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Feasibility Analysis of Teaching Reform of Computer-Aided for Environmental Art Design Course

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Abstract. This article uses the dual-master learning environment design based on the problem of computer replication to apply to the teaching of environmental art design course. It can solve the problems in the teaching of environmental art design courses in colleges and universities. Instructional design theory, problem-based philosophy of science theory, distributed cognitive theory, activity theory, and situational cognitive theory is the guides. Based on the principle and components of the dual-primary learning environment teaching design based on problem-solving, the computer environment art design in universities is constructed the dual-primary learning environment model based on problem-solving that can promote the development of learners' problem-solving skills in the course. The teaching model mainly includes front-end analysis, problem-solving activity design, and teaching evaluation design. Analyze and understand the current status of the online learning platform from different perspectives and carry out design positioning, and put forward the current issues and redesign summary. Based on the results of usability analysis, specific design ideas were developed from the aspects of structural design and visual interface design, and the feasibility was analyzed. Such a disruptive teaching experience will surely set off another wave of teaching reform.

Keywords: Computer-aided; Environmental art design; Teaching reform; Feasibility analysis
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1 INTRODUCTION

In recent years, the speed of computer-aided development is very fast. Compared with the traditional teaching of the environmental art design, the application of computer-aided teaching in environmental art design can break the traditional teaching restrictions. The use of computer-aided environmental art design teaching is more intuitive. Computer-aided simulation of various types of spatial environmental data can be used in teaching [1]. Computer-aided equipment is still constantly improving the equipment and strengthening the processing ability, and finally can be better applied to the teaching of the environmental art design, so that the teaching system of the environmental art design is more perfect, which can fully tap the potential of students and reflect environmental art. The teaching of environmental art design can obtain abundant teaching materials through computer assistance, to continuously develop its research theory. In the past, due to the constraints of funds, venues, and other factors, design teaching often failed to achieve the best results. Therefore, this subject proposes integrating computer-aided and environmental art design teaching to strengthen the vividness and impressiveness of environmental art design teaching. In the practical application of computer-aided design teaching, with the help of computer-assisted multi-perception, interactivity, conception, and other technical characteristics, it can make up for the deficiencies in traditional environmental art design teaching [2]. Teachers can use computer-assisted to make some abstract art the visualization and vividness of knowledge can help students understand relevant knowledge and concepts more emotionally. Due to the large scope of the environmental art design course, it covers both interior design, landscape design, and architectural design. Interior design can be subdivided into display design, room design, office space design, catering design, hotel design, and others. In this topic, the Zen interior design course is selected as an entry point, and the Zen interior design mouse operating interface learning software and 3D VR helmet roaming and interactive learning software are used as virtual reality teaching tools for experimental teaching and in-depth research on environmental art design Breakthrough in the teaching dimension of majors.

Cavalcante Koike C M C and Crafts established the first "interior decoration department" in China, which developed to 2017 and spanned over sixty years [3]. From the "Interior Decoration Department" majority of the Central Academy of Arts and Crafts to the environmental art design major in more than 700 domestic colleges and universities, the changes in teaching are not the same [4]. In terms of emerging computer-aided applications, the traditional teaching methods of environmental art design are lagging. Although all major universities have carried out certain method explorations, the research is still in its infancy. Violante M G researched this aspect of computer-aided applications has been strongly supported by the state in the past decade [5]. A computer-aided (VR) research plan has been formulated, and VR technology has been included in the national high-tech research and development, the National Natural Science Foundation of China, and Muñoz C Plan and other research projects. The Ministry of Science and Technology and the National Defense Science and Industry Commission have listed computer-assisted research as a key research project [6]. Many domestic research institutions are conducting computer-assisted research and application, and have achieved some research results: the realization of the National Disc Engineering Research Center of Tsinghua University The big panoramic virtual reality of the Potala Palace; Moore K has developed a desktop real-time roaming system of virtual building environment; the virtual reality laboratory of the School of Architecture, Tongji University has carried out virtual simulation experiments on building structures and landscapes [7]. It has made great contributions to the development of the domestic computer-aided industry.

In Europe, Płotka-Wasylka J is leading in computer-aided research and development [8]. The United Kingdom attaches great importance to the application of computer-aided education and teaching [9]. The educational computer-aided engineering established in Newcastle-Upon-Type Middle School is the first in the United Kingdom, and it has been a long time. The project is based on Dimension International technology and uses the Dimension's computer-aided software package. In many developed countries, computer aid has developed to a certain height, and it is no longer limited to indoor or architectural landscape design. Dick V researched institutions and companies have seen the good prospects of computer aid, and quickly entered the computer-aided research and related Product development [10]. They include computer-aided design, education, graphics and images, various machine simulation training, intelligent robots, entertainment and art, urban planning and design, real estate projects, construction and cultural relics protection, medical and military Practice areas. The integration of computer-aided and three-dimensional holographic projection technology will produce a more powerful sensory effect. The thesis research strives to provide some theoretical support for the reform and innovation of environmental art design teaching through the use of computer-aided research in environmental art design teaching, through self-developed Zen interior design mouse operation interface learning software and 3D VR helmet roaming and interaction Learning software for practical teaching research, providing software technology and research theory support for innovative teaching of interior design and even environmental art design. This subject is mainly to explore the application of computer-aided in environmental art design teaching, to explore new environmental art design teaching methods, to further improve the quality of environmental art design teaching, and enhance students' design ability and innovative thinking ability.

2 COMPUTER-AIDED ENVIRONMENTAL ART DESIGN CURRICULUM MODEL ANALYSIS

2.1 GLES Design Models

Dr. Li Yan conducted an in-depth study of the Jonathan CLEs design model, and combined with the supporting strategies of collaborative learning, in her doctoral thesis "Jonathan Constructivist Learning Environment Design Research" article constructed a CLEs design development model Referred to as the development model), as shown in Figure 1.

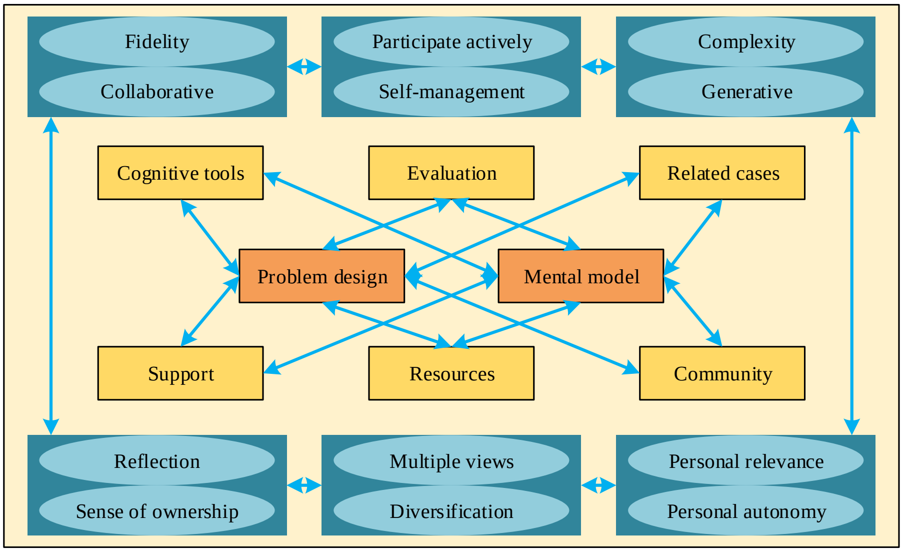

Figure 1: Development model designed by CLEs.

The development model inherits most of the design elements and design methods of the Jonathan CLEs design model, and creatively adds the "mental model" behind the CLEs design model to the design elements. At the same time, the author added scaffolds and evaluations to the design elements, making the model more systematic, scientific, and holistic. And the author points out in the article that the development model is more suitable for the field of poor structural problems. The development model provided us with more detailed and specific reference and practical guidance for building a learning environment model based on problem-solving.

The development model consists of two parts: (1) Design elements: problem design, related cases, cognitive tools, scaffolds, communities, resources and evaluation, mental models (implied elements); (2) evaluation variables: active participation, realistic Sexuality, collaboration, complexity, tentativeness, multiple perspectives, ownership, personal self-reliance, personal relevance, diversity, reflection, self-management. There are 12 evaluation variables in the development model: active participation, fidelity, collaboration, complexity, tentativeness, multiple perspectives, a sense of ownership, personal autonomy, personal relevance, diversity, reflection, and self-management. These 12 evaluation variables penetrate the design of the seven elements other than the mental model, to ensure that constructive learning of learners can take place, and thus guide and evaluate the design of the constructivist learning environment.

Because the design of the learning environment involves the transformation of the paradigm of instructional design and the current researcher's conception of the learning environment is unified, the practical research on the design of the learning environment is still being explored and explored. The construction of a learning environment based on problem-solving aims to help learners to discover problems, characterize problems and solve problems, promote the transformation of teachers 'teaching design concepts, and promote the development of learners' problem-solving abilities. Therefore, this research is based on computer training courses in colleges and universities, focusing on the problem and problem-solving design, and building problem-solving ability of learners by constructing real problem situations for learners. In this chapter, the author will determine the seven elements of the dual-primary learning environment based on problem-solving, including problems, related cases, learning communities, information resources, tools, supports, evaluation, and two hidden elements of learners and teachers. And model design around "7 + 2" elements.

The learner's problem-solving ability is a complex ability system in which a variety of ability elements work together. It is situational and systematic. Based on the above analysis, this study determines the composition of problem-solving ability as five aspects: understanding, representation, solution, reflection, and expression, as showed in Table 1.

Problem-solving ability	Connotation	Problem-solving process
Understanding	Fully understand and recognize the problem, and identify the important factors, concepts, and steps in the task.	Understand the problem
Characterization	Be able to think about the problems in the task from multiple angles, and be able to make appropriate comparisons, inferences, predictions, and summaries of the problems in the task.	Representation problem
Solve	Ability to use flexible and diverse methods to accurately describe and explain conclusions: be able to complete tasks with clear goals and clear goals, and make appropriate explanations, analysis or answers: be able to choose the appropriate problem-solving methods.	Solve the problem
Reflection	According to the result of problem-solving, review the process of understanding, characterizing and solving the problem, and find possible problems and areas for improvement.	Reflective solution
Expression	Communicate the achievements of the task and have further research.	Communication development

Table 1: Composition of problem-solving capabilities.

Problem-solving ability can reflect the learner's problem-solving ability. A series of behavioral activities for problem-solving is the process of developing the learner's problem-solving ability. Therefore, this research aims to cultivate and improve students' problem-solving ability in problem-solving activities by constructing a model of a problem-solving learning environment.

2.2 Analysis of Practice Framework

The learning environment design model of "focusing on the learning of learners" is designed from the vertical and horizontal dimensions. The vertical dimension is composed of 3 modules: an analysis module, a design module, and an evaluation module. The design module is the core. The analysis module is the analysis before the design, and the evaluation module is the feedback modification after the design. Together, they provide effective information and feedback for the operational design of the design module. The horizontal dimension has four elements of learning environment design: cognitive tools, learning resources, strategic support, and interpersonal relationships. They arrange horizontally and in parallel in the core design module. Among them, learning resources provide content support for learners 'learning activities, cognitive tools provide learners with learning methods for learning activities, and strategy support provides effective methods for learners' learning activities, and good interpersonal relationships. It builds a good atmosphere of communication and collaboration for learners ’learning activities to promote the achievement of learners’ learning goals. ” The learning environment model provides teachers with various elements necessary for specific learning behaviors while simplifying In the serial design mode, the various design requirements are carried out in the sub-model. The learner can carry out a lot of complicating work of good order design. More importantly, the learning model can be effectively connected in a bad environment. Born to promote collaborative communication of learner problems, will have the ability to solve common problems and achieve learning goals. As showing in Figure 2 for the learning environment design practice framework model.

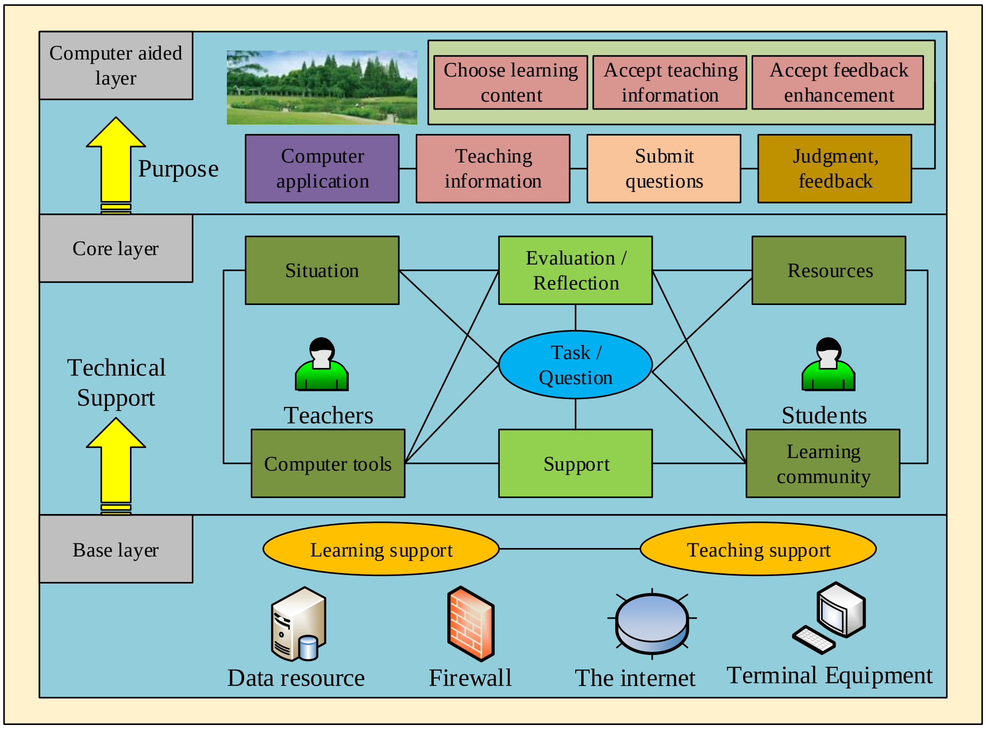

Figure 2: Practical framework model of computer-aided environment design.

After completing the design and construction, the final step is to deliver the interior space and evaluate the design of the project. During the formal use of the space by the owner, some problems and opinions will appear more or less, and the design unit can conduct a design evaluation based on the feedback of the owner. After the project is completed, follow-up inspections will continue to verify the design effect, continue to accumulate experience, increase awareness, and design a better plan. The systematic evaluation of a project needs to involve many aspects, such as whether it meets the needs of users in terms of function, visual effects, safety, price, and whether it meets the needs of investors in terms of technical construction and cost. Whether the aspects of culture. Conform to the main theme of the time and whether they fulfill their social responsibilities. Interior design, as a major of science and art, also involves many related disciplines, such as art, science, aesthetics, society, culture, environment, which requires designers to constantly enrich their knowledge base in daily life learning to learn some interdisciplinary subjects.

According to the conceived interactive content, the semi-transparent integrated button operation interface is used as the medium of interaction. The operation interface includes six functional areas, namely, material replacement area, texture replacement area, model replacement area, model tone adjustment area, lighting effect adjustment area, and model position adjustment area. Due to the need to place thumbnail icons for reference, the buttons should not be too small and have a compact layout. This button operation interface pops up by clicking the specific object to be adjusted through the middle mouse button wheel, and clicks the button and changes the slider parameters through the right mouse button, and is associated with the keyboard keys. This interface is programmed by Playmaker. Except for the operation buttons, a software entry interface will appear for a few seconds when the learning software is opened.

3 RESULTS ANALYSIS

3.1 Analysis of Test Object Results

In this study, through the experimental research, the problem-solving-based dual-primary learning environment teaching design model was applied to the series of practical training courses of the Applied Electronics Technology of the Z College-"Practical Networking Technology Experiment" in the "switch configuration and application experiment "Teaching module to test the teaching effect. The research object selected by the author is the 25 students of the "Practical Networking Technology Experiment" course of Z Academy September 1, 2019-December 30, 2019. Although there are only 25 students, the students are all from the majority of Applied Electronics Technology. It is representative of a certain extent and has certain research value.

Before carrying out the teaching practice of the dual-primary learning environment model based on problem-solving, a questionnaire "Practical Networking Technology Experiment" course learners were issued to the teaching class of the "Compulsory Networking Technology Experiment" course of the Applied Electronics Technology Specialty of Z College Learning survey ". 25 questionnaires were distributed and 25 valid questionnaires were withdrawn. The basic situation of the learners is analyzed as follows: 1 after investigation, the number of boys and girls in this teaching class is similar. When designing teaching cases, we must fully consider the learning characteristics and styles of learners of different genders. The level of application configuration of the learner's computer network is one of the factors that determine the starting point for teaching. The statistical results are shown in Figure 3.

From the above statistics, it can be concluded that the overall application level of the computer network of the students in this class is relatively low, and most of them are in the primary stage. Therefore, in the problem-solving teaching activities, attention should be paid to the level of the problem, from shallow to deep. As showed in the statistical results of the data in Figure 4, teachers should provide learners with sufficient resources in the instructional design so that learners can find available support at a time when they encounter learning difficulties. At the same time, it is necessary to provide learners with sufficient time and space for collaborative knowledge construction. In classroom teaching, 76% of learners give up classroom participation because of fear of the wrong answer, and 84% of learners lack the consciousness of independent learning.

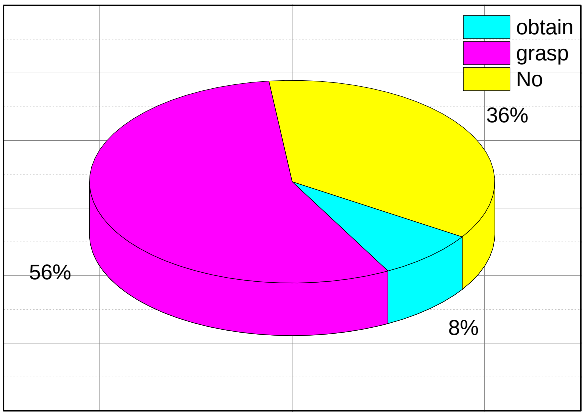

Figure 3: The application level of the dance machine network.

Therefore, teachers should continue to encourage learners to participate in problem-solving activities in the classroom, and give timely encouragement and support to drive the atmosphere of the entire classroom teaching; encourage students to self-reflect in experimental tasks, and make their experimental plans in combination with teacher arrangements to ensure the development of the model practice activities of this research.

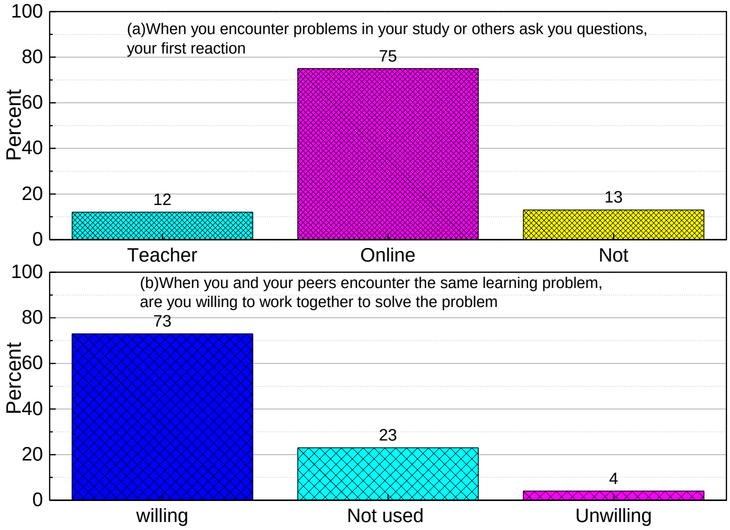

Figure 4: The learner's willingness to collaborate and how the learner likes to solve the problem.

According to the statistics of the above questionnaire survey results, it can be seen that the learners of this class have the conditions to carry out the design of a dual-primary learning environment based on problem-solving, but the ability of the learners of this class to apply and configure the computer network is generally, most Of the students do not understand the practical networking technology courses, so before carrying out the teaching practice of the dual-master learning environment model based on problem-solving, teachers must first introduce the content of the teaching of the class and the training of experimental tools, Let learners be familiar with the function and role of each module in the simulation experiment tool in advance: Secondly, we must pay attention to the richness and fun of the resources and case content, attract students' attention, and arouse the learner's desire to explore, to obtain good teaching. Compared with the traditional classroom teaching model, learners are more inclined to problem-solving teaching. Therefore, in the design of a dual-primary learning environment based on problem-solving, teachers must fully consider the contextually and guidance of the problem setting, and deal with the students. Conduct monitoring and guidance to enhance learners 'enthusiasm for learning, encourage learners to participate in the classroom, and at the same time, in the classroom teaching, with teachers as the lead and learners as the main body, effectively organize learners to conduct group experimental learning, and gradually improve learners' The planning organization ability of the experiment process, to achieve the purpose of cultivating the learner's problem-solving ability. As showing in Figure 5, it is the current learning status of learners.

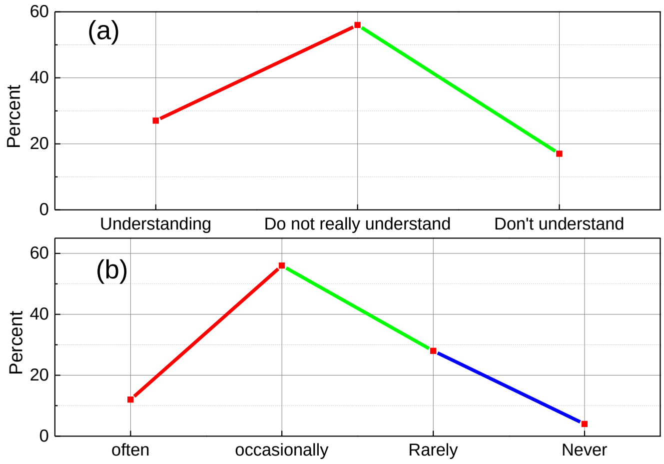

Figure 5: The status of learners' learning.

In this study, the case study method and quasi-experimental method are used in general, and data are collected through questionnaires, learner self-reflection evaluation, group self-evaluation and mutual evaluation, interviews, and teacher evaluation. The overall research plan is to design, implement, and evaluate the teaching case of "switch configuration and application experiment" based on the model.

3.2 Feasibility Analyses

After the students have been taught the model of dual-primary learning environment based on problem-solving in the "Practical Networking Technology Experiment" course, they have a different basic understanding, problem understanding, representation, solution, group collaboration, and communication and expansion skills. Opinion sees the learner's tendency through the average. It can be seen from Figure 6 that the average value of 24 questions is 3.92, which is greater than 3.5, ranging from uncertainty to basic consent, which is biased towards basic consent, indicating that learners have learned about exchange knowledge and skills through this course. Recognize the improvement of one's innovative problem-solving ability. Questions 4, 5, 6, 7, and 26 all have an average value greater than 4, ranging from basically the same to completely agreeing. It shows that the teaching of the dual-primary learning environment model based on problem-solving, the basic knowledge of learners, the understanding of the problem in the ability to characterize, solve, collaborate in groups, communicate and expand problems is of great help.

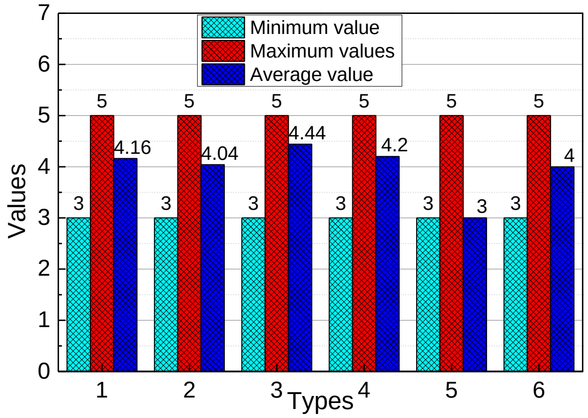

Figure 6: Capability data in terms of knowledge and problem-solving capabilities.

This course practice issues a self-reflection evaluation form for learners before and after each experiment, (the grade is set as excellent (≥90 points); B good (70-90 points); C qualified (60-70 points) ; D failed (<60 points)), conducted a total of 3 personal experiments, issued 150 evaluation scales, actually recovered 150 copies, the efficiency is 100%, group (group) learner code (id), each reflection The evaluation score, the average of six self-reflections (paved), see in Figure 7.

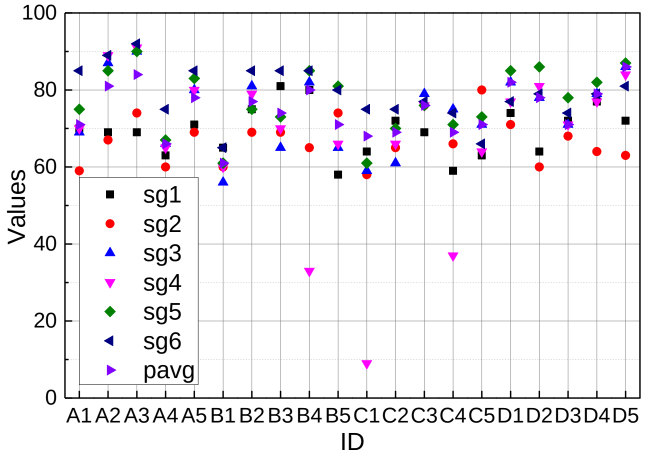

Figure 7: The distribution of learners' 6 self-reflection assessment results.

The graph of the learner's self-reflection score changes six times. Observation shows that learner's self-assessment shows an upward trend in multiple experiments. And with the average score of the learner's self-reflection evaluation in six experiments, it can be seen that the good grade accounted for 64% of the total, and the qualified grade accounted for 36% of the total. Therefore, it shows that learners recognize the improvement of their understanding, representation, resolution, collaboration, reflection, and expansion of their problems in multiple experiments. The dual-primary learning environment model based on problem-solving can promote the improvement of learners' problem-solving ability. Through the Kruskal-Wallis single factor ANOVA test on the learner's self-reflection evaluation results, the significance level of the learner's six reflection evaluations is 0.05, showing progressive significance, indicating that the learner Recognize your problem-solving skills in personal problem-solving learning activities.

At the same time, the teacher gives the final score of the semester according to the completion of the learner's experiment. This teaching experimental class is 25 learners of the "Practical Networking Technology Experiment" course from August 26, 2019, to December 30, 2019. Due to the limitation of teaching classes, 25 students who chose the traditional model teaching class from February 2019 to June 2019 to compare the final grades of the teachers to verify the validity of the model. See Figure 8 for the distribution table of spring and autumn classes.

First, SPSS24.0 was used to judge the significant difference between the results of the spring class and the autumn class, and the K-S normal test was performed based on the spring and autumn grades. It can be seen that the spring results and the autumn results conform to the normal distribution, and the t-test can be used to judge the significant difference. The average value of the spring results is 77.48, and the average value of autumn results is 83.68. Through two independent sample t-tests, it is concluded that significant indexes that assume equal variances or unequal variances are both less than 0.05, indicating that there are significant differences, and the use of problem-based dual-primary learning environment model teaching has certain teaching effects.

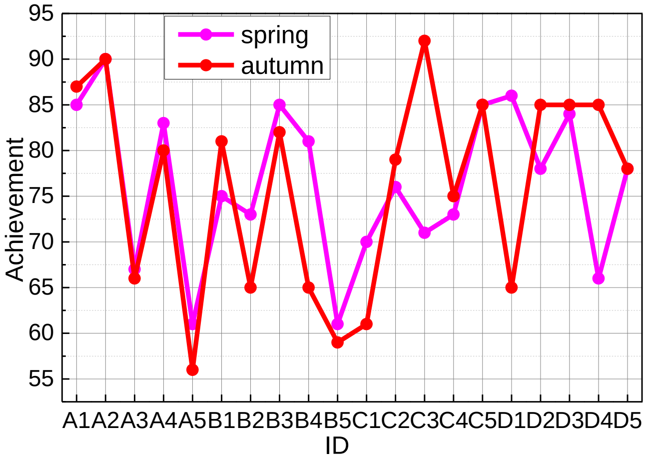

Figure 8: Performance distribution table of spring and autumn teaching classes.

4 CONCLUSIONS

Through computer-aided environmental art design curriculum reform, this article refers to the class learning environment model, and guides in the "dual master" instructional design theory, problem-solving science, philosophical theory, distributed cognitive theory, activity theory, situational cognitive theory, etc. Next, combined with the dual-primary learning environment elements and construction principles, builds a dual-primary learning environment model based on problem-solving. The model can provide learners with rich information resources, including specific forms such as courseware, teaching resource libraries, and e-books; provide effective learning tools, and provide efficient experiments, collaborative communication, and other tools for the development of learner problems solving activities. Provide learners with diverse and timely feedback and evaluation. The problem-solving activities emphasize the learning process, and the evaluation of learning is also the evaluation of the learning process. Learners can score and record their problem-solving learning activities autonomously, observe the changes in their learning situation, and facilitate the learners to continuously improve and revise your learning. This method will set off another wave of teaching reform in the future.

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