UDC 378.6
MRNTI 18.11
DOI: 10.47940/cajas.v9i2.858

ARTIFICIAL INTELLIGENCE IN EDUCATION: A REVIEW OF THE CREATIVE PROCESS OF LEARNING STUDENTS ON ART EDUCATIONAL PROGRAMS

Meruyert Zhanguzhinova [1]

Temirbek Zhurgenov Kazakh National Academy of Arts
(Almaty, Kazakhstan)

Abstract. The relevance of the study is driven by the advancing development of artificial intelligence (AI), which presents new prospects for the creative education of students on Art educational programs. The research problem lies in the current challenges to traditional art learning practices, which are losing relevance due to changes and the potential integration of artificial intelligence (AI) technologies. The aim of the research is to review the creative learning process of art students to identify: criteria for forming competencies in the fields of visual arts with the application of AI technologies, AI tools for teaching students in the field of visual arts, key competencies in working with virtual tools for students and teachers in the field of education and art, and to define recommendations for the implementation of AI in the art students' learning process. The methodological framework is based on interdisciplinary examination of researchers' works in education and art. Research methods include overview-theoretical, art-historical, methodological-pedagogical analysis, as well as comparative and case–study approaches. The theoretical significance of the research lies in reviewing the trajectories of education in the field of neural networks and providing scientific–theoretical justification for the application of AI technologies in the creative learning process of students enrolled in visual arts programs. The practical value offers recommendations for the formation of modern and efficient educational strategies in the field of art at the student level, including the specification of concepts and terms, defining curricula with new educational methodologies and personalized educational practices, adaptation to changing labor market demand, and laying the groundwork for further research. Implementing the research findings will enable the systematization and optimization of methodologies and approaches to the creative learing process of students on Art educational programs through AI tools, virtual, and augmented reality.

Keywords: artificial intelligence (AI), creative process, students on Art educational programs, educational technologies, training programs.

Cite: Zhanguzhinova, Meruyert. "Artificial intelligence in education: a review of the creative process of learning students on Art educational programs". *Central Asian Journal of Art Studies*, т. 9, № 2, 2024, с. 289–307. DOI: 10.47940/cajas.v9i2.858

Acknowledgments: The authors express their gratitude to the editors of the "Central Asian Journal of Art Studies" for the help in preparing the article for publication, as well as to anonymous reviewers for their attention and interest to the study.

The authors have read and approved the final version of the manuscript and declare no conflicts of interests

Introduction

This article presents a comprehensive analysis of the integration of AI technologies into the creative learning process of students on Art educational programs.

The scientific novelty of the research contributes to the field of art education by providing a prospective analytical perspective on the role of AI in shaping students' creative skills. The level of development of the topic is relevant, as new research and technological capabilities facilitate the integration of perspectives on personalized learning, the creation of artworks using AI, and the analysis of the creative process. Data collection tools included analyzing existing methodologies on AI technologies in the creative learning process of students, as well as interviews with teachers and analysis of creative portfolios of practicing professionals in the field of education and art.

Research Objectives:

- Investigate the challenges and limitations of integrating AI into education and art.
- Identify adaptable AI technologies and information resources to meet the needs of the creative process in education and art.

Determine the effectiveness of AI technologies on educational methodologies through the integration of personalized approaches, creating interactive and engaging educational scenarios for the creative learning process of students on Art educational programs.

- Formulate key competencies in working with virtual tools for students and educators in the field of education and art.

Propose recommendations for the integration of AI into the process of learning students on Art educational programs.

Literature review covers the following aspects:

- *Utilization of AI for personalized learning*: Reimagining our futures together: a new social contract for education. (2021). UNESCO. 188p.
- *Art generation using AI:* Elgammal и др. "CAN: Creative Adversarial Networks, Generating"Art" by Learning About Styles and Deviating from Style Norms". arXiv preprint arXiv:1706.07068, 2017.
- *Utilization of VR and AR in art and education*: Jdaitawi M. et al. "The effectiveness of augmented reality in art education among middle school students". Computers & Education, 2023.
- *Analysis of creative processes using data:* Palle, Dahlstedt. Big Data

and Creativity. (2019). European Review. 27(3). 411–439.

- *Reviews of studies on technologies in education and art*: Talan, T. (2021). Artificial intelligence in education: A bibliometric study. International Journal of Research in Education and Science (IJRES), 7(3), 822–837.
- *Conferences and framework trajectories of AI utilization in education, including art domains*: Beijing Consensus on Artificial Intelligence and Education. International conference on Artificial Intelligence and Education, Planing Education in the AI Era: Lead yhe Leap, Beijing, 2019. 13p.
- *Standarts and official recommendations in learning*: ISO/IEC CD 22989 Information Technology – Artificial Intelligence – Artificial Intelligence Concepts and Terminology.
- ГОСТ Э 59895 – 2021 Технологии искусственного интеллекта в образовании – Общие положения и терминология, – М. 2021 (GOST Z 59895 – 2021 Tekhnologii iskusstvennogo intellekta v obrazovanii – Obshchiye polozheniya i terminologiya, – M. 2021).
- Рекомендации об этических аспектах искусственного интеллекта, Генеральная конференция Организации Объединенных наций по вопросам образования, науки и культуры (ЮНЕСКО) 41–сессия, г.Париж, 24 ноября 2021года. (Rekomendatsii ob eticheskikh aspektakh iskusstvennogo intellekta, Generalnaya konferentsiya Organizatsii Obyedinennykh natsiy po voprosam obrazovaniya, nauki i kultury (YUNESKO) 41–sessiya, g.Parizh, 24 noyabrya 2021goda).

1. Theoretical and methodological foundations of the research:

The primary objective of the research is to explore the challenges and limitations of integrating AI into education and art. The integration of artificial intelligence (AI) into these fields represents a promising direction; however, it is associated with several challenges and constraints. Due to high costs or lack of infrastructure, not all educational institutions and creative organizations have access to advanced AI technologies. Large volumes of data are required for AI to function effectively. In some cases, access to such data is restricted or hindered, slowing down the development and implementation of AI solutions in education and art. Some AI algorithms may be biased or discriminatory, especially if trained on non-representative data.This fact can lead to undesirable consequences, such as exacerbating existing socio–cultural inequalities in education and art. Due to the absence of the human factor, in some cases, the implementation of AI may diminish the significance of the roles of teachers and artists, which can negatively impact the quality of education and the creative process.

Despite the potential for personalized learning and creativity with AI, many current systems are limited in their ability to adapt to the individual needs of students and artists. Technical complexities include issues of confidentiality and security, especially when handling students' and artists' personal data. Implementing AI requires competent personnel for its development, configuration, and support, necessitating training staff to use AI in education and art. A lack of qualified specialists and the complexity of technical training may pose barriers to successful AI implementation. Moreover, the application of AI in education and art also involves ethical issues related to data privacy, the use of technology for student assessment and monitoring, and the impact of AI on cultural values and creative processes.

Despite these challenges and limitations, the integration of AI into education and art still holds tremendous potential for enhancing learning, research, and creativity processes, provided it is approached judiciously and considers

relevant ethical and social aspects. The second objective of the research is to identify adaptable AI technologies and information resources to meet the needs of the creative process in education and art. Subsequently, the implementation of artificial intelligence (AI) in various fields of education and art will be examined.

1.1. Artificial intelligence (AI) in various areas of education is applied to enhance the efficiency of learning, personalize the educational process, and modernize new technologies and learning methods. The review of AI implementation areas in education provides unique opportunities to enhance the quality of learning, personalize the learning process, and prepare students for a rapidly changing world.

1.2. Artificial intelligence (AI) in various artistic fields. It brings innovations and influences the creative process. The third objective of the research is to determine the effectiveness of AI technologies on educational methodologies through the integration of a personalized approach, creating interactive and engaging educational scenarios for the creative learning process of students in Art educational programs.

Below are some of the artistic fields in which AI is actively used: generative art, interactive art, digital design and graphics, musical art, photography and image processing, theater and performing arts, literature and creative writing, film and video art, internet art and virtual reality.

The review of AI implementation areas in various artistic fields demonstrates the diversity and potential of creative applications of artificial intelligence, opening up new creative opportunities, enhancing processes and interaction with the audience, and contributing to the growth of innovations in the world of art and culture.

1.3. Research into international experience of providing educational services in the field of AI has allowed for the identification of bachelor's and master's degree programs.

In the United States, research institutes have been established at leading universities to provide such educational services. In European countries, Japan, and Singapore, AI education is conducted within faculties and departments. In China, AI education in universities has the broadest interdisciplinary coverage across all areas of education and the arts.

Based on the conducted research of foreign universities' experiences in AI education, it can be concluded that this educational methodology is associated with a holistic systemic approach, based on the state's demand for training specialists in this field and its financing. The result is the organization of regular conferences at top scientific venues, funding of scientific projects for various sectors of the economy, modernization of educational programs at universities to prepare students for the demand of sectors in the fields of education, arts, science, and industry.

It is worth noting that within various education conferences, the trend towards education in the use of mobile technologies to transform educational processes and outcomes began in 2011, initiated by UNESCO's "Mobile Learning Week". Additionally, under the guidance of UNESCO, the Recommendation on the Ethics of Artificial Intelligence was developed, which was adopted by 193 member states at the UNESCO General Conference in November 2021. This framework, developed over two years, represents the most comprehensive international guidance on the development and use of artificial intelligence technologies, resulting from extensive global consultations involving experts, developers, and stakeholders from around the world (Recommendations..., 2021).

UNESCO has developed a publication within the framework of the Beijing Consensus aimed at enhancing the readiness of education policymakers to

utilize artificial intelligence. The conference publications are intended for practitioners and specialists in the field of educational policy, providing an understanding of the opportunities and challenges of AI in education, as well as their impact on key competencies in the AI era (Beijing Consensus..., 2019).

The comprehensive review and analysis of the foreign experience in providing educational services in the field of AI allowed to identify that UNESCO's key universal framework trajectories for AI integration in education, which are:

- Generative AI and the future of education (2023).
- Artificial intelligence and the Futures of Learning (Recommendations..., 2021; Reimagining..., 2021; UNESCO..., 2021; Beijing..., 2019).
- K–12 AI curricula: a mapping of government-endorsed AI curricula
- AI and education: guidance for policy–makers (2021).

1.4 Research on Kazakhstani education in providing educational services in the field of AI has allowed for the identification that AI programs at the bachelor's and master's levels are offered in educational programs related to computer engineering and information technology, immersive technologies, mobile sciences, and telecommunications.

In the educational programs of Fine Arts, the Kazakh National Academy of Arts named after Temirbek Zhurgenov is at the forefront of the discipline of Art & Artificial Intelligence at the master's level.

It should be noted that unlike the foreign experience of integrating educational programs into universities, in Kazakhstan, the study of AI is included in some topics of the syllabi but rarely constitutes a separate curriculum. The education on AI in Kazakhstani universities currently mainly has a scientific overview and methodological character. Due to the lack of regulated criteria and legislative framework related to AI education in Kazakhstan, there are no clear guidelines regarding the goals and objectives for training specialists in industries where AI application is necessary. The existing framework standards for AI education in Kazakhstan are based on UNESCO's global recommendations (Recommendations on..., 2021), (ISO/IEC CD 22989, 2022), as well as GOST recommendations (GOST Z 59895 – 2021) from neighboring countries.

However, as of 2024, Kazakhstan actively conducts educational activities, both online and offline, offering courses on the fundamentals of AI for educational, analytical, design, and business projects. In contrast to AI training in Kazakhstani universities, these courses are tailored to specific industries and particular business projects, primarily in the private sector, targeting individual entrepreneurs. The objectives of these courses are to provide subject–specific practical problem–solving methods in various fields, including education, art, design, humanitarian sectors, analytics, business, and many others.

1.4. International experience in education regarding the integration of AI technologies in the creative process of learning students on Art educational programs was examined in the conducted research within the framework of the article's presented topic. It was found that several universities are implementing programs that combine art and AI.

The review of universities worldwide and in Kazakhstan has revealed dynamics in the provision of educational services in the field of AI. The greatest development and scale in AI education have been identified in the United States, where education in this direction is carried out in large, high-ranking specialized research institutes. Additionally, AI education in the field of art in China offers the greatest variety and interdisciplinarity.

In European countries, as well as in some Asian countries, AI is taught in

faculties and departments at universities. In Kazakhstan, AI education is part of the thematic plan within the framework of specialized disciplines of educational programs. The majority of AI education trajectories are represented by faculties operating in the fields of computer science, computer engineering, natural sciences, applied sciences, artificial intelligence, and efficient research programs in machine learning, statistics, information technology, electronics, and others. Alongside the aforementioned programs in various fields of education, it is noteworthy that AI education programs for the arts are in high demand among service consumers.

In several foreign countries (America, Great Britain, Sweden), within interdisciplinary projects, students on Art educational programs apply various AI technologies and applications conducive to creative learning processes.

The aforementioned educational programs represent only a small part of what AI education can entail. AI programs often offer the opportunity to choose specific directions depending on students' interests and labor market needs. AI programs in universities can encompass various specialties related to art and culture. Depending on the educational institution and specific program, students can choose specializations in various areas.

Thus, the conducted theoretical and theoretical review in the field of AI education in foreign and Kazakhstani universities has allowed identifying the main training directions for students and the areas of application of applications for neural networks in education and art. The theoretical review of AI education in foreign and Kazakhstani universities has identified the need to determine the areas of adaptation of neural networks in education and art.

Methods

Areas of application of neural network applications in education and art.

Artificial intelligence can be used in major creative fields such as painting, music, literature, and design, as well as in many other forms of art. This review article will examine the proliferation of AI technologies in the creative process of learning students visual arts. The fourth task of the research is to formulate the key competencies of working with virtual tools for students and teachers in the field of education and art. Currently, the most in—demand training areas for students in visual arts using AI application tools are: *computer graphics and visualization, content generation, interactive art and virtual reality, automated design and drafting, musical artificial intelligence, digital art and new media, Art analysis using data.*

The identified directions represent just a few possible specializations in the field of artificial intelligence. Specializations vary depending on the specific program and the trajectory of the university's education.

The use of neural networks in the educational process opens up new opportunities for personalizing learning, adapting to the needs of each student, and increasing the overall efficiency of the educational system. The study identified methods of using neural networks for the creative learning process of art students:

1) In personalized learning, neural networks can analyze student data and create individualized educational programs, taking into account the knowledge level, abilities, and needs of each student. Based on the AI's ability to generate a multitude of diverse ideas, students develop *divergent thinking.*

2) In adaptive testing, neural networks can be used to create adaptive tests that automatically adjust based on student responses, providing a more accurate assessment of knowledge. With the AI's ability to find optimal solutions to problems, students develop *convergent thinking.*

3) Diagnostics and early problem detection with neural networks help identify

issues in the educational process at early stages and suggest individual support methods. Using AI with exercises on originality and expanding horizons fosters *creative thinking* in students.

Predicting student success with neural networks will allow the analysis of student data and predict their academic success, which helps teachers and administrators make more informed decisions.

The choice of educational programs and, consequently, the formation of competencies using AI technologies depend on the interests and goals of students in the field of art.

Based on the conducted review research of the areas of application of AI technologies, criteria for forming competencies of students in the fields of visual arts were identified, presented below in Table 1.

Table 1.Criteria for forming competencies of students in the fields of visual arts using AI technologies

Criteria for forming competencies of students in the fields of visual arts using AI technologies	
Indicators of the criterion	**Characteristics of the criterion**
Generative art	Facilitates the creation of unique images and artworks based on the author's concept using Promt writing tools (utilizing machine learning methods and artificial intelligence algorithms) (Rawan, M., Raffaghelli, J., Malzahn, N., & Scheffel, M. (2018); Bohnacker, H., Gross, B., & Laub, J., (2012).
Recognition of styles across all areas of art	Modernizes the creation of new artworks based on the analysis and recognition of artistic styles (Wang, X.-Y., Xiao, W. (2021). Daniele, A., Song, Y.-Zh. (2019); Dahlstedt P. (2019); Daniele, A., Song, Y.-Zh. (2019).
Scriptwriting and editing for theater and cinema	Facilitates the creation of scripts, analysis of dramaturgy, and film editing to enhance stylistic aspects through the use of artificial intelligence algorithms (Baker, R. S. (2016), Hill, P., & Barber, M. (2014), Laforge, S., & Wonder, R. (2017).
Virtual characters and spaces	Creates virtual characters using AI with realistic behavior, appearance, voice, and personality based on given parameters. Forms virtual spaces based on the author's concept using Promt writing tools (utilizing machine learning methods and artificial intelligence algorithms) (Tanaka, K., Fushimi, T., Tsutsui, A., Ochiai, Y. (2023); Daniele, A., Song, Y.-Zh. (2019).
Trends and styles in design and fashion	Contributes to utilizing data analysis and AI for forecasting fashion trends and creating new designs.
Personalized design	Integrates AI into the process of creating unique designs, accessories, and new styles based on the author's concept using the Promt writing tools (utilizing machine learning methods and artificial intelligence algorithms) (Rawan, M., Raffaghelli, J., Malzahn, N., & Scheffel, M. (2018); Bohnacker, H., Gross, B., & Laub, J., (2012)..
Restoration and preservation of art and cultural heritage objects	Restores lost or damaged works of art using computer vision AI algorithms (Billgren, U., & Dannecker, L. (2019), Lakomski, G., & Lakomski, J. (2016), Rawan, M., Raffaghelli, J., Malzahn, N., & Scheffel, M. (2018), Slade, D., & Prinsloo, P. (2013).
Interactive exhibitions	Develops interactive exhibitions using AI to adapt to visitors and provide a personalized experience (Tanaka, K., Fushimi, T., Tsutsui, A., Ochiai, Y. (2023); Daniele, A., Song, Y.-Zh. (2019).

The identified criteria for developing competencies in the fields of visual arts with the application of AI technologies have allowed for the determination of key criterion indicators: generative art, style recognition across all art domains, scriptwriting and editing for theater and cinema, virtual characters and spaces, trends and styles in design and fashion, personalized design, restoration and preservation of art and cultural heritage objects, interactive exhibitions.

Thus, the theoretical review of competency development among students has revealed a spectrum of possibilities for AI utilization in the creative learning process of students on Art educational programs.

However, the use of AI in art underscores a fundamental condition for the creative process: the presence of an original creative concept is paramount to the outcomes of education. The use of machine learning methods, algorithms, and all AI technologies cannot replace the human ability to think creatively (Elgammal A., et all 2017; Clark L. & Sood D., 2022; Hoque Md N., et all., 2022; Dahlstedt P., 2019). The distinguishing feature of all projects created by humans, as opposed to artificial intelligence, is the human creative approach, emotional and intuitive components, as well as the ability for abstract thinking and inspiration, which enable the creation of unique and original ideas and concepts.

However, the advantages of creative projects created by artificial intelligence include high speed and efficiency, expanding the possibilities and accessibility of art, innovative approaches, automation of routine tasks, and the creation of virtual worlds and interactive artificial projects.

Definitions of the terms "neural networks" and "artificial intelligence (AI)" represent two differentiated concepts in the context of machine intelligence.

Artificial Intelligence (AI) is a broader concept that encompasses systems emulating human intelligence. AI applications can cover the creation of artistic works, transformation of images into artificial compositions, text generation, data analysis, formation of personalized learning plans, and much more.

A Neural Network (or artificial neural network) is a mathematical model inspired by the workings of the human brain. It consists of interconnected neurons that process information. The goal of neural networks is to solve various tasks such as pattern recognition, classification, prediction, and other forms of data processing. They can be applied in various fields, including machine learning and deep learning. Neural networks represent a specific method, inspired by the structure of the human brain, used within AI to process information.

An artificial intelligence application is software or a system designed to solve specific tasks. The purpose of using AI applications is to solve a variety of tasks depending on their specific purpose. These may include voice assistants, automation systems, image recognition systems, chatbots, and others. In practice, AI applications often involve the use of neural networks, especially in tasks related to data processing and identifying complex patterns.

Some types of neural networks and AI–based applications for educating students in the field of visual arts will be discussed below in Table 2.

However, it is important to emphasize that these programs are not intended to completely replace human labor and expertise in the field of visual arts. They can serve as valuable tools for generating new and original works of art, but they are not capable of replacing the creative process and expert judgment in this domain.

Discussion

There are numerous challenges and limitations associated with the integration

Table 2. AI tools for educating students in the field of visual arts

AI tools for educating students in the field of visual arts	
Name	**Description**
CHAT GPT	Neural networks generate textual descriptions of images using visual data as input. However, they are not capable of creating graphical images directly.
Adobe Sensei	Adobe products, such as Photoshop, Illustrator, and others, integrate a framework that allows for the generation of textual descriptions from images using neural networks.
RunwayML	Iprovides a set of tools and libraries for designers, enabling them to create and implement machine learning models in creative projects.
Canva	Iutilizes machine learning technologies to provide design recommendations, automate processes, and create personalized design solutions.
Watson Studio	Provides tools for working with artificial intelligence and data analytics, including for design and creative tasks.
Artbreeder, AI Painter	An online platform that utilizes genetic algorithms and machine learning to generate unique images, allowing users to combine and edit images
Midjourney	The neural network creates realistic illustrations based on textual descriptions, used in social media, websites, and advertising. Trained on millions of images, it emulates various artistic styles and creates compositions using diverse directions.
Logomaster AI и Looka Logo Maker	Software applications utilize artificial intelligence to create professional logos. They offer a selection of over 100 unique templates, allowing users to customize the logo and download high-resolution files for use in various situations. It is important to note that these applications do not replace the need for a professional designer
GAN	Generative adversarial networks (GANs) are widely used in generating images, videos, audio data, and other types of content.
Heygen.com, Beautiful.AI, Sofabrain.com	They create designs for residential spaces, transform space, and produce beautiful and powerful presentations without the need for design experience.
Colorize.cc, Evoto.AI, Artisto, DeepArt, Prisma	Generating new artworks based on existing photographs, transforming black–and–white photos into color, restoring and editing using photo restoration functions, and providing various artistic styles.
DALL–E, Autodesk Generative Design, Adobe Firefly, Runway.com, Kaiber.AI	They generate creative tasks such as text-to-image, color palettes, image inpainting (Generative Fill), object manipulation (Project Stardust), text-to-video conversion, color palette generation, image inpainting, object manipulation, video creation, photo editing, and music-to-video synthesis.

of artificial intelligence (AI) in the fields of education and art. One of the main difficulties is the potential for AI to replace human labor, which could lead to layoffs and staff reductions. Additionally, the cost of developing and implementing AI may limit access to this technology for many educational institutions, including schools and universities.

Another problem is the unpredictability and instability of AI, which can lead to errors and incorrect decisions. For example, technical glitches or malfunctions in AI systems can disrupt the learning process. Furthermore, resistance to AI integration from some educators may stem from concerns about job loss or loss of control over the educational process.

A concluding issue is the potential use of AI to create counterfeit works of art, which could pose problems with copyright and undermine trust in art. However, it is important to note that AI can also be a tool for generating new and original works of art, opening up new perspectives and sources of inspiration.

Adaptable AI technologies and information resources to meet the needs of the creative process in education and art.

There is a variety of technologies and information resources based on artificial

intelligence (AI) aimed at adapting to the unique requirements of the creative process in the fields of education and art. The application of AI encompasses various spheres, including but not limited to, the creation of new artistic works, transformation of photographs into artificial compositions, text generation, data analysis, development of personalized educational programs, and other aspects of creative activity.

The adaptation of artificial intelligence (AI) technologies and information resources to the needs of the creative process in education and art represents a significant strategic approach aimed at innovative development in these areas. The implementation of adaptive AI technologies may include the following aspects:

Personalized Learning – the development of intelligent educational platforms capable of adapting to the individual needs of students in the field of art. This includes analyzing levels of knowledge, preferences, and learning styles to create personalized educational programs.

AI-based Creative Tools – creating innovative creative tools that utilize AI to support and stimulate the creative process. These tools can provide intelligent suggestions, generate ideas, and provide visual and auditory effects to inspire artists and students on Art educational programs.

Art Generation – applying AI–based content generation algorithms to create new artistic works. This may include generating images, music, literary works, enriching the creative process.

Analytics and Feedback – using AI–based analytical tools to assess and analyze students' creative work. Feedback can be provided considering artistic criteria and styles, facilitating their further development.

Virtual and Augmented Reality – integrating virtual and augmented reality technologies with AI to create interactive artificial environments where students can interact with the creative process in new and innovative ways.

Collaboration between Designers and AI – fostering research aimed at the interaction between artists and AI systems for joint creation of unique and creative works.

These technologies and resources are intended to enrich the educational process and foster creative growth in the field of art, providing an individualized approach and innovative learning methods.

The effectiveness of AI technologies on educational methodologies through the integration of personalized approaches and the creation of interactive and engaging educational scenarios for the creative learning process of students on Art educational programs is a focus of research. The adaptation of AI in the educational context aims to develop unique approaches for each student based on their individual needs and level of knowledge.

In the field of education and art, AI-based technologies and information resources are widely used to adapt to the needs of the creative process. An example of such innovation is the implementation of personalized learning, which customizes the content, pace, and learning methods according to the individual needs of each learner. The effectiveness of such technological solutions is demonstrated in AI's ability to create personalized educational plans that take into account the individual abilities and preferences of students in the field of art.

Results

Integration of AI into educational methodologies also contributes to the development of interactive scenarios that stimulate active student engagement with educational content. For example, AI-driven applications can generate new artworks, transform photos into artistic compositions, generate text, analyze data, and develop personalized learning plans. This includes the creation of educational

apps capable of generating creative tasks and providing instant feedback, thus fostering creative thinking and self-expression. The use of AI technologies also enables the development of virtual and augmented realities, creating immersive learning environments that facilitate effective material absorption and the development of artistic skills. Thus, the integration of AI technologies into educational methodologies in the field of art aims to enhance learning efficiency through personalized and interactive approaches, enriching the creative process for students.

However, it is important to note that these technologies and resources are not intended to replace human labor and professional expertise in the field of visual arts. They serve as valuable tools to stimulate the creative process and create original artworks, but they cannot replace the creative intuition and expert opinion of artists.

Key competencies for working with virtual tools for students and educators in the field of education and the arts. Working with virtual tools in education and the arts requires certain key competencies

Table 3. Key competencies in working with virtual tools for students and educators in the field of education and arts

Table 3.
Key competencies in working with virtual tools for students and educators in the field of education and arts

Competency	Description
Digital Literacy	Ability to effectively work with computers, software, and virtual platforms, including navigation, file handling, and information exchange.
Critical Thinking	Key competency involving the ability to analyze information, evaluate its reliability and applicability. This skill set covers various important elements such as information analysis, credibility assessment, relevance evaluation, systematic thinking, argument identification and logic, reflection, tolerance of ambiguity, and making informed decisions. These aspects of critical thinking are important both in the educational process and in everyday life, enabling effective navigation of the information space and making informed decisions.
Creative Skills	Ability to generate new ideas, create original works of art, and find unconventional solutions.
Communication Skills	Ability to effectively communicate with others, work in teams, and express thoughts and ideas.
Visualization Technology Mastery	Skills in working with graphic editors, virtual drawing tools, modeling, and image processing software.
Interactive and Multimedia Tech	Understanding the principles of creating and implementing interactive and multimedia elements in educational materials.
Virtual and Augmented Realities	Experience with virtual and augmented reality technologies for creating and interacting with virtual images and environments.
Creative Art Technologies	Knowledge of tools for generating creative works, including applications for creating virtual art and content generation tools.
Collaboration in Virtual Environment	Ability to effectively interact and collaborate in virtual educational environments, including online communication and file exchange.
Data Security and Technology Ethics	Understanding the basics of network security, ability to protect data confidentiality, and adherence to ethical norms when using virtual tools.
Adaptation to New Technologies	Readiness to constantly update and expand skills in accordance with the emergence of new virtual tools and technologies.
Assessment and Feedback	Skills in analyzing and evaluating results created using virtual tools, as well as providing constructive feedback.
Technology Integration	Ability to integrate virtual tools into learning and develop innovative educational methodologies.

from students and educators. In the table 3 below are the main skills that are important for effective use of virtual tools in this field:

Mastering these competencies enables students and educators to utilize virtual tools most effectively within the context of education and the arts. These competencies can be developed through the use of virtual tools, such as applications utilizing artificial intelligence (AI) and other technologies that assist students and educators in working with data, creating new artworks, and communicating with one another. However, it should be noted that AI technologies cannot replace human labor and expertise in the field of visual arts. They can be useful tools for creating new and original artworks but cannot replace the creative process and expert judgment.

Main provisions

Recommendations for implementing AI in the student Arts education process. Based on the conducted research, the fifth task is to propose recommendations for implementing AI in the student arts education process. The integration of artificial intelligence (AI) into the process of educating students on Art educational programs can significantly enrich the learning experience and stimulate the creative potential of students. In table 4 below are several recommendations for

Table 4. Recommendations for implementing ai in the student arts education process

Table 4.

Recommendations for implementing ai in the student arts education process

Competency	Characteristics of competencies
Teacher Training	Teachers need training on using AI in curriculum planning. Conducting workshops for students and teachers with experts in the field of arts and technology to integrate their experience and the potential of technology into curricula.
Selection of Suitable Tools	Research and selection of optimal AI tools for art creation, data analysis, and personalized learning for educational purposes.
Personalized Learning	Applying AI to individualize educational plans considering each student's characteristics.
Creative Tools	Using AI applications to generate ideas, propose creative concepts, and assist students in the creative process.
Virtual and Augmented Realities	Utilizing virtual and augmented reality to create educational scenarios and virtual art exhibitions, as well as encouraging students to create their virtual exhibitions using VR technologies and online platforms.
Feedback and Assessment	Implementing an AI system for more effective feedback on student work and automated assessment, as well as identifying their strengths and suggesting directions for further creative development.
Industry Collaboration	Establishing partnerships with the industry to provide students with real–world experience in working with AI in art and supporting them in mastering new technologies. Creating virtual communities for sharing experiences and support among employers, students, and teachers.
Ethics and Safety	Learning students AI ethics and high standards of data security so that they can consciously integrate new technologies into the creative process. It is important to maintain a balance between the use of AI and respect for human creativity.
Research Projects	Supporting student projects in creating new AI applications in art. Using virtual tools for collaborative work between students and teachers and the exchange of creative ideas. Using AI-powered applications to generate ideas and enrich the creative process.
Effectiveness Evaluation	Implementing a system to evaluate the effectiveness of AI usage in education with regular analysis of results and adjustments. Integrating technologies for learning students' data analysis, statistics, and information usage to support creative decision–making.

successfully integrating AI into educational practices in the field of art:

Conclusion

Thus, the conducted research has identified the key challenges for education and art in Kazakhstan:

1) The lack of a state normative and legislative base for the implementation of AI. Due to the intensity of innovations in education and art, there is a need to update the content and teaching methods of AI-related disciplines in universities. To establish a unified Interuniversity Standard for the use of AI in higher and postgraduate education, which was reviewed on December 20, 2023, by the Republican Educational and Methodological Council under the Ministry of Education of Kazakhstan, it is necessary to create unified recommendations for teacher training programs (non-specialized specialties) and administrative staff, teaching methodologies, ethical aspects of AI use in the educational process; Development of infrastructure and digital architecture of higher education in Kazakhstan; staff training at the School of Artificial Intelligence.

2) To adapt AI technologies and information resources to the needs of the creative process in education and art, it is necessary to scale up the implementation of the School of Artificial Intelligence to a larger number of students, open business incubators, and introduce educational programs in artificial intelligence, data science, machine learning, cybersecurity with the creation of accompanying artificial intelligence laboratories.

3) The introduction of AI into education and art requires careful planning, training, and adaptation. When properly implemented, this can significantly enrich the educational process and stimulate students' creative activity through the integration of personalized approaches, creating interactive and engaging educational scenarios for the creative process of student learning.

4) Focusing on the development of data competencies through the use of virtual tools such as artificial intelligence (AI) applications and other technologies provides unique opportunities for the education and creative development of students and teachers in the visual arts field.

5) The identified competencies can be developed through the use of virtual tools such as applications utilizing artificial intelligence (AI) and other technologies that help students and teachers work with data, create new artworks, and communicate with each other. However, it should be noted that these technologies cannot replace human labor and expertise in the field of visual arts. They can be useful tools for creating new and original works of art, but cannot replace the creative process and expert opinion.

References

Miao, Fengchun, et al. "AI and education: guidance for policy–makers". UNESCO, 2021. p. 45. https://doi.org/10.54675/PCSP7350

Antonio, Daniele, Yi–Zhe, Song. "AI + Art = Human". AIES '19: Proceedings of the 2019 AAAI/ACM *Conference on AI, Ethics, and Society,* 2019, p. 155–161. https://doi.org/10.1145/3306618.3314233

Axel, Schaffland, et al. "New Interactive Methods for Image Registration with Applications in Repeat Photography." SUMAC'20: Proceedings of the *2nd Workshop on Structuring and Understanding of Multimedia heritage Contents,* October, 2020, pp. 41–48. https://doi.org/10.1145/3423323.3425749

Baker, Ryan. "Data mining for education: Handbook of educational data mining." CRC Press, 2010.

Beijing Consensus on Artificial Intelligence and Education. International conference on Artificial Intelligence and Education, *Planing Education in the AI Era: Lead yhe Leap, Beijing*, 2019. 13p. Results – UNESCO Цифровая библиотека

Billgren, Uyan, and Dannecker, Lee. "Artificial Intelligence in Education: Current Progress and Future Perspectives". Frontiers in Education, 2019.

Bohnacker, Hartmut, Gross, Benedikt, and Laub, Julia, Lazzeroni, Claudius (ed.), *Generative Design: Visualize, Program and Create with Processing,* Princeton Architectural Press, Princeton, 2012.

Ahmed, Elgammal, et al. "CAN: Creative Adversarial Networks, Generating "Art" by Learning About Styles and Deviating from Style Norms", 2017. https://doi.org/10.48550/arXiv.1706.07068.

Draft text of the Recommendation on the Ethics of Artificial Intelligence. UNESCO: SHS/IGM–AIETHICS, 2021, 28p. Draft text of the Recommendation on the Ethics of Artificial Intelligence – UNESCO Цифровая библиотека

Generative AI and the future of education. UNESCO: UNESDOC–Digital Library, 2023, 8p. Generative AI and the future of education – UNESCO Цифровая библиотека

Herman, Daniel. "Adaptive Learning Technologies: Tailoring Psychomotor Instruction to the Needs of Individuals". Journal of Research on Technology in Education, 2010.

Hill, Paul, and Barber, Max. "Building a Data Culture: A framework for measuring data–based decision–making capacity in American education". Washington, DC: Data Quality Campaign, 2014.

Ichiroh, Kanaya, et al. *Interactive art to go. ACE '14: Proceedings of the 11th Conference on Advances in Computer Entertainment Technology*, November, No.:48, 2014. pp. 1–4 https://doi.org/10.1145/2663806.2663871

ISO/IEC CD 22989 *Information Technology – Artificial Intelligence – Artificial Intelligence Concepts and Terminology*, 2022. https://www.iso.org/standard/74296.html

Jordan, Michael, and Mitchell, Tom. *Machine learning: Trends, perspectives, and prospects*, Science, 2015.

Karola, Marky and Annika, Kilian, et al. "Intelligent Music Interfaces: When Interactive Assistance and Augmentation Meet Musical Instruments." CHI EA '22: Extended Abstracts of the 2022 CHI Conference on *Human Factors in Computing Systems*. No.: 84, pp. 1–4, 2022. https://doi.org/10.1145/3491101.3503743

Kengo, Tanaka and Tatsuki, Fushimi, et al. "Method and Case Studies of Designing Tactile Graphics for Inclusive Tactile Picture Books by Digital Fabrication and Generative AI". SIGGRAPH '23: ACM SIGGRAPH 2023 Labs, No.: 10, 2023. pp. 1–2. https://doi.org/10.1145/3588029.3595471

Koreen, Andrew, and Soffer, Tim. "Adaptive e–learning: A review and comparison of multiple learner characteristics." *International Journal of Artificial Intelligence in Education*, 25(2), 2015, pp.134–150.

K–12 AI curricula: a mapping of government–endorsed AI curricula, UNESCO. 2022, 60p. K–12 AI curricula: a mapping of government–endorsed AI curricula – UNESCO Цифровая библиотека

Lynda, Clark and Divij, Sood. "Working Backwards: Creating a Character Backstory Generation System Using Idealized Creative Writing Outputs: Creating a Character Backstory Generation System Using Idealized Creative Writing Outputs." FDG '22: Proceedings of the 17th International Conference on the *Foundations of Digital Games*, No.: 29, 2022, pp. 1–9. https://doi.org/10.1145/3555858.3555867

Malek, Jdaitawi and Fatima, Muhaidat, et al. The Effectiveness of Augmented Reality in Improving Students Motivation: An Experimental Study, Athens *Journal of Education*. Volume 10, Issue 2, 2023. pp. 365–380. https://doi.org/10.30958/aje.10–2–10

Md Naimul Hoque, Bhavya Ghai, Niklas Elmqvist. "DramatVis Personae: Visual Text Analytics for Identifying Social Biases in Creative Writing". DIS '22: Proceedings of the 2022 ACM Designing Interactive Systems Conference, 2022. pp. 1260–1276 https://doi.org/10.1145/3532106.3533526

Palle, Dahlstedt. Big Data and Creativity. *European Review*, 27(3), 2019. 411–439. DOI: 10.1017/S1062798719000073

Philippe, Pasquier and Arne, Eigenfeldt, et al. "An Introduction to Musical Metacreation." Computers in Entertainment (CIE), Volume 14, Issue 2, No.: 2, 2016, pp. 1–14 https://doi.org/10.1145/2930672

Rawan, Max and Raffaghelli, Joe, et al. "Designing a Learning Analytics Framework: Insights from a Large–Scale European Project". *Journal of Learning Analytics*, 2018.

Recommendations on the ethical aspects of artificial intelligence, General Conference of the *United Nations Educational, Scientific and Cultural Organization (UNESCO)* 41st session, Paris, November 24, 2021.

Reimagining our futures together: a new social contract for education. UNESCO, 2021, 188p. https://doi.org/10.54675/ASRB4722

Talan, Tarik. "Artificial intelligence in education: A bibliometric study." International *Journal of Research in Education and Science (IJRES)*, 7(3), 2021, pp. 822–837.

Tianjiao Guo, Jie Yang, Qi Yu. "Deep Learning Based Neovascularization Detection in Color Fundus Photography Image." ICCAI '23: Proceedings of the 2023 9th International Conference on *Computing and Artificial Intelligence*, 2023, pp. 40–45 https://doi.org/10.1145/3594315.3594322

UNESCO Strategy on technological innovation in education (2021–2025). 2021, 5p. UNESCO Strategy on technological innovation in education (2021–2025) – UNESCO Цифровая библиотека

"International Conference on Artificial Intelligence in Education (AIED)". 2023. https://easychair.org/cfp/AIED2023

Xiaojiao, He. "Automatic Recognition System of Landscape Portrait Photography on Account of AI." APIT '23: Proceedings of the 2023 5th *Asia Pacific Information* Technology Conference, 2023, pp. 146–151 https://doi.org/10.1145/3588155.3588179

Xuan–Yao, Wang and Wei, Xiao. Application of Video Big Data in Technical Art Training, 2021.

ICIMTECH 21: Retracted on September 15, The Sixth International Conference on *Information Management and Technology*, No.: 296, 2021, pp. 1–4. https:// doi.org/10.1145/3465631.3465969

GOST Z 59895 – 2021 Tekhnologii iskusstvennogo intellekta v obrazovanii – Obshchiye polozheniya i terminologiya, M. 2021. [GOST R 59895 – 2021 Artificial intelligence technologies in education – General provisions and terminology,] Moscow, 2021. (in Russian)

Жангужинова Меруерт,
Темірбек Жүргенов атындағы Қазақ ұлттық өнер академиясы
(Алматы, Қазақстан)

БІЛІМ БЕРУДЕГІ ЖАСАНДЫ ИНТЕЛЛЛЕКТ: ӨНЕР БІЛІМ БАҒДАРЛАМАЛАРЫ БОЙЫНША СТУДЕНТТЕРДІ ОҚЫТУДЫҢ ШЫҒАРМАШЫЛЫҚ ПРОЦЕСІНЕ ШОЛУ

Андатпа. Зерттеудің өзектілігі өнер студенттеріне шығармашылық білім берудің жаңа перспективаларын ұсынатын жасанды интеллекттің (ЖИ) прогрессивті дамуына негізделген.

Зерттеудің проблемасы жасанды интеллект (ЖИ) технологияларын интеграциялау мүмкіндіктері мен өзгерістердің енгізілуімен байланысты сұранысын жоғалтқан өнерді оқытудың дәстүрлі тәжірибесіне қатысты қазіргі кезеңдегі талаптарға байланысты болып отыр. Зерттеудің мақсаты студенттер мен оқытушылардың өзара қатынасындағы білім беру нәтижелері мен креативті үдерісіне ықпалын анықтауға көңіл аудару үшін перспективті тәсілдерді, сондай-ақ өзекті тенденцияларды анықтау мақсатында жасанды интеллект технологияларын зерттеу және талдау болып табылады.

Әдістемелік негізі білім беру және өнер саласындағы зерттеушілердің еңбектерін пәнаралық зерттеуге құрылған. Зерттеу әдістері ретінде теориялық шолу, өнертану, әдістемелік-педагогикалық талдау, компаративті тәсіл және кейс-стади алынды. Зерттеудің теориялық маңыздылығы нейрондық желілер саласындағы білім беру траекторияларына шолу жасауда және бейнелеу өнері бағдарламалары бойынша студенттерді оқытудың шығармашылық процесінде жасанды интеллект технологияларын қолданудың ғылыми-теориялық негізделуінде. Тәжірибелік маңыздылығы студенттер деңгейінде өнер саласындағы заманауи және тиімді білім беру стратегияларын қалыптастыру бойынша ұсыныстармен қамтамасыз етіледі: ұғымдар мен терминдерді нақтылау, жаңа білім беру әдістерімен және жекелендірілген білім беру тәжірибесімен оқу бағдарламаларын анықтау, еңбек нарығының өзгермелі талаптарына бейімделу, ары қарайғы зерттеуге негіз қалау. Зерттеудің нәтижелерін енгізу өнер саласындағы студенттерді жасанды интеллект, виртуалды және шындықпен толықтырылған құралдармен оқытудың шығармашылық үдерісінің әдістері мен тәсілдерін жүйелеуге және одан әрі жетілдіруге мүмкіндік береді.

Тірек сөздер: жасанды интеллект (ЖИ), шығармашылық процесс, өнер білім бағдарламалар бойынша студенттері, білім беру технологиялары, оқыту бағдарламалары.

Дәйексөз үшін: Жангужинова, Меруерт. «Білім берудегі жасанды интеллект: өнер білім бағдарламалары бойынша студенттерді оқытудың шығармашылық процесіне шолу». *Central Asian Journal of Art Studies*, т. 9, № 2, 2024, с. 289–307. DOI: 10.47940/cajas.v9i2.858

Алғыс: Авторлар «Central Asian Journal of Art Sdudies» журналының редакторларына мақаланы баспаға дайындауға көмектескені үшін және анонимді рецензенттерге зерттеуге назар аударып, қызығушылық танытқаны үшін алғысын білдіреді.

Авторлар қолжазбаның соңғы нұсқасын оқып, мақұлдады және мүдделер қайшылығы жоқ екендігін мәлімдейді.

Жангужинова Меруерт

Казахская национальной академии искусств имени Темирбека Жургенова
(Алматы, Казахстан)

ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ В ОБРАЗОВАНИИ: ОБЗОР КРЕАТИВНОГО ПРОЦЕССА ОБУЧЕНИЯ СТУДЕНТОВ ПО ОБРАЗОВАТЕЛЬНЫМ ПРОГРАММАМ ИСКУССТВА

Аннотация. Актуальность исследования обусловлена прогрессирующим развитием искусственного интеллекта (ИИ), что предоставляет новые перспективы для креативного обучения студентов искусства. Проблема исследования заключается в текущих вызовах к традиционным практикам преподавания искусства, теряющим востребованность в связи с внесением изменений и возможностей интеграции технологий искусственного интеллекта (ИИ). Целью исследования является изучение и анализ технологий искусственного интеллекта (ИИ) для выявления актуальных тенденций, перспективных подходов для концентрации внимания на их влиянии на креативный процесс и образовательные результаты взаимодействия преподавателей и студентов.

Методологическая основа базируется на междисциплинарном изучении трудов исследователей по образованию и искусству. Методы исследования включают обзорно-теоретический, искусствоведческий, методико-педагогический анализ, компаративный подход и кейс-стади. Теоретическая значимость исследования заключается в обзоре траекторий образования в области нейронных сетей и научно-теоретическом обосновании применения технологий ИИ в креативном процессе обучения студентов по программам визуального искусства. Практическое значение предоставляют рекомендации для формирования современных и эффективных образовательных стратегий в области искусства на уровне студента: конкретизация понятий и терминов, определение учебных программ с новыми образовательными методиками и персонализированными образовательными практиками, адаптация к изменяющимся требованиям рынка труда, формирование базы для дальнейших исследований. Внедрение результатов исследования позволит систематизировать и оптимизировать методики и подходы креативного процесса обучения студентов искусства инструментами ИИ, виртуальной и дополненной реальности.

Ключевые слова: искусственный интеллект (ИИ), креативный процесс, студенты по образовательным программам искусства, образовательные технологии, программы обучения.

Цитирование: Жангужинова, Меруерт. «Искусственный интеллект в образовании: обзор креативного процесса обучения студентов по образовательным программам искусства». *Central Asian Journal of Art Studies,* т. 9, № 2, 2024, с. 289–307. DOI: 10.47940/cajas.v9i2.858

Благодарности: Авторы выражают благодарность редакции «Central Asian Journal of Art Sdudies» за помощь в подготовке статьи к публикации, а также анонимным рецензентам за внимание и интерес к исследованию.

Авторы прочитали и одобрили окончательный вариант рукописи и заявляют об отсутствии конфликта интересов.

Автор туралы мәлімет:

Жангужинова Меруерт Еркінқызы – педагогика ғылымдарының докторы (Phd), профессор, Сценография кафедрасының меңгерушісі, Темірбек Жүргенов атындағы Қазақ ұлттық өнер академиясы (Алматы, Қазақстан)

Сведения об авторе

Жангужинова Меруерт Еркеновна – доктор педагогических наук (Phd), профессор, заведующий кафедры Сценография Казахской национальной академии искусств имени Темирбека Жургенова (Алматы, Казахстан)

Information about the author:

Zhanguzhinova Meruyert Yerkenovna – PhD, Professor, Head of Scenography, Temirbek Zhurgenov Kazakh National Academy of Arts (Almaty, Kazakhstan)

ORCID ID: 0000-0002-9124-4099
E-mail: aumira@mail.ru