

# Practical Research on Computer Aided Design in Landscape Performance and Design Application

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## Abstract

The technology in the practical research of computer-aided design in landscape performance and design applications effectively solves the marine wavefront, which is algorithmically demultiplexed by applying extreme values to cause the signal of the sub-matrix. Other computer-aided design solutions can effectively solve the landscape design performance. The success of the practical research of computer-aided design in landscape performance and design application will improve the efficiency of landscape design.

**Keywords:** *Computer-aided Design, Landscape Design, Constructivism;*

## 1. Introduction

Computer-aided landscape design uses computers to assist landscape designers. The development of landscape engineering promotes the derivation of various design methods of landscape design<sup>[1-3]</sup>. Landscape aided design tools need to be continuously researched and developed in order to free landscape architects from sketching and improve the efficiency of landscape architects and construction projects<sup>[4-6]</sup>. Therefore, landscape design needs to keep pace with the times, pay attention to efficiency, economy, and efficiency, and do a good job of learning auxiliary tools. Mainly learn the basic theories of computer-aided design and landscape performance design, learn the basic knowledge of landscape design, computer technology and landscape performance processing technology, and have the basic ability to carry out landscape performance, design and integration of engineering.

### 1. Reform of teaching philosophy

Reform must be the idea first. In response to existing

problems, we can introduce advanced teaching concepts such as constructivism, humanism, cooperative learning, and action orientation. Constructivism emphasizes student-centeredness, and emphasizes students' active exploration of knowledge, active discovery, and active construction of the meaning of the learned knowledge (rather than just transferring knowledge from the teacher's mind to the student's notebook as in traditional teaching) ), emphasizing inquiry learning based on real situations, and advocating learning based on cooperation. Humanism emphasizes that the goal of education should be learner-centered, promote the development of students' personality and potential, and promote students' creative learning and work. Cooperative learning emphasizes the basic form of cooperative learning group, systematically uses the interaction of dynamic factors in teaching to promote students' learning, and uses group performance as the evaluation standard to jointly achieve the teaching purpose. Action-oriented emphasizes people-oriented, and believes that people are active, constantly optimized and self-responsible, and can conduct critical

self-feedback in the process of achieving established goals. The goal is to obtain professional behavior ability.

Using teaching plans instead of textbooks, teachers extract the most stable core functions of the software involved in the course as the main basis for teaching, and adjust the teaching plans in time with software updates. At the same time, students are recommended to read some relatively practical books that are close to the major. Students form study groups in dormitories, and each group must have two or more sets of related books for the purpose of consolidating study after class, and exchange study materials regularly.

The arrangement of teaching content adopts the method of "modularization, step-wise, combined method". In the course content arrangement, the author uses the first letters of AutoCAD, 3DMAX, Photoshop, SketchUp, and VRay as the code names to define the five modules A, D, P, S, and V. During the teaching, each breakthrough was broken and gradually deepened, emphasizing the combined use of modules, forming A+D, A+P, D+V, A+P+S, D+V+P, A+D+P+S +V and many other step-by-step combinations from shallow to deep, focusing on explaining the blank points of intercommunication between modules, in order to achieve integration.

$$d_A(x_i, x_j) = \sqrt{(x_i - x_j)^T A (x_i - x_j)}, \quad (1)$$

This is equivalent to the matrix L as a mapping, mapping the data in the original space to the new space, and transforming the time series of the original space into the time series data of the new space.

The school's own hardware and software resources must first be able to meet the learning needs of students, and secondly, the main lecturer must change to a "dual teacher" type, and be able to integrate the experience and skills gained in the first-line practical work into the course teaching, and use all available Resources, focusing on

non-classroom professional teaching activities, guiding students to field trips in the extracurricular landscape, and randomly entering the teaching itself. In addition, guide students to use the network landscape for self-study, teach people to "fish" instead of teaching people to "fish". Lectures can use multimedia teaching, use the campus network "sky classroom" platform to build virtual classrooms, establish interactive QQ groups, online discussion, assisted Q&A, and focus on cultivating students' conscious learning habits and interests.

## 2. Reform of teaching methods

### 2.1. Adopt the dual-main teaching mode of "combination of lectures and exercises" to guide students to learn independently

In the theoretical explanation link, the teacher is the leader, and the method of on-site explanation or operation demonstration is used to teach and inspire students to learn to master the ideas and methods of completing a drawing task, operation techniques, etc.; in the computer experiment link, the students are the leader and the teacher is from the side Assistance, allowing students to complete learning tasks through free thinking and team discussion. This method helps cultivate autonomy and collaboration. Teaching through alternating lectures and exercises, observe the acceptance of students, adjust the alternating rhythm of lectures and exercises, to ensure that students learn, learn thoroughly, and master.

### 2.2. Introduce case teaching method to cultivate students' ability to analyze and solve problems

Through selected cases, the set of commands to be learned is run through to deepen the concept of overall operation. For example, a set of CAD drawings can be used as a teaching example, and the design drawings of several spaces can be used as teaching content. The teacher completes the teaching part through demonstration operations; at the same time, follow-up questions are asked to ask students to improve the drawings of the parts that are not

demonstrated, and finally complete the whole set drawing. At the beginning, students "do it", with the increase of mastery of technology, from simple to complex, gradually change to "thinking to do", cultivate creativity and the ability to analyze and solve problems.

*2.3. Deepen practice, attach importance to non-classroom teaching, so that students have more opportunities to experience the process, while applying what they have learned, further develop team assistance skills*

Organize students to listen to lectures and participate in school-enterprise joint open classes. Regularly invite experts and scholars from other universities and enterprises to conduct academic reports, open classes and other exchange activities, introduce the latest achievements of this major and extended majors on software use, design performance, research methods, etc., broaden students' knowledge and increase students' interest in learning. Strengthen students' awareness of employment, management and entrepreneurship.

Organize students' extracurricular investigations, field surveys, and personal experience. Arrange students to visit various types of engineering projects, including projects under construction and completed, so that students have the opportunity to communicate face-to-face with construction personnel to discuss the feasibility of construction plans; organize students to conduct field inspections in the building materials, furniture, lighting markets, etc., and collect First-hand data, and draw a computer atlas based on the data collected on site, build a model material library, cultivate the habit of collecting data for students, and avoid the disconnection between the work and the construction due to lack of knowledge of construction materials. The tasks and requirements of the practice session are shown in the chart (Table 1).

**Table 1.** Tasks and requirements of the practice session.

Form	Claim	Purpose
a. Field measurement	On-site measurement includes the scale of different landscape objects such as space, construction, furniture, etc.	Personally perceive the sense of scale in space, construction, and furniture, and understand the grasp of spatial scale in drawing
b. Field drawing	Draw hand-drawn drafts on site, and arrange the machine drawing after returning	Experience the designer's process from on-site measurement to computer drawing
c. On-site shooting	On-site shooting includes image data of scenes, materials, nodes, etc.	Perceive the actual effect of material texture, material structure, combination form, etc., and better understand the performance of construction drawings and renderings

Organize students to participate in various types of exchange activities to understand and experience the methods and approaches to solve problems under different cultural backgrounds and different educational models.

The author takes an activity participated by the students of our school as an example to briefly describe.

Activity name: Workshop—Design classroom teaching under the background of Southeast Asian culture

Participating teams: teachers and students from seven domestic institutions of higher learning in Beijing, Shanghai, Jiangsu, and Guangxi, and ten foreign institutions in South Korea and Thailand.

Activity theme: Design detachable cabinets for

artists or travellers, multifunctional beds in high-density apartments, movable spaces and RVs; design movable studios, floating spaces and yachts, and water rest platforms for artists, Detachable combined exhibition space.

Our school students and teachers are assigned to various subject groups. One group is to design the landscape (Figure 1). It is required to design a multifunctional bed that can accommodate two people in a space of 6 square meters and a height of 3 meters. The bed is required to have functions such as storage and writing, and is easy to disassemble and transport. The team consists of two Chinese students, two Korean students and one Thai student. After three days of running-in and fighting, from the initial language barrier to the final tacit cooperation, it can be described as a lot of gains, and finally completed a set of suitcase-style bed design.



**Figure 1.** Landscape design.

The creative formation of this activity is a difficult point. The students come from different countries, and the individual cultural backgrounds and ideas are quite different. At first, the ideas were varied, including "hemispherical movable bed", "double U-shaped simple combined bed", "double solitary deformed bed" and other solutions. During the communication process, students fully understand that "learning by joining, joining, and critically investigating the opinions of others, through interaction can generate new insights". After the team members fully communicate and exchange, and learn from the opinions of the instructor, the final result A suitcase-type bed design that is achievable, space-saving and easy to carry is obtained. This is consistent with the enlightenment

given to us by constructivism, that is, students cannot be instilled in education, but students' original knowledge and experience should be taken as the growth point of new knowledge, and they should be guided to increase new experience from their original knowledge and experience. Know how. Teachers should organize and assist learning when possible, and guide the learning process to develop in a direction conducive to meaning construction.

Through this activity, students further understand that one person is incapable of major projects in today's society. Only an excellent team can successfully complete the task. Students also realize that team creativity is not simply the addition of individual creativity. An excellent team can often produce an effect of  $1+1>2$ , and an individual can only give full play to their talents in an excellent team. The whole activity promoted teacher-student interaction, and tested the students' personal professional design ability, teamwork ability, and professional coordination ability.

(4) Organize students to participate in professional competitions, and quickly improve their computer application ability within a limited time and specific propositions. For example, organizing students to participate in the annual "Newcomer Cup" national interior design competition, so that students have the opportunity to display their personality and ability in a certain landscape or situation.

(5) Schools or teachers can set up studios and give students the opportunity to participate in them and get more practical opportunities. This reflects the action-oriented teaching concept, which allows students to learn how to apply skills to work faster and experience tacit knowledge in the unspeakable professional field.

### **3. The reform strategy of landscape computer-aided design course**

#### *3.1. Revise the teaching plan and rationally plan the curriculum*



In the past, courses were offered in the second semester of the first grade or the first semester of the second grade, with class hours ranging from 48 to 64. It is very difficult to fully master the content and skills of the course in such a short time. Moreover, as students continue to improve their ability to master knowledge, their understanding and needs for computer-aided design will change. According to this situation, we have revised the teaching plan of the computer-aided design course. The course involves three semesters. The courses are taught in semesters according to the progressive relationship of knowledge and skills, and the new model of three-stage pre-employment teaching organization is implemented with the company. Cooperative teaching such as teaching process outsourcing.

### *3.2. Build a modular curriculum system and implement project-based teaching programs*

The computer-aided design course is rich in content and has many knowledge points. The 3DSMAX design software is mainly used to express the 3D scene effect, and it is also integrated into AUTOCAD, PHOTOSHOP and other design software. In the early stage of the course, we paid attention to the operation method of the software, arranged the teaching plan according to the order of the chapters of the textbook, and made the teaching content according to the content of the textbook. Students could not systematically master the design process. According to the needs of the job and the actual project operation, and integrating the knowledge, skills and attitude requirements of the relevant professional qualification certificates, we now introduce the real design project into the curriculum teaching and subdivide it into multiple sub-projects. Each sub-project is It is a small-scale work flow, from shallow to deep, step by step, mastering the rendering method of landscape 3D scene renderings in completing the task. The whole project can link up the theoretical knowledge and practical skills of 3DSMAX, CAD, PHOTOSHOP, and highlight the training of students' professional

competence in vivid and interesting. After mastering the complete work process, the students' comprehensive competence is strengthened in the form of reports, comments, and calibration.

### *3.3. Development of "workbook"-style teaching materials*

At present, there is a dazzling array of teaching materials and reference books for computer-aided design, but it is difficult to find a teaching material that is completely suitable for teaching, especially for project design. In view of this situation, we are professionally rooted in the development of the industry, cooperate with well-known decoration design companies, refer to the latest international teaching materials to compile design models, and develop a batch of three-dimensional teaching materials that closely integrate the actual production and reflect the latest technological achievements and real production techniques. The textbooks related to computer-aided design have been practiced and have outstanding effects. They mainly have the following characteristics:

(1) The theoretical part of the content of the textbook should be concise, concise and easy to understand, covering the knowledge required by the corresponding professional qualification standards;

(2) The productive training part is connected with the corresponding vocational qualification standard skill training, prepared with reference to the actual work process and typical project cases, with training steps, technical indicators, evaluation standards, etc.;

(3) The combination of graphics and text is professional, practical and maneuverable, and can be adopted by the front line of enterprises as a "work manual" and become industry technical standards or vocational skills training materials.

### *3.4. Adopt a variety of teaching methods and methods*

According to the training objectives of the course, in order to cultivate applied talents that meet the needs of the market, this course adopts a variety of

teaching methods. Through project teaching, task-driven, competition and other teaching methods, students' comprehensive knowledge, application skills and professional quality are effectively improved. Reflected in:

(1) Task-driven teaching method of embedded project. There are many knowledge points in this course. If you study according to the knowledge system, students often cannot connect the knowledge they have learned to complete the actual design. For this reason, we carefully selected cases that can cover the knowledge points of the course and are extracted from the actual projects of the enterprise, and introduce them into the teaching. Through the process of "propose tasks → analyze tasks → complete tasks → learn while doing → summarize", the teaching style of interactive innovation, promotion of individuality, application, and collaboration is reflected. With the gradual deepening of the case, the students not only exercised their skills, but also unknowingly consolidated their theoretical knowledge, and truly applied what they learned.

(2) A competitive teaching method that simulates professional positions. In the process of project case teaching, competition-style teaching methods are also introduced to promote students' overall improvement. In addition to the need for students to master the work process, operating methods, and design skills in computer-aided design courses, it is more important to strengthen the high quality and efficiency of student drawing to meet the needs of the design industry under the market economy. In each project, a certain small competition is set up in the course to sum up experience, exchange experience and innovate methods through the competition. The competitive teaching method effectively taps the potential of students for active learning, effectively stimulates students' enthusiasm for independent learning, exercises their acumen and agility, and cultivates a sense of collectivism and a sense of interaction of unity and cooperation.

(3) Use modern educational technology. In the

teaching process of this course, the key and difficult points will be demonstrated through multimedia courseware, video recording and other means to help students learn theories and master practical skills. These teaching methods not only provide students with high-speed and high-capacity information resources, but also increase the attractiveness and appeal of teaching with their dynamic scenes combining sound, shape, sound, and painting, and huge virtual design functions. Students create an environment that can fully mobilize learning interests and activate creative thinking.

(4) Establish an interactive learning website to enrich teaching resources and improve teaching quality. The course has a moodle interactive network teaching platform, and teachers use this platform for classroom teaching, homework correction, and extracurricular Q&A guidance. Students use this platform outside of class to personally learn the content of course units, online questions, discussions, homework, and tests. Through the network teaching platform, synchronous or asynchronous interaction between teachers and students, students and students can be carried out, which stimulates the collaboration and participation of students in learning, and helps learners solve problems encountered in learning in time.

Practice has proved that the rich teaching methods and methods have stimulated students' interest in learning and made teaching and learning easy and enjoyable. Teachers mainly play a guiding role in teaching. Students learn from real cases and projects to understand the development of the industry, master the front-line design skills of the enterprise, learn from passive to active, and the harmonious interaction of teaching and learning creates a brand new classroom surroundings.

### *3.5. Innovate the school-enterprise cooperative teaching organization form to meet the requirements of the combination of work and study*

School-enterprise cooperation is the most discussed topic in recent years. This major has been actively

promoting school-enterprise cooperation and has signed cooperation agreements with many companies. When the school and the enterprise cooperate to a certain extent, various problems are also prone to occur. Both parties hope to find a new way to cooperate. This course has found an innovative teaching organization form in the cooperative teaching process.

(1) Mini order education. It means that students strengthen specific professional skills through pre-employment in "school-based enterprises" or enterprises. Nowadays, the number of large-scale enterprises in the decoration industry is gradually decreasing, the number of specialized and characteristic enterprises is gradually increasing, the number of job subdivisions is increasing, and the difference in core professional skills required to be mastered by the job is increasing. Therefore, the number of talents required for each position will not be large, and a specialization direction micro-order cooperation training method has emerged. Computer-aided design is a course that trains students to independently draw 3D scene renderings. Mastering this course can provide necessary skills for various design positions and can also achieve employment independently. Through the micro-order method, the company selects several outstanding students to strengthen their training, so that they can better master unique professional skills to be competent for specific positions, and have a good job promotion and migration ability.

(2) Teaching process outsourcing. Introduce industry backbone enterprises or growth-oriented enterprises to invest in the school to build "school-based enterprises", establish studios, and realize enterprises in the form of "teaching process outsourcing", implement teaching training and realize cooperative employment. Students, enterprises, and schools achieve a win-win situation, thus establishing a long-term school-enterprise cooperation mechanism. In the process of process outsourcing, through the introduction of actual work projects of the enterprise, the students are organized

into multiple project teams to simulate the actual work process. Under the guidance of the company's part-time teachers and class teachers, the project team members collaborate to complete the project, and cultivate students' collaborative cooperation Ability and comprehensive skills in analyzing and solving practical problems have strengthened students' resilience to market demands and improved their job skills and professional quality capabilities.

### *3.6. Strengthen teaching quality monitoring and break through traditional assessment methods*

We have established teaching supervision groups, practical teaching working groups, quality education working groups and other working institutions to evaluate and feedback on teaching content, and monitor the teaching process throughout the teaching process; guide young teachers and part-time teachers on teaching methods; and provide teaching management. Put forward reasonable suggestions; monitor the production training at each stage, the pre-employment situation at each stage, and the internship at each stage to form a teaching evaluation mechanism that combines qualitative and quantitative evaluation to promote the improvement of teaching quality. Break through the traditional assessment plan, emphasize the assessment of the learning process, let the corporate mentors participate in the evaluation and scoring, and provide timely feedback. Encourage students to use their hands and brains, use creativity and tools to achieve the desired results, and at the same time can fully assess the students' comprehensive ability.

## **4. Conclusion**

Powerful computer-aided design tools build a ladder for design realization creativity. When mastering computer-aided tools, you also need to cultivate your own aesthetic creativity and interesting thinking. The design and development of computer-aided tools is to satisfy designers' expression of creativity , Rather than just using auxiliary tools. Landscape design, including any design, the designer's mind,

and the sense of innovation are fundamental, so we should pay more attention to the cultivation of this aspect.

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### **Acknowledgments**

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