

Research on the Application and Practice of Artificial Intelligence Technology in the Teaching Reform of the “Plane Composition” Course

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Abstract: To address issues in the traditional teaching model of the “Plane Composition” course, such as rigid form training, low efficiency in creative iteration, lack of personalized tutoring, insufficient cultivation of innovative abilities, and a single evaluation dimension, this article utilizes the teaching practice of this course as a vehicle. By flexibly employing various AI tools such as Adobe Firefly, Stable Diffusion, and the Chaoxing Learning Platform AI Teaching Assistant, it effectively integrates artificial intelligence technology throughout the entire teaching process—before, during, and after class—thereby achieving an effective reconstruction of the teaching model and evaluation system. This practice demonstrates that the rational use of artificial intelligence technology can significantly enhance students’ learning enthusiasm and creative practical abilities, further improving teaching efficiency and the scientific nature of teaching evaluations. The research aims to provide valuable references for the digital and intelligent reform of basic course teaching activities in art and design disciplines.

Keywords: Artificial intelligence technology; Chaoxing Learning Platform; Plane composition; Learning situation diagnosis; Project-based tasks

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1. Introduction

“Plane Composition” is an important foundational course in art and design disciplines, playing a role in cultivating students’ understanding of formal beauty principles, visual thinking abilities, and design innovation awareness. However, under the traditional teaching model, the course generally faces issues such as rigid form training, low efficiency in creative iteration, and insufficient personalized tutoring, limiting its educational effectiveness. Therefore, it is necessary to conduct in-depth research on the application and practice of artificial intelligence technology in the teaching reform of the “Plane Composition” course, thereby assisting in achieving high-quality development in the teaching of basic courses in art and design disciplines.

2. The practical dilemmas in teaching the course “Plane Composition”

The course “Plane Composition” serves as a pivotal transition for students from foundational knowledge to professional design. Based on teaching practice, traditional teaching models exhibit certain limitations, which can be specifically manifested in the following aspects:

1. Standardized teaching content and presentation formats. Static images or blackboard writing are commonly used to demonstrate the principles of formal beauty, resulting in difficulties in intuitively displaying abstract rules and making it challenging for students to comprehend.
2. Static hand-drawn practices dominate practical training, leading to high costs for actual modifications and iterations of individual assignments. This limits students’ space for creative trial and error and hinders the development of a mindset for comparing and analyzing multiple solutions.
3. Teaching guidance fails to cover all students comprehensively, preventing teachers from effectively addressing the individualized problems of every student. Consequently, students with weaker foundations are prone to experiencing learning disconnections.
4. The evaluation system predominantly focuses on final assignments, paying close attention to the specific form and effect of the final outcomes while neglecting sufficient emphasis on the process-oriented tracking of students’ creative processes and thinking development. This results in a lack of scientific and guiding evaluation. The existence of these issues continuously restricts the improvement of teaching quality, seriously affects the actual effectiveness of cultivating students’ innovative abilities, and creates a disconnect with the talent demands of the design industry in the era of digital intelligence.

3. Practical approaches and selection of AI tools

3.1. Practical approaches

This technological application follows a practical approach centered on “ability cultivation as the core and technological empowerment as the support.” Focusing on the pain points in course teaching under the traditional model, it attempts to fully integrate AI technology into the entire process of preview, in-class practical training, after-class expansion, and teaching evaluation. This aims to transform course teaching from the previous “knowledge transmission + formal training” to “thinking cultivation + creative practice,” creating a new teaching model and system for “Plane Composition” in the era of digital intelligence.

3.2. Selection of AI tools

Based on the fundamental principles of ease of operation, low cost, alignment with the professional attributes of design courses, and tool maturity, this practical research primarily employs the following four AI tools:

1. Creative generation and deduction tools. These include Adobe Firefly and Midjourney. The former is a generative AI with functions such as text-to-image, image-to-image, and vector graphic generation. The latter possesses strong capabilities for multi-style visual generation and can generate creative variants in image-to-image mode.
2. Rule demonstration and parametric practical training tools. Primarily utilizing Stable Diffusion (with the ControlNet plugin version), it effectively controls the specific arrangement, density, or morphological changes of constituent elements by adjusting parameters, enabling visual demonstrations of composition rules.
3. Teaching management and learning situation analysis tools. Mainly using Chaoxing Learning Platform’s AI teaching assistant, it offers functions such as intelligent grading of preview self-assessments, full recording of learning trajectories, and initial intelligent evaluation of assignments, providing reliable data support for process-oriented evaluation.
4. Personalized tutoring tools. Primarily employing the

iFlytek Spark large model, it supports the creation of a course-specific knowledge base, offering functions such as answering knowledge point questions, inspiring creative ideas, and organizing case studies, thereby supplementing teachers' tutoring blind spots ^[1].

4. Exploration of the application practice of artificial intelligence technology in the teaching reform of the “Plane Composition” course

4.1. AI-empowered preview and learning situation diagnosis before class

The key objective of the pre-class segment is to lower the threshold for knowledge comprehension, enabling teachers to comprehensively and accurately grasp students' specific preview situations and clarify the focus of in-class teaching. The specific practices are as follows:

1. Teachers primarily use the Chaoxing Learning Platform to assign preview task packages to students, involving micro-lessons on knowledge points, preview self-assessment questions, and expansion tasks. The expansion tasks mainly require students to “independently retrieve three application cases of repeated compositions in corresponding commercial design activities using the iFlytek Spark large model, analyze their compositional logic, and submit notes online.” This guides students to actively connect foundational knowledge with professional applications.
2. Teachers utilize the Chaoxing Learning Platform's AI teaching assistant to automatically grade students' preview self-assessment questions, simultaneously generate learning situation reports, and statistically mark the knowledge points with the highest error rates. For example, when previewing the chapter on “Gradient Composition,” the system statistically marks that approximately 72% of students misunderstand the knowledge point on “the differences between skeletal gradients and basic form gradients.” Teachers adjust the focus of in-class explanations based on this report and appropriately increase the demonstration time for corresponding cases.
3. In the preview segment, teachers use Adobe Firefly to directly generate correct and incorrect comparison cases for knowledge points, which are then used for in-class comparison explanations to aid in strengthening students' understanding and cognition of the knowledge.

4.2. Modular use of AI tools during class to enhance practical training effectiveness

4.2.1. Formal beauty principles module

The primary use of AI dynamic demonstration functions reduces the difficulty in understanding abstract knowledge. When teaching foundational rules such as points, lines, planes, and skeletal compositions, which are abstract and challenging to comprehend, teachers utilize Stable Diffusion for parametric demonstrations. In practice, teachers launch the Stable Diffusion WebUI and input keywords such as “black and white planar composition, no unnecessary decorations, pure formal expression.” Simultaneously, using the ControlNet grid control plugin, they dynamically generate compositional graphics corresponding to differentiated parameters by adjusting parameters such as grid quantity, element rotation angles, and size gradient ratios. For example, when teaching gradient composition knowledge, teachers gradually increase the size gradient coefficient of the basic form, allowing students to intuitively observe the specific changes in gradient rhythm. When teaching emission composition, by adjusting the quantity and position of emission centers, they guide students to compare and analyze the visual differences between single-center and multi-center emissions. After the demonstration, students are organized into groups to operate, with each group adjusting at least one parameter and effectively generating a solution, which is then presented and discussed in class to jointly

analyze and summarize formal rules.

4.2.2. Foundational composition practical training module

To address the issues of slow iteration and relatively high trial-and-error costs in hand-drawn training, this research constructs a practical training process that combines “hand-drawn initial draft + AI variant + refined creation.” Taking the teaching of the “Texture Composition Unit” as an example, in practice: Teachers require students to first complete the creation of an initial draft of a texture composition using hand-drawing, determining the core creative ideas and elements. After completion, the initial draft is photographed and uploaded to the Midjourney tool, and the image-to-image function is initiated. Teachers guide students in reasonably setting the image reference weight and input keywords such as “planar texture composition, black, white, and gray levels, paper texture quality, pure formal expression.” The AI can quickly generate 4–6 variant solutions with differentiated texture effects. Teachers guide students to compare and analyze the visual effects and compositional logic of different solutions, ultimately selecting 1–2 optimal directions. Then, using hand-drawing or a digitizer, refined adjustments are made to form the final assignment outcome ^[2].

By reasonably utilizing the aforementioned AI tools, the actual average number of iterations per student assignment has directly increased from 1.2 times under the traditional model to 5.7 times. Students’ creative trial-and-error space in class has been significantly expanded, and the richness and innovation of assignments have been notably enhanced.

4.2.3. Integrated composition project module

To address the issue of a disconnect between practice and professionalism under the traditional model, this practice adopts a project-driven teaching approach. It sets up an integrated design project titled “Poster Layout Composition Design for Campus Cultural Activities,” requiring students to effectively and independently complete design activities using the composition principles learned in class. In practice, teachers guide students to use the iFlytek Spark large model to organize project requirements and design directions, quickly generating three preliminary compositional concept frameworks. Subsequently, they leverage Adobe Firefly to effectively generate corresponding basic graphical elements that adhere to compositional rules and then use Canva’s AI-powered layout design function to construct layout solutions. After conducting peer evaluations in groups, students adjust elements such as proportions and skeletal structures using AI tools based on actual feedback to refine solution details. Upon completing these operations, a complete compositional design draft and design explanation are formed, with students taking turns to present the formal beauty principles employed in their individual solutions.

This segment organically combines knowledge of Plane Composition, layout design, and visual communication scenarios, further reinforcing the professional supporting role of foundational courses. After teaching, students’ overall recognition of the course’s practicality significantly improved.

4.2.4. Classroom tutoring module

In this practice, a dedicated course knowledge base was created using the iFlytek Spark large model, uploading all relevant knowledge information such as course materials, question banks on knowledge points, and answers to frequently asked questions. During practical training, if students encounter theoretical or conceptual issues, they can ask the AI at any time, which provides instant answers and relevant examples. For instance, during the practice, a student asked, “What are the common expressive techniques in contrast

composition?” The AI provided a textual explanation along with corresponding examples simultaneously. This approach frees teachers from repetitive and mechanical Q&A sessions, allowing them to allocate more time and energy to tutoring students on creative challenges and addressing individualized problems. Post-class statistics show that the AI answered an average of 42 student questions per day in class, enabling teachers to save approximately 30% of teaching time for one-on-one tutoring of students with relatively weak foundations, further enhancing the precision and overall coverage of teaching and tutoring ^[3].

4.3. After-class AI-supported hierarchical expansion and efficient feedback

After teaching, teachers assign hierarchical expansion tasks to students, with the foundational level involving manual design for assignment modification and improvement, and the advanced level primarily utilizing AI for creative expansion training. The Chaoxing Learning Platform’s AI teaching assistant can conduct intelligent initial evaluations of student assignments, scoring them based on multiple dimensions such as compositional balance and adherence to principles, and providing modification suggestions. Students can quickly complete modifications based on the AI’s feedback, with teachers responsible for conducting final re-evaluations ^[4].

5. Constructing a process-oriented evaluation system using artificial intelligence

To address the issue of overly simplistic teaching evaluations under the traditional model, this practice constructs an evaluation system combining “process-oriented data + outcome quality + innovation dimensions” using AI tools. The specific practices are as follows:

1. Set the proportions of process-oriented evaluation and final assignment evaluation at 50% each. Process-oriented evaluation data is primarily automatically collected by the Chaoxing Learning Platform’s AI teaching assistant, including data such as pre-class preview completion, classroom interaction participation rates, assignment iteration counts, and expansion task completion. The system can automatically generate process-oriented scores for each student, avoiding subjective arbitrariness issues present in manual evaluation models.
2. Innovatively construct an evaluation model combining “AI initial evaluation + teacher re-evaluation.” The AI is primarily responsible for conducting initial evaluations on standardized dimensions, providing base scores and general modification suggestions. Teachers, on the other hand, are mainly responsible for conducting re-evaluations on creative and professional dimensions, offering evaluations and personalized guidance on aspects such as design thinking and professional alignment of the solutions. This approach can improve both evaluation efficiency and depth.
3. This practice adds an innovation capability evaluation dimension, primarily setting the number of creative solutions students generate using AI tools, the uniqueness of their ideas, and the logical coherence of their design explanations as core evaluation indicators. This guides students to value innovative thinking training and prevents mere imitation of forms ^[5].

6. Practical results and directions for improvement

6.1. Practical results

This teaching practice of the “Plane Composition” course based on AI technology has primarily achieved the following three outcomes:

1. Students’ learning experiences and participation enthusiasm have significantly improved, with

classroom interaction increasing by approximately 63% compared to traditional modes. The completion rate of pre-class preparation and assignment submission rates have also shown notable growth. 2. Students' creative and innovative abilities, as well as their digital practical operational skills, have improved simultaneously. The diversity and innovation of student assignments are markedly superior to those of students in classes where AI technology was not introduced. Additionally, students have become familiar with various commonly used AI design tools in the industry in advance, laying a solid foundation for subsequent professional course learning and successful employment. 3. Teachers' teaching efficiency and the scientific nature of teaching evaluations have effectively improved. AI tools have taken on most repetitive tasks such as answering questions and initial assignment evaluations, allowing teachers to devote more time and energy to instructional design and personalized tutoring activities.

6.2. Problems and directions for improvement

This practice also encountered some issues: 1. A small number of students became overly reliant on AI-generated content during the practice, neglecting basic hand-drawing training, resulting in poor development of foundational modeling skills. 2. Some students directly applied AI-generated content, leading to a lack of independent thinking in their learning. 3. Teachers themselves lacked proficient operational skills in the advanced functions of AI tools, and the depth of tool application needed further enhancement.

In light of the aforementioned issues, the following directions for subsequent improvement are identified: 1) Further clarify the role of AI technology as an auxiliary tool. During the practice, set mandatory requirements for basic hand-drawing training and stipulate that AI-generated content can only serve as creative references. All final assignments must include an independent hand-drawn creation component. 2) Require students to specify in detail the specific scope and role of AI technology used in their assignments to enhance their awareness of originality. 3) Regularly organize training activities for teachers on the application of AI tools to enhance their digital teaching capabilities ^[6].

7. Conclusion

In summary, this practice effectively validated the feasibility and teaching effectiveness of the organic integration of AI technology with the “Plane Composition” course. By incorporating AI tools throughout the entire process, optimizing teaching modes, and reforming teaching evaluations, some core pain points in traditional teaching modes can be addressed, effectively improving teaching effectiveness. In the future, it is essential to further balance the application of AI technology, place great emphasis on the cultivation of foundational skills, and continuously optimize teaching processes and evaluation criteria to drive the high-quality and healthy development of the digital reform of basic art and design teaching.

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Disclosure statement

The authors declare no conflict of interest.

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