

Innovations and Challenges of AI Technology in Visual Art Education: A Systematic Review Based on General Systems Theory (2019–2024)

Xiaoyu Zhang

Institute for Advanced Studies, Universiti Malaya, Kuala Lumpur, Malaysia, Postcode 50603.
ORCID iD: <https://orcid.org/0009-0007-2473-9378>
Email: s2171176@siswa.um.edu.my

Wong Seng Yue*

Academy of Malay Studies, Universiti Malaya, Kuala Lumpur, Malaysia, Postcode 50603.
ORCID iD: <https://orcid.org/0000-0001-9278-4348>
Email: wongsengyue@um.edu.my

Kenny Cheah Soon Lee

Department of Education Management, Planning and Policy Faculty of Education,
Universiti Malaya, Kuala Lumpur, Malaysia, Postcode 50603.
ORCID iD: <https://orcid.org/0000-0001-9881-582X>
Email: kennycheah@um.edu.my

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Abstract: The sphere of visual art has been mostly transformed by the invention of AI technology, providing new ways and means to the education process and artistic craft to make the learning and teaching process more engaging and efficient. Credit to this absorption, however, are the added problems of originality, ethics and system adaptability. In this paper, the research approach using General Systems Theory (GST) is applied to quantitatively examine the implementation and impact of the AI technology in teaching visual art during the period of 2019-2024. The findings show that due to the adaptation of the learning process to individual peculiarities using AI-based adaptive learning systems and the usage of Generative Adversarial Networks to enhance the level of the creativity and engagement of the students, they can work on a wide variety of various types and forms of art and are enabled to receive an immediate response. In the meantime, one can identify such ethical problems that confront educational practices as the ownership rights to the copyright and the use of the AI tools.

Keywords: Missing. Artificial Intelligence in Art Education, Visual Art Pedagogy, General Systems Theory, Adaptive Learning Systems, Ethical Challenges of AI.

1. Introduction

1.1. Background of Research

The innovative boost of the visual art education has been caused by the rapid development of the Artificial Intelligence (AI) approach over the last years. In the potential to design any artistic design and student profiles, AI facilitates teaching instruments and enhances student learning experiences (Chen & Stroup, 1993). As a case in point, Generative Adversarial Networks (GANs) and style transfer algorithms enable students to work with different artistic styles, provoking creativity.

Individualized learning portals make learning more efficient with real-time feedback (Korepanova, Annus & Väljataga, 2024). The implementation of AI is especially promising as it increases the creative liberties of students as well as increases the accessibility of instructional materials by providing previously unavailable solutions to tackle the drawbacks of conventional instructional strategies within the art of visual education (Berryman, 2024; Goodfellow et al., 2020).

The vision of visual art education is the development of creativity, aesthetics, and culture, where the student develops different expressivity and adaptability and thinks about the world innovatively (Su, Zhang & Tang, 2025). Nonetheless, formal methods of teaching visual arts usually experience limitations of resources, time, and space; therefore, it is not easy to reach individual learning requirements (Chiu et al., 2024). New channels to solve these problems can be achieved through Artificial Intelligence integration. For example, transferring styles algorithms will help students sample various artistic styles effectively, whereas customized learning systems will improve the learning process with their real-time feedback cues (Crompton & Burke, 2023).

Although there is a long history of AI use across the creative sectors, there is a paucity of systematic studies on its usage in visual art learning. The current research is limited as it mainly concentrates on explaining the technical capabilities of the AI tools (i.e., the generation of art and style transfer) rather than giving a deeper study of how the technologies improve the learning experience and engagement and of the consequences to address the question.

1.2. Theoretical Framework

The institution of visual art education is a complicated system that consists of various interdependent factors, among which teachers, students, are the subject matter taught, equipment used during the lessons, and the environment in which the classes take place. All these factors are in a dynamic interaction, which influences the educational ecosystem (Von Bertalanffy & Sutherland, 1974). The classic research in education uses linear approaches to study effect of one variable. Nevertheless, these models do not exhaustively describe the relationships of the many parts composing a system as well as the dynamic relationship and variations among them (Chen & Stroup, 1993).

1.2.1. Core Concepts of General Systems Theory

Originally proposed by Von Bertalanffy and Sutherland (1974), the General Systems Theory (GST) tries to utilize the structures and interconnections within complex systems with a system-based perspective thinking. GST highlights the completeness of system and the interrelationship between the various components of a system by arguing that the existence of changes in one component of a system will affect the total functioning and outputs of a system. GST is a powerful theoretical instrument in education, with which researchers examine the dynamic nature of relationships in educational systems and how multidimensional variables interrelate (Chen & Stroup, 1993). The main principles of GST constitute the follows:

- (1) Holism: Nothing in an educational system stands independently of each other

(ex, teachers, students, curriculum content and instructional tools) but exists as a complex whole.

A system is dynamism, is a dynamic activity whereby the interactions between the components continue to vary with the change of time and the environment.

3. Mechanism of Feedback: The education system comprises two-way feedback loop between an input (e.g., teaching resources, technological tools) and output (e.g., student learning outcomes, classroom interaction efficacy) that will lead to experiences optimization of the overall system.

1.2.2. Application of GST in Educational Research

General Systems Theory (GST) has also been used widely in the study of multidimensional interaction in a complex teaching scenario in education. Another example is in which Chen and Stroup (1993) would use GST to do research in a sense of reforming science education, but here they would go to examine the systemic impacts of the teaching strategies and the learning environments. Similarly, Crompton and Burke (2023) state that they calculated the use of AI technology in college education based on the GST framework, namely the manner, in which this technology can be utilized to satisfy the needs of teaching practices and student needs. The introduction of AI technology, a new element, in the already existing system of education can be understood through an analytical framework provided by GST within the context of teaching visual art:

(1) Interaction between AI Technology and Teacher Roles:

AI tools like style transfer algorithms offer teachers more flexible instructional resources. However, they may also shift the traditional teacher-centered role toward supporting technology-driven personalized guidance.

(2) Impact of AI Technology on Student Creativity:

Technologies like Generative Adversarial Networks (GANs) and personalized learning platforms can inspire students' creative interests. However, potential risks, such as limiting students' independent creativity, must be evaluated.

(3) Reconstruction of the Teaching Environment:

The integration of AI technologies such as Virtual Reality (VR) and Augmented Reality (AR) reshapes classroom interaction patterns and learning environments, transforming traditional educational dynamics (Egunjobi & Adeyeye, 2024).

1.2.3. Relevance of GST to This Study

This study employs the General Systems Theory (GST) framework to analyze the integration of AI technology into visual art education, focusing on the following three aspects:

(1) Dynamic Relationships among System Elements:

Analyzing the change in internal interaction mode of the system because of AI technology in terms of its effects on teaching methods, learning habits of students, and curriculum development (Chen & Stroup, 1993).

(2) Interaction between Technology and Ethics:

Researching issues like copyright ownership and originality in art created by AI-

based mechanisms and implications on the overall balance of the educational system (Floridi & Cowls, 2022).

(3) **Feedback and Improvement Mechanisms:**

Degree of success of AI tools surveyed based on the feedback mechanisms provided by GST and evaluation of how easy it is to be a student in the framework of the system optimizing itself (Saputra et al., 2024).

1.3. Research Questions

1.3.1. Research Gaps

Despite the growing application of Artificial Intelligence (AI) technology in visual art education, the following gaps persist:

(1) Lack of Systematic Analysis

Existing research primarily focuses on the technical functionalities of individual tools, such as GANs and style transfer algorithms, without systematically analyzing the comprehensive impact of AI technology on student learning outcomes, creativity, and teaching effectiveness.

(2) Limited Studies on Educational Practice

Empirical research on how AI technology transforms teaching methods and student engagement in natural educational settings is scarce, leaving uncertainties regarding its practical classroom applications.

(3) Ethical and Originality Concerns

Such problems like copyright rights and the originality of AI-created pieces of art have no evident solutions. All of these difficulties can influence the intellectual level of students on the creative process and make the process of developing their independence in artistic creation difficult.

1.3.2. Research Questions

Based on these gaps, this study addresses the following core questions:

- (1) What are the primary applications of AI technology in visual art education, and how do they impact teaching methods and student learning outcomes?
- (2) How does AI enhance student creativity and learning engagement through innovative approaches?
- (3) What are the ethical and originality challenges associated with AI technology in visual art education?

1.4. Research Objectives

This study aims to systematically review the applications, impacts, and challenges of AI technology in visual art education from 2019 to 2024. The specific objectives are:

- (1) To analyze the applications of AI technology in visual art education and its impact

- on teaching methods and student outcomes.
- (2) To explore how AI technology enhances student creativity and learning engagement.
 - (3) To identify ethical and originality challenges AI technology poses in visual art education and propose potential solutions.

1.5. Significance of the Study

Visual art education is a significant area of innovative talents formation, and the integration of this category with AI technology will be beneficial to this form of education. This collocation will widen experience in the field of education and will offer new opportunities in motivating learners to think critically and creatively. The relevance of the study can be voiced as follows:

(1) Practical Significance

By engaging in the study of specific possibilities of applying the AI technology in the sphere of visual art education, this work will provide new teaching tools and learning paths to teachers and students.

(2) Theoretical Significance

The given analysis will bridge the research gap related to the systemic impact of the AI technology on the visual art education, and may offer another new analytical approach, the framework of the General Systems Theory (GST).

(3) Ethical Significance

By analyzing the questions of the originality and copyright of the AI-generated works of art, the paper could be used as a reference source on the evolution of the guidelines of ethical technology applications and help to promote sustainable increase of integration between education and technology.

2. Literature Review

2.1. AI in Education: Revolutionizing Learning Processes

Artificial intelligence (AI) is also rapidly reshaping the education sector, and personalized learning, automation, and instructional decision-making are some of the most meaningful contributions made by AI to the education sector. Intelligent Tutoring Systems (ITS) like ALEKS and Squirrel AI help in giving a dynamic learning path to the students and help in learning complex ideas effectively (Zhang et al., 2023).

Also, AI technology is particularly successful at relieving the pressure on educators. Grade and assessment systems are automated, enabling teachers to spend extra time that they have on meeting the individual needs of the students (Baker et al., 2023). Moreover, learning analytics solutions profoundly examine data that reflects student behavior to allow educators to detect troubled learners to provide them with specific interventions. Although the AI technologies have

shown significant success in STEM education and language learning, there is still little research conducted regarding the application of AI technologies to the arts (especially to visual art education).

2.2. AI in Creative and Artistic Domains

Artificial Intelligence (AI) technologies have been used in the creative industries, in particular. Generative Adversarial Networks (GANs) applied to the artworks to generate AI art can be characterized by adversarial training, which makes them powerful tools possessed by artists (Goodfellow et al., 2020).

Malytska et al. (2022) argue that the role of art education in society is creativity and cultural awareness. Artificial intelligence in visual art education promotes this objective by offering a wide range of interactive ways students can explore cultural heritage. Further, the development of style transfer algorithms and apps such as DeepArt, enables people to enter the world of artistic creation with very limited technical requirements since one can easily transfer an artistic style to an image.

In a similar way, generative AI technologies such as DALL·E show that AI can imitate and create new variants of traditional artistic styles, expanding the opportunities of digital art creation (Ioannidou, Ioannidou & Lenakakis, 2024). These technologies are making the creation of art more democratic; it is an unexplored area when it comes to art education.

2.3. Visual Art Education and AI Integration

Art education can be facilitated with the help of AI in education due to the fact that AI can help build 21st-century skills and improve the process of solving problems and creative thinking (Benvenuti et al., 2023). Student exposure to artworks created by AIs introduces a sense of appreciation to artistic expression in terms that the traditional art of craftsmanship could not fulfill and invokes a greater interest in art (Chiu et al., 2024).

Al Hashimi et al. (2019) also strengthen this argument by highlighting how multimedia tools could foster a more creative learning experience through enhanced rich learning. This implies that teacher-centred Art education on AI-driven multimedia platforms has the potential to expand student creative thinking and enable them to process content more profoundly.

In line with the role of AI in advancing the learning motivation of students associated with visual art education, Mun (2022) accentuates that aesthetic integration in STEAM education can be an effective component to stimulate the emotional engagement of learners. Nevertheless, when compared to STEM, AI implementation in visual art education has various challenges, which are the complexity of using technology, resource constraints, and a lack of expertise among the teaching staff (Lage-Gómez & Ros, 2024).

2.4. Ethical Considerations in AI Art Education

Ethical concerns regarding the use of AI in art teaching will no longer be ignored as the use of AI in both fields continues to grow. The study by Benvenuti et al. (2023) suggests that ethical reasoning must be a part of the process of the adoption of

AI in education.

To begin with, copyright and originality of AI-created content have become a matter of dispute. As an example, can AI be considered as the author of a piece of art, or does the final copyright belong to the user of the AI (McLoughlin, 2025), and second, can any of the biases toward Western cultures built into most AI-based systems lead to non-Western forms of art being ignored or poorly represented, thus constraining artistic exploration (Floridi & Cowls, 2022). Du and Xie (2021) underline the importance of AI products being ethical and less biased, especially in terms of visual art education, so that student works from different backgrounds can be evaluated in an appropriate manner due to having fewer biased judgments.

2.5. Research Gaps and Contributions

Despite the growing attention to AI applications in education and creative domains, significant research gaps remain in the context of visual art education:

(1) Lack of Systematic Analysis:

In the majority of the studies, the technical capability of separate AI tools is considered without devoting enough attention to the systemic meaning of the integration of AI-based technologies into the educational ecosystem (Crompton & Burke, 2023).

(2) Limited Research on Creativity and Engagement:

Studies on the influence of AI on the creativity of students and their engagement in the learning process are few. The current body of literature is either in the form of a case study analysis or a conceptual framework without an in-depth empirical examination.

(3) Insufficient Examination of Ethical Challenges:

Such aspects of AI-generated art in education as copyright ownership and cultural diversity have not been approached sufficiently well in current research.

This paper uses General Systems Theory (GST) to systematically review how visual art education can use AI technology. It dwells on the effect of AI tools to increase student creativity, positive teaching results, and mitigate ethical issues. Through the filling of these gaps, this study offers theoretical and practical recommendations to actualize AI technology in visual art education, thus making the integration of AI technology in visual arts ethical and effective.

3. Methods

In order to assess the existing use of artificial intelligence in teaching visual art and its problems and perspectives in a systematic way, this paper adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist. The systematic reviews was conducted covering the period from 2019-2024.

3.1. Database Search

This study retrieved literature from the ScienceDirect and Web of Science databases to conduct an empirical investigation into the application of artificial intelligence in visual art education. The following Boolean keyword combinations were used for the search:

("Artificial Intelligence" OR "AI") AND ("Visual Art Education" OR "Artistic Creation") AND ("2019–2024")

("AI Tools" OR "AI-assisted") AND ("3D Modelling" OR "Augmented Reality" OR "Virtual Reality") AND ("Art Education")

3.2. Searching Criteria

The search criteria were designed to identify articles focusing on the application of artificial intelligence in visual art education. Inclusion and exclusion criteria were applied based on the research objectives (Table 1).

Table 1: Inclusion and Exclusion Criteria.

Inclusion Criteria	Exclusion Criteria
1. Studies involving the application of AI technology in visual art education	1. Studies unrelated to the research topic
2. Articles reporting educational outcomes and ethical issues	2. Non-empirical studies or review articles
3. Articles published in peer-reviewed journals	3. Conference papers, book chapters, news reports, etc.
4. Articles published between 2019 and 2024	4. Non-English literature

3.3. The Screening Process

This test involved strictly adhering to the PRISMA process to provide scientific rigor and completeness of the systematic review. At first, the searches of the database retrieved 57547 articles. On deleting 10,512 records of duplications, 47, 035 articles remained. Only the studies published between 2019 and 2024 were kept during the time range filtering, whereas 97 works that were published prior to 2019 were excluded after the time range, thus remaining 46,938 articles. Journal articles were only selected to narrow down on the research topic eliminating 1,632 conference papers, 2,162 books, 373 book chapters and 75 anonymous articles. This action left a database of 42696 articles.

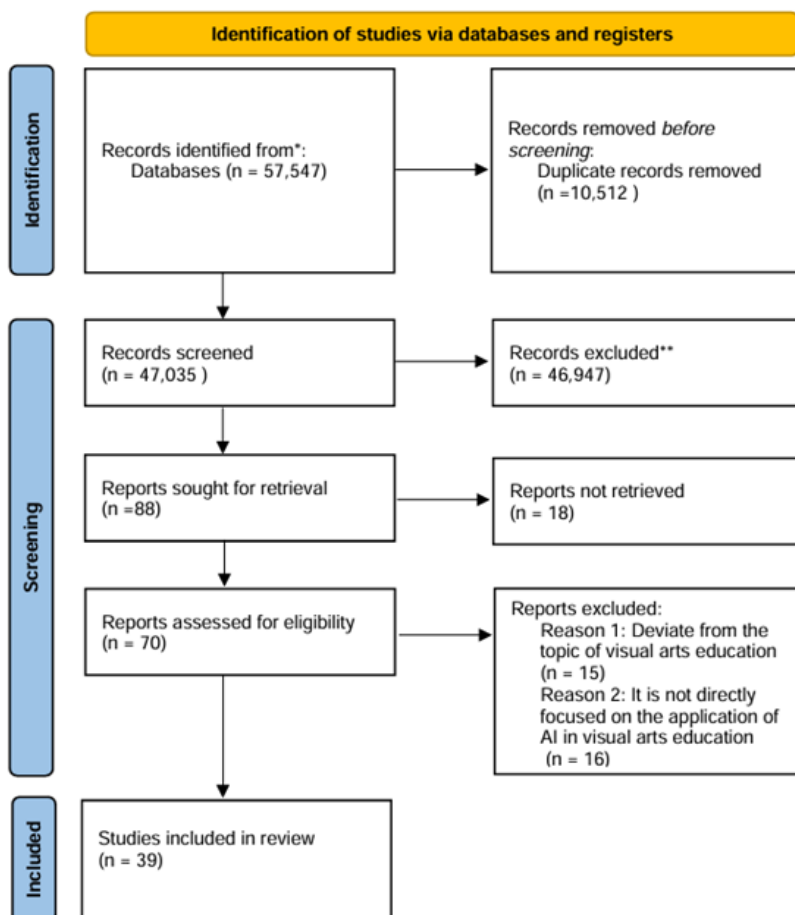
During the keyword screening phase, the search terms "AI," "art education," "3D modeling OR AR/VR AND creativity," and "ethical originality" yielded 6,748, 38, 272, and 155 articles, respectively, for a total of 432 relevant articles. This process excluded 42,264 unrelated articles.

In the title and abstract screening stage, further exclusion criteria were applied to eliminate studies that did not pertain to education or visual art or did not detail the application of AI tools in teaching. This step excluded 343 articles, leaving 88 for further review. At the full-text screening stage, the total number of articles that were excluded includes 18 articles that were inaccessible, 15 articles that were not related to visual art education, and 16 articles that were not directly about the

use of AI in visual art education. In the end, there were 39 articles retained. These articles touch upon the practical implementation of AI in visual art education and the challenges related to it.

Several authors conducted the screening to be in a position to guarantee its validity. The first author did the initial screening and the full-text examinations to ensure that the inclusion requirements are met. The second and third authors independently re-reviewed 20-30 percent of the articles to verify the validity and stability of the result of the screening. The demonstration in this study collected 39 valid papers, a formidable source of information on a systematic analysis of the role of AI in teaching visual art. The procedures involved in the screening process are shown in Figure 1.

Figure 1: PRISMA Flowchart.



3.4. Data Extraction and Coding

To strategically explore how visual art teaching is carried out in response to the

use of AI technology and its impacts on the educational ecosystem, the current study formulated a multidimensional coding outline about the General Systems Theory (GST) framework. GST emphasizes the dynamics of the relationships and interactions within an educational system's framework. It is a good start to gain practical pointers in examining how AI technology fits into the art education system (Xu & Ouyang, 2022). By placing the principles of synergy (holism), change (dynamism), and feedback systems of GST, this study was methodologically able to utilize the information found in the identified literature and thus derive and classify information.

3.4.1. Data Extraction Process

The data extraction process involved the following steps:

(1) Basic Information Recording:

Author and Year: Recording the authors and publication year of the studies.

Research Method: Identifying the type of method used, such as experimental design, case study, or theoretical exploration.

Sample Size: Documenting the number and background of participants (e.g., educational level, region).

(2) AI Technology Applications:

Type of AI Tools: Including Generative Adversarial Networks (GANs), Augmented Reality (AR)/Virtual Reality (VR) platforms, and generative AI tools such as DALL-E.

Educational Contexts: Describing specific applications of AI in classroom teaching, extracurricular learning, or online platforms.

(3) Educational Outcomes:

Student Performance: Documenting the impact of AI technology on students' creativity, learning interests, and skill development.

Teacher Roles: Analyzing how AI supports or challenges teaching efficiency and strategies.

(4) Ethical and Originality Challenges:

Examining issues related to copyright ownership, originality disputes, and privacy concerns arising from AI use in educational practices.

3.4.2. Design and Application of the Coding Scheme

In the given study, content analysis was applied relying on the main principles of a General Systems Theory (GST) so that the systematic and practical use of data analysis was provided. The 39 articles were selected and the information that was extracted and coded has to be critical. Table 2 shows the classification dimensions and the specific content of the coding scheme.

Table 2: Design and Application of the Coding Scheme.

Element	Dimension	Type
Subject	Instructor involvement	1. Support 2. Not support
	Creativity expression	1. High creativity 2. Moderate creativity 3. Low creativity
	Educational level	1. Primary school 2. Secondary school 3. High school 4. Higher education
Information	Learning content	1. Art theory and styles 2. Digital art 3. Interdisciplinary content
Medium	Educational tools	1. AI drawing tools, e.g., DALL-E 2. 3D modeling tools, e.g., Blender, MAYA 3. AR/VR platforms
Environment	Educational context	1. Traditional classroom 2. Online platforms, e.g., MOOCs 3. Hybrid learning environment
Technology	AI technology type	1. AI-generated art, e.g., Stable Diffusion 2. Personalized learning algorithms 3. Interactive creation systems
Ethics and Originality	Copyright and Ownership	1. Ownership issues 2. Data privacy challenges 3. Artistic originality issues

3.4.3. Classification Example

Table 3: Data extraction from selected studies.

Author and Year	Research Method	Sample Size	AI Tool Type	Educational Outcomes	Ethical and Originality Issues
Crespo and McCormick (2022)	Case Analysis and Theoretical Discussion	No specific sample size	ANNs, Generative Networks	Expanded artists' ability to address complex ecological themes	Limitations in the diversity of AI-generated content; issues with originality and physical-digital boundaries
Chandrasekera, Hosseini and Perera (2025)	Quasi-Experimental Design	40 design students	DALL-E	Significant improvement in design creativity and task performance; reduced cognitive load	Dependence on AI may weaken long-term learning ability; issues of originality and design ownership
Guan et al. (2024)	Quasi-Experimental Design	40 elementary students	VR Immersive Drawing Tools	Enhanced adventurousness and imagination; improved collaborative regulation quality	Metaverse platforms may impact students' social psychology; risks of creativity dependency on technology

The papers look into the role played by AI and technology in creativity and learning. Crespo and McCormick (2022) emphasize that AI enhances the artistic skills but has weaknesses of diversity and novelty. According to Chandrasekera et al. (2025), better design students had employed DALL-E, but in their research, there was a fear that learning will be lost in the long-term. In a study by Guan et al. (2024), VR has an advantage in improving imagination and teamwork, but the researchers factor in the psychological outcomes and technological addiction (Table 3).

3.4.3. Handling Ambiguous Classifications and Consistency Checks

In the process of coding, there were articles that had two or more themes or vague divisions. This paper employed an unambiguous classification approach in order to be consistent and accurate. The priority on categorizing the articles according to the specific target of the research was done by their purpose of research. For example, the survey by Chandrasekera et al. (2025) which focused on the impact of DALL-E on enhancing design students' creativity, was coded under "text-to-image generation tools. To check the reliability of the coding results, a consistency check mechanism was established. The initial coding of all articles was done by the first author, and a randomly chosen 30 percent of articles were independently coded by the second and third authors. Any disagreement in the coding results in cases was resolved by consulting the team.

3.5. Data Analysis

Microsoft Excel was utilized as the primary data upload and analysis tool to systematically analyze the extracted data to reveal patterns and distributions of AI technology in visual art instruction. In the data organization stage, the identified articles have been placed in the corresponding categories per the coding scheme so that a systematic table has been formed with primordial data regarding each of the studies (e.g., author, year, research method, sample size) and the respective categories (e.g., teaching tools, educational outcomes). The frequency distribution across various coding dimensions was statistically analysed using Excel's pivot table function. As an example, the frequency of usage of various AI tools was determined, such as Generative Adversarial Network (GANs) applications, interactive technologies (AR and VR), Generative AI (GenAI, e.g., DALL-E, ChatGPT and MidJourney), multimedia interactive applications, or deep learning models (e.g., ANN, CNN, and DQN). By ranking the most commonly used tools, as demonstrated in Table 2, GANs and interactive technologies were used the most, as both tools were mentioned 11 times, hence their wide applicability to studies in visual art education, especially generative art and educational innovation.

4. Results

The proposed research included a systematic review of 39 identified articles, categorized them into and summarized the tasks that AI technology can perform and the challenges it may produce in visual art education in accordance with the five dimensions of General Systems Theory (GST), namely, actors, information, media, environment, and technology:

4.1. RQ1: Applications of AI in Visual Art Education and Its Teaching Effects

The integration of AI technology is significantly transforming teaching effectiveness in visual art education, as reflected in the following aspects:

4.1.1. Actors and Information: Student Creativity and Learning Content

AI technology presents the new opportunities of creative student development and increasing learning content. The article by Kim et al. (2019) has shown that

technology is capable of enhancing student creativity in education, which is the good indication of the use of AI in visual art education. These technologies promote creative thinking that is critical using experimental exercises and real-time feedback. Besides, the author has also found that structured activities in art are a good way to develop cultural literacy and creativity among the students and thus indicated that AI tools can boost their cultural knowledge and creative perception by providing them with enriched cultural experiences (Fomina, 2021).

This sentiment is supported by the use of Generative Adversarial Networks (GANs) that was mentioned in 39 percent of the papers that were analyzed. The GANs, as Hughes, Zhu and Bednarz (2021) demonstrated, have the potential to utilize the ideas of creativity in the learning process of visual art by enhancing the principles of human-machine collaboration and interaction, and allow students to gain deeper knowledge of design concepts. Similarly, Puggioni et al. (2021) found that immersive VR technology enhances engagement and learning retention rates of students significantly, which indicates that immersive AI platforms will play a crucial role in enhancing student grasp of artistic concepts.

Additionally, Valachová et al. (2021) has backed the comprehensive quantification of art education to assist in quantifying creativity and self-expression to a larger degree, and AI can provide feedback with a special evaluation system. Hitsuwari et al. (2023) note that AI-assisted art has the potential to foster collaboration among the students involved who enjoy the levels of beauty by collaborating with one another and broadening their creative boundaries in this manner. Toledo Lara (2023) demonstrated that the visual-arts learning AI technology offers accuracy in feedback and content during the production process and sparks student interest and inspiration. Williams et al. (2023) evaluated the application of GANs to the creative training of schoolchildren of secondary educational institutions and concluded that the networks helped students understand technical transformations and inspired artistic creativity in them.

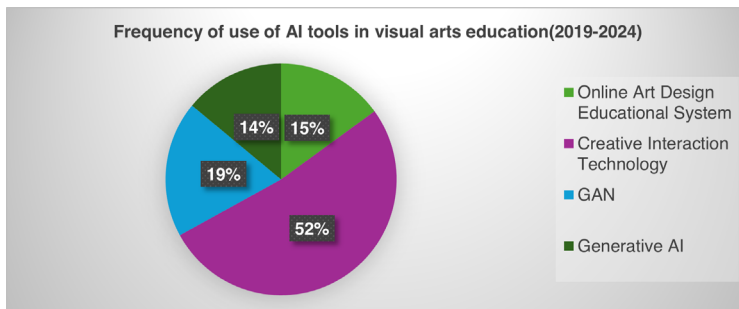
4.1.2. Media and Environment: Teaching Tools and Learning Environments

The use of multimedia sources and digital tools improve creative process and enable students to be more engaged in exploration of artworks due to the AI technology. According to Al Hashimi et al. (2019), such tools provide multiple opportunities of creativity. To illustrate, Vretos et al. (2019) demonstrated that AR, in its real-time responsiveness, can create a dynamically balanced task difficulty on the basis of the emotional states of students to enhance their motivation and engagement in learning.

Furthermore, Gubenko et al. (2021) stressed a significant presence of robotics in terms of exploring the cycle, which helped the students to remember and refine their artistic procedures. As Kim, Lee and Cho (2022) explained, technology and creativity work together to create an innovative way of thinking, giving an implementation of how AI can be beneficial in learning through the interdisciplinary approach of art learning.

Lorusso, Colizzi and Adamo (2024) noted that AI technology can simulate various artistic styles, offering students more apparent visual references. This is useful not only with their comprehension of classical art features but also in their appreciation of elaborate artistic skills. At the same time, Wang and Zhang (2023) discovered that young art and design students were fond of using generative AI tools due to their productivity and artistic results.

Figure 2: Frequency of use of AI Tools in Visual Arts Education (2019-2024).



To visually demonstrate how different AI tools are used in visual art education, the researchers developed a pie chart (Figure 2) demonstrating the prevalence of the AI tools used between 2019 and 2024. This graphical representation offers an informal understanding of the trends in the use of AI tools in the discipline.

4.1.3. Technology and System Optimization: Enhancing Multi-Element Interactions

The benefits of AI technology in the visual art education application of multi-elements interactions incorporate system optimization processes: a feedback loop within the General Systems Theory (GST), which offers an enhanced learning experience to students. Kim et al. identified that 28 percent of the literature they reviewed referred to art integration and strongly suggested that AI, meant to facilitate the spread of interdisciplinary education, should be widely used (Kim et al., 2019). As Mørch (2020) showed, automated feedback powered by AI can reduce the workload of teachers and simultaneously provide instant feedback to students, allowing them to improve on their creative tasks without direct guidance. On the same note, Gubenko et al. (2021) demonstrated that generate-and-explore models enhance the innovation capacity of students.

Puggioni et al. (2021) found that virtual reality technologies immerse students into the experience of learning art history and cultural heritage, increasing their cultural awareness and offering new forms of teaching in art education. The AI-powered technology of the virtual art instruction program created by Yang (2021) allows the learning to take place, offering teachers-specific feedback and customizing the learning pathways. As a point underscored by Rong, Lian and Tang (2022), interactive learning experiences matched with AI and VR can spark student interest, dramatically improving their impression and creativity.

Furthermore, work by Tang et al. (2022) said that AI tools engage students in interactive activities, engaging their creativity collaboratively. Tigre Moura, Castrucci and Hindley (2023) revealed that AI-human unification promotes the novelty of the visual artworks, which proves the role of AI in the progress of the visual art learning. Wang and Zhang (2023) accentuated that generative AI tools are able to influence creative thinking as they offer entertaining experiences, which easily leads to increased student engagement. Chandrasekera et al. (2025) explored the integration of technology in design courses where AI was demonstrated in sharing

cognitive load that also promoted innovation. Grájeda et al. (2024) suggested that AI was reframing higher education by providing increased personalized and adaptive learning journey. As the research by Lee and Suh (2024) shows, the possibilities of the generative AI in the metaverse open innovative prospects related to the creation of content and interaction.

Overall, AI applications in visual art education focus on three primary areas:

- (1) Enhancing students' creativity and learning interest through creative experimentation and personalized feedback.
- (2) Improving students' attention and knowledge retention via immersive tools and interactive platforms.
- (3) Achieving deeper integration of technology and education through system optimization mechanisms.

4.2. RQ2: How AI Enhances Creativity and Engagement

AI technology enhances students' creativity and learning engagement in visual art education through various approaches, as outlined below:

4.2.1. Actors and Information: Creativity Development and Optimization of Learning Content

GANs and Generative Art tools give students a large amount of creativity latitude by simulation of many artist styles. It was also stated by Al Hashimi et al. (2019) that application of multimedia tools would be capable of improving creativity by further enriching the learning process by stating that AI-assisted multimedia tools can make students even more creative when looking and being introduced to art. According to the findings of Jaiswal, Kumar and Badr (2020), GANs can create anime-style facial designs by themselves learning datasets, which suggests that AI tools allow students to innovate different art styles and develop their creative potential.

AI-enhanced creativity and prepares students to deal with fast-evolving systems, Nguyen, Mai and Anh Do (2020), which makes sense because AI tools give students greater freedom to exercise their creative ideas. Similarly, AI supports students' motivation and creativity through emotional interaction, as stated by Kim et al. (2022). In visual art education, AI tools provide emotional and cognitive support, helping students create more confidently.

Tomšič Amon (2022) discovered that augmented reality (AR) and virtual reality (VR) provide interactive experiences, which are greatly beneficial to improve the interest and creativity of students, and accordingly, analogous AI-based tools in visual arts education could be valuable motivational learning experiences. Since AI, as demonstrated by Jin et al. (2023), provides adaptability, the level of enthusiasm and entertainment in art classes among students rises dramatically, providing them with creative experimentation opportunities.

The study conducted by Toledo Lara (2023) has revealed that students of visual art have gained expert artistic assistance through AI tools and this boosts their awareness of various artistic styles and practices. In addition to it, the artistic abilities of AI can enable the students to familiarize themselves with the unorthodox forms of art, as discussed by Liu (2023) and present the creative minds with the variety of art articulations.

High-resolution digitization and simulation of a style to accurately reproduce the texture and detail of the past artwork is a possibility, which is discussed by Lorusso et al. (2024). This would come up with a different aspect of teaching the visual art, since the students would be allowed to learn more details about the slight differences of the artistic styles. According to Park, Kang and Kim (2024), AI-created works cannot be easily differentiated by viewers, which proves AI as a motivator of creative thinking regarding art training.

An interesting point about the generative AI tools, including text-to-image and image-to-image generators, as reported by Horvath and Pouliou (2024), is that it does this by automating several elements of the creative process, leading to increased creative potential in designers. This member is in line with the objectives of visual art education since the same tools can be used to help the students explore creativity as well as help them to have a greater involvement in the creative process. Zhao observed that the use of AI in visual art education is gaining more opportunities to boost the creativity and interest of students discussed by Zhao (2024).

4.2.2. Media and Environment: Interactive Tools and Immersive Learning Experiences

AI technologies provide extremely interactive learning conditions using virtual reality (VR) and augmented reality (AR) environments. Gejendhiran et al. (2020) explained the purpose of VR in immersive studies and indicated that AI-induced VR allows students to learn more about the style of art and its historical background using active experiences during art learning.

The example of 3D environments supporting hands-on interactive learning with the help of the ABR model, provided by Mørch (2020) demonstrates that AI-assisted virtual spaces can support the creativity of the visual art education by the means of a hands-on activity. Through the historical context, the role of history in integrating cultural competence into teaching art. This can be implemented through AI, which offers generative models of other styles in art and the interactive resources about the history backgrounds so that the students could comprehend different styles in art.

Yang showed that 3D virtual simulation technology could be used to add value to art education (Yang, 2021), showing the effectiveness of the online education system based on immersion in learning and retention of knowledge in students. This justifies the use of AI-promote learning environment in visual art education. On the same note, Tomšič Amon (2022) emphasized the adoption of digital technologies in addition to conventional methods of art education. The introduction of AI technology in visual art schooling must be made in such a way that students with proper appreciation of the importance of hand-made.

Guan et al. (2024) investigated the implementation of the metaverse technology in collaboration with painting within the academic environment. They have observed that SSRL- type collaborative painting in the information of the digital metaverse can give important information about the way the developed digital technologies including AI can create immersive learning environments in art education stimulating creativity and enhancing learning performance. According to Henriksen, Mishra and Stern (2024), AI-based learning environments can make students more creative due to learning experience being personal and interactive.

Lee and Suh (2024) applied generative AI tools, such as ChatGPT and MidJourney, in fashion design education and proposed educational strategies based on the TPACK model. These measures succeeded in improving creative thinking and participation among students. The model is in use as regards visual art education, in which AI can be used to empower students in their interest in various forms of art and facilitate cooperation.

4.2.3. Technology and System Optimization: Dynamic Feedback Mechanisms and Personalized Support

These measures succeeded in improving creative thinking and participation among students. The model is in use as regards visual art education, in which AI can be used to empower students in their interest in various forms of art and facilitate cooperation. Real-time feedback based on artificial intelligence hugely improves the independent learning skills of students. Vretos et al. (2019) emphasize that emotional-detection-based senses improve the immersive environment of VR. It implies that AI can track the real-time reactions of students in art learning and automatically adapt the teaching content, which will create a richer learning environment.

Gejendhiran et al. (2020) observed that AI-supported personalized learning provides feedback that addresses the needs of students, meaning that, for visual art education, AI may assist students in getting personalized instructions when they are in the process of creating work and enhancing learning. Goenaga (2020) claimed that GANs can be perceived as a partner in the process of creation and emphasized the potential value of AI as a co-creator in the context of art education, instead of a mere tool.

Jaiswal et al. (2020) also noted that GAN models are flexible in different design requirements, meaning that comparable models of AI in visual arts education would permit creating instruments to accommodate various creative tasks on a scalable basis. According to Nguyen et al. (2020), adaptability and creativity were listed among the necessary skills that educational innovations should be prioritized in the future. This supports the integration of AI tools in art education to prepare students for diverse creative careers.

Hughes et al. (2021) underscored that because GANs are creative support tools, creativity potential of designers can be more due to human-AI partnership. Such AI tools can be used to motivate students and get them to experiment in the field of the visual arts. Kalpokiene and Kalpokas (2023) suggested that AI is starting to be regarded as a creative being as the perspective changes not the human creation but posthumanism. Such an outlook provides learners of art education with a fresh chance to view the AI as a collaborator in the artistic process.

In their work, Tigre Moura et al. (2023) compared how various creative modes (fully AI-generated, collaborative, and purely human-created) affect the artistic value. Their results revealed that collaborative works were rated to be more novel and more desirable which indicates that AI in art education can be helpful in triggering creativity in students as well as provide them with innovative creative experience.

To sum up, AI in terms of visual art education has made a substantial contribution to the field, being helpful in improving the creativity and learning processes as well as offering individualized support.

- (1) **Actors:** AI tools generate deep creative learning environments among students and contribute to emotional and cognitive development.
- (2) **Media and Environment:** Immersive environments and interactive applications that are AI-based are incentivized to learn more about the style of art and historical events.
- (3) **Technology and System Optimization:** The dynamic feedback and individual support provided by AI enhances the students independent learning skills, and proposes innovative and creative experiences.

4.3. RQ3: Ethical and Originality Challenges of AI

Although the AI technology offers a variety of applications in visual art education, there are also serious ethical and originality issues, specifically, in terms of the following issues:

4.3.1. Actors and Information: Originality Controversies and Cultural Diversity

Jin et al. (2023) observed that although AI-created instructions enable the student to learn, the issue is that it concerns originality. Teachers are going to have to weigh the advantages of AI as an assistive tool in learning against the need to promote genuine individual artistic exploration. Kalpokiene and Kalpokas (2023) stressed that the existing copyright legislative practices insufficiently observe the creative authorship of AI-generated works. This is of extreme importance in the learning of art, as the students need to learn about the originality and the ethical consequences of joint artwork with AI.

The lack of self-awareness that could give the students a frame of reference to address this problem in terms of art education led Liu (2023) to question the motivation and originality of AI art. Likewise, Lorusso et al. (2024) pointed out the controversies regarding the exclusivity and criticality of AI-generated arts, which triggered debates of originality and possession, particularly in cases where students apply AI-generated tools in their work.

Additionally, Papia, Kondi and Constantoudis (2023) also discovered that the AI performance in generating particular styles of art is somewhat low and, therefore, hard to reproduce the extent of variations of art by human hands. This introduces new challenges on students when it comes to assessing the authenticity of artworks. The paper by Park et al. (2024) discussed the issue of identifying the authenticity of works created by AI, and it appeared that now the dispute about the merits of a work and its creator may arise. These problems present a dilemma in visual art education, particularly in the process of educating students to judge and understand AI-rendered materials.

To maintain artistic integrity, the ethical problems represented by Horvath and Pouliou (2024) such as the impossibility of attributing a person as the author suggest that there is a need to have clear regulations regarding the implementation of AI within an educational facility. Critically evaluating AI and NFT art, Poposki (2024) made the potential of commodification and crisis of originality of said art technologies obvious. The theoretical background of applying AI to visual art education as been presented in our current analysis serves as a reminder of the dangers of creative alienation and the intellectual property problems and prompts us to utilize AI tools in aid of student creativity.

4.3.2. Media and Environment: Challenges of Technology Dependence and Independence

Some of the studies propose that learners in AI-based learning aspect might develop too much dependence on technology and thus fail to develop their capacity of creation in the necessary standards. Evaluation of subjective creative works in a challenging way and it means that at the time the AI starts to be more widespread in the art education field, which Valachová et al. (2021) claim, the educators might require new evaluation patterns and approaches to embrace digital and AI-driven creative pieces.

In a research study on the discipline of entropy and complexity analysis of human art and AI-generated art, Papia et al. (2023) evaluated human-made and AI-generated paintings. They discovered that the works of AI can have attributes of certain works of art but are not as varied and complex as work created by human beings. This highlights the drawback of AI in the artistic output.

According to Lee and Suh (2024), the development of creative thinking and motivation of students is useful with the assistance of AR/VR and generative AI tools. However, they also revealed the danger of the fear of intellectual property and originality of works that were produced by AI which also brings some crucial questions to be answered as to how an educator can still become technologically friendly and remain creative in delivering courses.

4.3.3. Technology and System Optimization: Ethical Frameworks and Standardization

The implementation of AI technology will imply the necessity to introduce more transparent criteria of ethical integrity to ensure a clean creative process and student experience of learning art education. Goenaga (2020) cited the moral concerns regarding the use of AI in art, emphasizing that students should be assisted with a critical application of AI, as they should know how to utilize its creative potential and be mindful of its multiple limits. Toledo Lara (2023) discussed ethical concerns of AI in education both in terms of data privacy risks and Algorithmic biases.

Such issues can also be employed in visual art instruction as students are taught to make AI-generated art and as such, may end up becoming lost when it comes to the authenticity and possession of their work. When an AI-generated creation is fully automated, according to a study conducted by Tigre Moura et al. (2023), results proved low and did not indicate high degrees of originality and authenticity. This fact proves that school-based learners have the right to question the validity of the material produced by AI, creating a critical starting point regarding studying the ethical implications of AI-generated works.

Williams et al. (2023) have assessed the ethical issues of AI-generated pieces, including the threats of deepfakes and the need to cultivate awareness in students regarding the ethical aspect of originality and authenticity with regards to AI artworks. Henriksen et al. (2024) emphasized that some moral issues of ownership and intellectual property were not addressed. With the rise of integration of these technologies in education, it is necessary to combat ethical concerns such as ownership and originality so as to make students take pride and ownership of the products of their creativity.

As Zhao (2024) has indicated, the originality issue of AI-generated art gives special concern to the teacher in the learning process since teaching AI-generated art and art pedagogy has to be combined with the use of technology and artistic ethics. This will mean that students may take advantage of AI tools to unleash creativity with the realization of the ethical duties attached to their works. To give a more accurate structure of the distribution of various ethical issues that AI brings to the sphere of visual art education in the domain of sphere in 2024, a detailed analysis based on 39 identified studies was performed. Various ethical issues were statistically analyzed in terms of their frequency. Copyright has been the most cited form (15 cases), followed by originality issues (12 cases). The problems with data bias were included in 10 cases, and other ethical concerns were the least, numbering 2 cases. That shows that the most evident ethical concerns of visual art education are those related to copyright and originality, with data bias and other types of concerns having gained relatively little coverage.

- (1) **Actors and Information:** The concerns of authorship and originality in AI generated works create boundaries that a student must question the creative process.
- (2) **Media and Environment:** The extensive use of AI can result in the over-technological dependence of students, which impacts their independent creation. Educational settings thus need to have appropriate usage guidelines.
- (3) **Technology and System Optimization:** Clear ethical frameworks should be ensured in handling intellectual property and originality issues.

5. Discussion

This paper systematically searched to identify its application, teaching effects, and ethical issues of artificial intelligence (AI) in visual art teaching to university students from 2019-2024. The following discussion analyzes the value of the primary findings and makes recommendations for educational practice and future research within the context of the research objectives.

5.1. Educational Adaptability and Teaching Effectiveness of AI Technology

The results show that Generative Adversarial Networks (GANs) and interactive technologies, including AR/VR, are the most popular AI devices for teaching visual art. Besides enhancing teaching efficiency, their extensive use has expanded content delivery methods. An example is the use of GANs, which provide a variety of artistic styles, displaying them in the middle of creative art classes (Rong et al., 2022). In the meantime, the immersive experiences of VR enable students to pretend to be in historical and cultural scenes, which extensively improves the effectiveness of knowledge retention and learning engagement (Puggioni et al., 2021). However, there are also certain challenges arising consequently of the critical usage of these technologies. Even though GANs are optimally applied in the context of artistic creation, the reliance on single data sets may generate homogeneity which inhibits the process of discovering diversity and the experimentation of culture among students.

5.2. Dynamic Changes in Student Creativity and Engagement

The AI technologies possess significant opportunities in the form of achieving greater creativity and interest in students. As this study found out, 45 students

revealed their great creativity after using AI technologies, namely, GANs tools and generative AI tools, such as DALLE, which enabled them to produce mentified and elaborate artworks (Guan et al., 2024). Also, AR/VR portals increase the interests and engagement of students through the contextualized learning activities and are therefore more effective in boosting classroom participation.

Nevertheless, these are beneficial gains which might be accompanied by some disadvantages. In other studies, it was also mentioned that the over-dependence of AI tools by students in creative tasks can deteriorate their self-creative skills and eliminate critical thinking (Valachová et al., 2021). An example is the way students who utilize generative AI systems can directly generate pieces are not always provided with considerable thought about the creative process itself. To address it, teachers ought to use guided activities and reflection teaching techniques that will allow students to convert AI-generated works into their own creative statements.

5.3. Transformation of Teacher Roles and Adaptation of Educational Systems

Ranging not only in changing how students' study, the introduction of AI technology changes how teachers will perform their roles. In AI-assisted learning, instructors shift their role as conventional knowledge delivery agents to the position of learning facilitators and technology integration designers (Rong et al., 2022). This has been changed in three important aspects:

(1) Technology Guidance and Curriculum Design:

The use of generative AI (like ChatGPT) ensures that teachers have less preparation work, making them more able to work on curriculum design. As Grájeda et al. (2024) emphasized, instructors could be able to assist pupils in combining technical abilities and artistic creation by designing learning tasks on a case-by-case basis.

(2) Ethical Education in Practice:

Ethical consciousness is one of the areas that teachers should focus on when instructing students to use AI tools, e.g., referring to the difference between the AI-generated work and the work created by students. According to Kalpokiene and Kalpokas (2023), these methods of teaching contribute to the better knowledge of AI technologies in students and decrease the chances of their misuse.

(3) Capacity Building for Teachers:

The educators have to be professionally trained in the use of AI tools, such as the ability to choose the right tool, create individual tasks, and resolve technical issues such as biased data.

5.4. Educational Implications of Ethical and Originality Challenges

There are also important ethical and originality issues associated with the massive application of AI in education. In this paper, the researchers concluded that 39 per cent of the reviewed literature cited copyright concerns about AI-generated works. These problems are more complex than the differences between student and, especially,

teacher perceptions, as well as legal differences between technology developers and educational institutions (Kalpokiene & Kalpokas, 2023). Besides, discriminatory trends among training data of deep learning systems are existential risks to equal treatment in learning art (Zhao, 2024). To reduce these issues, policymakers and technology developers are required to collaborate to develop proper regulations in which they should determine who is the copyright holder, control the bias of data and ensure that AI applications are used in responsible manners within the learning context. The inclusion of learning ethics in the curriculum could also enable the student to enjoy intellectual right on his or her works. The scope of AI technologies has tremendous potential in visual art teaching, where it can be used to increase the efficiency of teaching, creativity, and student involvement. Nonetheless, there are originality, dependence, and ethics issues associated with their use. The pedagogical values should correspond to technological developments to keep students informed and respect proper moral positions following the artwork creation. Such a balance is paramount in finding a balanced harmony between technology and art in education.

6. Conclusion

From 2019-2024, the use of AI technology in teaching visual arts is a systematic review of this technology in teaching visual arts, which contributes to enhancing the effectiveness of the teaching method, student creativity, and interest in learning. Some of the technologies that have assisted students in understanding the knowledge in artistic form and being creative include the Generative Adversarial Networks (GANs) or personalized learning contexts. However, the application of AI also raises certain issues related to plagiarism and ethics such as copyright rights issues and the dependency of students on technology. This project does not only highlight the importance of responsible use of AI in academic aims but, also provides its suggestions of providing balance between using technology and promoting independent creative thinking in students.

7. Limitations

Despite conducting a systematic review of the use of AI technology in visual art teaching, this work also has limitations. First, the literature used in the study was mainly based on two databases, ScienceDirect and Web of Science, which probably left out other databases with pertinent studies and therefore, the literature was not adequately met. Second, the work was primarily based on the data and conclusions that were arrived at in previously published literature, without such important approvals as the development of original empirical research, which may restrict the overall universal application of results. Moreover, the timeframe of the study (2019-2024) might make certain conclusions outdated since the technology of AI is quickly developing. Lastly, there was a failure to comprehensively examine the various uses of the AI technology under any cultural and educational setting, a shortcoming that could limit the applicability of findings.

8. Future Research Directions

According to the limitations of this study, the future work may be developed along the following lines: The future research may widen the scope of literature sources by taking into consideration more databases making it comprehensive. Second, it is

suggested that more original empirical research be conducted where experiments or case studies are used to prove the particular impact of AI technology in visual art education. Moreover, there is a need to further research the discrepancy of AI utilization in terms of different cultures or educational background because how AI tool usage can be adjusted to better suit different students and their needs in different settings. Last but not least, the long-term effects of the use of the AI technology should be studied in the future, especially when it comes to supporting the creative and independent nature of students and helping educators to make more essential decisions.

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