Changes in the way of learning under the influence of AIGC

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Abstract. AIGC has catalyzed transformative shifts in production methods and societal sectors. With the advent of the AI era, the reliance on standardized education for mass-producing talent becomes unsustainable, prompting new educational demands. Technological changes in digital society have introduced numerous alterations in the educational domain, enriching student learning resources, diversifying tools, and breaking down learning barriers. These changes provide significant opportunities for the evolution of learning methods in higher education. The technological advancements brought by AIGC have transformed students' learning to deeper learning, interdisciplinary learning, and borderless learning, expanding the scope and depth of student learning. This also presents new challenges and opportunities for educational institutions in talent development.

Keywords: generative artificial intelligence; art colleges; teachers' role; educational impact.

1 Introduction

Artificial Intelligence Generated Content (AIGC) technology refers to the use of artificial intelligence algorithms to generate content with certain creativity and quality. Through the training model and the deep learning of a large amount of data, AIGC can generate relevant content, such as text, video and image, according to the input conditions or guidance. Since the first release of ChatGPT in 2022, it has a significant impact on the IT community and the field of artificial intelligence. ChatGPT can generate a human-like language by constantly learning, optimising its own model, and automatically updating language, which is difficult to distinguish from human-written text[1]. ChatGPT epitomizes the advent of AIGC technology, heralding a new era of innovative AI solutions. Remarkably, ChatGPT amassed over one million users within just five days of its launch, a feat that took Netflix 1278 days, Facebook 304 days, Instagram 75 days, and the iPhone 74 days to achieve[2]. This rapid adoption underscores the significant impact of emerging AIGC technologies on the user engagement and market penetration rates.

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AIGC has integrated into various aspects of society. In the realm of higher education, the potential of AIGC application such as ChatGPT and Midjourney can provide information, support learning processes and assist students[3]. They have changed the way students study and how teachers teach and evaluate learning. However, the study of higher education institutions on how to combine AIGC with courses and understand the adoption and use behaviour of students has become an important point.

Recent study discussed the association of AIGC and higher education involving teaching, learning and assessments. To address the urgent need for a comprehensive examination of ChatGPT adoption among students in higher education, the researchers focused on measuring actual user behavior. The findings demonstrate that changes in trust, emotional creepiness, and perceived behavioral control significantly predicted the observed change in students' ChatGPT usage behavior[4]. However, it is imperative to delve into the temporal dynamics of technology adoption, an aspect frequently overlooked in research. Understanding the temporal factors allows for a more nuanced analysis of how students and users adapt to or resist new innovations over time, providing insights into the ongoing interaction with AIGC technologies and their integration into daily practices. Besides, the learning curve for students using ChatGPT can be represented in two interdependent dimensions: learning to use ChatGPT and learning to learn with ChatGPT[5]. For example, it is essential for designers to study how to use this powerful tool to effectively promote innovation. With the development of AIGC technology, it will inevitably change the expectations of designers, forcing them to study the essence of design creativity in more depths, beyond traditional sketching or modelling skills. Learners should focus on AIGC's representative tool "Midjourney" and explore its integration with the design system to enable collaborative innovation among content creators[6].

The current research on the impact of AIGC on education is still in early days, focusing on teachers' and students' cognition of application and changes in teaching brought about by technology. Artificial intelligence technology not only changes cognition of teachers and students, but also changes the means of education. In the future, with the development of technology, AIGC will play a greater potential in the field of education. Education is a complex process of knowledge transmission. To promote the reform of the education system by artificial intelligence technology, it is necessary to analyse the impact of artificial intelligence on the elements of the teaching system as a whole, after that clarify the relationship among the elements of the teaching system. Therefore, this study will analyse the new form of learning from the perspective of students to promote education and teaching reform.

2 The Impact of AIGC on Education

The deep integration of AI technology into education and teaching not only provides more opportunities, but also changes the way students learn. AIGC technology changes the way of knowledge production, learning resources are more abundant and easy to obtain, and learning tools are enriched. Meanwhile, learning is no longer limited by time and space.

2.1 Enriched Learning Resources

Learning resources include support systems, teaching materials and learning environment, etc. Broadly speaking, learning resources include any factors that can help learners learn effectively. In the era of artificial intelligence, learning resources are not only the carriers of learning content, such as textbooks, e-books, tests, subject tools, etc., but also include supported services for learners in the process of using learning resources, such as resource retrieval, download, subscription and other functions, which support them to complete the process of resource search, organisation and application[7]. Artificial intelligence can provide personalized learning materials for learners according to their needs.

AIGC has led to the development of automated applications such as chatbots. Chatbots can appear in many forms such as virtual assistants on websites, embed into mobile phone or audio-based device. ChatGPT, a new AI chatbot, based on a language model that focuses on Natural Language Processing (NLP). NLP can generate and understand human language and respond to users' input. Through human-computer interaction, ChatGPT can generate text, answer questions, and translate which has a wealth of learning resources. The study showed that the chatbot was trained on a large dataset (40 GB in size) from text on the Internet, equivalent to 133 million pages of text which will take about 2200 years to read[8]. Generative language models enrich learning resources and integrate knowledge systematically. Students can flexibly interact with the machine and learn independently.

AIGC has scientific cognitive ability and level based on massive data and scientific algorithms. In the past, the impact of artificial intelligence on traditional classrooms was mainly presented on online teaching platforms or videos. Now with the popularity of AIGC applications, students can conduct real-time questioning and deep learning. In higher education students can use these applications to propose research hypotheses, design experiments and write manuscripts throughout the research process. This could accelerate the pace of educational research, for it can generate literature reviews, complete routine research task. Nevertheless, Chatbots like Chatgpt still have some limitations while it may generate inaccurate text or citation to research that doesn’t exist.

When AIGC technology gradually enters the traditional higher education classroom which mainly relies on teachers to disseminate knowledge, it breaks the educational environment in which teachers are almost the only source of students' knowledge acquisition in the past. The learning materials show the characteristics of informatization, digitization and diversification, and the way of learning changes from enabling the students to acquire knowledge to enabling students to learn how to employ information technology and other ways to acquire knowledge. How to make use of ample learning resources has become a key quality for college students at the age of science and technology.

2.2 Diversity of Learning Tools

Prior to the digital era, learning tools were primarily in physical forms, such as books, notebooks, and blackboards. While these tools effectively supported educational activities at the time, their functionality was relatively limited, relying mainly on text and images for information transmission. Students absorbed knowledge through reading and listening, a method that presented significant limitations in promoting deep understanding and accommodating individual differences. With the advancement of computer and Internet technologies, learning tools began transitioning towards digitalization. The emergence of digital tools, such as e-books, online video courses, and interactive learning applications, significantly enriched the content of learning resources. These tools offered enhanced interactivity and accessibility, freeing the learning process from the constraints of traditional classroom settings and allowing students to learn at their own pace and according to their interests.

The application of AIGC technology represents another significant innovation in the evolution of learning tools. AIGC employs AI algorithms to create educational content, such as automatically composed instructional materials, personalized learning trajectories, and interactive learning dialogues facilitated by natural language processing. Under the influence of AIGC, learning tools exhibit unique characteristics, which offer a highly personalized learning experience by analyzing students' learning habits and preferences to autonomously generate tailored content and exercises for each student.

Additionally, these tools enhance the interactivity of learning, enabling efficient interaction with students through simulated dialogues and instant feedback. Furthermore, AIGC technology diversifies the learning content beyond text and images to include videos, animations, and other multimedia formats, significantly enhancing the appeal and efficiency of learning. For instance, tools like Grammarly or ChatGPT assists in improving writing skills, generating creative texts, or conducting research by providing grammar checking, style guidance, and content creation services, thereby supporting users' needs in academic writing and creative expression. Sora, OpenAI's latest advancement in artificial intelligence, is a text-to-video generation tool that marks a significant leap forward in AI technology. This platform is capable of creating short videos up to 60 seconds long from written prompts, showcasing a remarkable blend of creativity and technological innovation. It stands out not only for its ability to generate videos from text but also from still images, expanding the possibilities for the content creation.

The evolution of learning tools from traditional physical media to digital instruments, and subsequently to the application of AIGC technology, not only mirrors the trajectory of technological advancement but also signifies a fundamental transformation in learning methodologies. The integration of AIGC technology, in particular, has propelled the development of learning tools towards greater personalization, interactivity, and intelligence, opening up new avenues in modern education. This shift has not only provided students with richer and more flexible learning resources but has also teached educators with innovative teaching tools and methodologies, thereby fostering innovation and progress within the educational domain collectively.

2.3 Transcending Spatial Boundaries

Historically, the physical infrastructure of education has been bound by the constraints of geographical location and architectural space, necessitating the physical presence of learners and educators in a designated area, typically a classroom. This traditional model, while effective in fostering a communal learning environment, inherently limits accessibility and flexibility. It necessitates significant resources for the maintenance of educational facilities and restricts educational opportunities to those within practical reach of these institutions.

The advent of technology, particularly the Internet and digital communication tools, has introduced the concept of transcending these spatial boundaries. Digital platforms and online resources have begun to break the geographical and physical constraints, offering a pathway to spatial independence in education[10]. This evolution represents a paradigm shift from a location-centric to a learning-centric approach, where the focus is on accessibility of information rather than the physical presence in a designated space.

The evolution of digital learning spaces, driven by advancements in Internet technology, represents a profound shift in educational paradigms, far surpassing the mere digitization of traditional classrooms. These platforms, underpinned by diverse technologies such as virtual reality and artificial intelligence, offer dynamic and interactive experiences that greatly enhance accessibility, flexibility, and personalization in education. By eliminating geographical barriers and enabling real-time engagement across continents, digital learning environments not only democratize access to education but also enrich it with global perspectives, catering to the diverse needs and schedules of learners worldwide.

AIGC technologies further augment the spatial flexibility of learning environments by creating dynamic and immersive experiences that surpass traditional and digital learning paradigms. AIGC applications, such as virtual reality simulations of historical events or scientific phenomena, offer learners the opportunity to explore and interact with content in ways that were previously inconceivable. For instance, AIGC can simulate real-world environments for medical students to practice surgical procedures or for architecture students to design and navigate through virtual structures. These applications not only solve with spatial limitations but also enhance the depth and quality of educational experiences, making learning more engaging and effective.

The transcendence of spatial limitations through technology brings numerous benefits to the education. It democratizes access to education, allowing individuals from remote areas or those with mobility challenges to participate in learning opportunities that were once out of reach. This inclusivity extends to lifelong learners, who can now engage with educational content without the constraints of traditional academic calendars or locations. Moreover, the breaking of spatial barriers fosters global collaboration among students and educators, enriching the educational experience with diverse perspectives and expertise. Personalized learning environments, tailored to individual learning styles and needs, become more feasible, enabling learners to maximize their

educational potential. In summary, the transcendence of spatial boundaries in education, facilitated by digital and AIGC technologies, represents a significant evolution in how learning is accessed, experienced, and valued.

3 Transformations in Learning Methods due to AIGC

AIGC in education marks a pivotal shift, not just in the tools and resources available for learning but fundamentally in the ways we approach learning itself. The integration of AIGC into education catalyzes a shift towards personalized, interdisciplinary, and unrestricted learning. It transitions from abundant of resources and diversification of tools to transcending physical boundaries, fostering deeper understanding, cross-disciplinary synthesis, and global connectivity in learning processes.

3.1 Depth Learning

The advent of AIGC technology signifies a significant transformation in the ways of student learning, facilitating a shift towards deep learning methodologies. Deep learning, as a cutting-edge pedagogical approach within the educational domain, is dedicated to enhancing individual qualities through the integration of comprehensive concepts and the application of knowledge and skills. It aims at optimizing and adjusting existing knowledge structures and capabilities to adapt to new academic fields and practical contexts. AIGC, by recommending content through intelligent algorithms, enables students to undertake more profound explorations on their individual learning trajectories. This method encourages students to proactively delve into uncharted territories, thereby deepening their understanding of knowledge. Compared to traditional learning methodologies, AIGC offers a richer array of learning resources and more convenient access to information. Its application not only expands the range of learning materials but also facilitates on-demand access to educational resources, significantly fostering the development of personalized learning experiences.

In the process of deep learning utilizing AIGC technology, students are required to master effective interaction with the technology to maximize learning efficiency and outcomes. Initially, students must learn how to present clear and specific instructions or queries to the AIGC system. This necessitates not only a profound understanding of the subject matter but also the ability to accurately articulate their learning needs. For instance, when exploring complex scientific concepts or conducting research, the ability to precisely define search parameters or pose questions directly impact the quality and relevance of the information returned by AIGC.

Furthermore, effective utilization of AIGC technology involves the capacity for critical analysis of its output. Students need to develop skills to assess the reliability, accuracy, and bias of information sources, including identifying and correcting errors or misleading information in generated content of AIGC. In the course of this process, students are motivated to consult multiple sources of information for cross-verification, thereby forming a comprehensive and objective perspective.

Finally, instructing students on how to integrate AIGC technology with other learning resources and methodologies is crucial. This implies considering generated content of AIGC as part of the learning process rather than the sole source of information. By combining AIGC with traditional learning methods such as classroom instruction, book reading, and experimental practices, students can learn within a broader framework, thus enhancing the depth and breadth of their learning experience. For instance, in the field of animation design, AIGC can facilitate students' in-depth learning of new character animation design. Through AIGC tools, students can access a wide range of materials on historical backgrounds, scene analyses, and cultural contexts, providing them with a wealth of learning materials and sources of inspiration. However, users need to verify the content generated by AIGC against historical books and other reliable sources.

3.2 Interdisciplinary Learning

In the context of the artificial intelligence era, the educational sector is confronted with unprecedented challenges and opportunities. The rapid advancement of technology herald significant changes, and even disappearance, of a multitude of job positions. Under such circumstances, adhering to traditional disciplinary for future talent cultivation evidently fails to meet the demands of the times. Consequently, recognizing the significance of interdisciplinary learning becomes an indispensable aspect of educational reform.

Interdisciplinary learning refers to an educational approach that integrates concepts, theories, and tools from multiple disciplines, enabling students to tackle complex issues through a diversified perspective. This mode of learning not only assists students in establishing a more comprehensive system but also fosters the development of innovative thinking and problem-solving abilities. Propelled by emerging technologies such as artificial intelligence, interdisciplinary learning has emerged as a key strategy in nurturing future talents. To adapt to this educational transformation, schools are required to expand the scope of general education, emphasizing and enhancing students' artistic cultivation, communication abilities, and other holistic qualities. These qualities are crucial for students to comprehend the interconnections between different disciplines and to effectively communicate and collaborate within an interdisciplinary context. Moreover, to better respond to the challenges brought about by the digital era, the educational field must demonstrate a greater resolve for reform and an interdisciplinary perspective. Through the integration of internal and external disciplinary transformations, the educational system can provide students with a richer and more diversified learning environment, thereby better preparing them for the complexities of the future world.

Interdisciplinary learning denotes an educational strategy that integrates concepts, theories, and instruments from various fields, enabling learners to address multifaceted issues through the lens of diverse perspectives. This shift in methodology is significantly propelled by two central facets of AIGC. On the one hand, AIGC possesses the capability to amalgamate and apply an array of algorithms, blending knowledge from different disciplines into a cohesive and comprehensive framework. To name only a

few, leveraging AIGC technologies allows students to simultaneously incorporate mathematical modeling, physical principles, and artistic creativity in design projects. Such interdisciplinary applications not only augment the richness of the learning content but also enhance its engagement and practicality. On the other hand, the high operability and variety of learning tools offered by AIGC considerably lower the barriers to interdisciplinary education. These tools, characterized by user-friendly interfaces and extensive functionality, render transdisciplinary learning more accessible and convenient. Students can effortlessly navigate among diverse areas, fostering connections and cultivating a multifaceted educational experience.

The long-term impact of AIGC on the educational sector could be transformative, encouraging a more holistic approach to knowledge acquisition and application. Students' awareness of the importance of interdisciplinary learning will be crucial in this context. AIGC's capacity to amalgamate vast arrays of knowledge from diverse disciplines provides a unique opportunity to cultivate a learning environment where students can engage with complex problems through a multifaceted lens. This integration not only enriches the educational experience but also mirrors the interconnected nature of the modern world, preparing students to navigate its complexities with agility and insight.

3.3 Boundaryless Learning

Boundaryless learning is defined as an educational approach that transcends traditional educational boundaries, centering on breaking the barriers of geography, time, and discipline to offer more flexible and extensive learning opportunities[9]. This learning paradigm is characterized by its flexibility in time and space, allowing students to learn at their own pace and according to their interests, unfettered by physical location. Moreover, boundaryless learning emphasizes the integration of interdisciplinary knowledge, encouraging students to apply insights from various fields to solve complex real-world problems.

This approach has driven fundamental changes in the structure of the education system and teaching methodologies. Centered around the learner, this transformation underscores the importance of flexibility, interactivity, and personalized learning pathways. Boundaryless learning has opened up the learning environment, moving education beyond the conventional classroom walls to a global scale, where learning is facilitated through online platforms and digital resources at any time and place. The advancement of modern technology, especially digital technology, provides a solid foundation for boundaryless learning. The integration of cloud computing, mobile learning applications, and Massive Open Online Courses enables students to easily access educational resources from around the globe, transcending geographical and cultural boundaries and fostering interdisciplinary and global perspectives in learning.

AIGC technology, through intelligent algorithms, offers customized learning resources, breaking the constraints of physical space and enabling students to access cross-regional and interdisciplinary materials anytime and anywhere. The sharing and convenient access to these resources significantly enhances the flexibility and efficiency of learning. AIGC technology enhances the attractiveness and engagement of

the learning experience through interactive content and simulated environments, such as virtual labs, promoting active student participation.

Despite the significant impetus AIGC technology provides to boundaryless learning, it also introduces challenges related to data privacy and content quality control. AIGC can generate a vast amount of educational content, including course materials, exercises, and instructional videos. However, ensuring the accuracy and appropriateness of these automatically generated contents pose a significant challenge. The generation process, reliant on algorithms, may lead to errors or misleading information. Additionally, the quality of content could be affected by algorithmic biases or limitations in training data. Educational institutions and teachers need to invest additional time and resources to review and validate generated content of AIGC to ensure it meets educational standards and learning objectives. This not only complicates educational practice but also presents new demands for professional development for teachers.

4 Conclusions

The rapid advancement of AIGC technology may lead to the obsolescence of certain professions in the future, exerting significant impacts across various sectors of society. Artificial intelligence technology has profoundly influenced higher education. From the perspective of student learning, this article endeavors to explore the transformation in learning methods under the influence of AIGC. AIGC technology has enriched students' learning resources and tools, as well as dismantling the traditional boundaries of learning. This has facilitated a shift from conventional singular learning modes towards more comprehensive approaches such as deep learning, interdisciplinary learning, and boundaryless learning. Expanding the breadth and depth of learning at educational level enables students to transition from tedious memorization of information to the integrated application of learning tools for solving problem. In summary, AIGC presents new challenges and opportunities to educational institutions, making the deep integration of humans and machines a worthwhile exploration.

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