The Environment Design on Intelligent Classroom of Online Learning and Teaching

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Abstract. Computer aided design has far-reaching significance for the development of modern design. Design software is a tool for designers to complete creativity and production. Computer aided design has been widely used in the field of design. Compared with the traditional teaching process, the teaching practice process under the background of computer-aided design has more ways to obtain high-quality teaching resources. The changes in the direction of talent supply and demand also put forward new requirements for classroom teaching. Smart classroom is a kind of intelligent and efficient classroom, which aims to cultivate talents with high-level ability and creativity. This paper analyzes several forms of intelligent classroom for environmental design specialty, and analyzes the teaching mode of intelligent classroom art class under computer-aided design. Through in-depth study, the teaching mode is optimized, the establishment of smart classroom for environmental design provides a guiding ideology for promoting the reform of classroom teaching mode. It provides guarantee for intelligent analysis under technology and technical support for students' personalized development. It further increases the environmental protection in teaching. Mobilizes students' subjective initiative, and promotes teaching reform and innovation.

Keywords: internet + education; environmental design education; smart classroom; CAD course
DOI: https://doi.org/10.14733/cadaps.2023.S10.192-202

1 INTRODUCTION

The development of environmental design requires students to create culture and environment on the basis of design. In the process of cultivating such high-end talents, teachers must carry out advanced teaching activities in combination with modern teaching methods to give full play to students' sense of science and technology and sense of the times. Students who like indoor can specialize in indoor environment design, and students who like outdoor can design outdoor environment. This can better realize the personalized development of students and improve the overall teaching level of environmental design specialty. The course of computer-aided design aims to cultivate students' ability to operate software and design thinking to complete design independently. Such as the training of comprehensive abilities such as software learning ability, design thinking and design ability [1]. We should grasp the following characteristics: ① software operation skills. ② Focus on software design application ability. ③ Combine basic theory with practical operation. ④ Focus on cultivating students' ability to complete the design independently. ⑤ The content of teaching practice should be combined with the application requirements of business design. The course of computer-aided design is of great significance to the intelligent teaching of art design majors in colleges and universities. Liu and Liu [2] focused on how to divide and design the material library to improve the efficiency of the system. Barro [3] made a data analysis of the language teaching environment. Through extensive geographical analysis and communication capabilities, the user construction of language teaching has been carried out. Finally, suggestions are made for the adoption of social media and future research. Parmaxi [4] describes the outline of the academic literature of virtual reality as a new language teaching technology.

Hamilton et al. [5] has monitored the level difference of short-term intervention measures and conducted personalized information supervision education for some advantageous students. Wong et al. [6] found that the use of I-VR in education has significant advantages, while a few studies found that there is no significant difference in students' learning level whether using I-VR or non-immersion methods. Most of the studies adopted short interventions without checking information retention. Geng et al. [7] created environment through various forms of technical support in face-to-face and online teaching. Compared with NBL environment, students' technical preparation has a greater impact on teaching in BL environment. These findings show that appropriate BL settings can create a cohesive community and strengthen cooperation between students. The structure of talent demand is also changing. The market requires designers not only to be able to master the operation skills of computer-aided design flexibly [8]. Wang and Bi [9] are committed to developing through mastering the basic knowledge of 3D modeling, model the game production and animation production of actual combat projects. Understand the latest modeling technologies and trends. Expand your own modeling network by participating in modeling competitions, online forums, social media, etc. János and Gyula [10] made a technical demonstration and analysis on how to model the thinking of traditional classroom. The limitations of classroom design are technically designed. Help improve the efficiency and quality of modeling by selecting according to your own needs, budget and skill level. Encourage students to actively participate in community activities to better master modeling skills and apply them to practical projects. This paper establishes a visual feature reconstruction model of the optimized design image of the intelligent classroom environment design teaching mode, and extracts the fuzzy feature quantity of the optimized design image of the art teaching mode by analyzing several common intelligent classroom modes. Its innovation lies in:

(1) In this paper, the restricted Boltzmann machine (RBM) training method in deep learning is used to reduce the execution cost of the algorithm.

(2) This paper constructs the key characteristic quantity of the optimization design image of the teaching mode of the intelligent classroom environment design specialty, and uses the method of integration and induction to realize the optimization design and recognition of the art teaching mode in the intelligent classroom.

This paper studies the optimization design of the teaching mode of smart classroom environment design specialty, and its structure is as follows:

The research framework of this paper is as follows:

The first section is the beginning. It mainly introduces the research background and value of this topic, and puts forward the research purpose, method and innovation of this paper. The second part introduces the subject literature, summarizes it, and puts forward research ideas. The third part is the research method, which mainly combines comprehensive induction and in-depth learning to optimize the project design. The fourth part is the experiment part. In this part, the data set is tested and the performance of the model is analyzed. The fifth part summarizes the theoretical application analysis and constructs the further development content of the study.

2 RELATED WORK

The vigorous development of information technology and the artificial intelligence, wireless communication and other technologies are integrated to create a smart classroom. It breaks the time and space limit of students' learning and enables students to complete their learning at any time and place, which has greatly innovated the traditional teaching mode. Smart classroom has changed the traditional education mode and formed a new education ecology. Environmental design is an emerging discipline that is composed of architecture, planning, ecology and design. In the course system teaching, we need to use rich environmental design cases for teaching Harrison et al. [11]. The traditional indoctrination teaching cannot meet the needs of cultivating environmental design talents. In the smart classroom, students are required to access the smart classroom through smart terminal devices such as smart phones, tablets and personal computers to learn anytime and anywhere. And watch the rich design cases to realize the mutual benefit of teaching and learning.

Believe that the smart classroom is supported by modern educational technology, and it has realized the student-centered, with the smart cloud platform and student terminal as the conditions. The pupils' learning has become the focus of the classroom, and the learning has turned to the pupils Lyon and Denner [12]. Teachers create learning resources through the platform and communicate them to pupils through educational media. Pupils learn independently and acquire knowledge. In addition, it can also effectively cooperate with home and school to build a good learning platform for pupils. Designed independent self-help learning mode, group collaborative learning mode, inbound learning mode and maker learning mode, providing guidance for the effective development of intelligent learning. Put forward the teaching application mode of lecture type, group cooperation type and virtual operation type smart classroom by fully considering the realization of teaching functions and the optimal allocation of teaching resources. Designed independent self-help learning mode, group collaborative learning mode, inbound learning mode and maker learning mode, providing guidance for the effective development of intelligent learning. Put forward an integrated teaching activity design model before, during and after class from the perspective of environmental design and activities in combination with multidisciplinary theory. Combed the different application levels of the integration of smart classroom and teaching, proposed that the construction way of smart classroom and its core is to change the teaching model, and through systematic analysis of the construction way and application cases of smart classroom, truly realized the learning change and innovation supported by information technology. Believe that the interactive hybrid teaching mode based on Internet technology is more three-dimensional than the traditional teaching mode. Teachers and pupils use Internet technology to carry out interactive learning activities inside and outside the classroom, focusing on the cultivation of learners' innovation ability and critical thinking. Discussed the "Internet +" College dual classroom teaching mode, which makes physical classroom, online classroom and database the core elements of the teaching mode, has the advantage of reducing the cost of resource development, and allows pupils to learn independently in rich learning resources. Discussed the "Internet +" College dual classroom teaching mode, which makes physical classroom, online classroom and database the core elements of the teaching mode, has the advantage of reducing the cost of resource development, and allows pupils to learn independently in rich learning resources.

3 METHODOLOGY

3.1 Teaching Mode of Smart Classroom for Environmental Design Specialty

The environmental design specialty undertakes the application-oriented specialty of high-quality talents with certain space design and environmental design capabilities. At present, the curriculum teaching of the environmental design major is mainly taught by teachers in the classroom, and the traditional teaching method that students passively accept cannot achieve the application-oriented talent training mode that combines theory introduction and project design output. Although there are teachers answering questions and teacher-student interaction in classroom teaching, they cannot attract students' attention and students lack initiative in learning. The major of environmental design requires higher innovation and practicality, and requires teachers to cultivate students' practical ability and thinking ability. The professional content theory of environmental design is relatively strong and requires a lot of design practice. Contemporary college students are open-minded and have distinctive personalities. They lack enthusiasm for the boring theoretical knowledge in the learning process. Smart classroom can undoubtedly effectively solve the problems existing in the traditional teaching mode.

The differences and advantages between traditional classroom and smart classroom are highlighted in multiple levels and aspects, as shown in Table 1:

	Traditional classroom	*Smart classroom*
Teaching process	Learn before you learn	Learn before teach
Teaching ways	Teaching way+ppt	Cooperation+exploration+interaction
Teaching interaction	Ask questions+delegate	Teachers and pupils+pupils
Teaching tools	Multimedia+projection	Electronic whiteboard+tablet+feedback device
Teaching mechanism	Experiential teaching	Data Decision
Teaching evaluation	Simplification	Multidimensional
Teaching guidance	Common problems	Personality problems

Table 1: Comparison between traditional classroom and smart classroom.

The delicate performance effect of traditional painting tools is difficult to be replaced by modern media. The electronic painting cannot replace the traditional painting. The traditional painting skills and expressions can more easily and meticulously express the pupils' feelings and reflect the pupils' aesthetic interest. Therefore, teachers should combine various media in teaching to achieve the best teaching effect.

The teaching goal is an important part of the whole process of classroom teaching - learning - evaluation. Before preparing a lesson, teachers must know what the pupils are expected to achieve in this lesson. Goals have many forms. From specific goals to overall goals, from external goals to implicit goals, different goals have different values. In combination with the theory and practice of the smart classroom, the teaching objectives of the smart classroom are set as three levels: primary, intermediate and advanced. The goals of the three levels are independent and interrelated, forming a teaching goal level of "point to line" and "line to surface", as shown in Figure 1.

The interactive smart classroom teaching mode mainly solves "ineffectiveness" of teacher-student interaction in traditional teaching, aims to provide teachers and pupils with an effective interactive classroom through information technology, and ensures that each student can participate in classroom activities under the guidance of teachers, experience the fun of learning, and learn knowledge efficiently. This teaching mode not only emphasizes the teacher's leading role, as shown in Table 2.

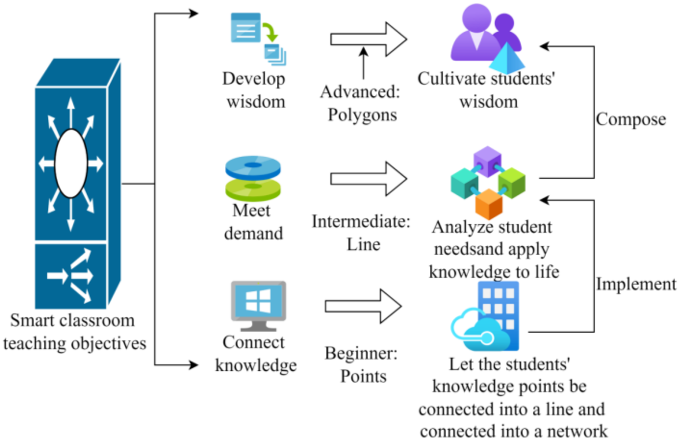

Figure 1: Teaching objectives of smart classroom.

Teaching link	*Teaching objectives*	*The role of smart classroom*
Create a situation	Connecting new knowledge with old knowledge awakens pupils' relevant knowledge and experience	Give examples; Give background; Create a situation to attract pupils' attention
Teach new lessons	Pupils initially learn new learning contents	Presenting materials or new knowledge; Keep pupils' attention
Organizing activities	Pupils master new learning contents through activities	Provide tools and resources for teacher-student interaction; Timely feedback and analysis of pupils' learning
Migrate applications	Expand knowledge, learn to transfer and apply knowledge	Provide rich resources

Table 2: Interactive smart classroom teaching mode - teaching objectives and smart classroom functions.

Exploratory learning is a learning way advocated by the new curriculum, which can enable pupils to actively acquire knowledge from inquiry, apply knowledge and solve problems. Exploratory learning is a learning way advocated by the new curriculum, which can enable pupils to actively acquire knowledge from inquiry, apply knowledge and solve problems. Smart classroom plays an important role in this teaching mode, as shown in Table 3:

Teaching environment	*Teaching objectives*	*The role of smart classroom*
Create a situation	Stimulate learning and inquiry motivation	Provide materials for creating situations
Inspire thinking	Inspire pupils to think about problems and phenomena	Provide tools to inspire pupils' thinking
Inquiry and collaboration	Cultivate pupils' divergent and innovative thinking	Tools and materials provided for pupils to explore and communicate independently
Summarize and improve	Consolidate, expand and transfer knowledge points	Provide diagrams and tables to help teachers and pupils summarize

Table 3: Exploratory wisdom classroom teaching mode.

In order to connect knowledge, we should first understand the classification of knowledge. In addition, Gagne also elaborated that four different learning types need different internal and external learning conditions, emphasizing that teachers should use pupils' internal conditions and create external conditions to improve pupils' learning efficiency. Anderson divides knowledge into declarative knowledge and procedural knowledge, as shown in Figure 2. Among them, declarative knowledge, also known as "descriptive knowledge", is used to answer the question of "what is". It is the knowledge that individuals can directly recall and state, mainly used to describe the characteristics, state and nature of things, and distinguish things. Proposition, representation and linear ordering are the representation forms of procedural knowledge. Procedural knowledge, also known as operational knowledge, unconsciously extracts clues when solving problems, mainly solving the "how to do" problem.

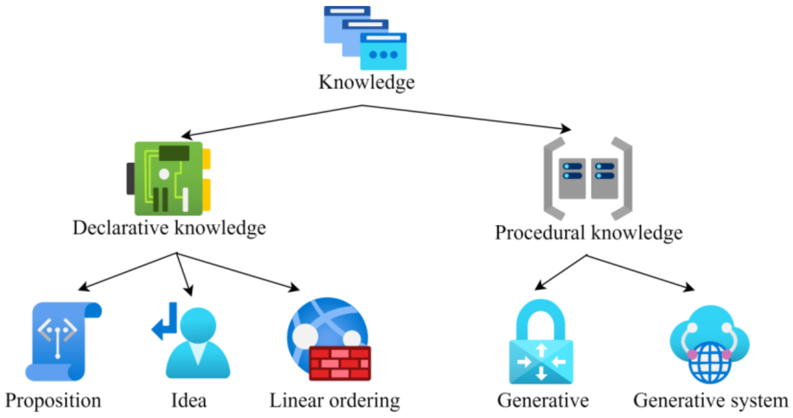

Figure 2: Dodson Knowledge Classification Diagram.

More inspiration and creative sparks are collided. The blending of life and the development of wisdom are achieved here. The "5+5" teaching process structure is mainly adopted for teaching activities in smart classroom, including five stages for teachers and five stages for pupils, namely, collaboration and mutual learning, problem breakthrough, creating situations, assigning new tasks, cooperative inquiry, classroom testing, practice consolidation, real-time comments, and self-reflection. See Figure 3 for details.

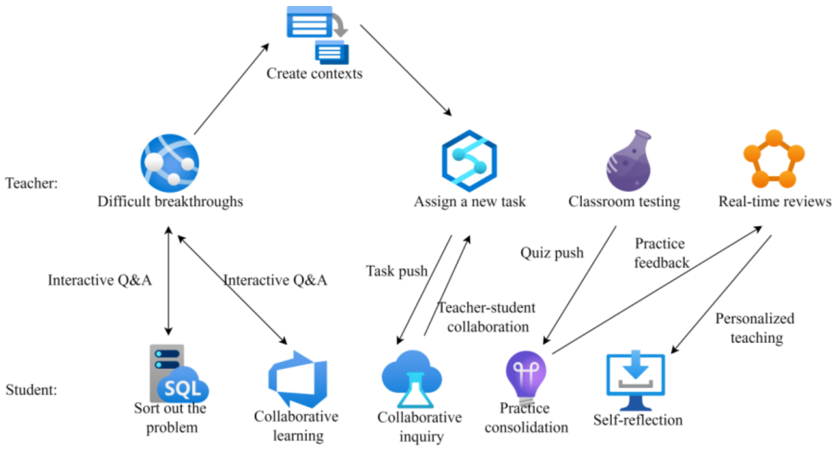

Figure 3: In class teaching flow chart of smart classroom.

3.2 Algorithm Optimization of Teaching Mode Based on Computer Aided Design

The multi-layer network structure of the deep learning model can more effectively express complex functions, thus learning features with stronger representation ability. Applying deep learning to the classification of art painting images can effectively improve the accuracy of classification. Before the overall training of the model, the deep learning first treats the multilayer neural network as multiple RBMs for superposition, and trains these RBMs layer by layer. Figure 4 shows an undirected graph model of RBM. As the structural unit of Deep belief network (DBN), RBM will share parameters with DBNs at each layer.

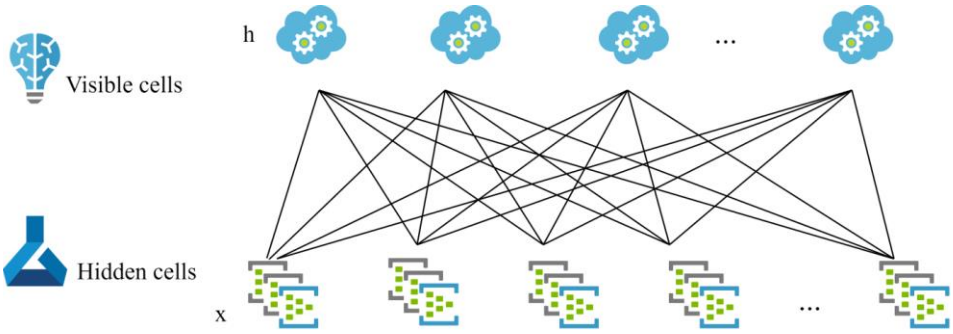

Figure 4: The undirected graph model of RBM.

$$p(x,h) = \frac{e^{-energy(x,h)}}{z} \tag{3.1}$$

The normalized constant is $z = \sum_{x,h} e^{-energy(x,h)}$, also known as the partition function. It can be called partition function. The marginal probability distribution of the observable input data x is

$$p(x,h) = \sum_h p(x,h) = \sum_h \frac{e^{-energy(x,h)}}{z} \tag{3.2}$$

By introducing free energy, formula (3.2) becomes:

$$p(x) = \frac{e^{-energy(x)}}{z} \tag{3.3}$$

$z = \sum_x e^{-freeEnergy(x)}$ in formula (3.3), namely:

$$freeEnergy(x) = -\log \sum_h e^{-energy(x,h)} \tag{3.4}$$

$$\frac{\partial \log p(x)}{\partial \theta} = -\frac{\partial freeEnergy(x)}{\partial \theta} + \frac{1}{z}\sum_{(\hat{x})} e^{-freeEnergy(\hat{x})} \frac{\partial freeEnergy(\hat{x})}{\partial \theta} \tag{3.5}$$

$$E_{\hat{p}}\left[\frac{a \log p(x)}{\partial \theta}\right] = -E_{\hat{p}}\left[\frac{\partial freeEnerge(x)}{\partial \theta}\right] + E_p\left[\frac{\partial freeEnerge(\hat{x})}{\partial \theta}\right] \tag{3.6}$$

4 RESULT ANALYSIS AND DISCUSSION

The simulation process in this section mainly compares the reconstruction errors of three arithmetic under the same training times, and sets the number of hidden layer units to 20 different numbers: 5-100, 30 experiments are conducted, set the number of training epoch to 20, and set the batch size to 100. The simulation results are shown in Figure 5 below:

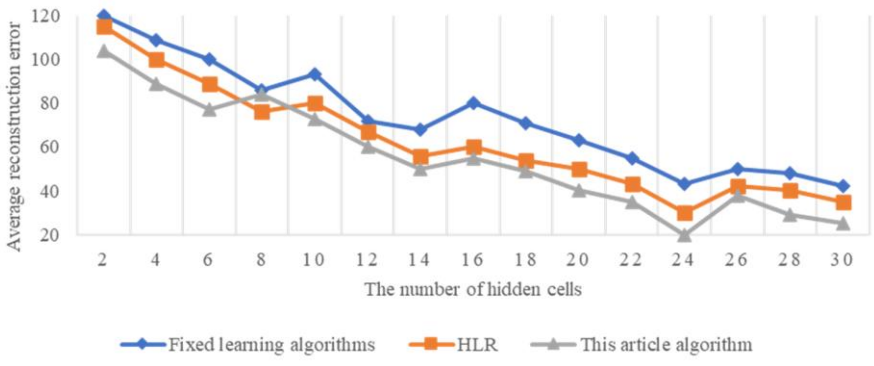

Figure 5: Average reconstruction error of three learning rate adjustment arithmetic.

It can be seen from Figure 5 that under the same training time, the average reconstruction error of RBM obtained from two adaptive learning rates is better than that of RBM with fixed learning rate. In the simulation process, training from 1 to 30 hours. The simulation results are shown in Figure 6.

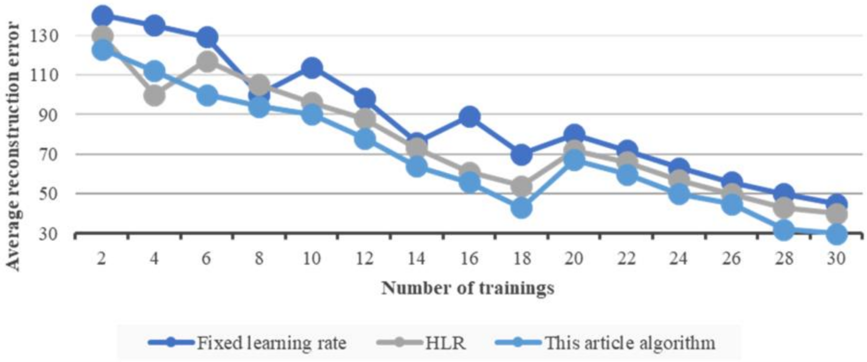

Figure 6: Comparison of convergence effect.

It can be seen from Figure 6 that the arithmetic in this chapter achieves better convergence effect under the same conditions. In the early stage of training, the error of this arithmetic has a faster decline rate compared with the other two arithmetic. After several trainings, it gradually tends to be stable. When the training number is 28, the average reconstruction error is 41.666, which is lower than the convergence threshold.

We conducted a small-scale experiment with only 15 hidden units, so that we can simply calculate the log likelihood by enumerating the states of hidden units, so as to improve the contrast accuracy. The average log likelihood of each model after six times of training. As shown in Figure 7.

Figure 7 shows that before 2000 parameter updates, the proposed algorithm has no obvious advantages in likelihood compared with in this paper to the training data increases gradually and reaches the level equivalent to the PT-10 algorithm. But in the training phase, compared with PCD algorithm, PT-10 algorithm needs 10 times of time. The time cost of the algorithm proposed in this paper is only 2 to 3 times that of PCD algorithm, which is far lower than PT-10 algorithm.

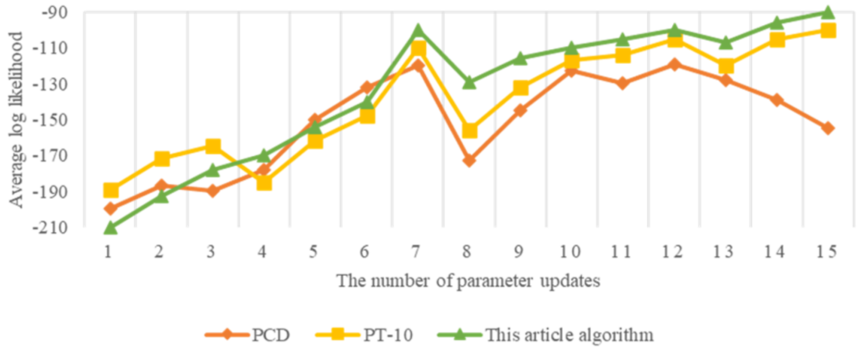

Figure 7: Average log likelihood of three arithmetic when the number of hidden units in MNIST dataset is 15.

The best of the two comparison algorithms and is the closest to the algorithm in this paper. Therefore, in this simulation process, only PT-10 is compared with the algorithm in this chapter. The number of hidden layer neurons is set to 20. RBM model has been trained 10 times with the algorithm in this chapter and PT-10 algorithm respectively. The average likelihood results are shown in Figure 8. It can be seen from Figure 8 that the proposed algorithm performs better than PT-10.

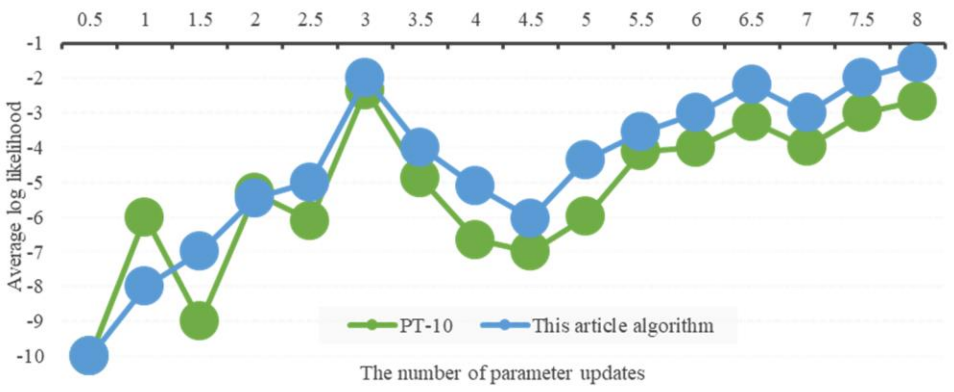

Figure 8: The average log likelihood of the three arithmetic when the number of hidden units in the toy dataset is 20.

This section conducts log likelihood simulation of high-dimensional RBM on MNIST dataset, sets the number of hidden units to 200, and compares the average log likelihood of the two arithmetic under different parameter updates. Because there are many dimensions of hidden units, AIS is used to calculate the log likelihood, another very simple RBM distribution is introduced, and the normalization constant is calculated directly through mathematical expression. Then, AIS is used to estimate the ratio of the normalization constant of the RBM to be evaluated to that of the simple RBM, and the normalization constant of the RBM to be evaluated is calculated by multiplication, so as to calculate the likelihood of the RBM to the training data. When simple RBM is selected during simulation, set the weight of simple RBM to 0. The simulation results are shown in Figure 9.

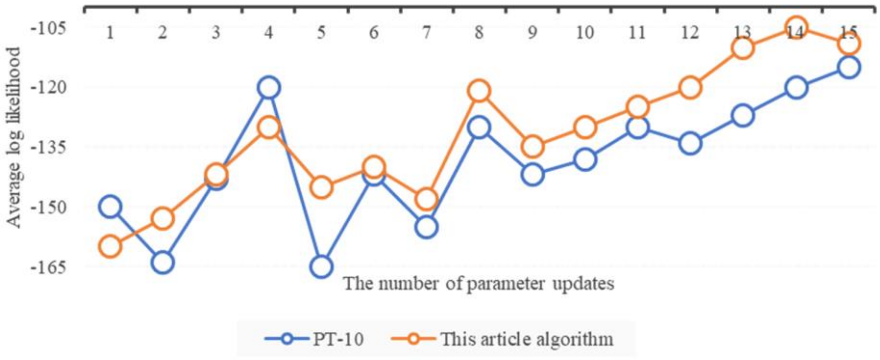

Figure 9: Average log likelihood of the two arithmetic when the number of hidden units in MNIST dataset is 200.

Figure 9 shows the likelihood of RBM trained by two arithmetic to training data under 200 hidden layer units of four arithmetic. When PT-10 has experienced 8 * 5000 parameter updates, the likelihood begins to decline. However, after 7 * 5000 parameter updates, the arithmetic in this paper falls into a local minimum. The arithmetic in this paper can jump out of the local minimum by continuously inputting samples.

5 CONCLUSIONS

This paper puts forward an optimized design scheme for the teaching mode of intelligent classroom environment design specialty under the background of computer-aided design. By analyzing several forms of intelligent classroom, this paper analyzes the professional teaching mode of intelligent classroom environment design, optimizes the teaching mode by using deep learning, and finally conducts simulation test analysis. The results fully show that the introduction of data noise processing and feature pool processing in the multi-layer RBM network avoids the over-fitting of the algorithm to the training data, improves the generalization ability of the algorithm, and improves the classification accuracy. "In the future, schools must turn the object of education into the subject of independent education, and education must also take learners themselves as the starting point." It can be seen that education informatization is the inevitable trend of education reform, and smart classroom is the main battlefield of education informatization. Use information technology to build a smart education environment, so that teachers can use smart teaching models and teaching methods to optimize teaching, and make the classroom teaching form gradually develop according to "standard classroom - effective classroom - efficient classroom - smart classroom". Give full play to the value of intelligent education, promote the cultivation of intelligent talents, and realize the advanced development of students from "intellectual" to "intelligent".

6 ACKNOWLEDGEMENTS

This work was supported by Industry-University Cooperative Education Project of Ministry of Education in 2022, "Research on New Model of Landscape Design Curriculum System Based on Digital Representation" (No.:220507022274203); Supported by Teaching Research Project of Hubei Engineering University Landscape and Planning Design of Residential Area" (Grant No.15) Social Practice Course.

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