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IMPROVING THE METHODOLOGY OF USING DIGITAL TECHNOLOGIES IN TEACHING VISUAL ARTS IN GENERAL SECONDARY SCHOOLS

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Abstract: This article examines issues related to improving the methodology of using digital technologies in the process of teaching visual arts in general secondary schools. The didactic potential of modern digital graphic tools, interactive learning platforms, graphic tablets, multimedia resources, virtual exhibitions, and artificial intelligence-based visual tools in visual arts lessons is highlighted. The possibilities of developing students' creative thinking, visual literacy, artistic and aesthetic taste, and digital competencies through the integration of digital technologies with traditional drawing and artistic-practical activities are substantiated. The article also analyzes methodological approaches aimed at integrating the technological, pedagogical, and subject-specific knowledge of visual arts teachers, selecting digital tools in accordance with lesson objectives, and organizing students' independent creative activity. In the study, digital technologies are considered not as tools that replace traditional methods of visual arts education, but as didactic resources that expand their pedagogical potential and increase the effectiveness of the educational process.

Keywords: visual arts, digital technologies, general secondary education, digital pedagogy, art education, visual literacy, creative thinking, multimedia, interactive learning, digital competence.

INTRODUCTION

Today, the rapid digitalization of society is creating new pedagogical challenges for the education system. The development of information and communication technologies, multimedia tools, digital graphic software, virtual and augmented reality technologies, and artificial intelligence is having a significant impact on the forms and methods of organizing the educational process. UNESCO's global report on the use of technology in education notes that digital tools can improve the quality of teaching, enable educational materials to be presented in various formats, increase students' engagement, and expand opportunities for collaborative learning [1]. At the same time, it is emphasized that technology should not replace the human interaction between teacher and learner, but rather serve educational goals.This process is particularly important for visual arts education. The visual worldview of contemporary students is shaped not only through traditional books and reproductions but also through the Internet, digital photography, animation, video materials, social media, graphic design, mobile applications, and other digital visual environments. As a result, the visual arts teacher is expected not only to teach students how to work with pencils, paints, composition,

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painting, and perspective, but also to prepare them to understand and analyze modern visual information and to use digital tools for creative purposes.

One of the distinctive features of visual arts as a subject is that the learning process involves not only the acquisition of theoretical knowledge but also direct practical and creative activity. Students construct compositions, harmonize colors, represent shape and volume, study perspective, and express their individual artistic views through visual means. From this perspective, digital technologies allow learners to perform certain experiments quickly and conveniently that may be more difficult to carry out using traditional visual tools. For example, with the help of a digital graphic editor, students can compare several color solutions for one composition, change the arrangement of objects, experiment with different textures and effects, and correct mistakes.However, the mere introduction of digital technology into the classroom does not automatically increase educational effectiveness. Its pedagogical impact depends on the purpose for which the teacher uses the technology, the types of tasks assigned, and the teaching methods applied. According to the TPACK framework developed by Mishra and Koehler, the effective use of technology in education requires the integration of subject content knowledge, pedagogical knowledge, and technological knowledge [2]. This approach is also highly relevant to visual arts teachers, as it demonstrates that digital tools become effective only when they are methodologically connected with the aims and content of art education.

There are also views suggesting that the use of digital technologies in visual arts education may negatively affect students' creativity. However, research conducted by Black and Browning shows that the use of digital technologies based on appropriate pedagogical strategies does not restrict students' creativity; on the contrary, it creates additional opportunities for them to discover new artistic possibilities and demonstrate their creative potential [3]. According to the authors, digital tools can strengthen the connection between students' everyday visual and technological experiences and school-based art education.The use of multimedia presentations, electronic reproductions, virtual museums and galleries, graphic tablets, digital drawing software, interactive whiteboards, 3D modeling, and other visual tools in visual arts lessons in general secondary schools makes it possible to present learning materials in a more visual and comprehensible form. For example, when studying art history, virtual museums allow students to visually explore works of art from different countries and historical periods. In painting lessons, digital color palettes can be used to compare warm and cool colors, contrast, color harmony, and tonal relationships in practice.

In recent years, the introduction of artificial intelligence-based tools into visual arts education has created a new stage in this process. A systematic scientific review published in 2026 noted that the use of artificial intelligence and digital technologies in visual arts education creates new opportunities for creativity, learning, and assessment, while at the same time emphasizing the need for deeper integration of these tools with the theoretical and methodological foundations of art education [4]. The study analyzed publications from 2020 to 2025 and found that, in some cases, the relationship between technological innovation and the pedagogical and creative essence of art education remained insufficiently developed.Therefore, the current methodological challenge is not simply to introduce digital tools into visual arts lessons as technological innovations, but to identify their didactic potential, adapt them to students' age and psychological characteristics, connect them with specific lesson

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objectives, and optimally integrate them with traditional artistic activities. For example, before using digital drawing software, it is important for students to understand the basic principles of composition, proportion, and color. Otherwise, the technological tool may begin to dominate the creative process, and students may become dependent on ready-made digital solutions.

Another important advantage of digital technologies is their ability to expand opportunities for individualized and differentiated learning. Students with different levels of artistic ability and preparation can complete the same task at varying levels of complexity and, when necessary, use additional electronic instructions, video lessons, or visual examples. In this way, learners can conduct independent experiments, identify their own mistakes, and repeatedly improve their artistic solutions. This process gradually helps students move from merely reproducing ready-made models toward making independent artistic decisions.In addition, it is not appropriate to create an opposition between digital and traditional technologies in contemporary visual arts education. Academic drawing with pencils, painting with watercolor and gouache, sculpture, and the study of elements of decorative and applied arts continue to play an important role in developing students' fundamental artistic skills. The main function of digital technologies is to expand this experience, present it in new forms, and provide learners with additional opportunities for creative experimentation.

Thus, improving the methodology of using digital technologies in teaching visual arts in general secondary schools is one of the important directions of modern pedagogy. The **purpose of this study** is to identify the pedagogical and methodological possibilities of effectively using digital technologies in visual arts lessons and to improve methodological approaches aimed at developing students' creative thinking, visual literacy, and digital competencies through the integration of traditional art education tools with digital resources.

MATERIALS AND METHODS

This study was aimed at identifying the methodological possibilities of using digital technologies in the process of teaching visual arts in general secondary schools and improving their pedagogical application. The research employed theoretical analysis, comparative analysis, pedagogical observation, modeling of educational activities, analysis of practical assignments, evaluation of students' creative products, and generalization methods. The methodological basis of the study was formed by the competency-based approach, activity-oriented learning, constructivist pedagogy, the TPACK framework, and the principles of digital pedagogy. On the basis of these approaches, digital technologies in visual arts lessons were examined not merely as technical additions, but as pedagogical resources designed to perform specific didactic functions. At the initial stage of the study, the main areas of visual arts education in general secondary schools in which digital technologies could be effectively applied were identified. Particular attention was paid to drawing, painting, composition, perspective, art history, decorative and applied arts, elements of design, and creative project activities. For each area, the pedagogical purpose of digital technology use was determined separately. For example, digital color palettes were considered useful in painting lessons for analyzing color harmony; graphic editors were employed in composition lessons to compare

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different arrangements of visual elements; virtual museums and electronic galleries were used for the study of art history; and digital graphic applications were applied in design-based practical activities.

In developing the methodological model, the interrelationship between learning objectives, educational content, technological tools, types of activity, student participation, and assessment criteria was defined as a key principle. A digital tool was introduced into the lesson only when its didactic function was clearly identified. In this regard, the European Framework for the Digital Competence of Educators, DigCompEdu, emphasizes that teachers' digital competence is directly related to teaching, assessment, learner empowerment, and the creation and management of digital educational resources [5]. Therefore, it was considered insufficient for a visual arts teacher simply to possess technical skills in using digital tools; the teacher must also be able to adapt such tools to the specific learning objectives and artistic development needs of students.During the study, a three-stage methodological model for organizing visual arts lessons was developed: the preparatory stage, the creative-practical stage, and the reflective-assessment stage. At the preparatory stage, students are introduced to the theoretical content of the lesson, analyze works of art or visual examples, become familiar with the functions of selected digital tools, and receive a creative task. Multimedia presentations, electronic reproductions, video materials, virtual museums, and interactive resources may be used at this stage. These tools are intended to form students' initial understanding of the topic and prepare them for independent creative activity.

At the creative-practical stage, students perform independent artistic activities by combining traditional and digital tools. For example, a student may first prepare a preliminary sketch on paper, digitize it, and then use graphic software to develop different versions of the color scheme, contrast, texture, or composition. Such a sequence makes it possible to preserve fundamental artistic skills while providing opportunities for digital experimentation. Digital technologies should be used primarily to create conditions in which students can make independent decisions, compare alternative artistic solutions, and experiment creatively. From the perspective of constructivist pedagogy, learners do not simply receive knowledge in a ready-made form; rather, they construct knowledge through active participation and personal experience [6]. Therefore, digital technologies in visual arts education were considered as tools that can transform students into active subjects of the creative learning process.At the reflective-assessment stage, students' artworks are analyzed, their artistic and technical characteristics are discussed, and learners are encouraged to explain their creative decisions. In this process, not only the final product but also the creative process itself is evaluated. The student's initial idea, preliminary sketches, selected tools, color and composition decisions, digital modifications, independence in improving the final work, and ability to reflect on personal creative activity were identified as major assessment criteria. Such an approach enables students to focus not only on the final outcome but also on the meaning and development of the creative process.

Special attention was also paid to project-based learning as an effective method for integrating digital technologies into visual arts education. Creative projects such as "School of the Future," "My City," "Nature and Human," "Modern Interpretation of National Ornaments," and "Environmental Poster" can be organized through the use of digital tools. In such tasks, students first analyze the problem, collect visual materials, prepare initial sketches, and subsequently develop the project using

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appropriate digital technologies. Project-based learning is valuable because it develops not only artistic abilities but also planning, problem-solving, critical thinking, communication, and collaborative skills [7].The principle of differentiated instruction was also considered during the development of the methodology. Since students differ in their artistic preparation and level of digital literacy, tasks were adapted according to varying levels of complexity. Students with basic digital skills may be asked to perform simple tasks such as changing colors, arranging shapes, or editing existing images, while more advanced learners may create original compositions, digital collages, posters, animations, or multimedia projects. This approach makes it possible to take into account the individual creative potential of each student and reduce unnecessary technological difficulties during the lesson.

Students' age-related characteristics were also considered an important methodological factor. In lower grades, digital technologies should primarily be used for visual demonstration, simple creative exercises, and game-based learning activities. In higher grades, more complex tasks involving graphic design, digital composition, photography, multimedia, virtual exhibitions, and project-based activities may be introduced. Thus, the technological complexity of tasks should increase gradually in accordance with students' age, artistic preparation, and level of digital competence.Artificial intelligence-based tools require additional methodological regulation. Such technologies should not be used as mechanisms that produce finished artistic products instead of students. Rather, they should function as auxiliary tools for generating ideas, comparing alternatives, experimenting with color and composition, and developing visual thinking. When AI-based applications are used, the student's original concept and preliminary sketch should remain central to the creative process. This approach is intended to prevent excessive dependence on technology and preserve the learner's independent imagination and artistic decision-making.

The integration of AI-based tools can be organized through a sequence in which students first formulate their own artistic idea, produce several initial sketches, and only then use an AI system to explore alternative visual solutions. The generated results can subsequently be compared with the student's original ideas, critically analyzed, modified, and incorporated selectively into the final work. This enables artificial intelligence to become a tool for reflection and experimentation rather than a substitute for creative activity. Studies on digital education also emphasize that the effectiveness of technological tools depends largely on their connection with clearly defined pedagogical objectives and on the active participation of learners in the educational process [8].Another important methodological principle was the balanced integration of traditional and digital artistic techniques. Traditional drawing with pencils, watercolor and gouache painting, sculpture, and decorative arts were retained as fundamental components of visual arts education. Digital tools were introduced to extend these activities rather than replace them. For instance, a traditional sketch may later be edited digitally, a hand-painted work may be incorporated into a digital collage, or a decorative ornament created manually may be transformed into a digital design. Such integrated activities allow students to recognize the relationship between traditional artistic craftsmanship and contemporary digital visual culture.

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The research methodology also emphasized the importance of digital portfolios. Students can document their creative process by collecting preliminary ideas, sketches, photographs, digital experiments, different versions of compositions, final works, and short reflective comments. A digital portfolio allows teachers to observe the development of artistic thinking over time and provides a more objective basis for assessing students' progress. It also helps learners understand their own development and identify the strengths and weaknesses of their creative work.Overall, the methodological model proposed in this study is based on the gradual, purposeful, and pedagogically justified integration of digital technologies into visual arts lessons. Traditional artistic activities, digital tools, independent creative work, differentiated instruction, project-based learning, and reflective assessment are integrated within a unified educational system. This approach makes it possible to view digital technology not as an end in itself, but as a means of improving the quality of visual arts education and developing students' creative thinking, visual literacy, artistic competence, and contemporary digital skills.

RESULTS

The results of the methodological analysis showed that the purposeful integration of digital technologies into visual arts lessons can significantly expand the possibilities of traditional art education. The proposed methodology demonstrated its potential particularly in the development of students' creative independence, visual literacy, ability to experiment with artistic solutions, digital competence, and motivation to participate in practical activities. The most important condition was that digital tools were not used separately from artistic objectives but were incorporated into the lesson as part of a structured creative process.The analysis showed that the combination of traditional and digital methods produced more pedagogically valuable outcomes than the exclusive use of either approach. When students first developed an idea through manual sketching and later used digital tools to experiment with color, composition, texture, and visual effects, they were able to compare several artistic solutions without losing the basic skills associated with traditional drawing. This approach also encouraged students to reconsider their initial ideas, identify compositional weaknesses, and make independent decisions about improving their work.

One of the main results was the increased level of student involvement in visual arts activities. Multimedia presentations, digital reproductions, virtual galleries, interactive resources, and digital drawing applications made lesson content more visually accessible and stimulated students' interest in artistic tasks. Digital technologies were particularly effective when they were connected with specific creative problems rather than used only for demonstration. Students were more actively involved when they were required to create, modify, compare, and explain their own visual solutions.The methodological model also contributed to the development of visual literacy. Through digital tools, students were able to compare different color combinations, compositional structures, proportions, visual hierarchies, and stylistic solutions. This made abstract artistic concepts more concrete and observable. For example, changes in contrast, saturation, balance, scale, and spatial arrangement could be demonstrated immediately in a digital environment. As a result, students were able to understand the relationship between artistic theory and practical visual outcomes more effectively.

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Another important result was related to creative thinking. The use of digital technologies created opportunities for experimentation without the fear of permanently damaging the original artwork. Students could test alternative versions of the same composition, return to previous stages, combine different materials, and compare results. Such flexibility supported divergent thinking and allowed learners to consider several possible solutions to the same artistic problem.The use of project-based activities further strengthened the effectiveness of the proposed methodology. Tasks such as creating environmental posters, modern interpretations of national ornaments, digital illustrations, thematic compositions, and virtual exhibitions required students to integrate artistic knowledge with planning, digital skills, and independent decision-making. These activities also encouraged communication and collaborative learning when projects were completed in pairs or groups.

The results also indicated that differentiated use of digital technologies is important in general secondary education. Students with lower levels of digital competence benefited from simple tools such as color selection, basic image editing, and digital composition exercises, whereas more advanced students were able to work with digital collage, graphic design, multimedia, and more complex creative projects. Therefore, the same digital tool should not be applied uniformly to all students; the level of task complexity should correspond to learners' artistic and technological readiness.

The main pedagogical effects identified through the proposed methodology are summarized in Table 1.

Table 1. Main results of integrating digital technologies into visual arts education

Evaluation criterion	**Traditional approach used independently**	**Integrated traditional-digital approach**	**Identified pedagogical result**
Student motivation	Depends mainly on conventional practical tasks	Enriched by interactive and visual resources	Increased interest and active participation in lessons
Creative thinking	Mainly based on manual experimentation	Multiple digital and traditional alternatives can be tested	Greater variety of creative solutions
Visual literacy	Developed through observation and traditional analysis	Supported by immediate comparison of color, composition, texture, and form	Deeper understanding of visual relationships
Artistic independence	Teacher guidance may remain dominant	Students can independently revise and compare their work	Increased independent decision-making

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Evaluation criterion	Traditional approach used independently	Integrated traditional-digital approach	Identified pedagogical result
Digital competence	Limited development	Digital tools become part of artistic practice	Development of technology-related creative skills
Understanding of composition	Changes often require redrawing	Elements can be repositioned and compared rapidly	Better understanding of balance and visual structure
Color competence	Based mainly on physical materials	Digital palettes allow rapid comparison of alternatives	Improved understanding of color harmony and contrast
Individualization	More difficult within limited lesson time	Tasks can be adjusted to different competence levels	Greater opportunities for differentiated learning
Reflection and assessment	Primarily focused on the final artwork	Digital portfolios document different stages of the work	More comprehensive assessment of the creative process
Project activity	Usually limited by available materials	Digital media allow broader formats and presentation methods	Development of interdisciplinary and project skills

The results presented in Table 1 demonstrate that the main advantage of digital technologies is not simply the acceleration of artistic production. Their methodological value lies in creating an environment in which students can compare alternatives, experiment, make corrections, analyze visual changes, and reflect on their decisions. Therefore, the pedagogical effect of technology is directly related to the way in which it is incorporated into the structure of the lesson.

The use of digital portfolios was also identified as an effective assessment strategy. Unlike traditional assessment, which often focuses predominantly on the final artwork, digital portfolios make it possible to document the development of a creative product from the initial idea to the completed work. Preliminary sketches, photographs, digital modifications, alternative compositions, and reflective notes can be stored together. This provides the teacher with a clearer understanding of the student's artistic progress and makes assessment more process-oriented.The analysis further showed that digital technologies can support the development of students' ability to explain and defend their artistic decisions. During reflective discussions, students can compare the initial and final versions of their works and explain why they changed specific colors, shapes, proportions, or compositional elements. Consequently, artistic activity becomes not only practical but also analytical. Students gradually develop the ability to consciously evaluate their own creative process.

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Artificial intelligence-based visual tools demonstrated additional methodological potential when used under teacher supervision. Their most appropriate function was identified as supporting brainstorming, generating alternative visual ideas, comparing stylistic possibilities, and stimulating discussion. At the same time, the methodological analysis showed that AI should be introduced only after students have independently formulated an artistic concept or prepared preliminary sketches. Otherwise, excessive reliance on automatically generated images may reduce the student's active role in the creative process.For this reason, the most effective sequence identified in the study was: **artistic problem → independent idea → preliminary sketch → digital experimentation → comparison of alternatives → revision → final artwork → presentation and reflection**. This sequence ensures that digital technology remains subordinate to educational and artistic objectives. It also preserves the central role of the learner as the author of the creative process.

Overall, the results demonstrate that improving the methodology of digital technology use in visual arts education requires a transition from the simple application of digital devices toward their pedagogically structured integration. Digital tools become most effective when they support specific artistic objectives, complement traditional techniques, encourage independent experimentation, and contribute to the development of students' visual, creative, and digital competencies. Therefore, the proposed integrated methodology can be considered a promising approach for modernizing visual arts education in general secondary schools while preserving the fundamental values and practical skills of traditional art education.

DISCUSSION

The findings of the present study indicate that the effectiveness of digital technologies in visual arts education depends not primarily on the availability of technological devices, but on the pedagogical methodology through which they are integrated into the learning process. Digital tools demonstrated the greatest methodological value when they were directly connected with artistic objectives, practical activities, independent decision-making, and reflective analysis. This supports the view that technology should not be introduced into visual arts lessons as an isolated innovation, but should become an organic component of the broader teaching and learning system.One of the most important findings is that the integration of traditional and digital artistic practices offers greater educational potential than the exclusive use of either approach. Traditional drawing, painting, composition, and decorative art activities continue to develop fundamental artistic skills, whereas digital technologies create opportunities for rapid experimentation, modification, comparison, and visualization. In this context, the proposed methodology does not seek to replace traditional art education with digital instruction. Instead, it establishes a complementary relationship between the two forms of artistic activity. This approach is consistent with Pavlou's research, which emphasizes that the integration of new media into art education can support creativity, collaboration, visual competence, and broader transversal skills when technology is connected meaningfully with artistic learning [9].

The results also suggest that digital technologies can contribute to the development of students' creative thinking by expanding the number of possible artistic solutions available during the creative

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process. In traditional practice, changing the composition, color relationships, or proportions of an artwork may require considerable time or even complete reconstruction. Digital environments, however, allow students to create alternative versions, compare them, undo changes, and return to previous stages. This flexibility encourages experimentation and may reduce students' fear of making mistakes. Consequently, the creative process becomes more exploratory and less dependent on producing a correct result at the first attempt.This finding is consistent with the systematic review conducted by Han and Chua, which examined studies published between 2019 and 2025 concerning the positive and negative influence of digital tools on creativity in fine arts education [10]. Their analysis indicates that digital technologies can support innovation, experimentation, and creative development, although the educational outcomes depend on the way these tools are integrated into artistic practice. The comparison with the present study therefore confirms that the pedagogical structure surrounding digital technology is more important than the technological tool itself.

Another significant aspect of the findings concerns visual literacy. Contemporary learners interact with a large volume of visual information through social networks, digital media, advertisements, websites, video platforms, games, and mobile applications. Therefore, visual arts education has an increasingly important role in preparing students not only to produce images but also to interpret, evaluate, and critically understand visual information. Digital environments provide opportunities to compare different visual solutions directly and to observe how changes in color, contrast, proportion, scale, balance, texture, and spatial organization influence the meaning and perception of an artwork.The proposed methodology also demonstrates that visual literacy can be strengthened when students are encouraged to explain their artistic decisions. When learners compare an initial sketch with a digitally modified version and describe why particular changes were introduced, artistic activity moves beyond technical execution and becomes a process of analysis and reflection. Such reflective practice is particularly important because it enables students to develop an understanding of the relationship between artistic intention and visual form.

The findings regarding student participation are also noteworthy. Interactive digital resources, multimedia materials, virtual exhibitions, and digital artistic tasks may increase students' interest when they are used as part of meaningful learning activities. However, the use of technology merely for entertainment or visual attractiveness cannot be considered sufficient. A multimedia presentation, for example, has limited pedagogical value if students remain passive observers. In contrast, a digital task that requires learners to analyze, create, compare, discuss, and revise visual material promotes active engagement.This interpretation is supported by Sattar, Rustemova, and Nebessayeva, who highlight the importance of combining socially interactive approaches and digital technologies in art education to develop students' creative thinking, analytical abilities, and deeper understanding of artistic processes [11]. The findings of the present study similarly suggest that the educational value of digital technologies increases when students actively communicate, evaluate alternative solutions, collaborate on creative projects, and reflect on their artistic experiences.

Project-based learning was identified as one of the most appropriate methodological forms for integrating digital technologies into visual arts education. Through projects, students can combine traditional drawing, photography, digital graphics, multimedia, research, and presentation within a

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single creative task. Such activities also create connections between visual arts and other areas such as history, ecology, literature, cultural studies, and information technology. For example, an environmental poster project may simultaneously involve artistic composition, ecological knowledge, visual communication, and digital design skills. Therefore, digital technologies can contribute not only to artistic competence but also to interdisciplinary learning.The findings further demonstrate that individualized and differentiated learning represents an important advantage of digital integration. Students differ considerably in artistic ability, practical experience, learning pace, and technological competence. Digital resources can provide different levels of support without requiring all learners to perform exactly the same operations. A student who requires additional assistance may use visual instructions or simple editing tools, while a more advanced learner may develop a complex digital composition or multimedia project. This flexibility allows the teacher to maintain common educational objectives while providing differentiated pathways for achieving them.

At the same time, the results reveal several potential limitations that must be taken into account. The first is unequal access to technological resources. Effective digital visual arts education may require computers, tablets, graphic tablets, projectors, stable Internet access, appropriate software, and technically prepared classrooms. These resources may not be equally available in all general secondary schools. Therefore, the proposed methodology should remain flexible and should not depend entirely on expensive equipment. Many pedagogical objectives can be achieved through a combination of a limited number of digital devices, teacher demonstrations, collaborative activities, and traditional materials.The second limitation concerns teachers' digital competence. Even when schools possess appropriate technological resources, their educational potential may remain underused if teachers lack the methodological skills required to integrate them into lessons. Technical knowledge alone is insufficient. A teacher must understand why a particular digital tool is needed, which artistic competence it develops, how it should be connected with traditional practice, and how students' learning should be assessed. This confirms the importance of continuous professional development for visual arts teachers in the fields of digital pedagogy, graphic technologies, media literacy, and emerging AI-based applications.

A further challenge is the possibility of excessive dependence on digital effects and ready-made technological functions. Modern graphic software can automatically correct images, apply filters, generate shapes, reproduce styles, and create complex visual effects. If students use such possibilities without understanding fundamental artistic principles, the apparent technical quality of the final work may conceal weaknesses in composition, proportion, color understanding, observation, or independent creativity. Therefore, digital technologies should be introduced only in combination with systematic teaching of fundamental visual arts knowledge and skills.This concern becomes especially important in relation to generative artificial intelligence. AI-based image-generation systems can create complex visual content within seconds, offering potentially valuable opportunities for brainstorming, stylistic comparison, and experimentation. However, they also create methodological challenges regarding authorship, originality, creative independence, intellectual property, and the assessment of students' personal contributions.

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Recent systematic research on artificial intelligence in visual arts education confirms that the field is developing rapidly but remains pedagogically fragmented. Hong's review of studies published from 2020 to 2025 found that technological innovation in visual art education is not always sufficiently connected with established learning theories and the epistemological foundations of artistic practice [12]. This finding is particularly relevant to the present study because it supports the need for a structured methodology rather than the uncontrolled introduction of AI tools into art lessons.For general secondary education, AI should therefore be treated primarily as a supporting resource rather than an independent producer of students' artwork. The learner should formulate the concept, develop preliminary ideas, produce sketches, critically examine AI-generated alternatives, and make the final artistic decisions. Such an approach preserves human creativity as the central component of visual arts education while simultaneously enabling students to develop an informed understanding of emerging technologies.

Assessment also requires reconsideration in digitally supported visual arts education. Traditional assessment frequently emphasizes the aesthetic and technical characteristics of the finished artwork. However, when digital tools and particularly generative technologies are used, evaluation of the final product alone may not accurately reflect the learner's knowledge and contribution. The findings of this study support a process-oriented approach in which preliminary ideas, sketches, experimentation, modifications, digital techniques, artistic decisions, reflection, and the final result are considered together.Digital portfolios can play an important role in implementing such assessment. They allow students to document different stages of their artistic work and provide teachers with evidence of how an idea develops over time. This makes it possible to assess not only artistic quality but also creative growth, independent problem-solving, reflective thinking, and appropriate use of technology. Furthermore, portfolio-based assessment encourages students to view revision and experimentation as natural elements of artistic practice rather than as indicators of failure.

Another important implication is that digital transformation changes the professional role of the visual arts teacher. The teacher increasingly becomes not only a transmitter of artistic knowledge and demonstrator of practical techniques but also a facilitator of creative inquiry, organizer of digital learning environments, adviser on technological choices, and guide in ethical digital practice. This expanded role requires the development of technological-pedagogical competence while maintaining deep knowledge of artistic principles and teaching methodology.The discussion of the obtained results therefore leads to an important methodological conclusion: modernization of visual arts education should not be understood as simple digitalization of existing lessons. Replacing a printed reproduction with an electronic image or a pencil with a digital stylus does not automatically constitute pedagogical innovation. Genuine methodological improvement occurs when technology changes the quality of students' learning activities by enabling them to investigate, experiment, compare, create, collaborate, reflect, and make independent artistic decisions.

Accordingly, the methodological model proposed in this study — **artistic problem identification → theoretical preparation → independent sketching → digital experimentation → comparison and analysis → artistic revision → final product → presentation → reflection and assessment** — provides a balanced framework for integrating digital technologies into visual arts

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lessons. The model preserves fundamental artistic skills while expanding opportunities for contemporary digital creativity. It also positions the student as the central subject of the creative process and the teacher as the organizer and facilitator of meaningful artistic learning.Overall, the findings and their comparison with previous research [9–12] indicate that digital technologies have considerable potential to improve visual arts education when their use is methodologically justified, age-appropriate, accessible, and connected with clear artistic objectives. Their most significant contribution lies not in making artistic production faster or technically easier, but in expanding students' opportunities for experimentation, visual analysis, independent decision-making, collaboration, and reflection. Consequently, the future development of visual arts education in general secondary schools should focus on creating a balanced educational environment in which traditional artistic culture and emerging digital technologies mutually enrich one another.

CONCLUSION

The findings of this study demonstrate that the purposeful and methodologically structured integration of digital technologies into visual arts education can considerably enrich the teaching and learning process in general secondary schools. The educational effectiveness of digital technologies depends not merely on the availability of technological devices or software but primarily on how these tools are connected with artistic objectives, pedagogical strategies, students' developmental characteristics, and practical creative activities.The proposed methodology confirms the importance of maintaining a balanced relationship between traditional artistic practices and contemporary digital technologies. Academic drawing, painting, composition, color theory, perspective, decorative and applied arts, and other traditional forms of artistic activity remain fundamental to the development of students' visual and creative skills. Digital resources should therefore not replace these forms of learning but complement and expand them by providing additional opportunities for experimentation, comparison, modification, and creative exploration.

The integration of digital drawing applications, multimedia resources, virtual museums, graphic editors, interactive platforms, 3D technologies, and artificial intelligence-based tools can contribute to the development of students' visual literacy, creative thinking, digital competence, artistic independence, and motivation. In particular, digital environments enable learners to explore several artistic solutions, compare color and compositional alternatives, revise their work, and critically evaluate the relationship between their initial artistic intention and the final visual result.The study also highlights the importance of organizing digital visual arts education as a consistent pedagogical process. The sequence consisting of artistic problem identification, theoretical preparation, preliminary sketching, digital experimentation, comparison of alternatives, artistic revision, final product creation, presentation, reflection, and assessment provides a methodological framework that places the learner at the center of creative activity. Such an approach ensures that technology functions as a supportive educational resource rather than as a substitute for students' independent artistic thinking.

Project-based learning, differentiated instruction, reflective activities, and digital portfolios can further improve the effectiveness of technology-supported visual arts education. Project activities allow students to integrate artistic knowledge with research, communication, planning, collaboration,

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and digital skills. Differentiated tasks make it possible to consider students' varying levels of artistic preparation and technological competence, while digital portfolios enable teachers to assess not only the final artwork but also the development of the entire creative process.The role of the visual arts teacher becomes particularly important in this context. Modern teachers need to possess an integrated combination of artistic, pedagogical, and technological competencies. They must be able to determine which digital tool is appropriate for a specific educational objective, organize students' independent creative activities, provide methodological guidance, evaluate artistic development, and promote responsible use of emerging technologies. Therefore, continuous professional development in digital pedagogy and contemporary visual technologies should become an important component of teacher training.

Artificial intelligence provides additional opportunities for visual arts education, particularly for brainstorming, generating alternative visual concepts, comparing stylistic solutions, and supporting creative experimentation. Nevertheless, the learner should remain the principal author and decision-maker throughout the artistic process. Excessive dependence on automatically generated visual content may negatively affect the development of manual artistic skills, independent imagination, originality, and creative responsibility. For this reason, AI-based tools should be used under clear methodological and ethical principles and should complement rather than replace students' personal artistic activity.Another important conclusion concerns assessment. In technology-supported visual arts education, evaluating only the final artistic product is insufficient. Assessment should also consider the originality of the concept, preliminary sketches, creative experimentation, selection and use of digital tools, independent modifications, problem-solving strategies, reflective analysis, and the learner's ability to explain artistic decisions. Such process-oriented assessment provides a more comprehensive understanding of students' creative and educational development.

At the same time, successful implementation of the proposed methodology requires consideration of several practical challenges, including unequal access to digital devices, differences in students' digital competence, limited technological infrastructure, and teachers' readiness to use modern tools. Consequently, the methodology should remain flexible and adaptable to the technological and pedagogical conditions of individual schools. Effective innovation does not necessarily require expensive equipment; meaningful educational outcomes can also be achieved through the thoughtful combination of available digital resources with traditional artistic materials.Overall, improving the methodology of using digital technologies in visual arts education should be understood not as the simple digitalization of traditional lessons but as the purposeful transformation of students' creative learning activities. The most important pedagogical objective is to create an educational environment in which traditional artistic culture and contemporary digital technologies mutually complement one another. Such an approach can contribute to the development of creative, visually literate, critically thinking, technologically competent, and independently motivated students who are prepared to participate effectively in the contemporary digital and visual culture.

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