires a rethinking of educational policies and curricula (Han, Park & Lee, 2022). Researchers note that there are various limitations in applications due to the lack of understanding of artificial intelligence and teachers' difficulties in adapting to these technologies (Yim & Wegerif, 2024). Therefore, teacher training and infrastructure investments need to be carefully planned for the effective

implementation of AI applications (Aliabadi, 2023). Considering all these factors, the role of AI in education is becoming increasingly diverse and important. In particular, the innovative solutions it can provide in interdisciplinary fields and arts education increase the quality and effectiveness of education (Kharroubi et al., 2024). In this context, the advantages offered by artificial intelligence applications have great potential in courses such as visual arts courses, where creativity and original thinking are at the forefront. The main purpose of this study is to make students' course outcomes more meaningful by using artificial intelligence-based teaching practices in the 6th grade visual arts course and to examine the effects of these practices on students' attitudes and academic achievement. For this purpose, the changes that may occur in students' learning motivation and creativity levels with the integration of artificial intelligence tools into the course process will be investigated. In particular, AI-based applications in visual arts education are expected to diversify forms of artistic expression by providing students with different perspectives (Grájeda et al., 2024; Su & Mokmin, 2024; Vu & Tran, 2022).

Research on the use of AI in education has generally focused on structured and analytical skills-based areas such as mathematics, science and language learning. These studies have demonstrated the potential of AI to provide personalized learning experiences, increase student achievement, and provide support to teachers (Hwang, 2022; Guo & Wang, 2025). However, the role of AI in disciplines that require creativity, aesthetic sensitivity and subjective expression, such as visual arts education, has not been sufficiently examined. In the literature, comprehensive studies on the effects of AI-supported practices on artistic skills, creative thinking processes or student attitudes, especially at the secondary school level, are limited (Choi, Yang & Goo, 2024). This research gap makes it difficult to understand the potential and limits of AI in disciplines such as art education. This study aims to fill this gap by examining the impact of AI-based instructional practices on student attitudes and course outcomes in a 6th grade visual arts course. In this way, it is aimed to make an original contribution to the literature by presenting concrete findings on the integration of AI in creative fields and to provide a guiding framework for educators.

The Role and Historical Development of Artificial Intelligence in Education

Artificial intelligence technologies are becoming more prevalent in educational institutions, providing students with new learning methods and teachers with data-driven decision-making mechanisms (Villegas-Ch et al., 2024). The role of AI in education also creates opportunities for professional development for teachers. AI-based teacher assistants facilitate time-consuming processes such as lesson planning and student assessment, allowing teachers to focus more on subjects that require creativity (Galindo-Domínguez et al., 2024). Artificial intelligence applications also capture students' attention and help improve academic performance by providing different learning environments (Hwang, 2022). AI-based simulations, game-based learning tools, and virtual laboratories increase students' experiential learning opportunities (Guo & Wang, 2025). In this way, students can concretize abstract concepts and increase their interest and motivation in the course.

Similarly, interactive content provided by artificial intelligence encourages students to actively participate in the course and enhances collaboration among students (Ren, Edwards & Jamiat, 2024). In addition, it is also stated that it contributes to the development of 21st century skills such as creative thinking, problem solving, and collaboration (Yue, Jong & Dai, 2022).

The historical development of artificial intelligence in education has paralleled the advancement of technological capabilities and computer science. Since the early 2000s, technology applications in education have become more accessible with the widespread use of the Internet and online learning platforms. In this process, computer-supported collaborative learning environments, online exams, and automated assessment systems began to analyze student data in more detail (Guo & Wang, 2025). The use of big data and artificial intelligence techniques in education gained momentum especially after the 2010s (Chauhan & Soni, 2024). In this period, adaptive learning systems and intelligent teaching guides aim to provide students with personalized learning experiences. Looking at the historical development, we can see that artificial intelligence applications were initially more rigid and rule-based, but today they have become dynamic thanks to deep learning algorithms (Han et al., 2022). Thus, AI in education has evolved from a tool that simply delivers learning content to a system that understands students' learning processes and can guide them in real time. In the process, AI technologies have become more inclusive and adaptive, enabling them to engage students of different ages and learning levels (Yim & Wegerif, 2024).

Applications of Artificial Intelligence in The Process of Learning and Teaching

Artificial intelligence applications in the learning and teaching process are designed to respond to students' individual learning needs and make educational processes more efficient. Adaptive learning platforms allow each student to progress at his or her own pace by providing content according to his or her level and interests (Xie, Lin & Yu, 2024). In this way, students do not need to move on to the next topic before they have fully grasped the subject and can more easily overcome their own learning deficiencies. In addition, AI-enabled course management systems allow teachers to monitor classroom performance and attendance in real time (Taskiran, 2023). In this way, teachers can provide personalized support by focusing on the points that students are having difficulty understanding. Students' interest and motivation in the classroom will be instantly measured by AI-based applications, maintaining the vitality of the learning process. In addition, AI-based chatbots and virtual assistants provide one-on-one guidance to students, allowing them to continue learning outside the classroom (Jindal & Kumar, 2024).

AI-based feedback mechanisms, on the other hand, not only provide correct and incorrect answers, but also analyze the student's thought process and offer developmental suggestions (Wood & Moss, 2024). Thus, students have the opportunity to learn from their mistakes and improve their learning strategies. Instructional materials are enriched with the

help of artificial intelligence, and students are presented with interactive simulations, games, video content, and problem-solving activities. All these applications keep students' interest and curiosity alive and make the learning process more enjoyable (Guo & Wang, 2025).

The use of artificial intelligence applications in learning processes makes it easier to support students with different levels of intelligence and different learning styles. For example, in language learning, AI-based online platforms improve students' pronunciation skills and vocabulary, analyze their reading and writing levels, and suggest appropriate exercises (Guo & Wang, 2025). Similarly, in math or science courses, AI-based problem-solving tools that provide instant feedback to students aim to deepen their conceptual understanding (Hwang, 2022). These applications encourage research and discovery processes by allowing students to learn through trial and error without fear of making mistakes.

Although the use of AI in education provides significant advantages such as providing personalized learning experiences, increasing students' motivation and supporting teachers in data-driven decision-making processes, the integration of this technology also brings some challenges (Chauhan & Soni, 2024; Choi, Yang & Goo, 2024). One of these challenges is that teachers do not have sufficient training and skills to use AI tools effectively (Aliabadi, 2023). This deficiency can make it difficult to implement AI-based applications efficiently in classrooms. Comprehensive and structured professional development programs are needed for teachers to combine AI technologies with pedagogical knowledge (Yim & Wegerif, 2024). In addition, the use of AI in education raises ethical issues; issues such as privacy of student data, potential biases in algorithms, and fair use of technology are issues that need to be carefully addressed (Chauhan & Soni, 2024). Designing AI systems in a transparent, fair and student privacy-protective manner is indispensable for their reliable use in education. In addition, the lack of technological infrastructure also stands out as an important obstacle. Not all schools have the hardware, software and internet access to support AI applications (Taskiran, 2023). This may increase the digital inequality between schools in socioeconomically disadvantaged areas and schools with better conditions. Therefore, the widespread and effective use of AI in education requires strategic approaches to address these challenges.

Integrating Visual Arts Education and Artificial Intelligence in Secondary Schools

AI applications in education reveal effective results in different fields with advantages such as producing solutions for students' individual learning needs, optimizing learning processes and providing important support to teachers (Xie, Lin & Yu, 2024; Guo & Wang, 2025). These benefits have a great potential especially for visual arts education where creativity and individual expression are at the forefront. Visual arts education aims to develop students' aesthetic sensitivity, critical thinking skills and artistic expression skills (Mahsan et al., 2023). Artificial intelligence tools offer students innovative opportunities to

support these goals. For example, AI-supported software can analyze students' artistic works and provide immediate feedback, thus enabling a better grasp of technical skills (Ren, Edwards & Jamiat, 2024). In addition, AI allows students to explore different art movements, get acquainted with digital art forms, and even participate in creative processes by collaborating with AI (Black & Chaput, 2024). This process increases students' artistic competence as well as their interest and self-confidence in art (Kim, 2023). Research shows that integrating AI into the visual arts curriculum encourages students' creativity and positively affects their academic achievement (Lin & Chen, 2024; Yılmaz et al., 2024). This relationship between the general applications of AI in education and its specific effects in visual arts education proves that AI can play a transformative role in arts education.

Visual arts education at the secondary level plays an important role in shaping students' cognitive and creative skills and developing their aesthetic perceptions. Art education aims to help students explore different perspectives and strengthen their critical thinking skills (Mahsan et al., 2023). In the visual arts course, students develop their own forms of expression using basic art elements such as color, shape, line, and texture. In this way, students' aesthetic sensitivity and abstract thinking skills are enhanced. In addition, while studying the visual arts, students engage in high-level cognitive processes such as problem solving and innovative thinking (Black & Chaput, 2024). The creative process is intertwined with students' self-expression and encourages them to create original products. Considering the mental development of middle school students, art education also contributes to their emotional maturation processes (Su & Mokmin, 2024). Visual arts allow students to explore their inner world and develop empathy skills. As a result, students can better communicate and express themselves through art. In addition, group work and collaboration in art activities help to strengthen social skills and sense of responsibility (Mahsan et al., 2023).

Another important aspect of visual arts education is that it helps students become aware of cultural and artistic heritage. Knowledge of art history and the artistic approaches of different cultures broadens students' worldview and contributes to their respect for cultural diversity (Aliabadi, 2023). As middle school students examine works of art from different time periods and geographical locations, they enrich their aesthetic tastes and artistic sensibilities. In the process, it is possible for students to better understand their own cultural identity and to use artistic forms of expression more authentically (Black & Chaput, 2024). In addition, projects and performance exhibitions through the arts enhance students' freedom of self-expression. In such activities, peer feedback and teacher evaluation open the door for students to further develop their artistic orientation. Visual arts education also facilitates interdisciplinary connections, allowing students to have a deeper learning experience in both artistic and academic processes. Therefore, visual arts education enables students to view the world from an aesthetic and holistic perspective while continuing to develop many skills related to academic and social life (Su & Mokmin, 2024).

Teaching visual arts in a traditional classroom environment may not have the desired effect due to various limitations. Large class sizes and inadequate physical facilities make it difficult to conduct student-centered art activities (Holmes, 2020). For example, a lack of materials and equipment may prevent students from expressing their creativity. In addition, teachers are limited by class time and curriculum time, resulting in a loss of flexibility in the process of planning and implementing arts activities. This can hinder students' active participation and deepening of learning (Su & Mokmin, 2024). In traditional teaching approaches, a learning environment that is sufficiently sensitive to individual differences cannot be created because students are usually directed to one type of work. If students' interests and ability levels are ignored, art education can lead to loss of motivation and negative attitudes towards the course (Baltezarević & Baltezarević, 2024).

Visual arts education is becoming more interactive and richer every day with technological innovations. The introduction of artificial intelligence technologies in this field is leading to a transformation in many dimensions, from teaching methods to the production of artworks. Students at the secondary level can interact more closely with visual design and creative processes thanks to AI-based tools. Today, AI-based image creation, photo transformation, and design projects not only develop students' artistic skills, but also provide them with technological literacy (Jindal & Kumar, 2024; Yim & Wegerif, 2024).

By exploring different art movements through AI-powered platforms, students become more engaged in the process of developing their own artistic style. At the same time, teachers can use these tools to more closely analyze student work and monitor their progress. Artificial intelligence algorithms can identify students' mistakes, styles, and strengths, and provide feedback mechanisms accordingly. As a result, course effectiveness and student learning become more efficient. Research shows that artificial intelligence tools have a positive impact on students' attitudes and performance (Lin & Chen, 2024; Yilmaz et al., 2024). This interaction is not limited to traditional visual arts techniques, but also encourages the integration of new media and digital arts applications into the program. The dynamism that AI-based applications bring to the classroom increases students' motivation to learn while diversifying their forms of artistic expression (Wood & Moss, 2024).

Integrating AI into the visual arts classroom requires a planned and deliberate approach. First, it is important for teachers to understand the basic principles of AI technologies and their pedagogical benefits (Su & Mokmin, 2024). By linking AI-based applications with curricular goals, teachers enrich not only students' technological skills but also their artistic perspectives. In this integration process, classroom activities need to be redesigned and learning outcomes need to be clearly defined (Chauhan & Soni, 2024). AI-enabled projects to be presented to students should be organized in a way that develops both their technical and aesthetic aspects. For example, while students experiment with color and composition using AI filters on a digital painting platform, they also gain awareness of traditional art concepts. The selection of AI tools to be used during the course is based on the teaching objectives and the age level of the students. Some applications

provide basic drawing and painting techniques in a digital environment, while others offer functions such as photo manipulation or object recognition with advanced artificial intelligence algorithms (Choi, Yang & Goo, 2024). Proper instruction of these applications by teachers will ensure that students receive maximum benefit. In addition, the suitability of infrastructure and hardware is also an important factor in the integration of artificial intelligence. Computer labs, tablets or interactive boards allow students to practice with these technologies. The transfer of course content to digital platforms and students' individual or group work with artificial intelligence software enriches the learning process (Lin & Chen, 2024; Yılmaz et al., 2024).

The integration of artificial intelligence into visual arts courses also brings innovations in assessment and measurement methods. While the subjective judgments of the instructor come into play in traditional art assessments, AI-based systems can analyze student work using more objective criteria. Students' color harmony, compositional balance, or technical application skills can be scored by artificial intelligence algorithms and constructive feedback provided to students (Ren, Edwards & Jamiat, 2024). In this way, students' performance levels can be more accurately determined, and teachers can create development plans tailored to each student. In addition, AI systems automatically transform student work into portfolios, making it easier to track progress over time. At the end of the year, teachers can more clearly see where the student has strengthened or struggled from the beginning. This allows the grading process to encompass student progress rather than being limited to the final product (Chauhan & Soni, 2024). At the same time, AI-based assessment increases students' sense of ownership of the course and makes them active participants in the learning process. This is because AI makes students' efforts and achievements visible at all times by providing immediate feedback. Moreover, by analyzing the data obtained, teachers can determine which subjects in the curriculum need additional support (Taskiran, 2023; Wood & Moss, 2024).

Artificial Intelligence Tools Used in Visual Arts and Their Effects on Learning Outcomes

In the field of visual arts, it is important to select artificial intelligence tools according to the level of the students, the goals of the course, and the needs of the curriculum. For example, Deep Dream, developed by Google, uses artificial neural networks to create surreal effects and unusual shapes on existing images. This application provides students with an art experience that encourages abstract thinking and allows them to experiment with different compositions (Alan & Yurt, 2024; Wood & Moss, 2024). Runway ML, on the other hand, stands out as a platform that can be used by both professional artists and educators, offering a wide range of features such as video editing, object recognition, and augmented reality effects with different artificial intelligence models. Such platforms allow students to bring physical works of art, such as traditional painting or sculpture, into the digital world. Text-to-image models such as DALL-E also allow students to combine vocabulary and expressive skills with visual elements. Images created with text input spark

students' imaginations and help them experience the relationship between "text and image" from a different perspective. In this context, performance in the visual arts also increases (Black & Chaput, 2024).

In addition to tools such as Deep Dream, Runway ML, and DALL-E, there are also AI-based applications suitable for different levels of education. For example, drawing programs with simpler interfaces allow students to digitally transform their own works using different effects and filters with just a few clicks. Some applications can analyze students' beginning drawings and offer automatic suggestions for areas open to development. Advanced students and teachers can train their own AI models using Python or similar programming languages and integrate them into their art projects (Jindal & Kumar, 2024). In this way, visual arts education offers a richer learning experience by combining disciplines such as coding and data science. The variety of AI tools also allows teachers to enrich the activities they will integrate into the lesson (Lin & Chen, 2024). For example, within the scope of a project, students can examine motifs in nature, transfer them to an AI application, and transform the resulting abstract designs into different art forms. In this way, students can play an active role in both analytical and creative processes. The automated processes offered by these tools save time and facilitate the implementation of larger-scale art projects. In addition, students can quickly share their own work and receive peer feedback, which strengthens the culture of collaboration and interaction in art education, increases attitudes towards the course, and encourages participation in the course (Baltezarević & Baltezarević, 2024; Grájeda et al., 2024).

Students who experience artificial intelligence applications in class help each other and solve potential technical problems together. Thus, a positive classroom climate and collaborative approach expand the benefits of artificial intelligence-based learning. At the same time, it is observed that students can more quickly change their attitudes towards technology to positive by being inspired by their peers who have similar interests (Kim, 2023; Choi, Yang & Goo, 2024). Since students grow up interacting with smart devices and computer games from a young age, they can adapt to artificial intelligence tools more quickly (Yılmaz, Erdem & Uygün, 2024). These students are generally open to technological innovations and enjoy digital applications in classes (Kharroubi et al., 2024).

Related studies reveal that students generally approach AI-based applications with feelings of curiosity and excitement (Lin & Chen, 2024). However, in addition to this positive approach, it is also reported that some students have concerns about the complexity of technology and the risks of failure (Yılmaz, Erdem & Uygün, 2024). These two extreme emotional states lead to different forms of interaction and learning outcomes in the classroom. Some studies show that AI tools increase students' interest in lessons, increase classroom interaction, and positively affect learning motivation (T et al., 2024; Villegas-Ch et al., 2024). On the other hand, studies that draw attention to the importance of the human factor in the learning process emphasize that AI cannot replace the teacher, but can contribute in a supportive position (Holmes, 2020).

Students' academic success, creativity levels, problem-solving skills, and interest in lessons are used as basic criteria in evaluating the effectiveness of artificial intelligence applications (Wood & Moss, 2024). Studies show that artificial intelligence-based teaching methods offer students a personalized and interactive learning experience when compared to traditional teaching methods (Chai et al., 2021; Aliabadi, 2023). This interaction can increase students' academic performance and make the scope of the course more interesting (Asio & Gadia, 2024; Xie, Lin, & Yu, 2024; T et al., 2024). At the secondary school level, it is emphasized that the integration of artificial intelligence not only positively supports course outcomes, but also provides students with the opportunity to prepare for future technologies (Yim & Wegerif, 2024). While working with artificial intelligence software, students grasp the logic of algorithms and unknowingly develop their data processing and modeling skills (Xie, Lin & Yu, 2024). This provides a strong foundation for students who want to focus on STEM fields in later stages of education (Grájeda et al., 2024). On the other hand, an innovative field of study emerges for students interested in the synthesis of art and technology. Artificial intelligence affects not only students' in-class performance but also their self-regulation skills and attitudes towards learning (Kim, 2023). Because artificial intelligence systems can instantly monitor students' learning processes and provide them with customized tasks, warnings and guidance. This helps students actively participate in course outcomes and take ownership of learning as a whole (Yim & Wegerif, 2024).

The potential of AI-based applications in education is increasing, but the impact of these technologies on students' attitudes and course outcomes is not fully understood. At the secondary school level, especially in courses that require creativity and interaction, such as visual arts, the use of AI has the potential to increase students' motivation and contribute to academic success (Yanal, 2019). However, it can be said that in the existing literature, comprehensive research on how AI tools are integrated into the classroom environment, to what extent they contribute to student skills, and what the difficulties are in this process is limited. Some studies suggest that AI technologies positively affect student attitudes and learning levels, while others highlight problems such as implementation difficulties, teacher competencies, or lack of technological infrastructure (Choi, Yang, & Goo, 2024; Taskiran, 2023; Lin & Chen, 2024; Yilmaz et al., 2024; Derinalp & Ozyurt, 2024; Han, Park, & Lee, 2022). These varying findings do not provide a clear framework for how effective artificial intelligence is in the field of visual arts. The differences in cognitive and affective needs of 6th grade students in particular suggest that the efficiency to be obtained from artificial intelligence tools may also vary. In addition, the nature of the visual arts course has an applied and experiential structure, which necessitates that artificial intelligence tools be examined in terms of process, creativity and aesthetic dimensions rather than just theoretical knowledge. Therefore, studies on how artificial intelligence technologies actually affect students' artistic skills, freedom of artistic expression and learning processes need to be expanded. It has not yet been sufficiently clarified how differences in student attitudes towards artificial intelligence-based applications shape interest and success in the course.

At the same time, it is also important to collect and analyze comprehensive data based on student feedback. It is clear that teachers, administrators and education policy makers need a guiding guide on this issue. This gap in the literature on the use of artificial intelligence in the field of visual arts constitutes the main problem of the study. Therefore, it is of great importance to deeply understand the contribution of these technologies to the educational process by examining students' attitudes towards artificial intelligence-based teaching environments and the changes in their course outcomes.

When the existing studies are examined, it is seen that there is evidence that AI-supported teaching methods increase students' academic performance and self-regulation skills (Guo & Wang, 2025; Villegas-Ch et al., 2024). However, these findings are generally concentrated on courses such as mathematics, science or language learning, and there are fewer studies in creativity-based areas such as visual arts. This situation creates a lack of information on the effectiveness of AI tools in art classes, and requires further expansion of theoretical and applied research. Considering that the visual arts course aims to help students develop original forms of expression, internalize basic art concepts such as color and form, and gain aesthetic sensitivity, the question of the extent to which AI technologies serve these goals becomes important (Black & Chaput, 2024).

On the other hand, the emotional dimension of students' experiences during their interaction with AI applications has not been fully elucidated. While AI tools can increase motivation by providing students with instant feedback and the ability to quickly correct errors, they can also cause negative effects such as technological anxiety, perception of inadequacy, or excessive dependence (Chauhan & Soni, 2024). This multifaceted interaction shows that the impact on student attitudes is not one-way and that AI technologies need to be managed. Similarly, teachers' level of adoption of these tools, course designs, and feedback mechanisms have the potential to affect students' attitudes and achievement levels. The limited number of studies in the literature that systematically address quantitative and qualitative data at the secondary school level in a holistic manner also complicates the problem. Therefore, examining the effects of AI technologies on student attitudes and course outcomes in detail will meet an important need in both practical and theoretical terms.

This study makes an important contribution to the literature by addressing the effects of the integration of artificial intelligence-based applications into the 6th grade visual arts course on students, both academically and emotionally. Since visual arts education is a critical area that shapes students' aesthetic perceptions, creativity skills, and cultural awareness, the role of artificial intelligence tools in this course is seen as a key point in understanding the digital transformation in education. Considering the limitations of existing research, the results of this study will guide not only student success, but also support creative processes through artificial intelligence, develop original thinking skills in students, and make the learning process enjoyable (Chai et al., 2021; Yim & Wegerif, 2024). In addition, the study findings will provide important data to the academic community on

how compatible the integration of artificial intelligence is with the objectives of the course and how the skills students gain in this process will be reflected in their future learning experiences. The feedback that students will give to this study will also shed light on the aspects in which artificial intelligence software can be developed in art education. On the other hand, conducting the study in a creative field such as visual arts aims to show that artificial intelligence technologies are not only a means of transferring information, but also play an active role in the processing of aesthetic and cultural values (Lin & Chen, 2024). Thus, examining the interaction between technology and art in depth will constitute an exemplary model for the spread of similar applications in different disciplines.

Purpose of the Study

The purpose of this research is to enable students to make sense of the course outcomes by using artificial intelligence tools in the 6th grade visual arts course and to examine the effects of these applications on student attitudes and achievements. In relation to this purpose, the following questions were sought:

- To what extent do the artificial intelligence-based teaching practices applied in the 6th grade visual arts course in middle school affect the students' course outcomes?
- To what extent do the artificial intelligence-based teaching practices applied in the 6th grade visual arts course in middle school affect the students' course attitudes?

METHOD

Research Model

In order to obtain the quantitative data of the study, a quasi-experimental design, which is one of the ways in which quantitative research can be conducted, was used (Bosh, 2017). A quasi-experimental research design is a model in which pre-test s and post-test s are applied to previously created experimental-control groups, experimental interventions are made to the participants in the experimental group, and no intervention is made to the control group (Fraenkel & Wallen, 1996). In cases where the groups cannot be formed by random selection and random distribution is not possible, the widely used method is the pre-test -post-test control group quasi-experimental design model (Valente & MacKinnon, 2017). In this context, it was decided that the most appropriate method for the research problem of the study, the characteristics of the group and the scales used was the pre-test -post-test control group quasi-experimental design. In the experimental design model created; lessons were given to the experimental group with activities developed in accordance with creative thinking skills, while the control group was given activities prepared in accordance with the requirements of the program prepared by the Ministry of National Education of Türkiye. In the research, data were analyzed using the "Course

Achievement Scale" and "Attitude Scale Towards Visual Arts Course" before and after the application of the experimental procedure.

Research Group

The study was conducted in a private secondary school located in Mersin province during the second semester of the 2023-2024 academic year. The research group consisted of 40 students who were taking visual arts courses in grades 6A and 6B. Of the participants, 20 students were in the experimental group and 20 students were in the control group. There were 20 (9 male, 11 female) students in the experimental group and 20 (10 male, 10 female) students in the control group. The artificial intelligence-based teaching method applied to the experimental group was examined as an independent variable in the experimental study. The course outcomes and attitude scores towards the visual arts course constituted the dependent variables of the experimental study. While the applications were applied in the experimental group with the teaching program developed by the researcher and artificial intelligence tools, the visual arts course activities were applied in the control group by fulfilling the requirements of the program prepared by the Ministry of National Education of Türkiye for the same outcomes. The applications were carried out by the researcher in the experimental and control groups. The scale form regarding the attitude towards the visual arts course and the course outcome scale forms were applied separately and the results were obtained.

Experimental Practice

In the first stage of the study, the Visual Arts Achievement Test and attitude scale were applied to the sixth-grade middle school students as a pre-test. In the second stage of the study, the students in the experimental group were informed about the subjects of the Visual Arts Education course and the use of subject-specific artificial intelligence tools. In the control group, the current visual education program was applied. Instructional practices lasted five sessions in both groups.

In both groups, the aim was to study the following course outcome and the work of Osman Hamdi Bey called "The Turtle Trainer" within this framework.

- *Discuss the subject chosen by an artist in his works and why he created a work of art.*
- *Explain the feelings and thoughts reflected in the artist's work.*
- *Explain how the work of art triggers feelings, emotions and aesthetic reactions.*

- Use critical thinking skills while defining, analyzing, interpreting and judging the work of art.

Students in the experimental group examined the digital prints of Osman Hamdi Bey's works called "The Turtle Trainer" using artificial intelligence tools in the classroom according to the methods of examining works of art. At this stage, students actively tried to analyze the related visual arts course outcomes on the artificial intelligence screen. In the experimental group, "Copilot (<https://copilot.microsoft.com/>)" and "ChatGPT (<https://ChatGPT/>)" applications were used as artificial intelligence tools.

The cognitive and technical competencies of the students allowed them to use the AI tools effectively with teacher guidance; the aforementioned tools were experienced in a structured process through prompts created jointly with the teacher at the beginning of the lesson, rather than independent learning by the students. The prompts were developed as a class with the teacher introducing and guiding the functions of the tools in Turkish; this approach made the abstract or complex structure of the tools understandable for the students and provided a learning environment appropriate to their age and developmental levels.

*** Translated with www.DeepL.com/Translator (free version) ***

In the first step of the application, the experimental group students wrote the prompt "Bringing Osman Hamdi Bey's work named "The Tortoise Trainer" to the screen" from the artificial intelligence application as indicated in the visual below (Figure 1 and Figure 2).

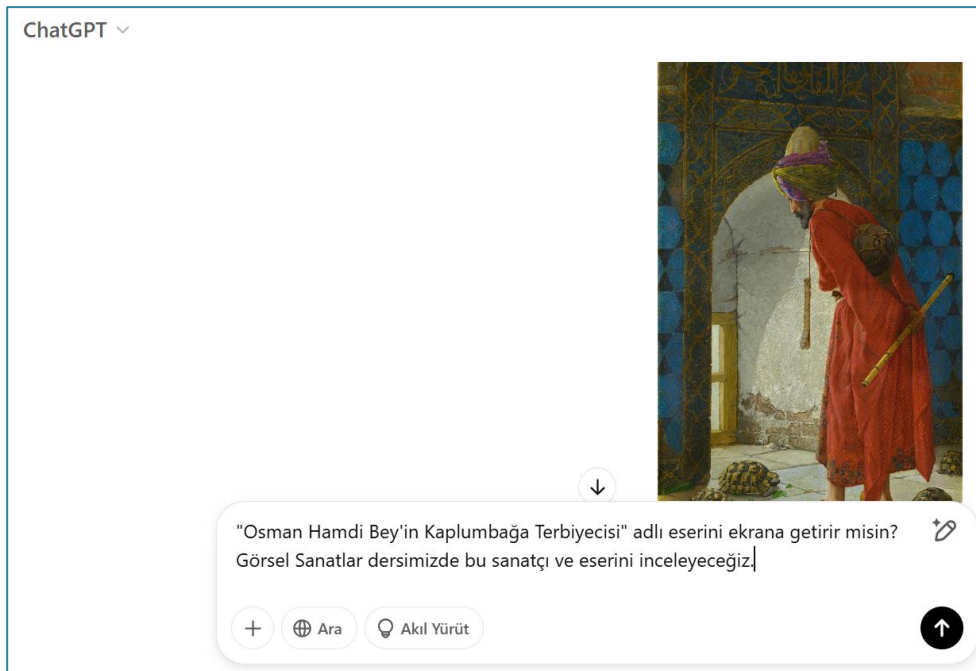


Figure 1.

As an example, the painters from our country and around the world who deal with similar themes and subjects like Osman Hamdi Bey and the characteristics of their works were examined with artificial intelligence tools.

ChatGPT ▾

Osman Hamdi Bey'in "Kaplumbağa Terbiyecisi" resmini ekrana getirir misiniz? Bu resmin ana teması nedir? Sanatçı bu eseri niçin ve hangi amaçla oluşturmuştur? Sanatçının eserinde yansıttığı duygu ve düşünceleri açıklayabilir misiniz?



Osman Hamdi Bey'in "Kaplumbağa Terbiyecisi" eseri, Türk sanat tarihinin en önemli ve ikonik tablolarından biridir. Bu tablo, sanatçının hem sanatsal becerisini hem de toplumsal eleştirilerini ortaya koyduğu bir başyapıttır. Aşağıda bu eserle ilgili detaylı bilgiler ve analizler yer almaktadır:



ChatGPT uygulamasına ileti gönder



Ara



Akl Yürüt



Figure 2.

On the ChatGPT server, students searched for answers by asking questions such as “What is the artist’s purpose in Osman Hamdi Bey’s work “The Tortoise Trainer”? What is the theme of the work? What are the feelings and thoughts reflected by the artist in the work, etc.?” on an image obtained with artificial intelligence and had group discussions with their friends (Figure 3, Figure 4, Figure 5). Then, students worked individually on the artificial intelligence application and were allowed to repeat the activities.

ChatGPT ▾

Eserin Ana Teması

"Kaplumbağa Terbiyecisi," toplumsal değişim ve modernleşme süreçlerini eleştirel bir dille ele alır. Osman Hamdi Bey, bu eserinde değişimin zorluklarını, sabır gerekliliğini ve liderlik kavramını metaforlarla işler:

1. **Kaplumbağalar:** Toplumun geleneklere bağlı, değişime karşı dirençli yapısını temsil eder. Kaplumbağaların hareketlerinin yavaşlığı, modernleşme sürecinin sancılı ilerleyişine bir göndermedir.
2. **Terbiyeci Figürü:** Osmanlı kıyafetleri içinde bir derviş ya da filozofu andıran figür, lideri ve reformcu temsil eder. Elindeki ney ve değnek, hem sabırlı hem de kararlı bir öğretici figürüdür.
3. **Mekan ve Arka Plan:** Osmanlı mimarisine özgü çini detaylar ve mekansal kompozisyon, geleneksel ile modern arasında bir denge kurma çabasını



ChatGPT uygulamasına ileti gönder



Ara



Akl Yürüt



Figure 3.

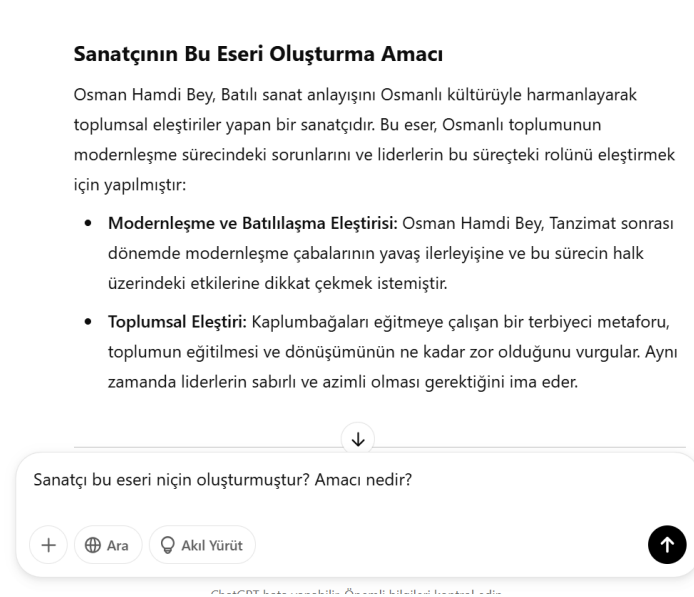


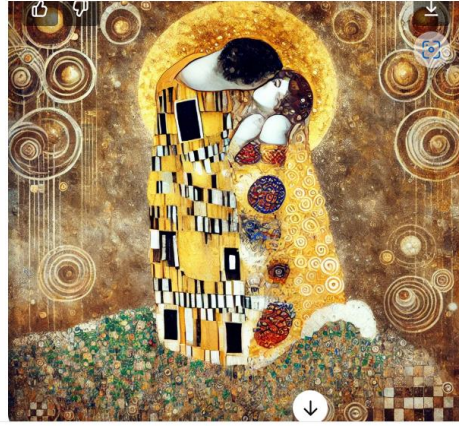
Figure 4.



Figure 5.

Later, on the artificial intelligence application, the students were given a command such as "Which painter and work in Turkey and the world does Osman Hamdi Bey's work named "The Tortoise Trainer" have similarities with? Show these works". The artificial intelligence suggested multiple images related to the subject and the images were selected by the students (Figure 6 and Figure 7). In addition, the students asked additional questions on an image obtained with the artificial intelligence, "What are the artistic features of the resulting works? What is their theme?" etc. and did group work with their friends (Figure 8).

ChatGPT ▾



Osman Hamdi Beyin dünyadan sanatçı ve resim örnekleri veriri misin? Görselleri de gösteriniz?

+ Ara Akıl Yürüt



Figure 6.

ChatGPT ▾

Osman Hamdi Beyin eseri ve Gustav Klimt'in sanat eserleri arasındaki benzerlikler nelerdir.

Osman Hamdi Bey'in "Kaplumbağa Terbiyecisi" ile Gustav Klimt'in eserleri arasında hem tematik hem de estetik açıdan dikkat çekici benzerlikler bulunmaktadır. Her iki sanatçı da farklı coğrafyalarda ve sanat akımlarında eserler üretmiş olsa da, bazı ortak yönlere sahiptirler:

1. Dekoratif Unsurların Kullanımı

- Osman Hamdi Bey:** "Kaplumbağa Terbiyecisi" eserinde Osmanlı mimarisine özgü çini detayları, süslemeler ve renkli desenler dikkat çeker. Arka plandaki motifler ve kıyafet detayları, dekoratif bir estetik oluşturur.
- Gustav Klimt:** Klimt'in eserleri, altın varaklar, geometrik desenler ve ince detaylarla bezeli dekoratif unsurlarıyla bilinir. Örneğin, "The Kiss" (Öpücük) eserinde zengin süslemeler hem duygusal hem de görsel bir zenginlik katar.

Benzerlik: Her iki sanatçı da eserlerinde dekoratif detaylarla görsel derinlik yaratır ve sanatın estetik yönünü öne çıkarır.

ChatGPT uygulamasına iletir gönder

+ Ara Akıl Yürüt

ChatGPT ▾

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ChatGPT uygulamasına iletir gönder

+ Ara Akıl Yürüt

Figure 7.

ChatGPT ▾

2. Sembolizm ve Derin Anlam

- Osman Hamdi Bey:** "Kaplumbağa Terbiyecisi" sembolik bir eserdir. Kaplumbağalar, toplumun değişime olan direncini simgelerken, terbiyeciyi figürü liderliği ve sabrı temsil eder.
- Gustav Klimt:** Klimt'in eserleri de yoğun bir şekilde sembolizm içerir. "The Tree of Life" gibi eserlerinde yaşam, ölüm ve aşk gibi evrensel temaları simgeleyen figürler ve motifler kullanılır.

Benzerlik: Her iki sanatçı da sembolizmi kullanarak izleyiciye derin düşünsel mesajlar iletme çabası.

ChatGPT uygulamasına iletir gönder

+ Ara Akıl Yürüt

ChatGPT ▾

3. Ruhani ve Manevi Temalar

- Osman Hamdi Bey:** Terbiyeciyi figürü, tasavvuf geleneğinden izler taşıyor. Ney, bir tasavvuf sembolüdür ve ruhsal bir huzur ile sabrı ifade eder.
- Gustav Klimt:** Klimt'in eserlerinde, özellikle kadın figürlerinde, ruhani bir atmosfer ve yaşamın anlamına dair duygusal bir derinlik bulunur.

Benzerlik: İki sanatçı da eserlerinde maneviyatı ve ruhsal huzuru işler, ancak bunu farklı kültürel bağlamlarda yaparlar.

4. Doğu ve Batı Kültürlerinin Etkileşimi

ChatGPT uygulamasına iletir gönder

+ Ara Akıl Yürüt

Figure 8.

Later, students individually repeated the same course outcomes on different artists and their works using artificial intelligence applications. The artists and works chosen by the students were projected on screens that the whole class could see and a class discussion was held. In the control group, the same outcomes were processed and realized in equal time within the framework of the current middle school sixth grade curriculum guidelines. In the final stage, the “Visual Arts Achievement Test and Attitude Scale” was applied to both groups simultaneously and as a post-test.

Data Collection Tools

Attitude Scale Towards Visual Arts Course

The Attitude Scale Towards Visual Arts Course was developed by Yanal (2019). The scale, consisting of 14 items, 8 positive and 6 negative, was prepared by taking into account the cognitive, affective and behavioral dimensions of attitude. The items, which are in the form of a five-point Likert-type rating scale, were rated as completely disagree (1) and completely agree (5). Factor analysis was conducted regarding the validity and reliability of the scale, and as a result, a one-dimensional structure emerged. The Cronbach Alpha coefficient of the 14 items in the scale regarding the reliability of the scale is 0.91.

Visual Arts Course Achievement Scale

The Middle School 6th Grade Visual Arts Course Achievement Scale was developed to measure the art course achievements of students at this grade level. While developing the Middle School 6th Grade Visual Arts Course Achievement Scale, the course curriculum was examined, and the opinions of art course teachers and measurement and evaluation experts were consulted. The experts consulted were, respectively, an academician with a doctorate in Visual Arts Education, a professor in the field of Curriculum and Instruction, and a faculty member in the field of Measurement and Evaluation. In this context, statements representing the achievements of the 6th grade visual arts course were included in the scale. In this way, 10 questions were prepared and the content validity of the Middle School 6th Grade Visual Arts Course Achievement Scale was tried to be ensured. A 5-point grading system was used in scoring the scale. If the student achieved the relevant achievement completely, 5 points were given, and if he/she achieved it very little, 1 point was given. The lowest score a student can get for each item of the scale is 1 and the highest score is 5. Item analyses were conducted during the validity process of the Middle School 6th Grade Visual Arts Course Achievement Scale, and then the Cronbach reliability coefficient was calculated as 0.89.

Data Collection Process

During the research process, the problem of the research, the sub-problems of the research were determined and after a comprehensive literature review, the most appropriate model for the research was determined. In the preparation process before the

application, a detailed planning of the experimental group education process was made and an activity plan for the weeks was prepared. During the application process, the Personal Information Form, Course Achievement Scale and Attitude Scale Towards Visual Arts Course were applied to the experimental and control groups as pre-test s. While the program regarding the artificial intelligence-based education process was applied in the experimental group, the current education program was applied. After the application, the equivalent forms of Course Achievement Scale and Attitude Scale Towards Visual Arts Course were applied to the experimental and control groups as post-test s. After the application, the data were analyzed and reported.

Data Analysis Techniques

Checking the distribution of data helps to select appropriate statistical models and methods for data analysis. For example, if the data follow a normal distribution, parametric techniques such as t-test and ANOVA can be applied. Conversely, if the data do not follow a normal distribution, non-parametric methods should be used (Brooks, 2008). Therefore, in order to decide on the type of analysis to be used, it was first examined whether the pre-test and post-test mean scores of the students in the experimental and control groups met the normality assumptions. The Shapiro-Wilk test was used to examine whether the data on the achievement and attitude scale applied to the students in the study group showed a normal distribution. de Souza et al (2023) recommend using the Shapiro Wilk Test to test for normal distribution in groups of less than 50 participants. The data obtained from the Shapiro-Wilk tests did not meet the normal distribution assumptions. In this context, the Mann Whitney U Test, one of the non-parametric analysis techniques, was used in the study.

Ethical Considerations

Before starting the research, ethical principles were applied to the Kastamonu University Social and Human Sciences Research and Publication Ethics Committee, and an ethics committee approval certificate numbered was obtained.

Ethical Review Board: [Kastamonu University Social and Human Sciences Research and Publication Ethics Committee]

Date of Ethics Review Decision: [07.01.2025]

Ethics Assessment Document Issue Number: [1/36-HP39AEA]

FINDINGS

Table 1 and Table 2 show the results of the visual arts course attitude scale applied to the groups before the experimental applications.

Table 1

Descriptive Analysis of Visual Arts Course Attitude Scale Pre-test Scores of Students in Experimental and Control Groups

Pre-Test	Group	N	Mean	Std. Deviation
Attitude	Experimental	20	3,66	0,50
	Control	20	3,73	0,44

The descriptive statistics of the middle school students' pre-test results on the visual arts course attitude scale before to the experimental procedures are displayed in Table 1. The study shows that the experimental group's students' overall pre-test score average on the attitude scale is 3.66, with a standard deviation of 0.50. Students in the control group had an average pre-test attitude score of 3.73, with a standard deviation of 0.44. Table 2 presents the findings of the Mann Whitney U test that was performed between the two groups' pre-test attitude scores.

Table 2

Mann Whitney U Test Results Regarding Pre-test Scores of Visual Arts Course Attitude Scale of Students in Experimental and Control Groups

Pre-Test	Grup	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	p
Attitude	Experimental	20	18,85	377,00	167,00	-0,90	0,37
	Control	20	22,15	443,00			

According to Table 2, the students in the experimental group had a mean pre-test score of 18.85 on the visual arts course attitude scale, compared to their counterparts in the control group who have a mean of 22.15. The Mann Whitney U test value computed between the pre-test attitude score rankings of the groups was 167.00. This figure indicates that students in both groups had similar sentiments toward the visual arts course prior to the experimental methods. Tables 3 and 4 show the outcomes of the visual arts course achievement scales administered to the groups prior to the experimental applications.

Table 3

Descriptive Analysis of Visual Arts Course Achievement Scale Pre-test Scores of Students in Experimental and Control Groups

Pre-test	Group	N	Mean	Std. Deviation
Achievement	Experimental	20	3,54	0,24
	Control	20	3,56	0,47

Table 3 shows the descriptive statistics of the visual arts course achievement scale pre-test scores of the middle school students before the experimental procedures. According to the analysis, the achievement scale pre-test score average of the students in the experimental group is 3.54, and the standard deviation is 0.24. The achievement scale pre-test score average of the students in the control group is 3.56, and the standard deviation is 0.47. The results of the Mann Whitney U test conducted between the pre-test achievement scores of the two groups are given in Table 4.

Table 4

Mann Whitney U Test Results Regarding Visual Arts Course Achievement Scale Pre-test Scores of Students in Experimental and Control Groups

			Mean	Sum of	Mann-	Z	P
Pre-test		N	Rank	Ranks	Whitney U		
Achievement	Experimental	20	19,10	382,00	172,00	-0,76	0,45
	Control	20	21,90	438,00			

According to Table 4, the mean rank of the pre-test scores of the visual arts course achievement scale of the students in the experimental group is 19.10, while the mean of their peers in the control group is 21.90. The Mann Whitney U test value calculated between the pre-test achievement score ranking means of the groups was calculated as 172.00. This value shows that the visual arts course achievements of the students in both groups were equal before the experimental procedures. Table 5 and Table 6 show the results of the visual arts course attitude scale applied to the groups after the experimental applications.

Table 5

Descriptive Analysis of Visual Arts Course Attitude Scale Post-test Scores of Students in Experimental and Control Groups

Post-test	Group	N	Mean	Std. Deviation
Attitude	Experimental	20	4,42	0,38
	Control	20	3,94	0,36

Table 5 shows the descriptive statistics regarding the post-test scores of the visual arts course attitude scale of the middle school students after the experimental procedures. According to the analyses, the attitude scale post-test score average of the students in the experimental group is 4.42, and its standard deviation is 0.38. The attitude scale post-test score average of the students in the control group is 3.94, and its standard deviation is 0.36. The results of the Mann Whitney U test conducted between the post-test attitude scores of the two groups are given in Table 6.

Table 6

Mann Whitney U Test Results Regarding Visual Arts Course Attitude Scale Post-test Scores of Students in Experimental and Control Groups

Post-test		N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	p
Attitude	Experimental	20	26,95	539,00	71,00	-3,51	0,00
	Control	20	14,05	281,00			

According to Table 6, the mean rank of the post-test attitude scale scores of the students in the experimental group on the visual arts course is 26.95, while the mean of their peers in the control group is 14.05. The Mann Whitney U test value calculated between the post-test attitude score ranking averages of the groups was calculated as 71.00. This value shows that there is a significant difference between the visual arts course attitudes of the students in both groups after the experimental procedures ($p < 0.05$). As a result of the experimental procedures, it was seen that the attitudes of the students in the experimental group towards the visual arts course were significantly higher and more positive compared to their peers in the control group. Table 7 and Table 8 show the results of the visual arts course achievement scale applied to the groups after the experimental procedures.

Table 7

Descriptive Analysis of Visual Arts Course Achievement Scale Post-test Scores of Students in Experimental and Control Groups

Post-test	Group	N	Mean	Std. Deviation
Achievement	Experimental	20	4,23	0,35
	Control	20	3,99	0,30

Table 7 provides the descriptive statistics for middle school students' post-test scores on the visual arts course achievement scale following the experimental procedures.

According to the analyses, the children in the experimental group have an average achievement scale post-test score of 4.23 with a standard deviation of 0.35. The achievement scale post-test score average for kids in the control group is 3.99, with a standard deviation of 0.30. Table 8 shows the results of the Mann Whitney U test, which was done between the post-test achievement scores of two groups.

Table 8

Mann Whitney U Test Results Regarding Visual Arts Course Achievement Scale Post-test Scores of Students in Experimental and Control Groups

			Mean	Sum of	Mann-	Z	p
Post-test		N	Rank	Ranks	Whitney U		
Achievement	Experimental	20	24,50	490,00	120,00	-2,23	0,03
	Control	20	16,50	330,00			

According to Table 8, the mean rank of the experimental group's post-test scores on the visual arts course achievement scale is 24.50, while their counterparts in the control group had a mean of 16.50. The Mann Whitney U test value calculated between the post-test accomplishment ranking averages of the groups was 120.00. The experimental techniques resulted in a substantial difference in students' visual arts course outcomes between the two groups ($p < 0.05$). The experimental techniques revealed that students in the experimental group performed much better in visual arts courses than their classmates in the control group.

DISCUSSION AND CONCLUSION

This study aimed to determine the effects of artificial intelligence applications on student attitudes and course outcomes in the 6th grade visual arts course of middle school. The findings obtained in the study will contribute to the increasing interest and discussions on the use of artificial intelligence technologies in education in recent years.

The research findings show that the attitude scores of the students in the experimental group towards the visual arts course were statistically significantly higher than those of the control group, where the traditional method was applied. This result suggests that artificial intelligence-based applications caused students to experience a more active and participatory process in the visual arts teaching process, which positively affected their approach to the course. There are findings in the literature that teaching environments supported by artificial intelligence attract students' attention, involve them in the learning process, and increase their attitudes and motivation (Chauhan & Soni, 2024; Choi, Yang & Goo, 2024; Kharroubi et al., 2024).

The current study confirms these findings in the context of the visual arts course. It has been determined that especially 6th grade students are more interested in the lesson and

a positive atmosphere is created when they work with artificial intelligence tools that enable them to obtain concrete outputs. In this process, student-student interaction also increases significantly with the guidance of teachers, and in-class sharing increases. Indeed, although the positive effect of the activities carried out within the framework of the traditional program on the attitude scores was observed in the control group, it was observed that it did not create a significant difference compared to the experimental group. This difference reveals the additional source of motivation that technological innovations provide to art education (Wood & Moss, 2024). This situation makes the lesson more attractive by encouraging students' original expressions and experimental studies.

Another finding is the significant increase in the visual arts course achievements of the students in the experimental group. The results of the study showed that most of the course objectives were achieved at a higher rate in the group where artificial intelligence-supported applications were used. This may be related to the fact that artificial intelligence tools diversify learning materials and appeal to different learning styles of students (Xie, Lin & Yu, 2024). In particular, instant feedback mechanisms and error correction systems provide students with the opportunity to grasp artistic techniques faster and improve their works (Derinalp & Ozyurt, 2024). This finding becomes even more evident when compared to the achievement scores obtained as a result of the course being taught with traditional methods in the control group. According to the results of the study, artificial intelligence tools make it easier for students to explore basic art concepts such as color, composition, and texture through applied examples and keep their interest constantly alive (Kim, 2023; Black & Chaput, 2024).

According to Mahsan et al. (2023), artificial intelligence is not only a tool in the artistic process, but also a factor that triggers creativity. Guo and Wang (2025) stated in their research that the use of artificial intelligence has taken students to a more advanced level in developing an aesthetic perspective. In this research, the increase in students' creativity levels is also reflected in course achievements and coincides with positive scores on the attitude scale. With the aid of artificial intelligence tools, students can make more visual experiments, receive instant feedback, and this accelerates the learning process. Furthermore, the scale results used in the research show that artificial intelligence-based applications provide multifaceted contributions to students' cognitive, affective, and psychomotor development.

The research results show that the artworks of the students in the experimental group contain much more diverse and innovative elements. This finding shows that artificial intelligence tools open new horizons for students and encourage them to try different styles, materials and techniques (Ren, Edwards & Jamiat, 2024). In addition, it is observed that the approach of transforming the error and generating a new idea from there, instead of avoiding mistakes, is more common in artificial intelligence-supported environments. This approach enriches the trial-error and discovery processes that underlie creativity (Chauhan & Soni, 2024). Thanks to the automatic arrangements or suggestions provided by artificial intelligence, students do not hesitate to take risks and tend to produce original products. In addition, the observation of the positive effect of the use of artificial intelligence on course outcomes shows that the positive findings in previous studies in mathematics and science (Asio & Gadia, 2024; Guo & Wang, 2025) may also be valid for art education. However, the results found within the scope of the research also confirm that the applications are largely

dependent on the class level, students' digital skills and teacher guidance. Examples of applications in visual arts classes allow students to produce more advanced works in terms of aesthetics and technique by providing instant feedback from artificial intelligence (Kugel, 1981; Choi, Yang & Goo, 2024). However, this situation emphasizes the importance of not only technological infrastructure but also elements such as pedagogical design and teacher guidance (Taskiran, 2023).

According to Yim and Wegerif (2024), the integration of artificial intelligence technologies into visual arts classes provides significant benefits, but it is a process that needs to be kept constantly up-to-date. Students need to adapt to rapidly changing technological innovations, and teachers need to follow these innovations and blend them with pedagogical content knowledge. It is stated that schools need roadmaps on infrastructure, licenses, data security, and ethical issues (Su & Mokmin, 2024). In addition, issues such as how artificial intelligence tools affect the boundaries of originality in student works and who owns the artistic property of these works also come to the fore (Choi, Yang, & Goo, 2024). At this point, school policies play a critical role in determining the framework of artificial intelligence use in art classes. Similarly, it is important to observe digital privacy principles in the storage of artificial intelligence data and the storage of student information (Chauhan & Soni, 2024). Moreover, it is one of the core values of artistic education that students understand the difference between works produced with artificial intelligence and that technology is a support tool and that human creativity is still at the center (Guo & Wang, 2025).

The findings of this study are generally considered reliable since they are based on a quasi-experimental design with an experimental-control group, but they have certain limitations. First of all, the study was implemented only at the 6th grade level in a private school in Mersin province, and the results may vary depending on regional or institutional differences. Therefore, studies conducted with larger samples and in different types of schools are important in terms of increasing generalizability. Data on students' attitudes and achievements were collected using self-reported scales. This carries the risk of partially skewing the data due to social desirability bias or students' tendency to present themselves more positively (Fraenkel & Wallen, 1996). In addition, the data collection tools used in the study reflect limited quantitative feedback on AI-based activities. The emotions, difficulties experienced by students, and changes in the process can be supported by more in-depth interviews or observation methods (Holmes, 2020). In addition, the duration of the application is relatively short, and it is not yet clear how students will develop in the long term with AI tools. Long-term follow-ups can provide clearer data on students' sustained progress and skill transfer (Guo & Wang, 2025). Finally, the adequacy of the teacher's and school's technology infrastructure may have played a major role in the experimental group's successful results. This raises the possibility that similar results may not be achieved in schools with lower equipment levels.

The choice of AI tools and access to these tools during the study can also be considered as limitations. Although there are many AI-based art applications, only certain software was used in the study. This choice may have restrictive aspects in terms of the functions and features experienced by the students. In addition, the research teacher's aptitude for AI technologies and the ability to integrate them into the lesson are also seen as a determining factor in the success of the application (Aliabadi, 2023). Another teacher having a different

level of technical knowledge may make it difficult to reach similar results. It should not be ignored that the number of students in the study group was limited to 40 and that demographic factors such as students' age, interests, and family support may also affect the data.

RECOMMENDATIONS

In future studies, it is recommended that similar studies be conducted in different age groups and education levels. In particular, by examining the effects of artificial intelligence use on art education at the primary or high school level, it is possible to discover how developmental differences that emerge with age are shaped. In addition, interdisciplinary approaches can shed light on future studies. For example, similar application of artificial intelligence tools in music, drama or literature courses can make it possible to evaluate the development of creativity and aesthetic sensitivity from a transdisciplinary perspective. In addition, studies to be conducted in different cultural environments and socioeconomic conditions can reveal more clearly the universal or culture-specific effects of artificial intelligence-based applications. The inclusion of artificial intelligence technologies in teacher education curricula and the impact of this process on the professional competencies of teacher candidates can also be the focus of future studies. In particular, it should not be forgotten that the success of field applications largely depends on the knowledge, skills and attitudes of teachers.

In future studies, the ethical and security dimensions of AI technologies in the education-training process should be examined more comprehensively. The protection of confidentiality and ethical standards in the processes of collecting, storing and analyzing student data continues to be a critical issue (Chauhan & Soni, 2024). It is important for researchers to clarify how AI-based applications use student data during art education and with whom this data can be shared. At the same time, the originality and copyright of the content automatically produced by AI tools are also among the priority issues in the field of art education. Future studies can focus on defining the ownership of works produced by AI systems, determining students' creativity share and evaluating possible copying or imitation risks.

However, the development of content that discusses the social and cultural reflections of artificial intelligence in art classes supported by artificial intelligence and provides students with a critical perspective can be qualified examples of studies in this field. Subjective evaluations of students about the works they produce with artificial intelligence, and peer and teacher opinions about how creative or inspiring these works are found, can provide rich content for future studies. The performance differences of different artificial intelligence models and software in art education can also be a subject of future research. The advantages or disadvantages of different artificial intelligence tools specialized in areas such as image processing, natural language processing or object recognition can be evaluated in terms of visual arts classes.

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