

ORIGINAL

Digital art as a tool for developing students creativity

El arte digital como herramienta para desarrollar la creatividad de los estudiantes

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Cite as: Galchynska O, Mykhailiuk O, Byedakova S, Vashchenko O, Hamolin P. Digital art as a tool for developing students creativity. *Seminars in Medical Writing and Education*. 2025; 4:434. <https://doi.org/10.56294/mw2025434>

Submitted: 01-09-2024

Revised: 05-02-2025

Accepted: 19-07-2025

Published: 20-07-2025

Editor: PhD. Prof. Estela Morales Peralta 

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ABSTRACT

Introduction: the study aimed to assess the status of digital art in the matrix of professional competencies among higher education students and explore its potential as a tool for developing creative thinking and skills.

Method: a qualitative case study was conducted using a survey involving 14 students enrolled in artistic higher education programs. The instrument comprised a six-question questionnaire, combining Likert-scale, binary-choice, and open-ended questions. The responses were analysed through systematic comparison and interpretation of students' experiences with digital art in the educational process.

Results: the results demonstrated a high level (100 %) of student engagement with digital art tools in their curricula. Most respondents (85 %) expressed positive expectations about the introduction of digital resources into the learning environment, while 57 % acknowledged the practical development of creative skills through digital technologies. Despite this, students identified both benefits and perceived risks in the digitalisation of the artistic process, with equally divided opinions on its potential impact on creativity. The findings reflected a growing awareness of digital art as an inevitable component of modern artistic education.

Conclusions: digital art was confirmed as a relevant and effective educational tool that supports the development of both digital and creative skills. The study highlighted the need for updated methodological approaches that integrate digital art into educational strategies while preserving the integrity of human creativity.

Keywords: Digital Art; Creative Thinking; Educational Technologies; Art Education; Interactive Approaches.

RESUMEN

Introducción: el estudio tenía como objetivo evaluar el estado del arte digital en la matriz de competencias profesionales entre los estudiantes de educación superior y explorar su potencial como herramienta para desarrollar el pensamiento y las habilidades creativas.

Método: se llevó a cabo un estudio de caso cualitativo mediante una encuesta en la que participaron 14 estudiantes matriculados en programas de educación superior artística. El instrumento consistió en un cuestionario de seis preguntas, que combinaba preguntas de escala Likert, de elección binaria y abiertas. Las respuestas se analizaron mediante la comparación e interpretación sistemáticas de las experiencias de los estudiantes con el arte digital en el proceso educativo.

Resultados: los resultados demostraron un alto nivel (100 %) de participación de los estudiantes con las herramientas de arte digital en sus planes de estudio. La mayoría de los encuestados (85 %) expresaron

expectativas positivas sobre la introducción de recursos digitales en el entorno de aprendizaje, mientras que el 57 % reconoció el desarrollo práctico de las habilidades creativas a través de las tecnologías digitales. A pesar de ello, los estudiantes identificaron tanto los beneficios como los riesgos percibidos en la digitalización del proceso artístico, con opiniones igualmente divididas sobre su impacto potencial en la creatividad. Los resultados reflejaron una creciente conciencia del arte digital como un componente inevitable de la educación artística moderna.

Conclusiones: se confirmó que el arte digital es una herramienta educativa relevante y eficaz que favorece el desarrollo de habilidades digitales y creativas. El estudio puso de manifiesto la necesidad de actualizar los enfoques metodológicos para integrar el arte digital en las estrategias educativas, preservando al mismo tiempo la integridad de la creatividad humana.

Palabras clave: Arte Digital; Pensamiento Creativo; Tecnologías Educativas; Educación Artística; Enfoques Interactivos.

INTRODUCTION

Introduce the problem

The integration of digital art into education has become a key issue amid the growing influence of innovation in higher education. Digital technologies now permeate all aspects of specialist training programs.^(1,2,3,4,5,6,7) The traditionally human-centered field of art is no exception. Over time digital resources have been gradually integrated into artistic space. Innovations in the socio-cultural environment have necessitated a reconsideration of the media and broadcasters, and ultimately the creative potential of the art world.^(8,9,10,11,12,13,14) As a result, the creative component of artistic activity has been transformed, which, along with human potential (talent, skills), has actualised the technological and digital format of creativity.

In the educational sector, there have been significant shifts in the positioning of all segments of skills acquired during the learning process. The concept of creativity has lost its exclusively human dimension. Previously shaped solely by humans, creativity has now acquired another agent—digital technologies.^(15,16,17,18,19,20,21) As a result, the content and format of the competencies required to sustain the creative process have evolved, transitioning from general—fundamental and flexible—to specialized—creative and digital skills. Early studies on the integration of digital art into the development of students' professional skills primarily focused on the structural elements of this learning tool.^(8,22,23,24,25,26,27) The active use of digital technologies has shaped their practical and everyday positioning in the educational process. Instead, the use of such large-scale elements in the educational process should be regulated by appropriate methodological algorithms. Therefore, the current study aims to analyse the use of such a tool as digital art in the content dimension. The primary hypothesis of the study is based on the definition of digital art as a tool for acquiring specialised skills by students. It is important to identify digital art as a dimension of digital-creative-skills. The secondary hypothesis of the study is to identify a cluster of skills that are acquired through the use of digital art. The dominance of the functional aspect of digital art activity indicates that it belongs to the fundamental segment of skills. The content and semantic characteristics of digital art in the educational process define it as a tool for flexible skills. In contemporary scholarly and cultural discourse, the impact of technological and digital transformation has given rise to distinct theoretical approaches, including connectivism, which is based on experiential learning and networked knowledge acquisition. The core principles of connectivism, centered on the pursuit of continuous development, position creativity as the primary driving force of this process. In this context, creativity emerges through the active use of digital art as both a generalizing framework and a practical dimension. The present study contributes to addressing existing gaps in the scholarly discourse on digital art and creativity by highlighting the need for a synergistic integration of these components within the cultural and educational paradigm. The hypotheses of the study were systematised in the form of questions that were offered to students in a survey about their perception of digital art activities in the educational process. Some questions are designed to obtain quantitative indicators of the demand for digital art among students. Another part is focused on determining the qualitative characteristics of digital art in shaping the creativity of students.

The practical result of the current study is the interest of students in such an educational tool as digital art, as it is actively used in the educational process. The theoretical result of the study determines the level of demand and the content and semantic positioning of digital art in the educational environment.

Explore importance of the problem

The importance of the current study is determined by the trends of the contemporary socio-cultural space, according to which innovative educational tools acquire relevant roles, losing their auxiliary or secondary status in the educational and methodological arsenal. Digital art has transformed from a creative, technologically

mundane manifestation to a specialised (in our case, educational) tool.

The purpose of the article is to analyse the survey data on the scale and intensity of the introduction of digital art tools into the curriculum. A case study of the problem of introducing digital art requires answers to the question of the functional capacity of this tool to ensure the proper development of creativity in students. On the other hand, the current study also provides answers to the opposite question - whether students are ready to fully use the potential of digital art to acquire the required level of competence.

An important point is the correlation of the results and conclusions of the study with current trends in the development of the educational sector. It is worth noting the increased use of artistic and digital activities in the context of large-scale digitalisation of the educational process.

Describe relevant scholarship

The integration of digital tools into education has become a major focus of scientific and pedagogical discourse over the past decade. Initially driven by theoretical and ideological studies,^(22,28,29,30,31,32,33) research has increasingly shifted toward analyzing the practical and educational impact of specific aspects of digitalization.

Digital art should be considered one of the tools of the educational process, which has become relevant primarily for students of cultural and artistic fields. At the same time, the use of creative and digital activity is also used to train non-artistic specialists. In this context, the literature has attempted to analyse the specifics of the creative dimensions of digitalisation in the general education space and in the context of specialised training of cultural and artistic cluster specialists.^(34,35,36,37,38,39,40) The issue of digital art as a tool in the educational process is addressed in scientific research from several perspectives: digital art as an innovative space^(41,42,43,44) for the student in the context of using its functional characteristics;⁽²⁴⁾ digital art as a learning and training platform⁽³⁶⁾ for the implementation of creative endeavours in traditional and online learning;⁽²⁷⁾ digital art as a medium for introducing the latest technologies: AI,⁽²⁰⁾ VR⁽¹⁸⁾ in education; digital art as a new worldview-mental, psycho-emotional⁽³⁵⁾ and conceptual-significant⁽⁷⁾ nature of human creativity and the formation of its creative potential; digital art as a tool for self-expression,⁽¹³⁾ self-efficacy⁽³⁸⁾ and self-actualization⁽¹¹⁾ in the creative segment.⁽⁴³⁾ Despite the large number of scientific studies on the principles of digitalisation in education, the issue of digital tools becoming key elements of the educational process requires a more thorough analysis. Moreover, the boundaries between technology and art are actually blurring.⁽⁵⁾ It is worth noting the existence of sceptical views on the digitalisation of art education,⁽²⁾ which point to the utopian nature of the merger of technological and natural human creativity. Also, critical views⁽¹⁾ on the aspects of responsible and safe use of digital technologies in the artistic space are becoming more relevant. When the issue of the creative component in the educational dimension is actualised, the problem is exacerbated by the need to clearly define the concept of creative potential. Digital art has demonstrated its resource in the development of creative dimensions in students and received the first estimates of effectiveness.⁽⁴⁴⁾ The current study conducts both a general and in-depth assessment of the demand for digitalisation⁽⁹⁾ in the context of comparing the potential of digital technologies with traditional teaching and learning tools in the acquisition and development of creative skills.

METHOD

The methodological framework of this study is based on a case study—providing both general and in-depth analysis⁽²³⁾ of the integration of digital art tools into the educational process and comparing two types of outcomes: general educational demand and specialized demand. This article employs a qualitative approach to gather students' experiences and impressions as they engage with digital art in their studies. Student feedback generated data that must be organized using general scientific analytical methods, including systematization and comparison. The prioritization of qualitative research is driven by the aim to correlate international universals in the interpretation of digital art with the experiences of students engaged in current educational practices at Ukrainian institutions of higher learning.

Identify subsections

The main practical and methodological tool of the study was a survey. In the questionnaire, students were offered a variety of questions (6 questions): simple questions with clear answer options (Yes or No); questions with graded answers using a Likert scale; questions without answer options, but with an incentive to express their own opinions or share their own experiences. The internal consistency of the Likert scale items, as measured by Cronbach's alpha, is $\alpha > 0,8$, which indicates a good level of reliability and may serve as a validation factor. The choice of the survey method is due to the effectiveness of self-reporting⁽³¹⁾ of students in assessing their own creativity.

Participant (subject) characteristics

The study participants were students of two higher education institutions of Ukraine: Kyiv National University

of Technology and Design and the Mykhailo Boichuk Kyiv State Academy of Decorative and Applied Arts and Design. The participants of the study are applicants for bachelor's and master's degrees in the specialty "Design" and are students of disciplines taught at the departments of graphic design. The sample size ($n = 14$) is small for making generalizations; however, it is important to consider not only quantitative but also qualitative characteristics of the study participants. Currently, Ukrainian institutions of higher education are experiencing a significant shortage of academic personnel, which makes the number of students a reflection of the concentrated presence of learners specifically in the field of the arts. This is particularly valuable for the present study. The following aspects were important factors in selecting participants for the survey: practical use of digital art elements in the educational process; formation of creativity (thinking and skills) for students of artistic fields as a component of professional competences.

Sampling procedures

The study procedure involved asking students to complete a questionnaire about their experience using digital art in the educational process. Throughout the academic year, elements of digital art were actively incorporated into the study of artistic disciplines at the Department of Graphic Design. Therefore, all students who participated in the survey had prior experience engaging in digital art activities.

Given the nature of the case study, the student sample serves informational purposes only and does not establish research representativeness. The key characteristics of the sample include:

- Number of survey participants: 14 students.
- Years of study: second- and third-year students.
- Educational qualification level: Bachelor's and master's degrees.
- Study program: design.
- Department at the higher education institution: graphic design.

The survey was conducted at the initiative of a lecturer from the Department of Graphic Design and involved students who volunteered to answer questions regarding the use of digital art in the educational process and its role in fostering and developing students' creativity.

Educational and professional criteria were applied to the selection of research participants—only students enrolled in artistic educational programs were invited to participate. However, no individual restrictions (such as age, gender, or academic performance) were imposed when selecting respondents.

Sample size, power, and precision

A case study, having no clear parameters for the selection of respondents, involves the actualisation of a large number of variables that affect the characteristics of the case study. In the current study, such variables were:

- Insufficient technological support, which made it impossible to fully use the potential of artificial intelligence, virtual reality and other digital elements of innovative art.
- Lack of clear differentiation between traditional and innovative (in our case, digital art) tools in the formation of knowledge and skills of students.

Despite the presence of factors that did not allow students to fully grasp the possibilities of digital art, the level of implementation of innovative artistic and digital resources allows us to analyse the experience of students gained during their studies.

Measures and covariates

The methodological sequence of the case study consists of two key stages:

- Primary stage: data collection through a student survey.
- Secondary stage: data analysis and organization of the results related to the specified scientific and pedagogical problem.

Research period: november 2024 - survey administration and data analysis.

RESULTS

The survey of students on the relevance of using digital art in the acquisition of creative skills was conducted using a questionnaire with 6 questions. The content and format of the questions allows us to identify the key aspects of artistic and digital activity in the educational process (table 1).

Table 1. Content and semantic background of questions about the use of digital art in the learning process	
Question	Conceptual results of the case study
Question 1. Your attitude to the concept of digital art as a socio-cultural phenomenon.	General understanding of the student's digital resource in the artistic sphere and its positioning in the paradigm of the cultural and artistic space.
Question 2. Were elements of digital art used in the educational process?	A quantitative indicator that indicates the actual use of digital art tools by students during the educational process.
Question 3. Were you expecting the introduction of digital learning materials?	An indicator that reflects the level of perception of an innovative learning format through digital art tools by the student.
Question 4. Have digital art tools helped you develop your creative skills?	Specifying the experience of attracting digital art resources and identifying positive guidelines for the formation of the student's creativity.
Question 5. Can elements of digital art harm the development of a student's creative potential?	Identification of risks and warnings that may actually or potentially have a negative impact on the formation and development of creative abilities.
Question 6. What are the prospects for artistic and creative activity in the educational process?	Personal understanding of the role of artistic and creative component in the acquisition of professional competences

Description: students were offered 6 questions to determine the level of perception, use, relevance and prospects of digital art tools in the formation and development of creative skills and creative thinking.

Question 1 is of a general socio-cultural nature, which determines the students' conceptual perception of digital art as a format of the artistic sphere in general. To enable a more accurate formation of their attitude towards digital art, this question was formulated in terms of a 5-point Likert scale (figure 1).

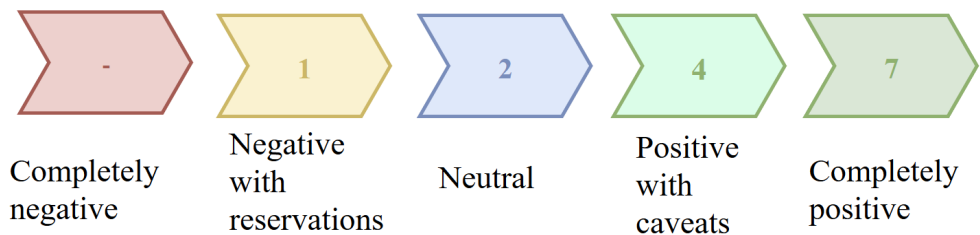


Figure 1. General attitude of students to digital art as a socio-cultural phenomenon, people

Description: the 50 % rate of completely positive perception of digital art and the absence of completely negative assessments indicate a high level of tolerance for the digitalisation of the artistic and creative cluster.

Question 2 is marked by a 100 % (14 out of 14 students surveyed) result of quantitative indicators of the involvement of digital art resources in the curriculum for students in the artistic fields of education. Such indicators indicate the existence of a powerful socio-cultural trend of digitalisation of all spheres of social activity and individual qualities of a specialist. The creative segment has long been left out of the influence of technology, but with the development of artificial intelligence and virtual reality,⁽³²⁾ this segment has begun to actively use digitalisation as a resource source.

Therefore, the introduction of an artistic and digital element into the general professional arsenal of an artist is a logical consequence of the total digitalisation and technologisation of modern society. Obviously, curricula should transform the sources and resources that help students develop their creative potential. The survey results only confirmed the socio-cultural trend in the educational and artistic space.

The next two indicators (Questions 3 and 4) indicate the level of students' perception of digital art as a teaching tool and the level of its effectiveness in the educational process (figure 2).

Description: according to the data obtained, the dominance of positive impressions and experiences from the use of digital art in the initial process can be traced. At the same time, the experience of acquiring real practical creative skills still demonstrated lower rates (8 students in total) than the effect of expecting the effectiveness of digital art (12 students in total). This indicates that in the process of developing competences, students still face problems in developing creative skills using innovative technologies.

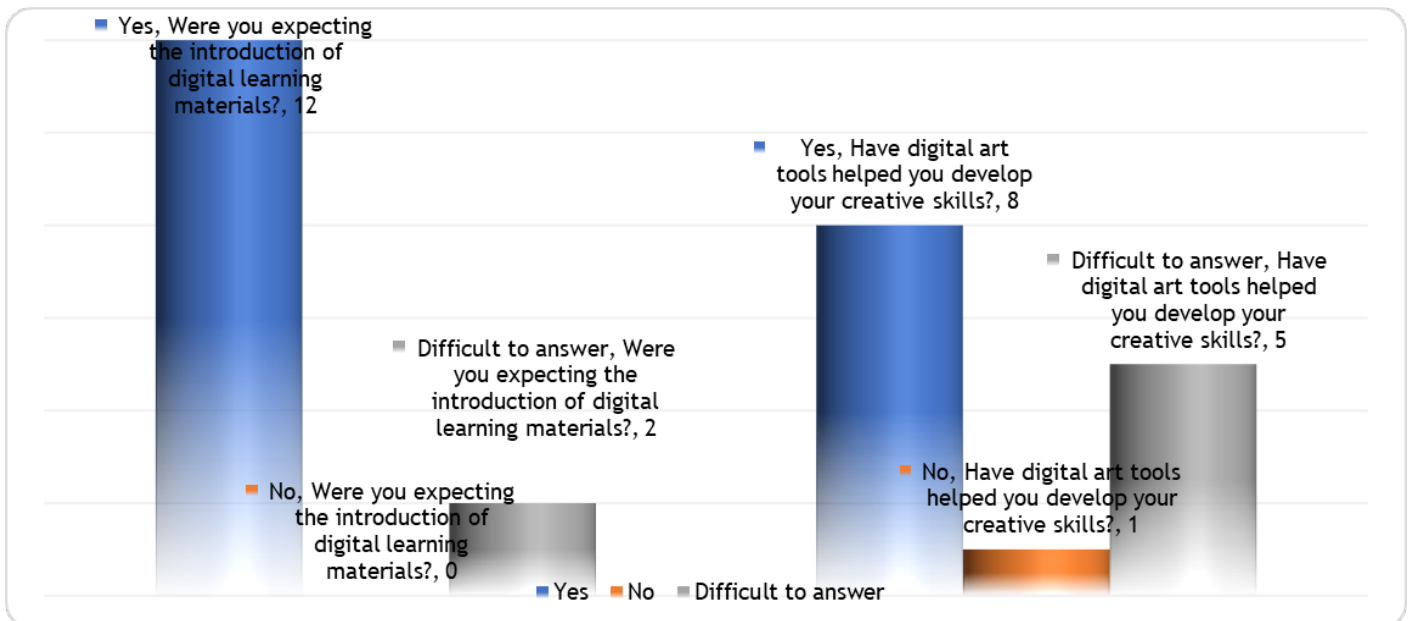


Figure 2. The level of expediency and effectiveness of digital art use for students, people

Question 5 actually divided the survey participants in their views on the threats and risks posed by the use of the digital dimension in artistic creation (figure 3).

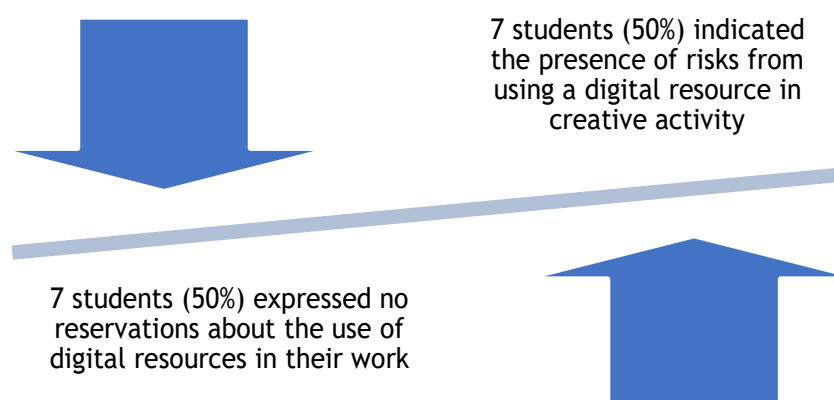


Figure 3. The level of expediency and effectiveness of digital art use for students, people

Description: in general, the results of the survey on the reservations of using digital resources in the acquisition of creative skills are consistent with the general perception of the audience of the principles of digitalisation in the educational and artistic process. Question 6 concerned the personal vision of the prospects of digital technologies in shaping the professional qualities of art students. Almost all surveys agree on the irreversibility of digitalisation in the educational process and the development of creativity through tools such as digital art. Such views correlate with the general trend of post-digital art,⁽¹⁹⁾ for which digital resources do not help to create, but rather create cultural heritage. Global perspectives on artistic and digital activity⁽¹²⁾ create a favourable space for the implementation of these guidelines in the educational sphere.

The students' answers confirm the need to transform the existing educational and methodological guidelines in teaching art disciplines with the obligatory involvement of an innovative and digital component. In the practical educational and artistic space, new principles of training programmes are already being introduced, which are focused on "a creative model of teaching contemporary computer design art based on the model of open learning based on the potential of the Internet".⁽²¹⁾ Art education, when introducing digital technologies, can refer to the successful experience of other related educational fields that have a positive experience of using digital storytelling⁽³⁾ as an innovative learning resource.

In general, the results obtained on the relevance and feasibility of using digital art in the development of students' creativity confirm the research hypothesis in the context of the final formation of the identification of this tool in the educational space. Digital art is clearly positioned as an element of the combination of artificial

intelligence and virtual reality, which are used to create a creative dimension.⁽¹⁰⁾ Therefore, the creative component in the form of creative thinking and creative skills is also acquired by students when using digital resources.⁽¹⁴⁾ The survey demonstrated a 100 % rate of perception of digitalisation as a socio-cultural everyday practical resource that is being implemented in the educational sector. 85 % of respondents perceived digital art as a teaching tool with expectation, and 57 % emphasised the unequivocal positive result of its use in the development of creative skills.

Another dimension of the research hypothesis points to the differentiation of the positioning of artistic and digital activity in the initial and methodological paradigm of the educational sphere. Depending on the specificity of the experience of using digital art elements, the student draws his or her own conclusions about the effectiveness of this resource in acquiring creative skills. Since there is a total conviction (of all respondents who assessed the prospects of digital art in the educational process) that the integration of digital potential into the artistic and creative segment is irreversible, it is worth emphasising the debatable aspects that will potentially arise in the course of such activity.

DISCUSSION

Formation of creative thinking, acquisition of creative skills, improvement of creative activity - all these problems are traditionally relevant in the paradigm of the educational space. If earlier creativity was positioned as a talent not given to everyone, in the modern sense it is “a product of education and training”.⁽²⁶⁾ It is worth separating the request for a creative component for students of cultural and artistic specialities and the creative dimension for students of non-artistic fields. This differentiation allows us to understand the role of digital art in the classical educational paradigm of competences - hard and soft skills.

Student creativity belongs to the cluster of flexible skills in the general educational sense. At the same time, creativity is a fundamental characteristic of the acquisition of professional skills by students of artistic educational programmes. Therefore, discussions on the positioning of creativity in the niches of the competence paradigm have intensified in the scientific and pedagogical space.

It is worth noting that the use of digital technologies is most often resisted by the artistic community, as it is believed that the creative component is an exclusively human characteristic (based on the artist's talent and ability to work). Therefore, in the educational process, the use of digital resources as an educational and methodological tool causes an ambiguous position among students of artistic fields of education, unlike students of other fields and majors. It is also worth considering the position of the teaching cluster, who, according to the results of a similar study,⁽⁴⁾ pointed to the deepening influence of digital resources on the formation of students' creative skills. It should be noted that a comparative analysis of the effectiveness of digital methods and non-digital approaches in the educational process in Ukrainian higher education institutions has been conducted in an unsystematic and, for the most part, situational manner. To evaluate the results, it is necessary to consider the student's ability to apply the skills acquired through the use of the digital art learning cluster in practice (the results of non-digital approaches are already available and systematized), which will serve as an indicator for comparative analysis in the future. The results of the study on the general understanding of the role of digital resources in art education correlate with the indicators of similar studies in the context of digitalisation of education. The unifying dimension of such studies is the data obtained, in which students, understanding the socio-cultural realities and having experience of everyday use of digital technologies, are aware of the irreversibility of introducing this element into the educational process. At the same time, previous studies of creativity still identified student potential as a priority factor in their development,⁽³¹⁾ outlining the supporting role of digital technologies.

Musical art is one of the segments of creative activity in which digital potential is actualized in the modern educational dimension. It is obvious that the digital accompaniment of musical works is being improved and deepened, which necessitates taking these aspects into account in the education of this artistic field. At the same time, there is a need to maintain a balance - both in the creative process and in creative achievements. It is particularly important to emphasize the influence of the socio-political context in Ukraine, especially the stress factors associated with wartime conditions, on learners' creativity and their access to digital tools. Evidently, a combat zone is not a suitable environment for realizing the full potential of innovative educational approaches.⁽⁴¹⁾ Ukrainian learners experience moral and psychological pressure due to the ongoing security threats and socio-political instability. These circumstances may result in incomplete data collected during the case study, as students may lack full access to the operational algorithms of digital art tools. At the same time, innovative approaches provide opportunities to organize the educational process in situations where traditional methods are unfeasible due to complex socio-cultural conditions.⁽⁴²⁾ It is important to compare the data obtained in the present study with future indicators that will not be affected by the adverse influence of the current socio-political context. On the one hand, there is a desire to use digital resources as fully as possible in the process of creating or distributing music content. On the other hand, there is the problem of positioning the author's dimension in the system of a musical product. That is, the question of the dominant

target factor of educational activity is actualized: the formation of skills in the digital processing of an author's work or the acquisition of skills for creating a digital musical work. It is worth noting that the results obtained in the course of the case study have rather optimistic dimensions regarding the perception of digital art as a tool for developing creative skills by art students. On the one hand, such results may indicate the effect of a global impression of the potential of digitalisation and the corresponding expectations of the effectiveness of digital tools in the development of individual or professional creativity. On the other hand, a more critical analysis outlines the problem of the dominant factor in the artistic and creative cluster of culture and education.⁽²⁸⁾ It should be understood that at some point, the potential of artificial intelligence⁽⁶⁾ and virtual reality will be enough not only to support and accompany the artistic and creative activities of a specialist,⁽¹⁷⁾ but also to form the prerequisites for positioning this resource as an alternative⁽²⁵⁾ to humans and their creative abilities. The research perspective is to develop guidelines that will prepare a synergistic basis⁽²⁹⁾ for the digital and creative skills cluster. One option is to combine these skills in a single flexible skills paradigm. However, this option is more relevant for students studying in non-artistic fields. Given that creativity for the cultural and artistic niche of educational training is a concept of fundamental skills, there is a need to form a new competence matrix with a new format for aligning digital and creative skills. The integrated model of creative-digital-skills currently lacks clear methodological guidelines for the coexistence of human potential and technology in the creative process. Therefore, it is necessary to create algorithms for professional creative activity with a clear division of roles: individual (talent, performance) and technological and digital (productivity, verification).

Thus, the survey highlighted socio-cultural trends in the relevance of the introduction of digital resources into the teaching and methodological resources of the educational and artistic sphere. Based on their everyday experience, students perceive the irreversibility of the use of digital art as a factor influencing the development of creative skills. There is a large-scale and intensive supply of digital resources in the implementation of educational programmes. At the same time, students' experience of using digital art tools indicates the prevalence of positive feedback on this format of educational and methodological support for the educational process. The majority of students identify the positive impact of digitalisation on the formation of individual creative potential (creative thinking and creative skills). Despite the growing demand for digital integration in education and the arts, students express concerns about certain aspects of its implementation, particularly regarding the challenges in developing and realizing their creative potential.

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FINANCING

The authors did not receive financing for the development of this research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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