Research on the Application of a New Generation of Artificial Intelligence in Urban Planning and Landscape Design Teaching

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Abstract. In landscape architecture education, artificial intelligence idea Generation (AICG) technologies, including ChatGPT, Stable Diffusion and Midjourney, are leading a revolution in education. These technologies, with their powerful data processing and generation capabilities, have brought unprecedented opportunities to landscape architecture teaching. ChatGPT's natural language processing ability greatly promotes the communication efficiency of students in the expression of design concepts and document writing, making the communication of design ideas more accurate and smooth. Stable Diffusion's image generation technology significantly improves the efficiency and visual effects of the design process by quickly generating high-quality design sketches and renderings. Midjourney's image synthesis capabilities provide rich visual materials and inspiration for urban planning and landscape design, stimulating students' creativity. Taking the teaching of urban planning and landscape design in Hangzhou Business School of Zhejiang Gongshang University as an example, this paper confirms the remarkable effect of AICG technology in improving students' design skills and creativity, and provides reference experience for the promotion of a new generation of artificial intelligence in design teaching.

Keywords: Artificial Intelligence, AICG, Urban Planning and Landscape Design Teaching.

1 Introduction: New generation of artificial intelligence AICG

Artificial Intelligence-generated Content (AIGC) is a method that uses artificial intelligence technology to generate content, covering text, images, video, audio and other fields. The core of AIGC technology is to generate content with certain creativity

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and quality through the learning and identification of existing data. Common AIGC applications include AI writing, AI painting, AI composition, AI editing, AI animation, and AI interaction, etc. Of these, ChatGPT, Midjourney, and Stable Diffusion are representative tools in the AIGC field. ChatGPT is a large language model that generates various types of text; Midjourney is an image generation tool that generates high quality images based on text descriptions; Stable Diffusion is known for its free, local deployment, and high customization.

2 The background of Artificial intelligence teaching

Ministry of science and technology of six ministries and commissions on accelerating the scene innovation with high level application of artificial intelligence to promote high quality economic development guidance emphasized the importance of promoting artificial intelligence scene innovation in the field of education, aims to promote technology iteration and industrial growth, for AICG technology in urban planning and landscape design teaching application provides policy background [1]. The Institutional Ai Innovation Action Plan of the Ministry of Education further establishes the goals of strengthening the construction in the field of AI, improving the talent training system, and promoting the transformation of scientific and technological achievements, highlighting the importance of interdisciplinary integration and the "AI +" education action. Under the guidance of these policies, Zhejiang industrial and commercial university Hangzhou business school and Shenzhen elegant tao landscape architecture design co., LTD [2]. Collaborative education project application of AICG technology education innovation and response to the practice of national artificial intelligence strategy, the development of the research and teaching activities will have a profound social impact in a broader space.

3 Teaching and research background of artificial intelligence urban planning and landscape design

In the research trend of AIGC technology application in the urban planning and landscape design industry, scholars are exploring how to use artificial intelligence to improve design efficiency and innovation. For example, the SCUrban Lab team of South China Agricultural University demonstrated the potential of AIGC technology in landscape architecture design by adjusting and optimizing the Stable Diffusion model [3]. In addition, AIGC technology can automatically generate high-quality landscape renderings through deep learning algorithms, providing designers with fast and diversified design options, which is gradually becoming a reality in the urban planning and landscape design industry [4].

In the field of urban planning and landscape design education, AIGC technology is regarded as an important tool for teaching innovation. Scholars are studying how to integrate AIGC technology into the curriculum to promote the development of students' design ability and innovative thinking. For example, some studies have discussed the

application of AIGC technology in design education, including the innovation of teaching models, the improvement of students' abilities, and the reconstruction of the education system [5]. The application of AIGC technology in art and design education also faces opportunities and challenges, which requires educators and students to explore and adapt together [6]. Feng Mingyang, Cao Rui, and Chen Qingjun (2023) discussed the reform and reconstruction brought about by AIGC to art and design education, including the construction and practical path of the education system [7]. Chen Lufan, Xiang An Ling and Shenyang (2023) pointed out key research directions such as the combination of AIGC technology and traditional culture, technology popularization and training, and the change of creative principles [8].

AICG technology shows its unique value in the urban planning and landscape design major, especially in terms of artistic association, creation and expression. However, there are some challenges to its popularity and application:

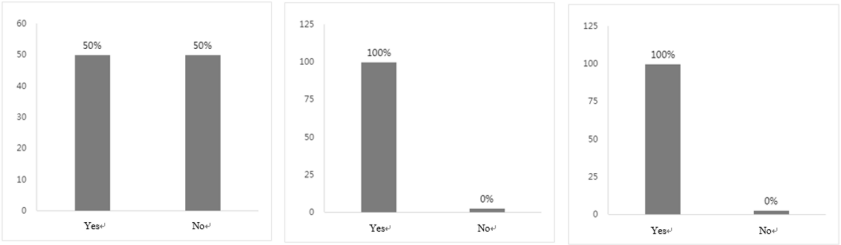
Learning curve: Students need to master the operation of AICG tools such as ChatGPT, Midjourney and Stable Diffusion, which usually requires additional training and learning time. Educational institutions should provide relevant courses to help students get these tools started quickly.

Resource input: The effective application of AICG technology requires corresponding hardware and software support, which may involve certain economic input. Schools should consider providing the necessary equipment and software licenses to ensure that students can study and practice smoothly.

Teacher training: Teachers need to adapt to the application of AICG technology and improve their professional skills in order to guide students more effectively. Participation in relevant training and workshops is an effective way to improve teacher literacy.

Although urban planning and landscape design started late in the promotion and application of AICG technology, compared with the architectural and civil engineering industries, with the increasing demand of AICG technology, urban planning and landscape design have gradually realized its importance in artistic creation and expression. AICG tools such as ChatGPT can assist with the generation of design documents, while Midjourney and Stable Diffusion can provide rich visual performance and enhance the intuition and appeal of design concepts.

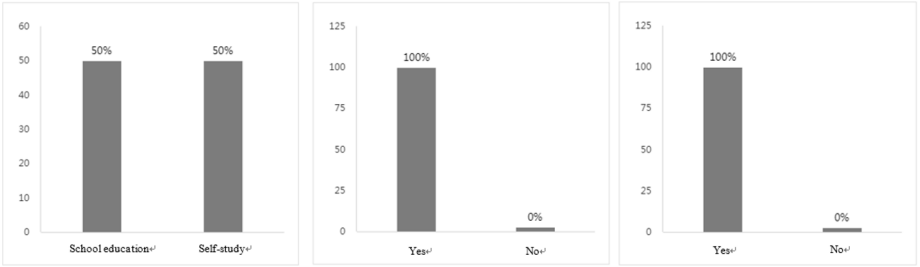
Through the investigation of domestic universities, such as Hangzhou Business School of Zhejiang Gongshang University, Shanghai School of Visual Art and Design, and Gengdan College of Beijing University of Technology, we found that students majoring in urban planning and landscape design showed a strong interest in AICG technology. They realize that mastering these technologies is essential to enhance their competitiveness in future employment, so they actively learn and apply AICG tools to improve their artistic creation and expression skills in the design field (as shown in figure 1).



(a) To know AICG (b) Contributes to urban planning and landscape design (c) Contributes to career development

Fig. 1. College students' cognition of AICG

According to the survey results, 50% of students majoring in landscape design in universities have used AICG technology for professional design, and 50% of some students have mastered AICG technology through self-study, rather than through classroom teaching. Some students majoring in landscape design are interested in the new generation of artificial intelligence technology, and they take the initiative to learn AICG technology, participate in relevant training or self-study. They realize that AICG technology can enhance their design capabilities and competitiveness, and can better cooperate with architecture and planning majors (as shown in figure 2).



(a) Learning AICG technology (b) Improve design efficiency (c) Recommend AICG to others

Fig. 2. Cognition of students after using AICG

4 Application of AICG in landscape design specialty

In today's rapidly developing era of science and technology, artificial intelligence (AI) technology is constantly breaking through the traditional design boundaries and bringing revolutionary changes in various fields. Landscape design, as a discipline integrating natural aesthetics, humanistic care and ecological balance, is also experiencing a wave of innovation driven by AI technology. The application of AICG (artificial intelligence generates content) technology not only greatly improves the efficiency of design work, but also provides designers with unprecedented creative space and implementation means. This paper will deeply discuss the application of AICG technology in landscape design, from preliminary analysis, conceptual design, scheme design and drawing generation, and show how it can help designers to achieve more efficient and innovative design results.

4.1 Preliminary analysis

Site Selection Analysis: Utilize artificial intelligence tools, such as ChatGPT, for preliminary site selection analysis. By inputting relevant geographical and socio-economic data, as well as the project's objectives and expected outcomes, preliminary site selection recommendations can be obtained.

Site Analysis: Employ Geographic Information Systems (GIS) and other artificial intelligence tools for a detailed analysis of the selected site. This includes the site's topography, soil types, hydrological conditions, vegetation status, and surrounding environment. GIS can help identify potential environmental issues and opportunities, providing a scientific basis for design.

Demand Analysis: Conduct demand analysis through ChatGPT to understand the preferences, style, and functional requirements of the target user group. Data can be collected through surveys, interviews, or social media analysis, and then artificial intelligence tools can be used for pattern recognition and preference prediction.

Case Study Analysis: By analyzing historical successful cases, AICG can extract design elements and concepts to provide inspiration for new projects. For example, by analyzing the design techniques and layout of famous parks, key design principles can be distilled.

4.2 Concept design

Design Concept: AICG can extract design concepts from multiple dimensions such as natural landscapes, cultural elements, and social needs. For example, by analyzing the characteristics of the local natural landscape, it can propose a design philosophy that coexists harmoniously with nature.

Design Theme: AICG can assist designers in determining the design theme, such as ecology, culture, technology, etc., and develop the design around these themes. For instance, it can propose a "Green Ecology" theme and design corresponding landscape elements.

Functional Zoning: Based on the design theme, AICG can divide the landscape area into different functional zones, such as leisure areas, viewing areas, activity areas, etc. Each zone can be designed in detail according to its function and theme.

Element Implementation: AICG can help designers concretize design concepts by generating specific design elements, such as plant configurations, paving materials, landscape features, etc. These elements can be directly used in design drawings or models.

4.3 Scheme design

Line drawing: The application of AICG technology in landscape design provides designers with a powerful tool for them, and can quickly generate preliminary line drawing according to their design ideas. These line drawings not only clearly show the basic layout and form of the landscape, but also reflect the core concept and creativity of the design. Further, through the control component ControlNet in Stable Diffusion,

these hand-drawn line manuscripts can be further refined and filled in to generate a more vivid and specific real map. ControlNet Can automatically select the appropriate elements and styles according to the outline and design requirements of the line drawing, and fill out the landscape image with rich details and a sense of reality. This method not only improves the design efficiency, but also enables designers to preview and evaluate their design effects more intuitively, resulting in more precise adjustment and optimization (as shown in figure 3).

Fig. 3. Line draft produces effect drawing.

Text picture: AICG technology can transform designers' text descriptions into intuitive visual images through the powerful ability of natural language processing. This technology not only understands the designer's language description, but also deeply analyzes the intentions and needs behind it, so as to generate the corresponding design diagram. For example, when a designer describes a park that wants to be modern and eco-friendly, the AICG is able to capture these keywords and generate a park design map with modern architectural elements and rich vegetation (as shown in figure 4).

Fig. 4. Text description produces effect drawing.

Figure: Stable Diffusion technology through its advanced figure figure ability, can Sketchup 3D software generation model, simple graffiti sketch, and even the finished figure need to modify part, intelligent redrawing and rendering, generate realistic live figure, greatly improve the design efficiency and visual expression, makes the designer can quickly achieve from the concept to the visual transformation (as shown in figure 5).

Fig. 5. The grass model generates the effect drawing.

Figure raw video: AICG technology through the static design into dynamic video, makes the landscape design is no longer limited to a single perspective, but to show such as seasonal change, night conversion with time evolution of rich visual effect, enhance the design of the intuitive and the audience immersion, let design intention and landscape aesthetics to vivid in the flow of time.

Local redrawing: AICG technology, through its fine local adjustment ability, enables designers to redesign and optimize specific areas without changing the overall design framework, so as to enhance the flexibility and adaptability of the design and ensure the consistency and consistency of the overall visual effect and design concept. The application of this technology not only improves the efficiency and innovation of the design process, but also enables the design works to better adapt to different environments and needs, and show richer aesthetic and functional values (as shown in figure 6).

Fig. 6. Redraw before and after comparison.

4.4 Drawing generation

Flat line draft rendering color drawing: AICG can render a flat line drawing into a color plan, showing the detailed layout and color effects of the landscape.

White mode rendering: AICG can generate 3D white mode to show the three-dimensional form and spatial relationship of the landscape.

Aerial view effect rendering: AICG can generate a bird's eye view of the entire landscape from high above, showing its overall effect and spatial layout.

Style migration: AICG can transfer one design style to another style, such as the modern style to the classical style, to provide designers with a variety of design choices. Drawing generation: AICG can automatically generate standard design drawings, such as construction drawings, effect drawing drawings, etc., to reduce the workload of designers and improve the design efficiency (as shown in figure 7).

Fig. 7. Style transfer

5 AICG teaching methods in landscape design majors

In the professional education of landscape design, the application of AICG technology not only provides students with a new design aid tool, but also greatly expands their thinking and practical ability. By gradually guiding students from the understanding of AICG concept, to the skilled operation of tool software, to the training of new thinking modes, and the in-depth study of enterprise cases, and finally realizing the use of AICG technology to design in actual projects, educators can comprehensively cultivate students' comprehensive design skills and innovative thinking.

5.1 Introduce the concept of AICG

To introduce the basic principles of AICG (AI content generation) and its application in the field of design. By explaining how AICG simulates the design process through the algorithm to generate innovative landscape design schemes, students can understand how this technology assists and optimizes the design work, laying a foundation for subsequent learning.

5.2 Familiar with AICG tool software

Students need to master basic software operation skills, such as entering design parameters, adjusting the generation results, etc. Through practical operation, students can intuitively feel the practical application effect of AICG technology in landscape design, and enhance their familiarity with and operation ability of technical tools.

5.3 Training new thinking modes

After students have a preliminary understanding and operation experience of AICG tools, the teaching will deepen into how to use AICG technology to train new design thinking modes. Through the diverse design cases generated by AICG, teachers can guide students to think about design problems from different perspectives, cultivate their innovative thinking and problem-solving ability, and enable them to jump out of the traditional framework in the design and explore more possibilities.

5.4 Enterprise case learning

In order to further enhance students' practical ability and understanding, enterprise case learning will be introduced in teaching. By analyzing landscape design projects in the real world, students can understand the application of AICG technology in practical work, and learn how to combine the design ideas generated by AICG with real needs to improve their professional skills and professionalism.

5.5 Practical project operation

Teaching will enter the actual project operation stage. Students will have the opportunity to complete a complete landscape design project, independently or in groups, with faculty guidance. In this process, they will use AICG technology to design conception, scheme generation and effect display, and experience the complete design process from concept to implementation, so as to comprehensively improve their design practice ability and innovation ability.

6 The contrast with the traditional teaching

The application of traditional landscape design teaching mainly uses hand drawing, CAD drawing and 3D modeling, which is many different from AICG teaching. AICG technology in improving design efficiency, By rapidly generating a preliminary design scheme, Let the students can focus more on the innovation and deepening of the design; In terms of improving students' imagination ability, AICG is able to translate written descriptions or initial ideas into visual images, Stimulate students' creativity; In solving the student modeling problem, The automated modeling function of AICG lowers the learning threshold, Let the students focus more on the creativity and expression of the design; In providing learning resources, Diversified design cases and simulation projects generated by the AICG, Broaden the students' horizons, Provides more learning and reference opportunities; In terms of a personalized learning experience, The AICG is able to follow the learning progress and interests of each student, Provide a personalized learning experience, Improve the learning results. These advantages enable AICG to show its unique value and potential in landscape design teaching.

6.1 Improvement of design efficiency

Compared with the traditional landscape design teaching, AICG technology significantly improves the design efficiency of students. With AICG, students are able to quickly generate preliminary design schemes, reducing the time for manual mapping and repeated revisions. This efficiency improvement enables students to devote more energy to the innovation and deepening of design, rather than being constrained by the tedious basic work.

6.2 Enhancement of imagination

AICG technology has greatly expanded students' imagination through its powerful image generation ability. It can translate students' written descriptions or preliminary ideas into visual images, helping them to understand and express their design ideas more intuitively. This intuitive feedback mechanism not only stimulates students' creativity, but also improves their ability to embody abstract concepts.

6.3 Solving modeling problems

In landscape design, complex three-dimensional modeling is often one of the problems faced by students. Through its automated modeling function, AICG technology can help students to easily generate complex landscape models. The application of this technology not only lowers the threshold of learning, but also enables students to focus more on the creativity and expression of design, rather than being troubled by technical challenges.

6.4 Abundant learning resources

AICG technology provides rich learning resources for landscape design teaching. Through the diverse design cases and simulation projects generated by AICG, students can be exposed to more design ideas and styles. This rich learning resource not only broadens the students' horizons, but also provides them with more learning and reference opportunities, and promotes their all-round development.

6.5 Personalized learning experience

AICG technology can also provide a personalized learning experience based on each student's learning progress and interest. Students can learn according to their own pace and needs through the design tasks and exercises generated by the AICG. This personalized learning method not only improves the learning effect, but also enables each student to get the maximum learning benefits in the own way.

7 Conclusion

The application of AICG technology in the field of landscape design is increasingly showing its revolutionary advantages, indicating that it will become a new trend in design education. As the cradle of cultivating future designers, higher education institutions must pay enough attention to and conduct prospective research on this emerging technology. By integrating AICG technology into the teaching of landscape design, it can not only greatly improve students' learning efficiency and imagination ability, but also effectively solve complex modeling problems, provide rich learning resources, and realize personalized learning experience. Although some challenges may be encountered in the promotion process, with the continuous progress of technology and the deepening of educational reform, the application of AICG technology in the teaching of landscape design specialty will become more and more popular and important. As educators, we should actively change our ideas, keep up with the pace of the industry development, gradually carry out the talent training of AICG landscape design, constantly improve their own quality, and cultivate more landscape design talents with innovative spirit and practical ability for the society.

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