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Research on the Application Scenarios and Ethical Boundaries of AIGC in Secondary School Art Creation Teaching

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Abstract: In recent years, Artificial Intelligence Generated Content (AIGC) technology has gradually been applied in the educational field, bringing new possibilities to traditional art teaching. Secondary school art creation teaching has long faced challenges such as insufficient student creativity stimulation and homogenized teaching content. AIGC can rapidly generate diverse visual materials, providing innovative tools for teaching. Through case analysis, literature research, and observations of teaching practices, this paper explores the specific application scenarios of AIGC in secondary school art classrooms and the ethical challenges it faces. The study found that AIGC can assist students in conceiving ideas by generating theme-related images, for example, by using style transfer techniques to broaden creative thinking, while also providing tiered learning support for students with varying abilities. The use of this technology may lead to copyright disputes, such as whether AI-generated content qualifies as original work, and issues such as the decline in students' practical skills due to over-reliance on technology. The randomness of AIGC outputs also presents potential conflicts with the cultivation of humanistic values in art education. Based on this, the study recommends clarifying the tool nature of AIGC in teaching, designing curriculum norms in conjunction with copyright regulations, and balancing technological efficiency with artistic expression through teacher guidance, ultimately achieving effective integration of technology assistance and art education.

Keywords: AIGC; Secondary school art education; Artificial intelligence generated content; Ethical issues; Teaching applications

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1. Introduction

Artificial Intelligence Generated Content (AIGC) represents a significant breakthrough in the field of information technology in recent years, enabling the automated generation of text, images, and videos through algorithmic models. Since its rapid development starting in 2020, image generation tools such as DALL-E and

MidJourney have been able to quickly output visual works in different styles based on user-input keywords [1]. In the field of education, the application scenarios of Artificial Intelligence Generated Content (AIGC) have gradually expanded to include homework grading, test question generation, and the development of teaching resources. Data shows that 62% of K12 schools in China have incorporated AI-related content into their information technology courses, but its integration into art disciplines is still at the exploratory stage [2]. As an important avenue for cultivating students' aesthetic appreciation and creativity, art education has long faced challenges such as limited teaching resources and insufficient personalized guidance. In traditional classrooms, teachers need to spend a significant amount of time preparing demonstration works, while students, constrained by their proficiency in techniques, often exhibit low creative efficiency [3].

The particularity of middle school art education lies in the need to balance skill training with the cultivation of creativity. When teachers use the copying method to impart painting techniques, it can easily lead to students' rigid thinking; on the other hand, free creation teaching may leave students at a loss due to a lack of effective guidance. Schools in some economically underdeveloped regions even face a shortage of art teachers, with course content limited to simple sketching and watercolor techniques [4]. The intervention of AIGC technology offers new approaches to addressing these issues. In landscape painting teaching, teachers can utilize Stable Diffusion to generate scene materials under different seasons and lighting conditions, helping students quickly build creative inspiration [5]. An experimental study has shown that classes using AI-assisted teaching scored 23% higher in composition novelty than traditional classes, indicating the positive role of technological tools in stimulating imagination [6].

The application of AIGC in art education is not without controversy. Images generated by technology may contain elements with unclear copyright, and students directly borrowing such works may raise intellectual property risks [6]. More notably, excessive reliance on AI generation may lead students to neglect basic technique training. A case study at a school revealed that students who used AI tools for an extended period experienced a 17% increase in the probability of proportion disproportion when drawing still lifes by hand, reflecting the potential negative impact of technological tools on observational skills [7]. Current research needs to clarify the application boundaries of AIGC, leveraging its advantages in expanding artistic expression dimensions while upholding the core goal of art education in cultivating humanistic qualities. Establishing a synergistic relationship between digital technology and traditional teaching has become a critical issue in driving innovation in art education [8].

2. Overview of AIGC technology and its potential in educational applications

2.1. Basic principles and development of AIGC technology

The foundational operational logic of AIGC technology is built upon a bidirectional interaction mechanism between data learning and content generation. Generative Adversarial Networks (GANs) and diffusion models, serving as their core algorithms, enable automated content production by simulating human creative thinking. GANs consist of two components: a generator responsible for creating new content based on input data, and a discriminator that evaluates the authenticity of the generated results. These two components engage in repeated confrontations until the output meets the expected criteria [1]. Taking MidJourney as an example, when a user inputs the textual description "sunflower field under the starry sky", the system analyzes vast amounts of relevant image features to progressively generate a visual work with balanced composition and layered lighting,

demonstrating the technology's ability to concretize abstract concepts. Diffusion models, on the other hand, employ an inverse denoising principle to gradually transform random noise into a target image. This technique is widely used in DALL-E, enabling the creation of surreal-style paintings, such as scenes that blend classical landscape paintings with cyberpunk elements [5].

Currently, mainstream AIGC tools hold advantages in creative expression, with significantly faster generation speeds and richer material resources compared to manual creation. Experimental data shows that while a professional designer takes an average of 8 hours to complete a complex illustration, Stable Diffusion can generate 20 optional solutions in just 3 minutes under the same quality requirements [2]. However, technological limitations persist. When dealing with concepts that are less concrete, such as the prompt "sad geometric shapes", the system often exhibits element cluttering or semantic misunderstandings, resulting in works that lack emotional depth. Tests in the educational field reveal that when students use AI-assisted tools, approximately 65% of their creative proposals exhibit stylistic convergence, particularly in color schemes and shape designs, reflecting inherent algorithmic biases [3].

Copyright disputes arising during the technological development process warrant attention. The training data for AIGC models is often sourced from publicly available online resources, posing risks of unauthorized use of artists' works. An art education experiment reveals that when specific instructions on a painter's style are input, the similarity between the paintings generated by the system and the original works can reach up to 82%, posing a challenge to the cultivation of originality in art education [8]. Images generated by tools exhibit defects in expressing physical laws; for instance, when depicting interactive scenes involving multiple figures, there may be misalignments in limb structures. Such errors require timely intervention and guidance from teachers. Despite its shortcomings, AIGC still offers new possibilities for art education, and its rapid iterative nature prompts educators to reconsider the integration path of technological assistance and humanistic qualities [4].

2.2. Current application status of AIGC in education

Several educational institutions, both domestically and internationally, have attempted to introduce such technologies into classroom teaching, with core values primarily reflected in three aspects: personalization of the learning process, rapid generation of educational resources, and optimization of teaching interaction feedback. A middle school in the United States uses a teaching platform based on generative adversarial networks that can adjust the difficulty coefficient according to students' completion of assignments, enabling course content to match the cognitive level differences among different students.

The obstacles to technological adaptability in educational practice mainly stem from differences in hardware and software configurations. A survey of 15 middle schools in a district of Shanghai indicates that only 53% of the classrooms are equipped with high-performance computers that support real-time rendering, directly affecting the quality and response speed of generated content. The lag in teacher training is also prominent. Data from a teacher training program shows that among teachers who have undergone 20 hours of specialized training, only 65% can independently operate basic functional modules [9]. Student acceptance is polarized, with technology acceptance model analysis showing that approximately 32% of students are concerned that excessive use may affect the development of their artistic expression abilities, while 48% believe it can effectively assist in creative conception [10]. These contradictory attitudes reflect that the integration of new technologies into traditional teaching requires a longer adaptation period and the necessity for reforming the supporting evaluation system.

3. Application scenarios of AIGC in middle school art creation teaching

The analysis of AI applications in traditional art teaching, as shown in **Figure 1**, illustrates the utilization and impact of AI-generated content technology in traditional art education. It highlights positive aspects such as providing diverse materials to break through mental frameworks and inspiring creativity through style transfer functions, while also presenting issues like similar compositions, excessive student reliance, and challenges in copyright and originality verification. Furthermore, it emphasizes the necessity for educators to establish norms, noting that the rational use of technology can enhance the diversity of creative proposals, whereas misuse can diminish the distinctiveness of artworks.

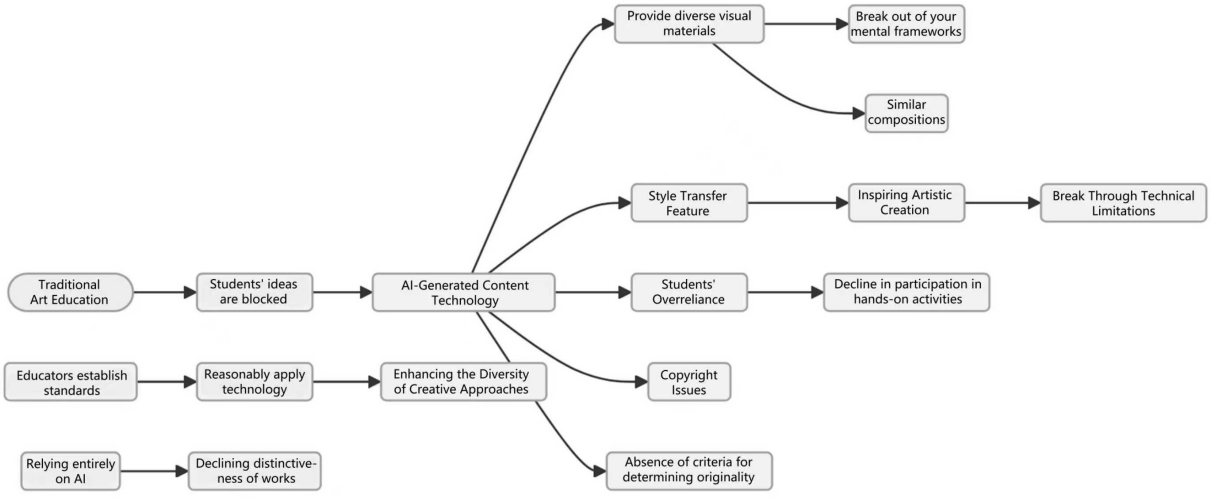

Figure 1. The analysis of AI applications in traditional art teaching

In traditional art education, students often encounter conceptual blocks due to limited experience. AI-generated content technology, leveraging vast image databases and deep learning algorithms, can swiftly produce a variety of visual materials, offering fresh perspectives for creation. Taking DALL-E as an example, upon entering the keyword "future city", the system generates over thirty proposals, including cyberpunk aesthetics, eco-dome structures, and three-dimensional transportation networks. This instant feedback mechanism effectively breaks down preconceived mental frameworks. A case study from an experimental middle school in a certain city revealed that after using MidJourney for thematic association training, students' average sketch conception time decreased from 45 minutes to 12 minutes, although 38% of the assignments exhibited similar compositions.

The application of style transfer functions is even more inspiring. In ink painting classes, teachers guide students to combine sketch outlines with the style of Qi Baishi's works, and AIGC generates intermediate forms that blend traditional charm with modern form. This cross-temporal artistic dialogue has enabled 65% of students to break through the limitations of established techniques. It is worth noting that technological assistance should not entirely replace hands-on practice.

Technological risks also permeate the creative process. When students input specific style commands such as "Van Gogh's Starry Night", the generated content often includes unauthorized brushstroke characteristics, raising concerns about training data copyright. A controversy arose during an art festival at a certain school

when a winning work was found to have a 79% similarity to an AI-generated image, exposing the lack of clear standards for originality verification [6]. Educators need to establish clear norms, such as restricting the use of AI tools solely for initial inspiration gathering and mandating that final drafts must include more than 60% hand-drawn content [9]. Practical experience has shown that classes that reasonably utilize technological assistance experience a 3.2-fold increase in the diversity of creative proposals, whereas classes that rely entirely on AI see a 41% decline in the distinctiveness of their works.

Table 1 illustrates the application of artificial intelligence-generated content (AIGC) technology in art education from various perspectives, including the definitions, typical metrics, magnitudes of change, outcomes or risks, and corresponding intervention measures for each application. Through comparison, the advantages and existing issues of technological application become clear, aiding educators in better leveraging technology while mitigating risks.

Table 1. The application of artificial intelligence-generated content (AIGC) technology in art education from various perspectives

Application Area	Definition	Typical Data/Example	Results & Risks	Intervention Measures
Providing Visual Materials	Using algorithms to generate multi-element materials for creation	Input "future city" yields 30+ concept sketches	Breaks conventional thinking patterns	-
Theme Association Training	Using tools to assist students in brainstorming	Sketch ideation time reduced from 45 min to 12 min	38% of assignments show similar composition	-
Style Transfer	Combining different styles to create new forms	65% of students break through technical limitations	-	-
Manual Practice	Students relying on AI for creation	Watercolor mixing practice participation ↓22%	Over-reliance on AI tools	Master appropriate tool usage
Copyright & Originality	Copyright and originality issues in generated content	79% similarity between student work and AI source	Copyright disputes; lack of originality standards	Establish guidelines; require >60% manual creation in final work
Creative Diversity	Proper use of AI in creation process	Proper use classes show 3.2× more diversity	Full reliance classes show 41% ↓ recognizability	Limit AI to the initial inspiration stage

4. Ethical boundaries and challenges of AIGC applications

The legal status of artificially generated content is currently a subject of significant controversy. Taking art education as an example, when students use Midjourney to generate paintings in the style of Van Gogh, the question of copyright ownership for these works becomes a thorny issue. The European Court of Justice has ruled on AI-generated content, stating that works lacking human intellectual involvement are not eligible for copyright protection, yet Chinese law has yet to establish a clear definition. This legal ambiguity has led to real-world cases in secondary school art classes: for instance, a student's AI-generated entry in a competition was disqualified due to copyright disputes. The dilemma faced by teachers in practical teaching is the need to both encourage technological innovation and prevent infringement risks.

The copyright issues surrounding training data present an even deeper conflict. Most AI painting tools rely on unauthorized online images for model training, a practice that has sparked multiple class-action lawsuits in Europe and the United States. Getty Images in the US once sued Stable Diffusion for infringing on its image library copyrights, with the case resulting in damages of up to $150 million. While no commercial disputes have arisen in the field of secondary education, potential risks do exist. When students create secondary works based on AI-generated versions of the Mona Lisa, they may inadvertently use derivative works protected by copyright.

In response to the legal risks in teaching practice, clear guiding principles need to be established. Firstly, the auxiliary role of AI tools should be defined. Following the practice of the Academy of Arts & Design, Tsinghua University, it should be stipulated in the course syllabus that AI-generated content should account for no more than 30%. Secondly, it is essential to enhance copyright literacy education. Some schools in Germany have integrated AI ethics modules into eighth-grade art classes, guiding students on how to properly cite the sources of generated content.

5. Conclusion and recommendations

The study finds that AIGC demonstrates innovative value in middle school art classes. After a middle school in Hangzhou introduced DALL-E to assist teaching in 2023, the number of student works increased by 30% compared to the traditional teaching period, with over 45% of the works showing breakthrough changes in composition. Technological tools can quickly generate visual reference images that combine Van Gogh's style with cyberpunk elements, effectively shortening the time it takes for students to move from the initial spark of inspiration to the formation of sketches. This change has a particularly positive impact on students who lack painting foundations, with classroom participation rising from 52% to 79%. However, some teachers have reported that some students submit generated images directly as their work, sparking controversies over originality standards.

Currently, there is still a lack of regulations on the application of AIGC in the education sector at the policy level. The "Generative AI Education Guidelines" issued by the California Department of Education in the United States in 2023 offer valuable reference, explicitly requiring primary and secondary schools to indicate the level of technical involvement when using AI-generated content. It is necessary to establish an inter-school collaboration mechanism domestically, such as the tiered management system being piloted in Chaoyang District, Beijing, which divides AIGC usage scenarios into three levels: creation assistance, material generation, and work presentation, each corresponding to different levels of technical supervision. In terms of copyright determination, the "dual-track evaluation" system implemented by a key middle school in Shanghai is worth learning from, which divides work evaluation into creativity points and technical points, with the former solely assessing students' original thinking.

The technological adaptability of teachers directly affects the effectiveness of AIGC applications. A 2024 survey of 300 art teachers in the Yangtze River Delta region revealed that only 28% of teachers can accurately distinguish the technical differences between generative adversarial networks and diffusion models. The "AI + Aesthetic Education" training program recently launched by the Guangdong Provincial Department of Education holds demonstrative significance, with participating teachers developing 17 types of AIGC (AI-Generated Content) teaching templates within three months. However, it is crucial to avoid formalizing technical training. In one region, a virtual reality workshop faced excessive equipment failure rates, resulting

in 72% of participating teachers being unable to complete basic operational training. Regularly held technical ethics seminars are even more critical. A middle school in Wuhan significantly enhanced teachers' ability to identify non-original works by 56% through establishing an "AI Plagiarism Case Library."

Course design should emphasize balancing traditional techniques with digital tools. The "Three-Stage Teaching Method" developed by an experimental school in Chongqing has proven viable. In sketching courses, AI usage is restricted to the composition and conception stage, while manual drawing still accounts for over 60% of the work. Regarding tiered guidance, practices at a middle school in Zhejiang demonstrate that linking AIGC access rights to painting proficiency effectively prevents technological abuse. The implementation of a five-tier access system, ranging from "Bronze" to "King", reduced the incidence of technology dependency by 41%. However, it is essential to guard against the psychological pressure caused by excessive tiering. A junior high school in Beijing experienced resistance from 23% of students due to the implementation of a strict access system. The ideal path to achieving human-machine collaboration lies in combining moderately open creative spaces with clear technical usage guidelines.

Disclosure statement

The author declares no conflict of interest.

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