Teaching Design of Course Building Decoration Materials Based on Generative Artificial Intelligence

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Abstract With the digital transformation of global education and China's emphasis on education digital, generative AI technology has been widely used in the field of higher education. In this paper, the development of generative AI technology and its potential in personalized learning, interactive content creation and adaptive assessment in education were introduced firstly. Then, the application case of generative AI tools in teaching content creation, scenario-based teaching content development, visual teaching content development, complex concept deconstruction and analogy, student-led application practice and other aspects in the teaching of Building Decoration Materials was discussed. Through the teaching experiment and effect evaluation, the positive influence of generative AI technology on the improvement of students' learning effect and teaching efficiency was verified. Finally, some thoughts and inspirations on the combination of educational theory and generative AI technology, the integration of teaching design and generative AI technology, and the practice cases and effect evaluation were put forward, and the importance of teacher role transformation and personalized learning path design was emphasized to provide theoretical and practical support for the innovative development of higher education.

Keywords Generative artificial intelligence, Higher education, Teaching design, Education digitization

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With the deepening of the new round of technological and industrial revolution, digital technology has increasingly become a key force leading the fundamental transformation and all-round reshaping of the way of thinking, organizational structure and operation of human society, providing a major opportunity to path innovation, form reshaping and development promotion. Around the world, the digital transformation of education has become a universal consensus. At the Summit on Transforming Education of the United Nations, the digital transformation of education has been listed as one of five priority areas for action.

China attaches great importance to the digital transformation of education, and the 20th National Congress of the Communist Party of China has made special strategic plans to promote the digitization of education, and has clearly proposed promoting the digitization of education and build a learning society and country with lifelong learning for all the people. In the government work report in 2024, it is proposed that it is necessary to deeply implement the strategy of rejuvenating the country through science and education, strengthen the basic support for high-quality development, and vigorously develop digital education. On May 29, 2023, when presiding over the fifth collective learning of the Political Bureau of the CPC Central Committee, the General Secretary Xi Jinping stressed that the digitization of education is an important breakthrough for China to open up a new track for education development and shape new advantages of education development. Some national policy documents, such as *the Key Points for Improving the Digital Literacy and Skills of the Whole People in 2024*, *the Overall Layout Plan for the Construction of Digital China*, and *Teachers' Digital Literacy*[1-3], provide top-level design and action guidelines for the digital transformation of education. In this context, artificial intelligence (AI) technology has gradually become an important driving force for the digital transformation of education.

1 Generative AI technology and educational curriculum design

1.1 Rapid development of generative AI technology in education

With the continuous progress of AI technology, generative AI technology has been increasingly widely used in the field of education. These technologies, especially large-scale language models, provide entirely new tools and methods for education, dramatically changing traditional teaching models. Generative AI technology has the ability to generate text, images, and other digital media, provides education with a variety of applications such as personalized learning, interactive content creation, and adaptive assessment. For example, generative AI technology can assist teachers to efficiently complete lesson preparation, broaden the horizon of teaching design, stimulate teaching inspiration, and produce customized teaching resources, thus improving teaching efficiency and quality[4]. The impact of generative AI technology on education is not only reflected in teaching design and content generation, but also in the empowerment of learners' ability cultivation and learning evaluation. Bai Xuemei et al.[5] pointed out that generative AI technology promotes the deep integration of education and technology, makes large-scale personalized learning possible, and promotes the comprehensive development and personalized growth of learners by providing fine-grained information and timely feedback. In addition, it can enhance students' engagement and knowledge retention through personalized learning experiences, the creation of interactive content, and adaptive assessment[6]. In higher education, the technology is used not only in curriculum design and development, but also in educational administration and academic research. Johri et al.[7] point out that the technology can support teaching and improve the efficiency of curriculum development by creating interactive learning content and enhancing visual effects. Tzirides et al.[8] further explored the multiple potential applications of generative AI in education, emphasized its role in the generation of complex assessment of students' works and AI-driven learning experiences.

1.2 Demand for innovative teaching methods in higher education

One of the goals of higher education is to cultivate application-oriented talents with practical operation ability and professional skills. The demand for innovative teaching methods has become increasingly urgent, and it faces multiple challenges of improving teaching quality and students' practical ability and adapting to industrial changes. The application of generative AI technology provides new possibilities for course design and teaching methods in higher education. Through personalized learning experiences, interactive content creation, and adaptive assessment, generative AI can help higher education achieve instructional innovation. For instance, Li Yongzhi et al.[9] pointed out that by providing additional information about role characteristics and preferences to the large model of generative AI, the large model can generate more personalized and attractive responses, and realize various learning modes. Qadir[10] proposed that generative AI technology can provide personalized and effective learning experiences by providing customized feedback and interpretation and creating realistic virtual simulations. At the same time, Mello et al.[11] mentioned that generative AI technology has shown great potential in teaching design and development, and interactive learning content can be created by generating text, images and codes, to improve course quality and development efficiency.

In the specific practice of higher education, generative AI technology can be used to simulate real work scenes, generate multimedia teaching materials and design personalized learning paths, provides new tools and methods for teaching innovation in higher education, and has broad application prospects.

2 Teaching design and imple-mentation

The course Building Decoration Materials, which is a core course of building decoration engineering technology major in colleges and universities, aims at cultivating students' cognition and application ability of various decorative materials, so that they can carry out reasonable selection and use of materials in practical work. The course covers the basic properties, application scope, construction techniques and the latest development trends of materials. The content specifically includes characteristics of wood, stones, ceramic tile, glass, metal materials, bathroom bath materials, film materials, coatings, cultural and historical decorative materials and other materials as well as their applications in decoration. In the teaching design and implementation of this course, generative AI technology is actively explored and innovatively applied to improve the innovation of course content and the effectiveness of teaching methods. The application not only enriches the teaching resources, but also optimizes the learning process, thus effectively enhancing students' learning experience and knowledge absorption ability.

2.1 Creation of teaching content based on generative models

In the teaching of chapter "Tiles", this course explores the integration of various generative AI tools to create high-quality text and multimedia content, enrich the teaching medium, and enhance the interactivity and interest of learning experience.

In order to enhance students' grasp and memory of related knowledge to tiles, intelligent technology is integrated in the teaching, and Kimi intelligent assistant and other intelligent models widely recognized in China are adopted. By entering the specified prompt words and uploading course PPT, the lyrics of a teaching song called "Tile Knight" are developed and generated, and the song precisely describes the many types of tiles and their respective properties. The lyrics cover the anti-slip and wear properties of full-body bricks, the smooth surface and relatively weak anti-slip properties of polished bricks, the high density and excellent anti-pollution properties of vitrified bricks, and the rich color and low wear resistance of glazed bricks. Through the integration of music as an art form, complex knowledge points become easy to understand, and the effect of memory can be enhanced in a pleasant learning atmosphere.

In the specific process of teaching implementation, grouping and interactive teaching methods are adopted to enhance the participation of students. In class, after each knowledge point is explained, interaction is carried out by randomly calling names or encouraging students to take the initiative to answer questions. Students who fail to answer the question correctly will be arranged to learn to sing "Tile Knight" with the group members within 10 minutes before class. In addition, the accompaniment and melody of the song are created by Suno, an artificial intelligence music generation software, and students' learning motivation and enthusiasm for participation can be enhanced through the pleasant melody. This method aims to enhance the interest and interactivity of teaching through music as an intuitive and attractive medium, so as to effectively improve students' learning interest and knowledge retention.

2.2 Development of scenario-based teaching content based on generative models

In the teaching design of this course, how to create specific classroom teaching situations is explored to improve students' learning motivation and practical application ability. Specific implementation strategies include combining classroom teaching with generative AI technology to enhance the attractiveness and practicality of teaching through real-time generated interactive content and situational simulation.

Firstly, by using the Kimi intelligent assistant, the course transforms traditional PPT teaching materials into a more dynamic and interactive learning experience. By uploading teaching PPT to Kimi intelligent assistant, teachers can guide the system to automatically generate topics and learning scenarios for group discussions based on course content. The system automatically classifies knowledge into four groups, and each group focuses on different building materials and application environments, such as metal curtain walls, decorative panels, partition systems, etc., so as to make students have a comprehensive understanding of the characteristics of materials and their application in actual construction.

Secondly, in order to enable students to learn in a relaxed and enjoyable atmosphere, generative AI technology is used to write role-playing scripts. These scripts revolve around specific building projects, such as how to choose the right building materials to achieve the best economic and aesthetic results. By taking on the roles of designers, engineers and project managers, students experience the decision-making process and enhance their understanding and memory of material properties. In this way, students not only learn the basic knowledge of building materials, but also understand the combined impact of material choice on project cost, aesthetics, and functions through real situation simulation.

In order to maintain students' attention and deepen their understanding after each situational activity in the course, Kimi intelligent assistant will automatically generate test questions related to the activity through prompt words, and students need to answer them immediately after the activity is over. This kind of immediate feedback mechanism helps to consolidate the knowledge points of students, and immediately

correct the deviation in understanding, making the learning process more efficient. With the aid of generative AI technology, students' practical operation ability and problem-solving ability are improved by creating specific learning situation.

2.3 Development of visual teaching content based on generative models

In the course Building Decoration Materials, the comprehensive application of a variety of generative AI tools has also been used to improve the visual presentation of the teaching content. Tools such as Amy mind, Wancai AI, Canva Classroom Magic and Kimi intelligent assistant provide indispensable technical support for this course.

Amy mind, an online AI-driven mind mapping and artboard tool, has simple and elegant toolbars and open and friendly import and export functions, and support multiple file formats such as Markdown, FreeMind, PPT, PDF, and Word. It is particularly good at handling complex knowledge structures, and can generate simple and beautiful mind maps based on the input paragraphs. For example, when analyzing the performance characteristics of different types of wood, such as the durability and aesthetics of hardwood, the light weight and insulation of cork, the stability and adaptability of plywood, the cost effectiveness and ease of processing of fiberboard, Amy mind provides clear visual aids to help students understand the application and characteristics of these materials. When more complex data or concepts need to be presented, such as the analysis of overall life cycle of building materials, Kimi intelligent assistant generates Mermaid codes, and these codes can be imported into some code-to-chart platforms and quickly converted into interactive charts. Using this advanced data visualization technique, students can not only observe the representation of data, but also explore the properties and environmental impacts of materials through interactive manipulation, thereby effectively enhancing their understanding and critical thinking skills.

The application of Wancai AI mainly focuses on the generation of dynamic content. The tool enables teachers to quickly create personalized instructional videos and courseware, and is ideal for transforming complex building material cases into vivid instructional media. For instance, when the application of aluminum alloy in modern architecture is discussed, the video generated by Wancai AI can show the aesthetics and functionality of aluminum alloy in different architectural structures in detail, and this dynamic visual presentation effectively attracts students'

attention and enhances their learning interest.

Canva Classroom Magic, which is an online design platform designed specifically for the education sector, offers rich instructional related templates and an intuitive drag-and-drop interface to allows teachers to easily create personalized instructional visual content. Meanwhile, it can be used to create interactive course presentations and a variety of instructional materials such as information charts, comparison charts and flow charts in course design.

2.4 Complex concept deconstruction and analogy based on generative models

In the course Building Decoration Materials, the complex concepts and diverse material classification and characteristics often make students confused. In course design and explanation, specific prompt words are designed to generate vivid analogies and metaphors by using generative AI technology, so as to visualize abstract concepts and make them concrete and easy to understand. For instance, when wood types are explained, generative AI is used to provide a vivid analogy: different types of flooring are likened to different types of wine. For example, solid wood floor is like white wine, pure and strong, and symbolizes natural and unique texture, but it is not easy to manage; solid wood floor is like a well-prepared cocktail, having both natural beauty and stability; laminate floor is similar to beer, is affordable and durable, and is suitable for everyday use. Such metaphors allow students to understand and distinguish between different types of floors in a familiar context.

In order to generate these interesting and useful analogies and metaphors during the teaching process, language models such as Kimi intelligent assistant and Zhipu Qingyan are used. These tools can generate a variety of analogies and metaphors based on input prompt words. The specific method of operation is to write a fixed prompt word template, and then enter concepts or materials that need to be compared during the teaching process. By comparing the output of different generation tools, the best metaphors are selected for use in teaching.

2.5 Student–led application practice based on generative models

During the process of course design, through generative AI tools and virtual simulation experiments, students can actively simulate material characteristics and use effects in the classroom. For example, generative AI tools such as Kujiale AI are introduced to provide students with an intuitive virtual environment, in which students can perform intelligent tile replacement, wall paint color testing and other operations.

Through a highly visual way, students can intuitively understand the visual effects and physical properties of different materials in practical applications, and observe the impact of color on the room light and visual spatial sense, so as to make a more reasonable choice in the actual design. Moreover, the experimental course on the national virtual simulation experiment platform lab-x.com is also introduced. For instance, when learning wood related knowledge, students can deeply understand the construction principle of traditional wood structure through the experiment "mortise and tenon structure", assemble and test the mortise and tenon structure, and understand the performance of these structures under different stress conditions, which enhance students' awareness of traditional building techniques and develop their ability to apply these techniques in modern architectural design.

Through these generative AI tools and virtual simulation experiment courses (Table 1), students can carry out a large number of practical operations in a virtual environment, which enriches the teaching content, and improve students' learning interest and enthusiasm.

3 Discussion and innovation of methodology

In the teaching of Building Decoration Materials, the application of generative AI technology not only greatly enriches the teaching resources, but also brings many innovations in teaching methods. These innovations include the combination of educational theory and generative AI technology, as well as multiple aspects of teaching design, implementation, and practical effectiveness evaluation.

3.1 Combination of educational theory and generative AI technology

The application of generative AI technology should be based on solid educational theory and teaching design principles. Constructivist learning theory emphasizes that learners construct knowledge through interac-tion with the environment and others, and generative AI technology provides a rich platform for interaction, exploration, and generation. For instance, Piaget proposed that knowledge is gained through interaction with the environment, and generative AI can help students constantly build and adapt their own knowledge system as they interact by providing immediate feedback and dynamically generating content. In addition, the cognitive load theory emphasizes that students should avoid excessive cognitive load in the learning process to improve their learning effect.

Table 1 Application of generative AI tools in the course Building Decoration Materials

Tool	Application scenario	Usage description	Effect
Kimi intelligent assistant	Creation of teaching content, and scene teaching	Inputting prompt words to generate text and multimedia content, and automatically generating group discussion topics, role-playing scripts, and test questions	Enriching teaching media, enhancing the interaction and interest, improving students' learning motivation and practical application ability
Suno music generation software	Creation of teaching content	Generating the accompaniment and melody of teaching songs	Improving students' learning motivation and enthusiasm for participation, and enhancing their knowledge retention
Amy mind	Development of visual teaching content	Generating mind maps to help students understand complex knowledge structures	Providing clear visual aids to enhance understanding of material applications and properties
Wancai AI	Creation of teaching content	Creating personalized teaching videos and courseware to show complex cases	Dynamic visual presentation attracts students' attention and enhances their learning interest and effectiveness
Canva Classroom Magic	Creation of teaching content	Creating interactive course materials using templates and drag-and-drop interfaces	Beautiful and interactive teaching materials promote students' understanding and interest in the aesthetics of architectural design
Kujiale AI	Student-led application practice	Providing a virtual environment for material replacement and color testing	Intuitively understanding the visual effects and physical properties of materials in practical application, and making reasonable design choices

Generative AI technology can automatically generate teaching materials, and reduce the burden of lesson preparation for teachers, so that teachers have more time to pay attention to the personalized needs of students, and the cognitive load of students can be reduced through intuitive content presentation.

3.2 Integration of teaching design and generative AI technology

In terms of teaching design, generative AI technology provides new possibilities for the design of personalized learning paths. Each student's learning background, interests, and needs are different, and generative AI technology can dynamically adjust the content and difficulty of teaching based on students' feedback and learning progress. Generative AI technology also provides new means of classroom interaction. In traditional classroom teaching, the form of interaction is relatively simple, and is limited by teacher's energy and time. Through generative AI technology, real-time interactive content can be generated in the classroom, such as role-playing scripts and situational simulation. By playing different roles, students can experience the

decision-making process and apply knowledge, and improve the participation and practicality of learning. This dynamic interactive teaching model not only enhances students' sense of participation, but also effectively promotes the deep understanding and application of knowledge.

3.3 Practical case and effect evaluation

In order to verify the application effect of generative AI technology in the course Building Decoration Materials, the course team conducted a systematic teaching experiment and effect evaluation. In the teaching experiment of tile chapter, students were divided into experimental group and control group. The experimental group used generative AI technology during the teaching process, while the control group used traditional teaching methods. The experimental results show that students in the experimental group were significantly better than those in the control group in knowledge mastery and application ability. The experimental group scored an average of 85 points in knowledge mastery, while the control group scored 75 points. In terms of application ability, the average

score of the experimental group was 90, while that of the control group was 80 (Fig.1).

In addition, through the questionnaire survey of students, it is found that the experimental group was significantly higher than the control group in terms of learning interest and participation. The results show that students' satisfaction with their interest in learning was 90% in the experimental group and 70% in the control group. The satisfaction with participation was 85% in the experimental group and 65% in the control group (Fig.2). These results reveal that generative AI technology can not only improve students' knowledge mastery and application ability, but also significantly improve students' learning interest and classroom participation.

Students' feedback is generally positive, believing that the application of generative AI technology enriches their learning content and enhances the fun and effect of learning. Teachers also said that generative AI technology has greatly reduced the burden of lesson preparation and improved teaching efficiency, allowing them to focus more on the teaching itself and
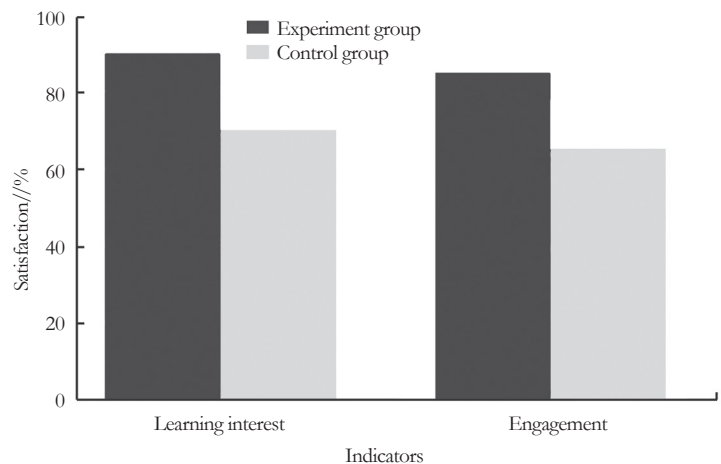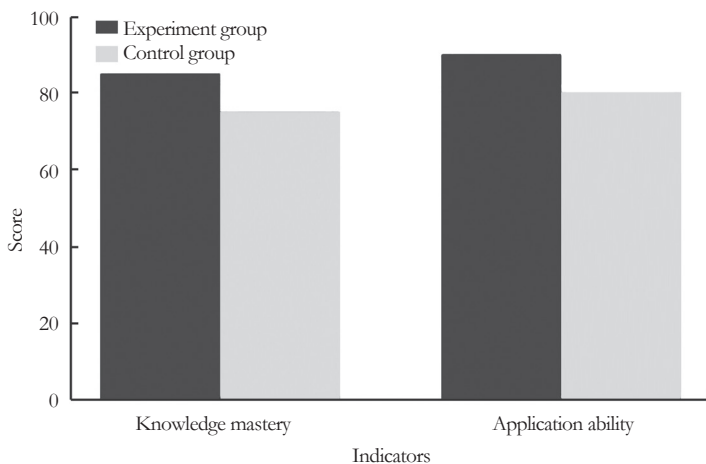

Fig.1 Comparison of knowledge mastery and application ability

Fig.2 Comparison of learning interest and participation satisfaction

personalized guidance of students.

4 Reflection and enlightenment

Generative AI technology provides a powerful tool for education, but its application must be deeply integrated with educational theory and teaching practice. Only based on solid educational theory and scientific teaching design can the potential of generative artificial intelligence technology be given full play to and the quality of education be truly improved. Generative AI technology can not only realize the design of personalized learning paths, but also dynamically adjust the teaching content and difficulty to meet the needs of different students and significantly improve the learning effect. In the future, it is needed to further explore how to use generative AI technology to achieve large-scale personalized learning.

The application of generative AI technology needs to be continuously optimized through practice and evaluation. In the process of teaching implementation, it is necessary to adjust the teaching strategy and content in time according to the feedback and evaluation results of students. Through continuous experiments and optimization, the application effect of generative AI technology in education can be gradually improved. The role of teachers in this context also needs to change. Teachers must not only master the methods of technology application, but also have the ability to design

personalized learning paths and interactive content. In the future, teacher training and support should be strengthened to enhance their teaching ability in the context of generative AI technology.

In short, the application of generative AI technology in higher education has broad prospects. Technology and education are deeply integrated to optimize teaching design, enrich teaching resources, constantly improve the teaching process according to practice and evaluation, and provide strong support for the innovation and development of higher education. Teachers and curriculum designers should actively embrace this technology and take full advantage of its potential to provide students with a better and more personalized educational experience.

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impact on traditional art and design education practices. In the future, it is necessary to ensure that teaching objectives remain unchanged and clear while technological innovation leads teaching reform.

In summary, the current introduction of AI drawing technology into environmental art and design teaching in universities is a multidimensional and interdisciplinary attempt. It can not only affect the field of art and design teaching, but also trigger profound changes in a wider range of educational levels. While

embracing the infinite possibilities of this technology, we should also deeply consider how to fully utilize it while maintaining teaching objectives and educational principles, so as to jointly create a more diverse and colorful future.

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