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Research Article

Research on the impact of AI-Generated Content technology on design education in Chinese universities

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ABSTRACT

The purpose of this study is to investigate the impact of emerging AI Generated Content （AIGC） technology on teachers, students, and teaching in design and related majors in Chinese universities, and to make a summary. This study combines qualitative and quantitative analysis methods to investigate the subjective feelings and opinions of Chinese university teachers and students towards AIGC technology and summarizes AIGC participation in designing teaching through teaching workshops. By conducting literature research on the principles and development of AIGC technology, a clear understanding of AIGC has been gained. Collect the opinions and viewpoints of Chinese university teachers and students on AIGC technology through a quantitative study and analyze the data. Research is conducted in the form of design practice to form an AIGC design workshop. Through AIGC teaching courses, the reactions and attitudes of workshop students are summarized. Research has found that teachers and students majoring in art and design in Chinese universities have a high acceptance of AIGC technology and generally believe that it has significant advantages in improving efficiency and stimulating creativity. This indicates that AIGC technology has broad potential for application in art and design education. The AIGC tool has brought profound changes to art and design education in Chinese universities. And the application of AIGC technology in art and design education in Chinese universities is an important direction for future development.

Keywords: AI-Generated Content, Chinese higher education, art and design education, curriculum design.

INTRODUCTION

Computer systems using Artificial Intelligence (AI) algorithms alongside their natural intelligence create AI-Generated Content (AIGC) automatically through programming-based technology to produce various content types

ranging from text to images, audio, and visual components. Artificial intelligence technology combines knowledge from computer graphics alongside machine learning and deep learning functions to produce intelligent content generation through the simulation of human creative thought patterns during the creative process (Brown et al., 2023). Large datasets form the basis of its operation, which trains algorithms to spot patterns and extract styles that lead to content creation for specific needs (Smith et al., 2022). Through human creative style simulation, AIGC generates substantial quality content at a high pace, effectively boosting creative productivity (Johnson & Lee, 2023). AIGC continues to develop through technical progress to become a leading force in reshaping the content creation business (Chen et al., 2023). As a result, AIGC is currently evident in the transformation of technology and its use in design education at higher education institutions. To assess the impact of AIGC on this discipline, a study of design education in Chinese universities was conducted based on literature review, questionnaire surveys, design practice, and teaching practice.

LITERATURE REVIEW

AI-Generated Content Technical Principles

Research on artificial intelligence technologies started in the 1950s as theoretical exploration before developers reached practical milestones in development which established wide possibilities for multiple sectors (Russell & Norvig, 2020). The combination of better computational power with big data adoption and deep learning algorithm progress enabled the widespread growth of artificial intelligence technology across all parts of social organization (Goodfellow et al., 2016). The research field of artificial intelligence technology recognizes AIGC as its fundamental branch because this discipline drives modern content development processes (Brown et al., 2023). AIGC operates through natural language processing and machine learning technologies to produce multiple content outputs from user-provided specifications such as conditions and formats along with keywords and topics and stylistic options (Smith et al., 2022). The speed of content production receives significant improvement through AIGC technology because it produces high-quality writing outputs that mimic human writing (Johnson & Lee, 2023). The AIGC system enables users to outline requirements after which it generates news releases besides advertising copy alongside academic papers and literary works (Chen et al., 2023) as well as image-generation capabilities (Wang & Zhang, 2023) and audio and video elements (Li et al., 2023). Through its tailored solutions AIGC gives users access to quick content production capabilities. The combination of user behavior analysis with personal preference evaluation by AIGC results in generated content which achieves user needs while improving the entire experience (Garcia & Martinez, 2022).

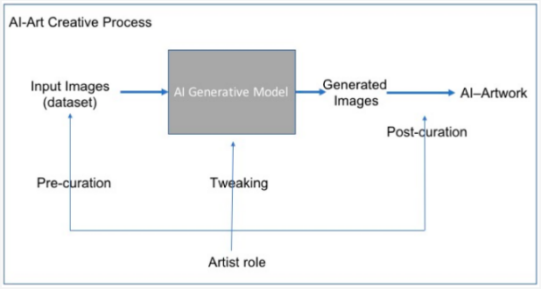


Figure 1. AI generative model in making art

AI-generated content (AIGC) in image generation follows learning analysis techniques combined with complex

algorithm model processing of large datasets to generate other images. Goodfellow et al. (2014) and Ho et al. (2020) state that deep learning with neural network algorithms such as generative adversarial networks (GANs) and diffusion models is used to create new images. Using these technological methodologies, AI extracts feature from whole image data collections and develops learning principles so that it can produce new images that meet specific requirements. GANs model is AIGC's image model's two main generator categories. GANs are made of two components consisting of generator and discriminator models and operate through a dual mechanism. The generator has a mission to generate images that fool the discriminator into looking real while the discriminator is determined whether a given image is real or synthetic. Inspired by adversarial training procedures, the generator completes changes and provides generated images to become more realistic in successive improvements (Goodfellow et al., 2014). An amazing technology in image generation has been found successful in artistic creation, image restoration, and style transfer tasks (Karras et al., 2019; Brock et al., 2019). However, BigGAN from DeepMind, and even more so, StyleGAN from NVIDIA, are the classic GANs-based models that generate high-quality, high-resolution images (Brock et al., 2019; Karras et al. 2019).

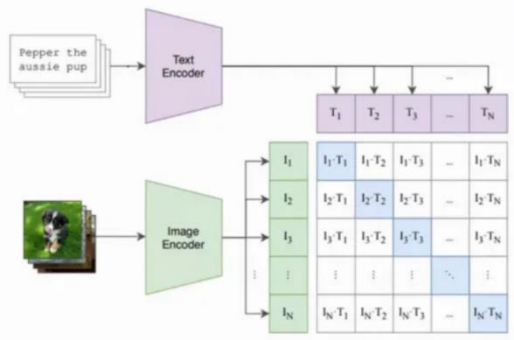


Figure 2. The core idea of CLIP method

(2) Diffusion Models

In recent years, the image generating technology using diffusion models has become a new technology. To be fundamental, added noise to real images and let the systems reverse engineer images from the noise cascade (Ho et al., 2020). Photo generation through diffusion models delivers superior results for image details and diverse outputs while achieving optimal performance when creating high-resolution images (Sohl-Dickstein et al., 2015). DALL·E 2 and Stable Diffusion from OpenAI are typical diffusion models available in the market. The system uses text descriptions to produce highly realistic and creative images (Ramesh et al., 2022; Rombach et al. 2022).

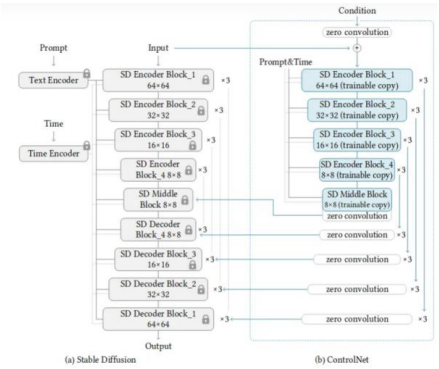


Figure 3. The working principle of Stable Diffusion

The two models differ by offering faster speed for generations and better image quality through GANs, yet diffusion models excel at detailed and diverse output production. All these models share the requirement that they need extensive image data for training, along with algorithm complexity to optimize feature understanding and generation capabilities. Research teams must carry out both evaluation and selection of AIGC tools to fit specific usage situations and generate output types.

Application Areas Of Ai-Generated Content

AIGC technology, along with its associated products, has gained instantaneous industry-wide attention and sparked strong industry discussions. AIGC technology has quickly made an industrial impact through its strong content generation abilities and efficient production speed, becoming prevalent across business, educational, and entertainment fields, resulting in advanced industrial transformation and AI innovation.

The traditional commercial design process is transformed through AIGC technology, as it provides high-efficiency outputs alongside major cost-saving benefits. Enterprises can achieve brand image design plans, product prototypes, and advertising creative content generation through AIGC tools, reducing the time between concept formulation and execution. AI cooperation enables designers to overcome creative obstacles and unlock new creative paths, helping brands achieve better market success and strength (Chen, Hu, & Wang, 2024). AIGC technology enables companies to produce visual items and marketing text that align with the brand voice by processing market data and user behavior preferences, allowing companies to capture emerging market needs and business opportunities swiftly.

Figure 4. AIGC Commercial Design

In the field of education, AIGC technology is becoming an important assistant for students and teachers. For students, AIGC can help them improve their skills in art learning and stimulate creativity and imagination. Through AI painting tools, students can quickly master painting skills, try different artistic styles, and even break through the limitations of traditional art creation and explore new ways of expression. For teachers, AIGC provides powerful teaching auxiliary tools that can automatically generate teaching materials, design personalized learning plans, and provide real-time feedback and adjustments based on students' learning progress. With the popularization of AI painting technology, the threshold for artistic creation has been greatly lowered, and more people can participate in artistic creation, experience the fun of creation and improve their artistic literacy(Foo, Rahmani, & Liu, 2023).

Figure 5. AIGC Painting Teaching

METHODOLOGY

Questionnaire Survey

Investigate the understanding of AIGC technology and attitudes and viewpoints towards AIGC teaching among Chinese university teachers and students and collect data for design practice. This study was conducted in June 2024 through an online survey, with a total of 200 students and teachers from the Technical School in Lianyungang Economic and Technological Development Zone, Jiangsu Province, China. The first stage of the overall research was a questionnaire survey.

The questionnaire is divided into two parts. The first part is to investigate the understanding and actual use of AIGC among young people. The first part consists of four questions. Firstly, the questionnaire surveyed the respondents' majors, understanding of AIGC, usage of AIGC tools, and types of AIGC tools used. The second part is to investigate the attitudes and opinions of young people towards AIGC, which is divided into four questions. Their attitudes towards AIGC, their participation in course design, their attitude towards learning AIGC tools, and finally their evaluation of AIGC.

Table 1: Questionnaire survey on AIGC technology among Chinese college teachers and students

Q#	Survey Question	Response Options
Q1	What is your major?	Humanities Sciences Humanities Art Design Other
Q2	What is your understanding of AIGC?	Familiar Unclear Indifferent
Q3	How do you use AIGC tools?	Frequently Occasionally Never
Q4	What types of AIGC tools have you used?	Text Image Video Music Other
Q5	What is your attitude towards AIGC?	Accepting Resistance Indifferent
Q6	What is the attitude towards AIGC's participation in	Accepting

	designing courses?	Resistance Indifferent
Q7	What is your attitude towards learning AIGC tools?	Willing Unwilling Indifferent
Q8	What is your evaluation of AIGC?	Efficiency Difficult Unclear

Teaching Practice

The teaching practice of this study is in the form of a teaching workshop, conducting teaching experiments of the AIGC course, and summarizing and observing through feedback from students and teachers participating in the workshop. The AIGC teaching workshop was held in the Artificial Intelligence Application and Design Studio of Lianyungang Economic and Technological Development Zone Technical School from December to February 2024. The participants included 30 students and teachers from e-commerce, new media, and Internet art majors.

The AIGC teaching course is divided into three aspects: "Image Content Generation", "Text Editing", and "Short Video Production". A total of four mainstream AIGC tools were taught to participate in the production, including Stable Diffusion, "ERNIE Bot", "DeepSeek", and Alibaba Cloud. These tools have played an important role in their respective fields: Stable Diffusion is used to generate high-quality visual images, ERNIE Bot and DeepSeek assist in the editing and optimization of text content, and Alibaba Cloud provides strong technical support for data processing and storage. In the course, 18 works were produced using AIGC tools, including 10 short videos and 8 articles.

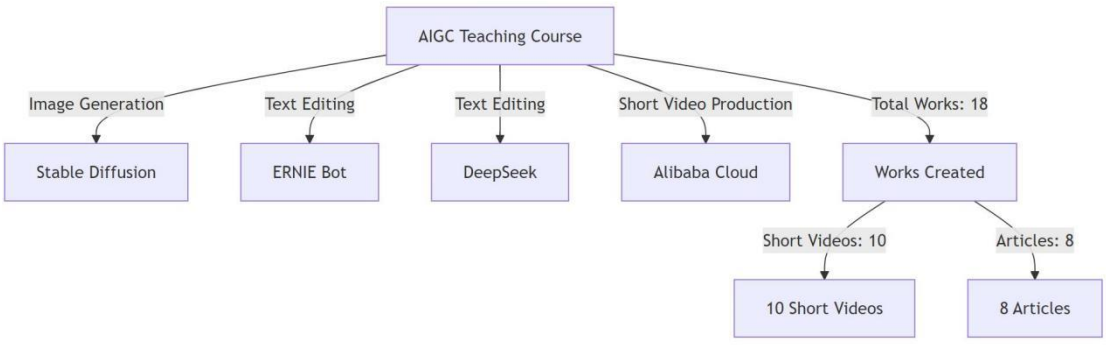


Figure 6. AIGC Design Course Summary

RESULTS

Findings from the questionnaire survey

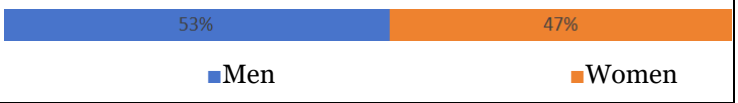
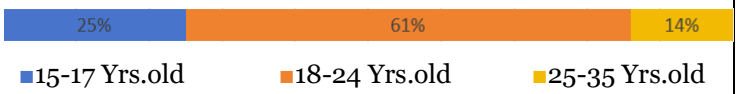
The questionnaire is divided into two parts. The first part is to investigate the understanding and actual use of AIGC among young people. The first part consists of four questions. Firstly, the questionnaire surveyed the majors of the respondents, with 51% of them in humanities, 19% in science, and 20% in arts. According to the results of

understanding AIGC, 81% of respondents are familiar with AIGC, while 9% of respondents are not clear about AIGC. The results of AIGC tool usage show that 77% of respondents frequently use AIGC tools, while 3% of respondents never use AIGC tools. According to the types of AIGC tools used, 62% of respondents used text generation AIGC tools, 17% used image generation AIGC tools, 10% used image generation AIGC tools, and 9% used music generation AIGC tools.

The second part is to investigate the attitudes and opinions of young people towards AIGC, which is divided into four questions. The attitude towards AIGC showed that 88% of respondents actively accepted AIGC technology, while 6% chose to resist. In terms of attitude towards AIGC's participation in design, 86% of respondents indicated actively accepting, while 7% expressed resistance. In terms of attitudes towards learning AIGC tools, 75% of respondents expressed willingness, while 5% expressed unwillingness. According to the evaluation results of AIGC, 84% of respondents chose efficiency and creativity, while 6% chose difficult ones.

The specific questionnaire survey results are shown in the table below.

Table 2: Results of a questionnaire survey on AIGC technology among Chinese college teachers and students

Basic Information	**Statistics**
Gender	
Age	
Questionnaire Content	**Questionnaire Result**
Major	Humanities 20% / Sciences 19% / Art and Design 41% / Other 19%
Understanding of AIGC	Familiar 81% / Unclear 9% / Indifferent 10%
Usage of AIGC tool	Frequently 77% / Occasionally 10% / Never 3%
Types of AIGC tools used	Text 62% / Image 17% / Video 10% / Music 9% / Other 2%
Attitude towards AIGC	Accepting 88% / Resistance 6% / Indifferent 6%
Attitude towards AIGC's participation in teaching	Accepting 87% / Resistance 7% / Indifferent 6%

Attitude towards learning AIGC tools	Willing 75%	Unwilling 5%	Indifferent 20%
Evaluation of AIGC	Efficiency 84%	Difficult 6%	Unclear 10%

The survey results show that college teachers and students have a high level of understanding of AIGC technology, with 81% of respondents indicating familiarity with AIGC, and 77% of respondents frequently use AIGC tools, with the highest usage rate of text generation tools (62%).

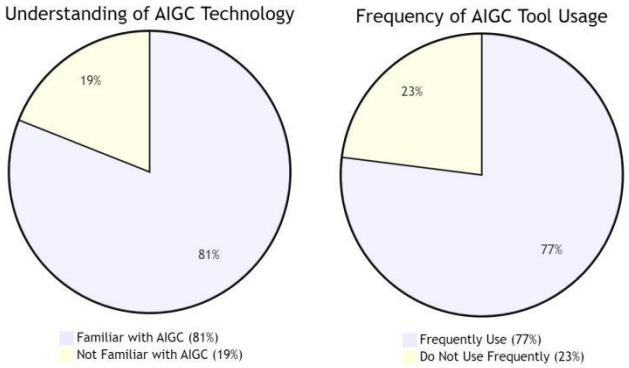


Figure 7. AIGC University Popularity

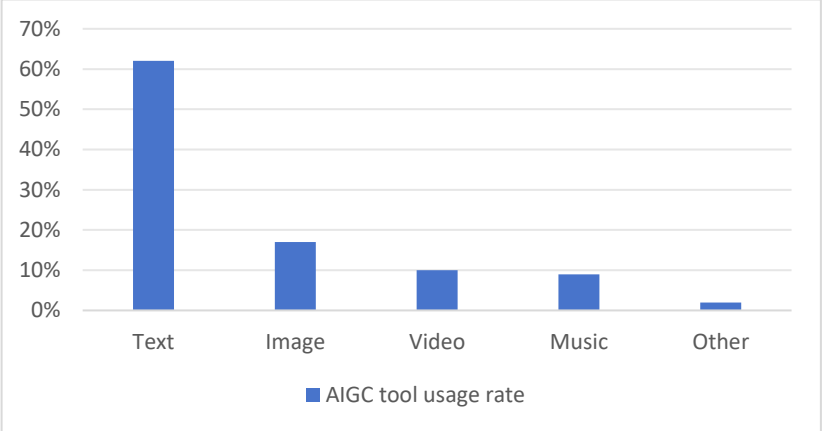


Figure 8. Analysis of AIGC tool usage

In terms of attitude, 88% of respondents have a positive acceptance of AIGC technology, 86% of respondents support AIGC participation in design, and 75% of respondents are willing to learn AIGC tools. In addition, 84% of respondents believe that AIGC has the characteristics of efficiency and creativity, with only a few people holding a resistant or negative attitude towards it.

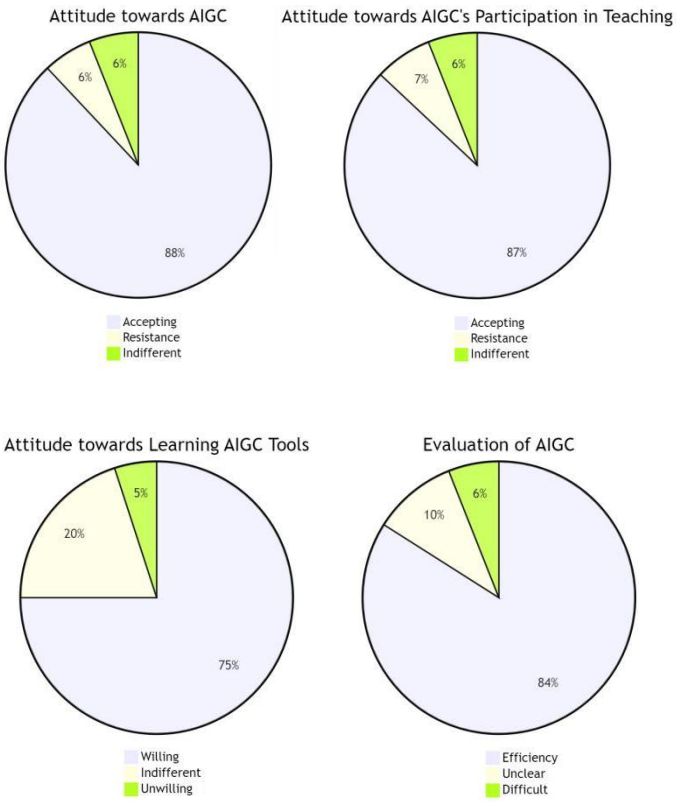


Figure 9. Analysis of the acceptance of AIGC by college students

Overall, the survey shows that the teachers and students of the school have a high acceptance of AIGC technology and generally believe that AIGC has significant advantages in improving efficiency and stimulating creativity. This provides data support for the further application of AIGC technology in university teaching, while also reflecting the open attitude and learning willingness of young people towards emerging technologies.

Feedback on AIGC Course Workshop

To fully investigate the feedback of college teachers and students on the AIGC course, this study organized an interdisciplinary and cross-field AIGC course workshop, with members including students and teachers from e-commerce, new media, and Internet art majors, totaling 30 people. During the workshop course, the AIGC tool was deeply integrated into various links such as course meetings, information collection, creative discussions, and design execution. For example, in team meetings, AI-generated text and visual materials provide intuitive references for discussions; in the information collection stage, AI tools help quickly organize and analyze market data; in the design stage, the diverse solutions generated by AI provide the team with more choices and inspiration.

Figure 10. AIGC course workshop

This study has conducted in the form of a seminar to summarize the feedback and findings of AIGC tool participation in designing teaching, and to provide a summary to AIGC teaching course members. Each student who participated in the course expressed their thoughts based on their real experiences of using AIGC tools to participate in the production. The researchers recorded the speech content of the attendees in detail through text and images and conducted a systematic summary. According to the summary of students participating in the course, there are three main impacts of AIGC tools on art and design education in universities:

1. AIGC tools enable them to provide much better creative features for drawing students' interest in art and design and for supporting them in pursuing further art and design. AI generation tools allow students easy access to design schemes and materials of various styles, eliminating tedious research and sketching. These technologies shorten work time and have innovative designs that increase students' creative motivation. Putting much effort into making the learning process diverse in its genres, AI-generated content also makes it much more interesting, and it comes complete with 'learning by struggle' in tow.
2. As a new trend of AIGC technology rises, new expertise and improved competitiveness arise because AI tools are now vital in the art and design industry. By mastering the ability to work with AI in image creation, design optimization, or virtual reality building, students acquire professional skills that will become an advantage when competing for jobs. AI technology facilitates the bridging into topics of two distinct domains (combining technology and design work), which improves students' holistic skills and expands their intellectual dimensions through the cooperation of a couple of disciplines.
3. AIGC tools introduce cost-effective access to high-quality design resources, relieving students of the financial obstacle to learning. AI tools make things easy in material generation, design improvement, and technological education so that the students can concentrate on their creations and not worry about the expenses of resources or software. With students being able to quickly start working with AI tools to enable them to gain practical experience and develop their design abilities, the obstacle in terms of cost has been eliminated.

DISCUSSION

Several research papers have shown that AIGC technology lends itself very well to high levels of acceptance and teaching effectiveness in the field of art and design education. AIGC tools have been researched to help improve students' creative performance and expand their design creative possibilities (Smith et al., 2022; Johnson & Lee, 2023). We can conclude that AIGC technology does two things: first, it minimizes design periods, and second, it allows students to innovate ideas that do not belong within regular cognitive paradigms of thinking. AIGC tools are used by students as essential supplementary teaching resources in art and design classes due to the creation of various types of useful tools to increase student interest and reduce learning obstacles (Chen et al., 2023). While research has found that the use of AIGC technology in education may decrease fundamental design skills for students, Wang and Zhang (2023) argue that finding the equilibrium for this is still essential.

Several such studies corroborate that AIGC alters art and design education and have shown a similar outcome. They assert that AIGC technology revolutionizes teaching design methods by creating automated creations and multiple outputs that promote the rapid progress of student’s creative work development (Brown et al., 2023). This transformation leads to efficiency gains in teaching and offers a variety of teaching materials and a greater chance of

combining various disciplines. According to the research by Li et al. (2023), AIGC technology, when coupled with virtual reality and augmented reality systems, seems to be the evolution of art/design education. The appealing quality of these AIGC tools that students have grown in the range of AIGC tools has enabled students to have more creative exploration opportunities to develop their artistic direction (Garcia & Martinez, 2022). The widespread application of AIGC technology raises the issue of the importance of traditional design teaching that leads to teachers' reflections on the objectives and methods of teaching (Taylor et al., 2023).

Most research in this field is based on the potential and vast future expansion possibilities of AIGC technology in the art and design instruction. The development of AIGC technology into the intelligent and market mainstream will more and more complex and extensive applications of teaching (Kim et al., 2023). University curricula should incorporate AIGC technology for teaching students how to use this new tool, which will boost their competitive position (Zhang et al., 2023). AIGC technology becomes stronger through its multidisciplinary character by enabling the merger of artistic creations with scientific counterparts to develop interactive educational material (Anderson et al., 2023). The novel teaching method enables the development of art and design education as it simultaneously creates innovative design talents suitable for upcoming societal demands. Quick advances in AIGC technology necessitate educational staff to keep their teaching principles and approaches modern so students can sustain their fundamental competitive abilities during technological transformations (Harris & Wilson, 2023).

CONCLUSION

Acceptance and Teaching Potential of AIGC Technology

Research findings from survey responses indicate that Chinese university students and teachers studying art and design highly welcome AIGC technology because they believe it enhances operational efficiency and creative inspiration. The survey data shows that Artificial Intelligence Generative Creation technology works effectively in art and design learning environments. The integration of AI generation tools allows students to access various design materials and creative solutions, reducing their workload and broadening their project possibilities. This efficient tool enhances educational capabilities in teaching art and design by increasing learning process efficiency and engagement, providing additional teaching resources, and introducing creative instructional methods to educators.

The transformative role of AIGC in art and design education

AIGC tool has made a tremendous transformation in Chinese university art and design teaching methods. The AIGC technology helps increase students' efficiency in creative design by rapidly generating schemes of different designs compared to traditional design education. By breaking down learning barriers and simultaneously igniting their creative passion, this technology will further encourage students to explore more innovative design styles. AIGC tools can produce flexible content output that offers students multiple cases to shape their own creative ways of working and artistic direction for developing their innovative skills. By applying AIGC technology across educational institutions, artistic and design subjects are integrated with other curricular disciplines through the combination of virtual reality (VR) or augmented reality (AR).

The Future Development Direction of AIGC Education

Strategic development is needed for the technology applications of AIGC technology into art and design education in

Chinese universities. AIGC technology tools are advancing rapidly, becoming more intelligent and spread wider, and it means that education systems are supported well. Universities should integrate AIGC technology into their curriculum planning to teach students this new tool, enhancing their academic profile. The multidisciplinary nature of AIGC technology allows researchers to effectively combine art and design with other sciences when creating interactive educational content. This unique teaching model presents an opportunity for Chinese universities to advance art and design education and cultivate innovative design-trained talent to meet future social needs.

LIMITATIONS

The limitations of this study are mainly reflected in the following aspects: Firstly, the research mainly relies on a combination of qualitative and quantitative analysis methods. Although it can provide some subjective feelings and objective data, the selection of samples may be biased, especially the teacher-student group participating in the survey may not fully represent the overall situation of art and design majors in Chinese universities. Secondly, studying the teaching practice of AIGC technology through the design of workshops can observe students' reactions and attitudes, but the limited time and scale of the workshop may not fully reflect the long-term impact and application effects of AIGC technology in actual teaching. In addition, the research mainly focuses on the advantages of AIGC technology in improving efficiency and stimulating creativity, but there is insufficient exploration of its potential negative impacts, such as the impact on traditional design skills and the dependence of teachers and students on technology. Finally, based on the current level of technological development and application scenarios, the timeliness of research results may be limited with the rapid iteration and changes of AIGC technology. Therefore, future research needs to further expand the sample size, extend the observation period, and explore in depth the multifaceted impact of AIGC technology in art and design education.

CONFLICT OF INTEREST

No potential conflict of interest was stated by the authors

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