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Original Paper

Design Education under the Influence of Artificial Intelligence New Paradigm

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Abstracts

With the evolution of AI technology from computational intelligence to cognitive intelligence, and the rapid development of generative tools and multimodal models, design education is undergoing profound changes in curriculum systems, teaching methods, and industrial ecology. This study explores the impact of AI technology on design education and discusses the future development direction of design education. The research indicates that AI promotes educational model innovation through technological empowerment, curriculum restructuring, and industrial drive. In the future, design education needs to balance technological application with humanistic values, build an "AI-native" educational ecosystem, and cultivate full-chain creative talents who possess both intelligent literacy and critical thinking, in order to meet the new industrial landscape and social demands of the AI era.

Keywords

Artificial Intelligence, Design Industry, Design Education, Paradigm Restructuring

1. Introduction

1.1 The age of Artificial Intelligence

Now, the underlying technology and industrial ecology of AIGC have formed a new pattern.The concept of artificial intelligence was proposed in the summer academic seminar held by Dartmouth College in 1956. In more than half a century, with the continuous development of digital technology, communication technology and hardware carriers, it has gradually developed from "computational intelligence" and "perceptual intelligence" to "cognitive intelligence".

The emergence of a series of AICG models such as ChatGPT has brought the masses into a new era of artificial intelligence from passive to generative. AIGC is generative artificial intelligence, also known as the new generation of artificial intelligence, is an important sign of artificial intelligence from 1.0 to

2.0 stage, its core pillars are "data", "algorithm" and "computing power".This study aims to analyze how AI technology is driving the evolution of China's design education ecosystem, and based on this, propose strategies for design education when facing challenges in the AI era.

1.2 National Strategic Position of Artificial Intelligence

The end of the first decade of the 21st century is a period in which AI has gradually gained a national strategic position in the world. 2009, the European Union launched the "Blue Brain Program". The U.S. Department of Defense Advanced Research Projects Agency (DARPA) has been supporting the development of artificial intelligence since 2010. And Japan have respectively formulated corresponding plans as well. In July 2017, the China State Council issued the New Generation of Artificial Intelligence Development Plan.

China has transformed from a follower to a leader in the field of AI.At present, China's artificial intelligence development has gradually come to the forefront of the times. The "2024 China AI Large Model Scene Exploration and Industry Application Research Report" jointly released by Shenzhen Prospective Industry Research Institute, Shougang Fund CANPLUS and Huawei Cloud shows that the scale of China's AI large model industry has reached 14.7 billion yuan in 2023 and has shown high growth.At the Sixth World Conference on Artificial Intelligence and High-Level Conference on Global Governance of Artificial Intelligence in July 2024, China's advocacy resolution in the field of artificial intelligence was adopted by the UN General Assembly.

2. THE NEW FORM OF DESIGN IN THE ERA OF ARTIFICIAL INTELLIGENCE

Observing the progress of human civilization and the evolution of design, the development of design can be divided into five major periods: the period of handicrafts, the period of the first industrial revolution, the period of the second industrial revolution, the arrival of the information age and finally the new era of artificial intelligence design. It can be said that the current artificial intelligence has given birth to art forms, design processes and industrial patterns across generations.

2.1 Spawning New art Forms

Digital art, interactive art, and artificial intelligence art have also become new art forms. Artificial intelligence art is also known as generative art, in which some or all of them use techniques such as Computer Vision , natural language processing , Digital Image Processing, Convolutional Neural Networks , and Generative Adversarial Networks to create art (Generative AI Research on : "Course Special - Yu Yukizawa: Art in this Era", 2024). As early as 1973, British artist Harold Cohen created AARON, a computer program capable of creating art on its own, which does not require manual input of commands and is able to draw abstract closed shapes by virtue of its own learning ability.

2.2 Development of Virtual Reality Applications

Virtual Reality (VR) is a simulated three-dimensional space constructed through a computer program that provides a highly interactive environment that allows users to communicate and operate intuitively. According to different technical characteristics and application scenarios, virtual reality systems can be

categorized into augmented reality (AR), mixed reality (MR) and extended reality (XR). Virtual reality technology has also driven the development of digital people, meta-universes capable of virtual twins. Meta-universe is a virtual world that integrates various technologies such as virtual reality (VR), augmented reality (AR), blockchain, and artificial intelligence.

In this world, users can interact with other users through digital identity and perform various activities such as socializing, working, and entertainment. At present, the digital person and meta-universe technologies have generated more application scenarios. Such as Shanghai University, Professor Jiang Fei tried to use digital people and other students interested in the secondary as a stand-in for classes and improve the experience of virtual reality teaching.

2.3 AIGC's Multidimensional Intervention in Design

A variety of AIGC models continue to disrupt people's traditional perception of design, and have a great impact on design activities.AIGC models mainly include two kinds, one is the language generation class such as NewBing, ChatGPT, Claude, etc., which generates text content in the form of questions and answers,. The other is the visual generation category, such as Midjourney, Stable Diffusion, and other image generation tools.2024 The release of Sora further shook up the video generation field. From the design of the generation method can be divided into "text-to-diagram", "diagram-to-diagram" and so on.

Artificial Intelligence replaces designers to do the complicated bottom work, so that designers have more energy to devote to creative planning and program optimization. The content provided by AIGC can generate creative sparks that break through the inherent stereotypes, effectively expand the design boundary, and quickly generate personalized design solutions according to the characteristics and needs of different users. AIGC can greatly improve the design efficiency. First of all, AIGC can be a powerful assistant for designers to brainstorm in the idea generation process. Secondly, in the design optimization and program iteration process, the designer will input the pre-determined creative solutions into the AIGC model with optimization suggestions, and the AIGC model will automatically fine-tune the original design according to the feedback, which greatly improves the modification efficiency.

3. A NEW PARADIGM FOR DESIGN EDUCATION UNDER THE INFLUENCE OF ARTIFICIAL INTELLIGENCE

Design education in China began with a new type of school education that emerged between the late Qing Dynasty and the early years of the Republic of China. 1978, Mr. Yin Dingbang introduced the advanced design education system of Japan and Hong Kong to the mainland, laying the foundation for the reform of modern design education in China's undergraduate colleges and universities (Hong, W., & Hong, W. D., 2022), based on which the modern design education has gradually developed.

After the expansion of design majors in 1999, the scale of modern design education in China has expanded very rapidly (Li, 2022), and the increasing tension of educational resources and the

imbalance of teacher-student ratio have led to the reduction of the quality of design education.And design education lags behind the speed of social and economic development and the actual needs of industrial transformation and upgrading. The development of design discipline is also criticized by teaching methods that are not conducive to the cultivation of innovative ability, course content is out of line with market demand, (Zhu, 2024) and it has become a weak link in the domestic talent training system. Therefore, how to make design education meet the opportunities and challenges brought by the explosion of technology in the context of today's artificial intelligence, and cultivate new design talents to meet the needs of society and the development of The Times is an important topic.

3.1 Review of Research on Artificial Intelligence and Design Education

Artificial intelligence and design education have also become a hot research topic in recent years. CNKI (China National Knowledge Infrastructure) as the source of basic data, as of January 2024, a total of 402 results were searched with "artificial intelligence design education" or "AI" design education as the theme. The 402 results were imported into CiteSpace for keyword visualization analysis (Figure 1), and the keywords were clustered for visualization analysis (Figure 2). From the CiteSpace analysis results, it is known that AI design education is the first to play a role in the field of pedagogical reform and pedagogical design, and has been used in the field of pedagogical reform, artificial intelligence, robotics, pedagogical design, design education, intelligent education in the past two years, Learning, Curriculum Design, and Educational System Design, which are the nine keywords clustered to exert a more average influence.

Fu and Zhou (2017) believe that with the development of artificial intelligence, the knowledge and skills in the fields of computational thinking and brain cognitive science are being integrated into the design discipline to form a new methodology, and colleges and universities should provide design students with courses related to computational thinking, and master the way of thinking and realization tools in the age of intelligence. Xu (2019) proposed that the penetration of artwork appreciation and design research should be strengthened, and a network platform for teacher-student interaction should be constructed. Guo (2020) analyzed the role of "5G+AI" technology in the practice of industrial design education, and proposed that design teaching based on virtual space improves teaching effectiveness. He and Chen (2023) proposed updating the teaching content and curriculum, adopting practice-oriented teaching methods, and cultivating innovative thinking and critical thinking to cope with the changes of the times.

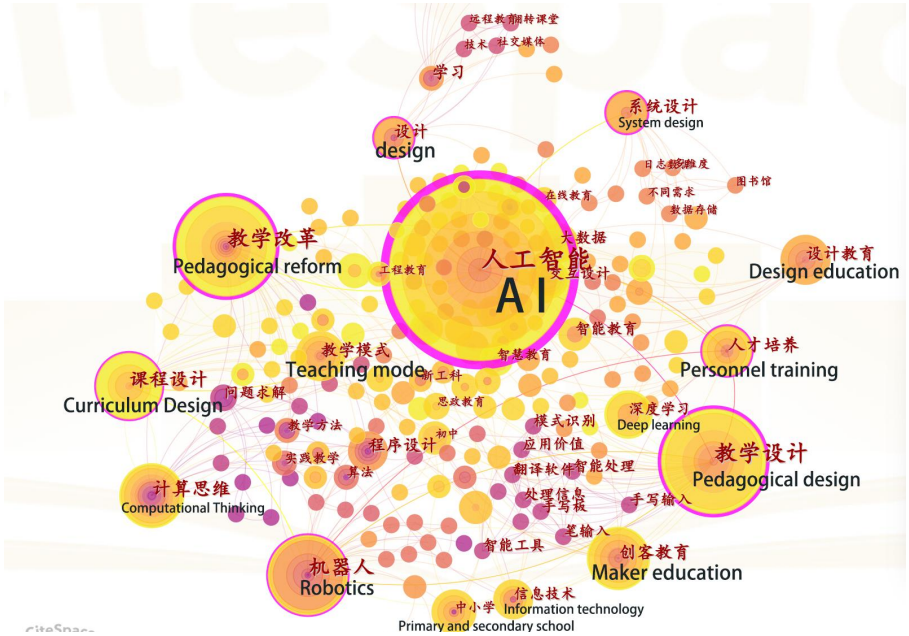

Figure 1. CiteSpace Keyword Analysis

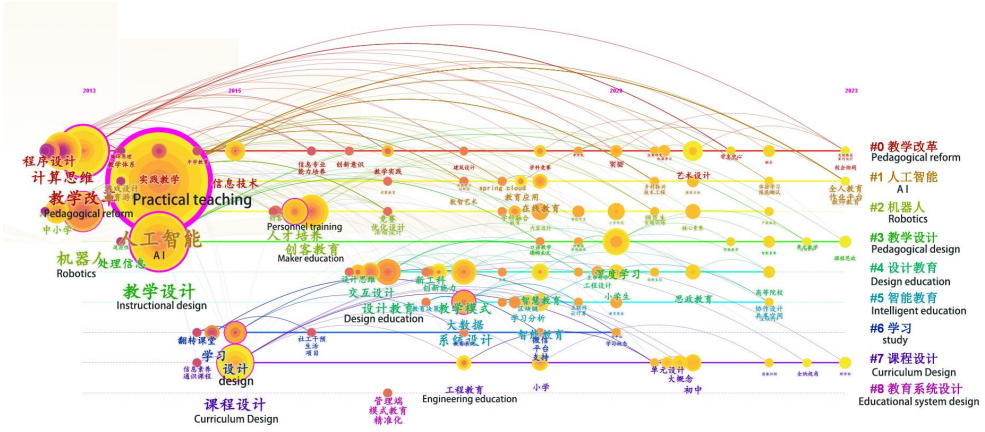

Figure 2. CiteSpace Keyword Clustering Timeline Analysis

3.2 Reinventing the Traditional Design Education Paradigm under Artificial Intelligence Speakers

Artificial intelligence is promoting the deep integration of the Internet, big data, virtual reality and other emerging information technology and design education, and will further reshape and recreate the ecology of design education, the current design disciplines in the field of scope, talent training paradigm, teaching methods and means have significant changes.

3.2.1 Ecological Reconstruction of Traditional Design Discipline Fields

Design is originally a highly interdisciplinary discipline. In the context of the Ministry of Education's proposal of new liberal arts and new engineering disciplines to promote the development of cross-disciplinary subjects, the interdisciplinary nature of design has been further strengthened.

2022 The Catalogue of Disciplines and Specialties of Graduate Education published in September has made significant structural adjustments to the "design" disciplines. In the new version of the catalog, "design" is not only explicitly mentioned in the first-level discipline of art under the discipline of art, but also the professional degree of "design" has been newly established in the discipline of art; in addition, the first-level discipline of design has been set up under the newly established cross-disciplinary discipline. The discipline of design has also been set up under the newly established cross-disciplinary category. This "division of a field into three" shows that the cross-disciplinary attributes of the design discipline across arts, sciences, engineering and arts have been clearly defined. Intelligent technology provides unlimited possibilities for the cross-disciplinary development of design across specialties, disciplines and fields.

In recent years colleges and universities at home and abroad have begun to build their own AI interdisciplinary systems, establish AI laboratories and so on, and have opened new majors at the intersection of design and AI.Such as The Royal College of Art and other universities have launched joint training programs such as Global Innovation Design (GID), Information Experience Design (IED), and Innovation Design Engineering (IDE). And In 2009, Tsinghua University Academy of Fine Arts, in cooperation with the Department of Computer Science and the School of Journalism, launched a master's degree program in "Information Art and Design Interdisciplinary", than established a cross-disciplinary program in "Intelligent Engineering and Creative Design (CDIE)".

3.2.2 Designing a New Paradigm Shift in Talent Development

The social needs and industrial evolution in the intelligent era are constantly upgrading and changing on a monthly and yearly cycle, requiring intelligent education and learning methods to match. The traditional way of design education, which is mainly based on knowledge transfer and skill exercise, needs to be updated urgently. Design education is also facing a strong need to shift from the old paradigm to the new paradigm. Since China's design education was born out of fine arts and arts and crafts education, design education based on skills and results is deeply rooted. If the cultivation of skilled and professional design talents is adapted to the needs of the industrial era, then entering the digital and intelligent era, AIGC's rapid entry into the market with its low cost, low threshold, high efficiency, and high quality has pushed the current design education to change.

The knowledge system of design in the era of artificial intelligence is a new type of knowledge system that aims to cultivate design talents with the whole chain by shaping them. In the context of the rapidly changing era of artificial intelligence, design tools, design objects, design goals, and the scope of design have experienced significant changes. The single knowledge and skills valued by traditional artifact-making or visual design can hardly solve the complex digital and virtualized survival needs of the modern society nowadays (Chen & Lu, 2025), and the design is constantly transformed to cross-border big design and intelligent design. The original traditional knowledge map and system of design colleges need to be updated, evolved and redefined in order to cultivate full-chain creative talents in the new liberal arts of design.

In the construction of the knowledge system of design education, not only is the mastery of the whole chain of creative knowledge system of the new liberal arts necessary, but the design tools under the intervention of artificial intelligence have also become the foundation of the emerging necessary knowledge system (Table 1). This requires students to learn and master various AI tools and integrate them into the design process. This includes not only using existing AI systems, but also understanding the underlying algorithms and principles. Courses and teaching materials related to AI design have become essential elements in the construction of design disciplines in order to cultivate students' intelligent and innovative design capabilities and design modeling abilities. For example, in 2020, the "Artificial Intelligence and Innovative Design" course of the University of Science and Technology Beijing was launched on the Mucou platform, and in 2024, textbooks such as "Essential AI Architecture" and "Digital Architecture" were published. These textbooks focus on the innovative applications and future trends of AI in the field of building design.

Further, the knowledge base of science and technology has also become a need for future designers to have an interdisciplinary knowledge base, including computer science, material science, robotics, and so on. In order to cultivate a good designer, it is not only necessary to cultivate his understanding of philosophical theories, but also to cultivate his ability to develop tools.

Table 1. Design AI Courses Offered by Universities in Recent Years

Design AI courses offered by universities in recent years	
Universities (colleges)	Course Name/Program
Tongji University (School of Software, School of Design and Creativity)	Intelligent Design Course, Algorithm Design, Machine Learning Theory and Applications, Principles of Artificial Intelligence, Advanced Computer Graphics
Donghua University (Institute of Artificial Intelligence, School of Textiles, School of Fashion and Art Design)	Intelligent Interaction Design, Artificial Intelligence Aided Design, Fashion Technology and Functional Apparel Design, Introduction to Artificial Intelligence Technology for Textile and Clothing Majors, Introduction to Intelligent Systems, Fundamentals and Applications of Industrial Intelligence
Beijing Institute of Technology (School of Design and Art)	Artificial Intelligence and Design Course, Image Visual Language and Generative Analysis
Jiangnan University (School of Design)	Intelligent Design Course, Intelligent Product Design Fundamentals, Intelligent Technology Fundamentals
Guangzhou Academy of Fine Arts	Intelligent Design Orientation Course, Introduction to Artificial Intelligence, Fundamentals of Artificial Intelligence
University of Science and	Artificial Intelligence and Innovation Design, Virtual Simulation

Technology Beijing (School of Intelligent Science and Technology)	Practice Teaching of Artificial Intelligence and Innovation Design for Driverless Vehicles
Shanghai Jiao Tong University (School of Design)	Artificial Intelligence, Intelligent Design
Tsinghua University (Academy of Fine Arts)	Artificial Intelligence Applications, Artificial Intelligence: Principles and Techniques, Parametric Design and Artificial Intelligence, Artificial Intelligence Industry Guide, Intelligent Space Design
Central Academy of Fine Arts	Art of Artificial Intelligence, Metaverse Solving Experience Design, Metaverse Clutch + AI (Artificial Intelligence) Training Ground Design, Ethics of Future Technology - Art of Artificial Intelligence, Art of Technology
Sichuan Fine Arts Institute	Intelligent Interaction Art, Intelligent Product Usability and Evaluation
Xi'an Academy of Fine Arts	Intelligent Product Design, Introduction to Artificial Intelligence
Lu Xun Academy of Fine Arts	Intelligent Visual Design
Tianjin Academy of Fine Arts	Intelligent Product Design
Hubei Academy of Fine Arts	Intelligent Interactive Art
Nanjing University, NJU	Artificial Intelligence General Studies, Artificial Intelligence Literacy Course
Huazhong University of Science and Technology	artificial intelligence (AI)
Shandong Academy of Arts and Crafts	Artificial Intelligence and Creative Design, Introduction to Artificial Intelligence, AIGC Intelligent Generative Art, Intelligent Generative Fundamentals, AIGC Applications
Jingdezhen Ceramic University	Smart Home Product Design, Artificial Intelligence and Art, Digital Design (Intelligent Media and Interaction), AI Artistic Expression, Intelligent Product Design
Wuhan Institute of Technology	Intelligent Design Tool Development
China Academy of Art	AI movie course, AI drawing course
Soochow University	The Perfect Combination of Art and Technology - Creative Design of

(School of Textile and Clothing Engineering)	Smart Clothing and Smart Wear: The Fusion of Technology and Fashion
Peking University (Institute of Artificial Intelligence)	Artificial Intelligence General Studies, Artificial Intelligence and the Arts

3.2.3 Design Teaching Technology and Media Innovation Development

Through the informatization construction and intelligent transformation of the teaching environment and learning space, it breaks the boundaries of time, space and geography, realizes the in-depth integration of artificial intelligence technology in teaching activities before, during and after class, and creates an intelligent and immersive teaching environment. With the help of artificial intelligence programs, the collection and analysis of information data on students' learning process in the design of the teaching process, customized learning resources push and accurate learning interventions are realized, and student-centered diversified teaching is carried out to reach the unity of scale and personalization.

Through high-tech devices and systems, the development of artificial intelligence engines and other integrated tools can not only enrich the means of design education, but also expand the scenarios of design education. For example, the "Artificial Intelligence and Art Creation and Research Center" of Tongji University, as one of the earliest Artificial Intelligence and Art laboratories in China, is equipped with advanced equipment and platforms such as brain wave sensors, 3D printers and motion capture instruments, which are used for the first year of undergraduate public foundation course "Art Modeling"Course use (Shanghai Yangpu District People's Government, 2024).

It ensures the effective distribution and open sharing of high-quality digital teaching resources through the construction of a multifaceted and collaborative, content-rich, widely used and efficiently serviced education and teaching cloud service platform. Huazhong University of Science and Technology 2024 released ARTI Designer XL, the first artificial intelligence supercomputing platform for higher art and design education in China, which is not only applied to teaching, providing teachers and students of art and design majors across the country with AI art and design innovation tools; at the same time, the platform supports professional model training, model trading, through training, gallery, classroom and other functional modules, and Q&A exchanges and other online application scenarios, creating an AI art education ecological field with Chinese characteristics.

4. CONCLUSION: CHALLENGES AND RESPONSES OF DESIGN EDUCATION IN THE PERSPECTIVE OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence, as a cross-generational technological advancement, provides solid support for design education to reform, innovate, and optimize its iteration. However, development and challenges

often go hand in hand, and design education is undergoing greater challenges while reshaping its ecological paradigm by virtue of AI.

For one thing, the challenges of science and technology governance issues under the field of artificial intelligence such as intellectual property rights, safety, ethics and the environment are equally, if not more, evident in design education. Issues such as the originality of design works, copyright ownership, and the identity of designers brought about by the process and results of AI design have always been important issues that cannot be avoided in the field of AI design. AI design education must also fully consider these ethical and legal issues to ensure the healthy development of AI design.

Secondly, the need to cope with the challenge of rapid iterative development of AI technology. 2023 Gartner Emerging Technology Impact Report is full of foresight that in the next three to five years, the utility and automation potential of the application of AI technology will be dramatically increased [11], and efficiently promote the productivity revolution. A variety of AI tools are emerging, and there are often breakthroughs in the mode of thinking, and the speed of updating is constantly increasing, how to continuously adapt to the progress of AI technology is also a greater challenge for the reform of design education. Such as the scenario-based application of Deepseek in design education in 2025 has become an important direction for new AI intervention in design education [12].

As Flaubert said, art and science are separated at the foot of the mountain but converge at the top. The combination of design and science and technology is an important trend in the future development of design. In the face of the future of the deep integration of artificial intelligence and design education, it is necessary to firstly shape the thinking mode of “intelligent teaching”, continuously improve the acceptance and adaptability of teachers to artificial intelligence, cultivate contemporary college students to have basic artificial intelligence literacy, and innovatively construct the “teaching unity” and “knowledge sharing body” under the assistance of artificial intelligence, so as to accelerate the development of design in the context of the new quality productivity. The innovative construction of the “teaching unity” knowledge sharing body under the assistance of artificial intelligence accelerates the innovation of design education under the background of new quality productivity. Secondly, it is necessary to give up the blind worship of technology, not only relying on technological innovation, but also turning our attention to deeper value exploration, focusing on the essence of value creation. Finally, we should always hold the view that AI assists human beings rather than replacing their creativity and dominance, and emphasize in design education that designers in the age of AI should pay attention to the role of “human beings” in the integration of technology and creativity.

FUND PROJECTS

1. Guangdong Provincial Undergraduate Colleges and Universities Online Open Course Steering Committee's Key Project: “Study on Promoting the Digital Transformation of Higher Education through Online Open Courses--Taking the Construction of Online Open Course of Urban Design as an Example” (2022ZXKC168)

2. 2024 Guangdong General Colleges and Universities Key Field Special Project “Research on the Paradigm of Guangdong Historical Villages' Digital Intelligence Protection and Development to Help the Implementation of the Hundred Million Project” (2024ZDZX4065)

3. Guangdong Province Joint Graduate School Demonstration Base

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