Using Computer-Aided Design Software in Teaching Environmental Art Design

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Abstract. Based on computer-aided design software, this paper studies the application in teaching environmental art design and designs new innovative teaching methods. Taking information technology to promote the enhancement of environmental art design ability in the study, teachers and students at the university education level are used as the research objects, and the literature method, survey research method, case study method, and comparative research method are applied comprehensively. During the study, the concepts of computer-aided design and environmental art design were defined, the connotation and requirements of information technology to promote the improvement of design ability of environmental majors were explained, and the curriculum of environmental art majors, teachers' teaching methods, students' learning situation, the advantages of computer-aided design software in environmental art color design, and the advantages of three-dimensional model design in environmental art were analyzed in terms of The feasibility of information technology to promote the design ability of environmental majors. After applying information technology to the practice of environmental art design, students of environmental majors have significantly improved their ability to design environmental art colors and models, and students are not only willing to learn the basic knowledge of environmental art, but also willing to use computer-aided design knowledge to participate in environmental art design.

Keywords: computer-aided; design software; environmental art; art teaching
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1 INTRODUCTION

Our innovative computer-aided design course teaching is not to emphasize the importance of the course again and advocate computer-aided design instead of hand-drawn performance, but to make it serve the profession earlier through a more reasonable course arrangement. Graduation designs, employment to lay a good foundation [1]. Various teaching software are scattered in different semesters, and the computer training courses seem to be poorly connected, and cannot form a continuous workflow, so that students will not be able to successfully complete the professional design because of the lack of a certain software operation skills, and the interval between the two courses is long, and the teaching effect is poor. At the same time, the special nature of the software decided to ensure the continuity of software teaching, when several software classroom teachings are over, a comprehensive application of practical engineering training becomes very necessary, and most institutions lack this link, until the professional courses in doing practical training, software learning and application has long been disconnected [2].

In order to meet the needs of future social and technological development, interest-based, problem-oriented, project-driven, and funded, interdisciplinary research is integrated into teaching, research and practice, in order to cultivate high-level complex comprehensive talents with interdisciplinary research vision and interdisciplinary knowledge ability to solve more complex problems. Liu et al. [3] brought by global economic integration has started a new era of network education. Developed countries are ahead in terms of measures and methods of using art education resources in the network environment, and the British Government attaches great importance to education informatization and has issued policy documents on education informatization. Kok and Bayaga [4] research content contains: text, printmaking, oil painting, sketching painting and art design and other material resources. Ford and Minshall [5] put forward the idea of applying computer-aided design software technology in environmental art design. Tang [6] discussed the theory and method of computer-aided environmental design teaching. Dong et al. [7] researched "the concept, principle and technology of network education resource platform", which integrates philosophical epistemology, information science and cognitive theory, carries out research on the construction of education resource platform based on network technology, explores the integration of education platform resources, constructs the framework of information technology and knowledge structure organization model, and creatively proposes. The theory of educational resources for construction, construction methods and construction technology solutions is creatively proposed, and the framework of resource platform model is specifically implemented for construction. Computer-aided design in environmental art design is a practical course, whose ultimate goal is to use technology to convey design ideas and achieve a balance between technology and art [8].

In this paper, we analyze the current teaching situation of this course and propose some ideas for teaching innovation so that this course can play a more effective role in teaching environmental art and design. Along with the rapid development of computer-aided design technology, AutoCAD, 3dsmax, Photoshop, these types of design software is updated almost every year a version, similarly our teaching content also needs to be updated year by year, teaching materials should also be prepared for students the latest, teaching methods should be more with the software itself to increase the function and change, and at the same time the course syllabus The course syllabus should also be updated at a rate appropriate to the development of the software. Students should understand the importance of hand-drawn expression and computer-aided design together, and not rely on computer-aided design, so that computer-aided technology can be better used for design.

2 RESEARCH ON COMPUTER-AIDED DESIGN SOFTWARE IN TEACHING ENVIRONMENTAL ART DESIGN

2.1 Computer-Assisted Environmental Art Design Teaching Curriculum Research

We deepen the diversified practical teaching mode in environmental design education, and make innovation and reform with the local characteristics of universities. First of all, in a relatively time-concentrated practical teaching session, students tend to blur, confuse or even forget the theoretical knowledge they have acquired before, while in a project-based learning format, students get a clear goal from the beginning, that is, what they learn is what they use, and all aspects of learning are designed to enable students to comfortably solve the problems they may encounter in real projects in the future [9]. The teacher is responsible for developing the framework of the project, breaking down a specific project into smaller branches in a phased manner, and designing the main points of knowledge for teaching in a specific environment. Before the course is taught, each student can fully understand the overall requirements of the project and the specific problems that need to be considered and solved, analyze and explain the knowledge points of environmental design in the context of the actual problems, and integrate new media tools for the assignment of tasks. In this way, we can combine theory with practice in the environmental design course, so that students can learn the original boring theoretical knowledge with the problems they may encounter, and induce students to learn actively instead of simply being filled with knowledge points, so as to achieve twice the result with half the effort. The teacher can guide the students more precisely when they are gradually completing the assigned small projects, so as to explore and cultivate the students' personal characteristics from the micro level and better guide their positive development. Figure 1 shows the computer-aided environmental art design teaching curriculum model.

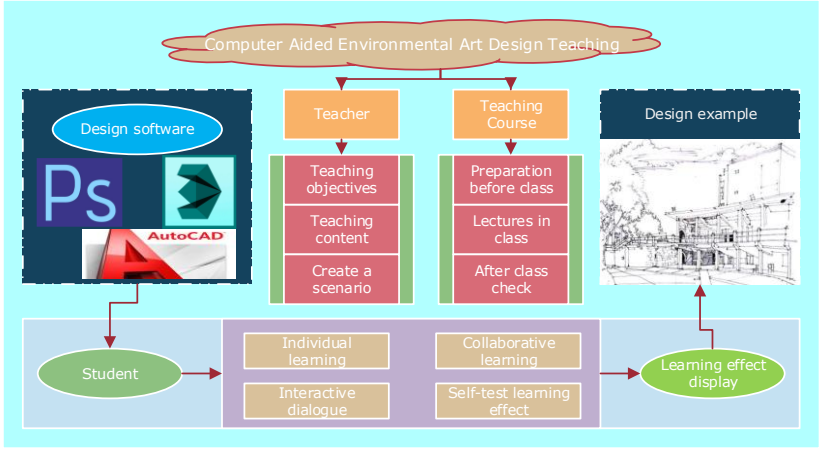

Figure 1: computer-aided environmental art design teaching curriculum model.

The content of the assessment is mainly divided into three parts: theoretical knowledge, practical ability and usual performance (Table 1), the proportion of these three varies in different institutions, some institutions focus on the cultivation of theoretical knowledge, some institutions mainly on the cultivation of practical ability, and usual performance is only in a small part in each institution, which is also reasonable. The focus of the institutions is not only the practical ability and theoretical knowledge, from the phenomenon of the survey, we can see that many institutions of higher education are not only concerned about the cultivation of course learning, but more aware of the importance of combining with social enterprises, knowing the needs of the market,

being able to communicate with people and having a sense of service is also the goal of the school focus on training. However, the combination of practical and theoretical teaching is not very good at higher education institutions. The practical courses are in a single form.

Rating type	Theoretical knowledge	Practical ability	Usual performance
1	29	87	21
2	45	33	28
3	41	42	23
4	34	41	16
5	39	38	19

Table 1: Environmental art teaching assessment.

2.2 Computer-Aided Environmental Art Design Teaching Model Construction

Unlike the traditional environmental art "binary structured" teaching model, the computer-assisted environmental art teaching model is a "multi-structured" teaching model, because it includes not only the two participants of environmental art educators and learners in the actual space, but also the participants in the digital In addition to the educators and learners of environmental art in the physical space, it also includes the participants in the digital network (the educators and learners of environmental art in the hyperspace). The teaching model breaks the traditional "dual structure" relationship between teaching and learning of environmental art and forms a "multiple structure" relationship among educators, learners, digital network learning platforms, and virtual participants (virtual managers, virtual experts, and virtual classrooms). This "multi-structured" teaching model reflects the equal interaction of all participants in the model, as showed in Figure 2.

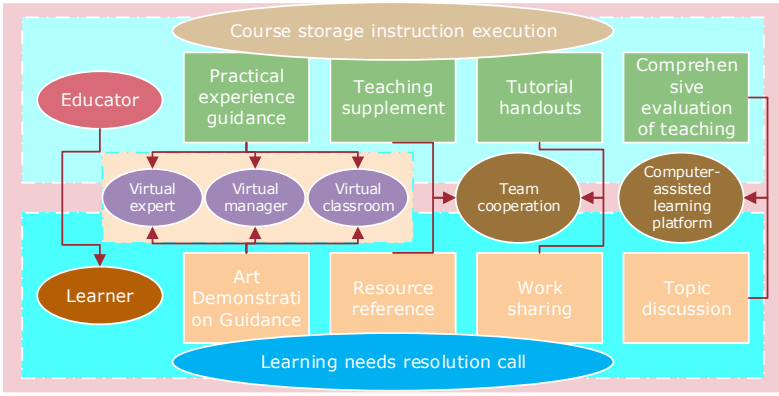

Figure 2: Multi-structured teaching model.

In the five stages of learning activities of the "multi-structured" teaching model, educators and learners are equal in learning and research from the beginning to the end, and educators create topics based on the advantages of computer networks, form diversified sources of subject knowledge, and provide learners with specific contents of the project of environmental art research; computer digital features The "multi-structured" teaching model creates a dual identity for the learner as a learning subject and a guide to learning, and through the digital network learning platform, the learner receives immediate demonstration and guidance from a virtual teacher; with the help of a collaborative team discussion approach and the educator's continuous guidance and

evaluation, and using the learning platform to share a large number of course resources, the learner completes the subject research study characters, and share and publish research results. The computer virtual manager carries out unified management of the instructions issued by the digital network learning platform, and instructs virtual experts to provide educators with teaching experience supplements to form a sustainable environmental art teaching model. In addition, the "multi-structured" teaching model provides learners and educators with an equal voice and establishes the principle of a fair and equitable learning environment, which stimulates the potential of environmental art learners and promotes the advancement of environmental art education.

The computer-aided environmental art composition drawing technology has changed the teaching idea of environmental art composition foundation course, and the course teaching has changed from focusing on perspective performance and standard drawing to space shaping and space simulation. The computer technology involved including sketch up, 3DMAX, MAYA, AUTOCAD and other software technologies. The digital network learning platform database stores diverse model data for learners' project creation, which greatly facilitates the improvement of learners' self-directed learning quality; educators provide software tutorials to assist learners to have computer graphics editing ability as soon as possible, give learners more evaluation and guide project creation activities. Computer-aided environmental art composition drawing technology responds to the development needs of the basic composition course of environmental art teaching, forming a new pattern of digital environmental art teaching.

2.3 Computer-Assisted Environmental Art Design Teaching Evaluation Study

The evaluation of the results of computer-assisted environmental art teaching mode mainly reflects the learner participation index and the project research index. The learner participation index reflects the learners' learning efforts, and can be evaluated based on the number of speeches, seminars and the number of works created by the learners; the project research index reflects the learners' comprehensive professional level of learning, and can be evaluated based on the quality of the learners' project design program, the quality of creative production, the quality of the work concept and the quality of the summary report [10]. The project research index is more difficult to evaluate than the learning participation index. According to the constituent factors of the project research index, evaluation indexes related to it can be adopted to carry out evaluation, and the evaluation runs through the whole research learning process.

The correlation coefficient reflects the closeness of the random variables to each other, according to which the correlation coefficient can measure the degree of interconnection and mutual influence between attributes, which are defined in Equation (1).

$$G(\mathrm{x}, y) = \frac{\alpha \sum_{i=0}^{m} \mathrm{cov}(X, Y)_i}{\beta(x, y)} \tag{1}$$

For n different attributes, the correlation coefficients between two can be calculated separately, so that all the correlation coefficients form a matrix, as in equation (2). The magnitude of the correlation coefficient can indicate the degree of interdependence between two attributes, if the correlation coefficient between two attributes is large, the correlation between the two attributes is strong, and conversely if the correlation coefficient is small, the correlation is weak. Therefore, the independence between attributes can be indirectly analyzed by the range of the magnitude of the correlation coefficient.

$$M_{ij} = \begin{bmatrix} m_{11} & m_{12} & m_{1n} \\ m_{21} & m_{22} & m_{2n} \\ m_{n1} & m_{n2} & m_{nn} \end{bmatrix}_{ij} * 100\% \tag{2}$$

3 ANALYSIS OF RESULTS

3.1 Teaching Model Analysis

The computer-assisted environmental art teaching mode is applied to the 2019 class of art and design students, while the 2015 class of students (who have graduated) under the influence of the traditional environmental art teaching mode is contrasted with them. The 2019 class was chosen for several reasons: First, the professional representativeness of the art and design program. Secondly, the class of 2019 is an advanced group of students with the ability to apply computers and create environmental art, which is suitable for the comparative study of the learning effect of digital online learning platform. The advantages of environmental art creation under the computer-assisted environmental art teaching mode are reflected in both design time and design effect. Compared with the traditional environmental art teaching mode, the computer-assisted environmental art teaching model has the advantages of both data access and digital technology application support in the creation conditions of environmental art topics. By comparing the learning and design time of environmental art project creation between the 2015 and 2019 classes, we can clearly see the obvious difference (Figure 3).

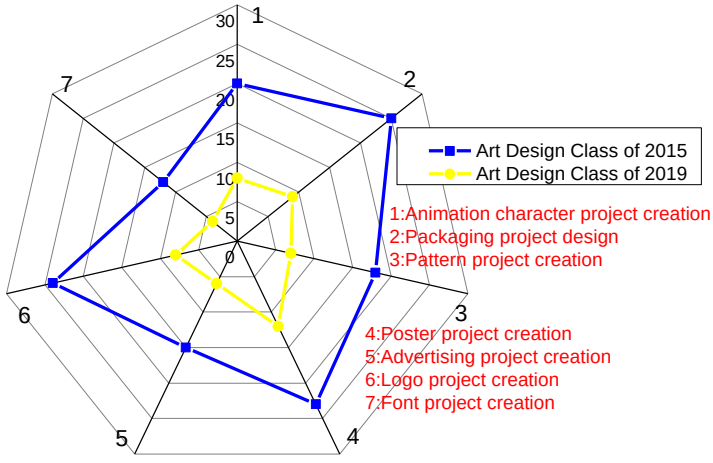

Figure 3: Results of the comparison of subjective creation time.

To further verify the practical application of the learning model of the computer-assisted environmental art teaching platform, a practical targeted survey of the digital network learning platform was therefore conducted to obtain application feedback in the form of a questionnaire. The survey involved several aspects, namely: the combination of software and material materials of the computer-assisted environmental art teaching platform; the tendency of the computer-assisted environmental art teaching platform to promote learners to form a collaborative team research form; and the results of the impact of the computer-assisted environmental art teaching model on research learning. For the questionnaire survey of 60 students in the environmental art major, the summary of the survey on the combination of software and materials of the computer-assisted environmental art teaching platform is shown in Figure 4(a), the summary of the survey on the trend of the computer-assisted environmental art teaching platform to promote learners to form a teamwork research form is shown in Figure 4(b), the summary of the survey on the impact of the computer-assisted environmental art teaching mode on research learning is shown in Figure 4(c). The summary of the survey in terms of the results of the impact of research learning is shown in Figure 4(c).

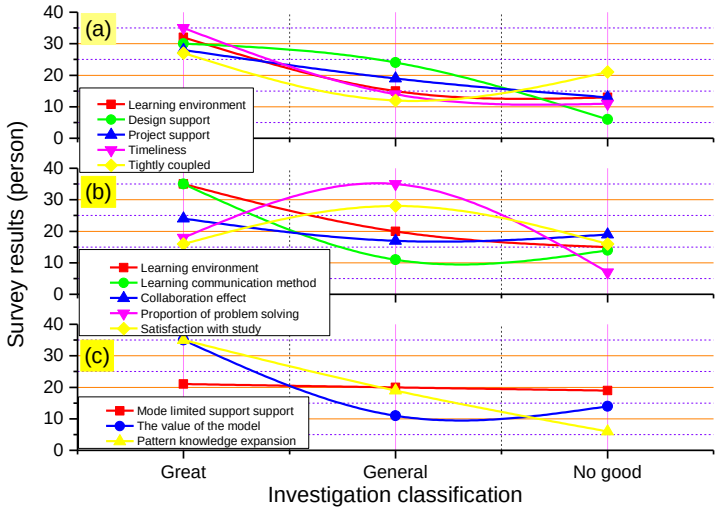

Figure 4: Results of teaching mode survey.

3.2 Analysis of Teaching Evaluation

The initial use of the index system was carried out through the classroom evaluation of three live teaching videos and one online teaching video, and the evaluators were fully aware of the structure and instructions of the index system, and the first use of the evaluation items may result in NA. Therefore, the rating results were obtained by summing the average of the scores of the four primary dimensions (without weighting), and the results are shown in Figure 5. The consistency of the scores of the different raters in using the instrument was examined. Rater reliability was related to the number of raters, which was determined using Kendall's coordination coefficient, since there were four raters. The Kendall's coordination coefficient was 0.665 ($p = 0.034 < 0.06$), which indicates a good degree of agreement, as calculated by the SPSS nonparametric test for multiple correlation samples.

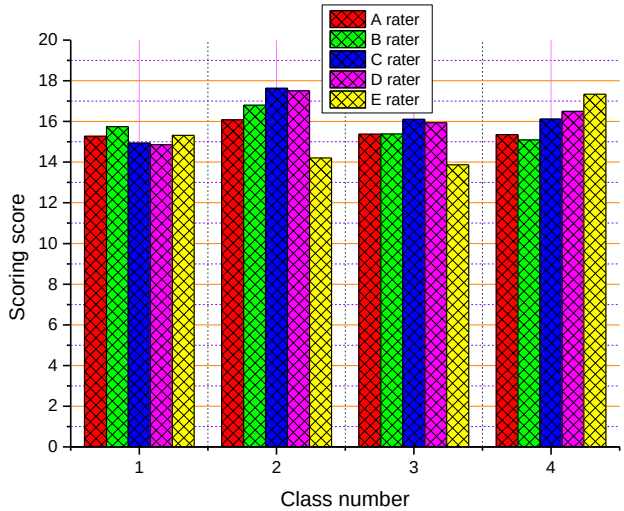

Figure 5: Classroom grading results.

The evaluation of the lessons took the opportunity of the district teaching and research activities. It is undeniable that the quality of the curriculum itself is relatively high due to the form of public lessons. Thus, the results of differentiation is less satisfactory and need to be further tested by subsequent studies. All three on-site teaching classes were conducted through a pre-class meeting to talk about the lessons, and after the communication between the teachers who observed the lessons and the teachers who taught them, the observation records during the lessons, and the summary and reflection in the post-class meeting, we discussed together how to better complete the teaching practice. The four first-level dimensions from the evaluation index system as subscales can be used as a tool to predict the overall score and show good structural validity. At the same time, the index system has good rater reliability when applied to actual teaching evaluation. The stepwise multiple regression analysis (see Figure 6) obtained the standardized regression model as: Overall = 0. 197 x course structure + 0. 245 x course content + 0. 146 x classroom culture + 0. 534 x teaching effectiveness.

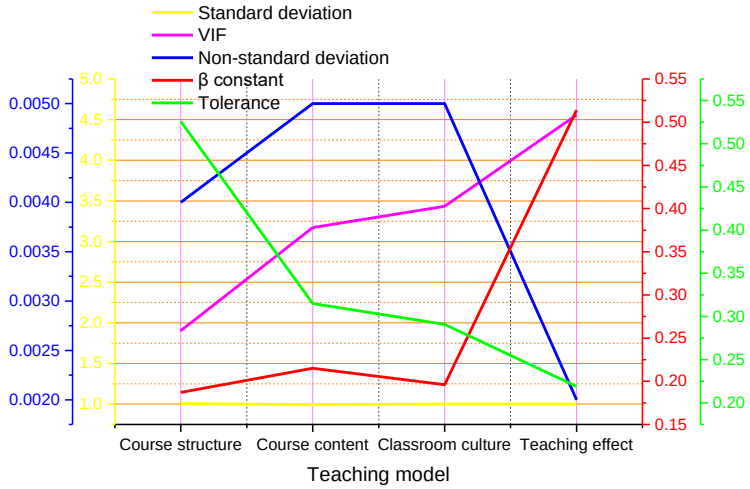

Figure 6: Multiple regression analysis evaluation results.

The evaluation system should be able to reflect the characteristics of the curriculum itself. The construction of the evaluation index system is to guide teachers in optimizing teaching design before class, and provide basis for teachers to reflect and improve teaching after class, which is conducive to the professional improvement of teachers and promotes the common development of teachers and students. The main body of evaluation should include instructors, students, teaching administrators, etc., which can explore the relevance of teachers' self-evaluation and the results of other evaluations. From the perspective of students, teachers can timely understand students' acceptance of teaching methods, so that they can be more fully and timely. Optimize the classroom and improve the design quality of the environmental art classroom. Teaching managers can also make corresponding teaching arrangements according to the quality of the classroom, so that the school's management work is more systematic and the decision-making is more scientific.

3.3 Analysis of Teaching Effectiveness

In order to understand whether the environmental art and design students from the beginning of the internship to employment, the study of environmental art and design courses play a corresponding role in the work, part of the questionnaire is for the graduated students from the employment of graduates, graduates engaged in new media, e-commerce industry accounted for 48.4%, graduates engaged in planning industry accounted for 46.1%, graduates engaged in other

industries accounted for 5.5%. The number of courses in environmental art and design, 90% of the students said that the environmental art and design courses are not set up enough, some content in the learning process in general, not enough help on the subsequent courses; 12.3% of the students think that the current number of environmental art and design courses are reasonable and do not need to increase. The survey results are shown in Figure 7.

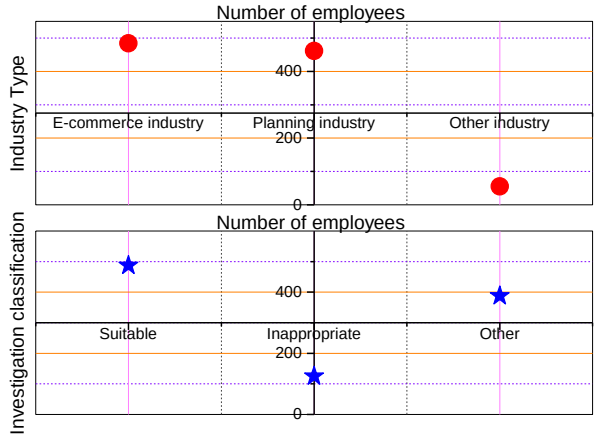

Figure 7: Survey results.

After the survey (Figure 8), it is clear that the computer-assisted environmental art teaching model plays a great role in promoting learners' research-based learning, and the model improves the way and habits of previous environmental art learning. The learning platform provides functions such as teamwork, result sharing, information reproduction, educator Q&A, and participant discussion to adapt to the new ideas and concepts of today's education, greatly satisfying the highest requirements of environmental art education in the context of modern information technology. Along with the flourishing development of digital information technology and Internet science and technology, research-based learning based on computer-assisted environmental art teaching has gradually become the preferred learning method for environmental art education in colleges and universities, while it is a powerful learning method for lifelong education.

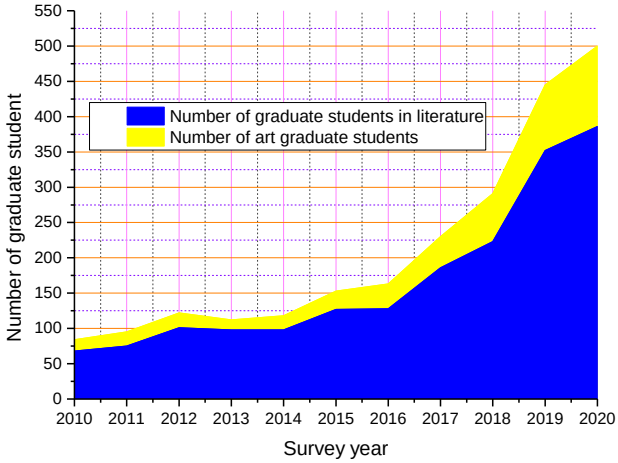

Figure 8: Comparison of the number of students majoring in environmental arts.

4 CONCLUSIONS

With the continuous progress and development of society, the demand for application-oriented and skill-oriented talents has become more and more prominent. As a course specialized in cultivating students' skills, computer-aided design itself has its unique advantages and great potential for development. The information age and the network era provide a unique soil for the development of computer-aided design. All kinds of advantages and benefits prompt us to follow the development of the times in the teaching process, innovative concepts, based on the actual needs of students' professional learning and talent training, from the purpose of human-oriented design, constantly analyze the advantages and disadvantages of technological development, refining and selecting the content of software technology suitable for students to learn and master, with the concept of scientific development, with the attitude of advancing with the times, through the continuous innovation of teaching methods, the timely update of teaching content, to achieve the goal of computer-aided design. With the concept of scientific development and the attitude of keeping abreast of the times, through the continuous innovation of teaching methods and the timely update of teaching contents, the teaching innovation of computer design courses is achieved, so as to play an important role in cultivating application-oriented and skill-oriented talents.

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