

# *Research on the Framework Design and Construction of Intelligent Education Environment Supported for Engineering by New Generation Information Technology*

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**Abstract:** This paper takes the new generation of information technology as the technical support, combines the reality of the integrated classroom of theory and practice in engineering schools, focuses on the construction of intelligent education environment, takes learners as the center, designs and constructs the intelligent classroom without time and space limitation, and verifies the feasibility and superiority of this system through the combination of various technologies.

## **1. Introduction**

With the continuous promotion and development of the new generation of information technology, artificial intelligence, parallel technology and other new generation information technology have been integrated into all walks of life in modern society, which has had a great impact on the construction and reform of traditional classrooms and training rooms.

Smart classroom was proposed by Australian professor rachinho in 1988. It takes "learner centered" as the basic development concept, and aims to stimulate students' interest in research and learning, create an interactive communication teaching environment, and achieve the purpose of improving teaching quality with the help of advanced information means and teaching methods. The research on intelligent education at home and abroad can be divided into three categories: basic theory, teaching application and media technology. The follow-up should be gradually deepened from four aspects: the design of learning space, the improvement of evaluation system, personalized teaching research, and the transformation from smart classroom to smart learning environment.

## **2. Research Status at Home and Abroad**

### **2.1. Research Status Abroad**

Smart classroom started relatively early in foreign countries, and the relevant software and hardware are relatively complete. Countries carry out research and construction of smart classrooms from different perspectives according to their own development. The future Apple project in the United States focuses on the development of teachers and explores the use of information

technology to change the original teaching methods; From the perspective of interaction, the University of reading pays attention to the promotion of teacher-student communication and interaction on teaching; Japan has found another way, starting with the use and management of classrooms, to explore how smart classrooms can facilitate teaching management, promote students' thinking, and meet learning interaction.

Foreign studies are divided into nine clusters, They are "smart learning environment", "machine learning", "enabling spaces", "mobile ad hoc networks", "digital capabilities", "software systems", "learning Analytics" and "intelligent classroom" (smart classroom) "and" distance education"[1].

## 2.2. Maintaining Domestic Research Status

In order to better promote the in-depth development of informatization, a series of documents have been issued at the national level. The opinions of the Ministry of education on accelerating the construction of high-level undergraduate education and comprehensively improving talent training ability issued in 2018 proposed that we should actively promote hybrid teaching, vigorously promote the construction of smart classrooms, and build a teaching mode combining online and offline. In 2018, the Ministry of Education issued the "education informatization 2.0 action plan", which clearly requires the construction of a smart learning support environment. It advocates personalized learning and deep learning, which is not only open and shareable, but also has a perfect intelligent interaction space. In July, 2021, the Ministry of education and other six departments jointly issued the guiding opinions on promoting the construction of new infrastructure for education and building a high-quality education support system, focusing on interpreting the key directions of new infrastructure for education, namely, information networks, platform systems, digital resources, smart campuses, innovative applications, trusted security and other new infrastructure. The new infrastructure of education supports the construction of a new ecosystem of smart education. Smart classrooms shoulder the great mission of cultivating talents in the new era.

With the support of relevant policies, the construction of smart classrooms in China has developed rapidly. At present, colleges and universities in China have successfully built a variety of smart classrooms, such as mobile interaction, network interaction, flexible discussion, entrepreneurship and innovation discussion, multi-screen discussion, multi window interaction and so on [2-4].

Since 2015, the number of articles related to smart classrooms in China has increased exponentially. The keywords with high frequency and centrality include smart classroom, future classroom, smart education, learning space, Internet of things, augmented reality, ambient intelligence, Artificial intelligence, cloud computing, collaborative learning. However, for the weak link in Education - practical training, the smart classroom still does not realize remote training, online training or unlimited training. Similarly, for the integrated courses of engineering teaching, the smart classroom that realizes relevant functions has not been realized. Therefore, this paper proposes a smart classroom construction framework based on a variety of new generation information technologies, which can realize practical teaching without time and space limitation. borative learning, etc. [1]

## 3. New Generation Information Technology

Smart classroom is a new learning space. It redefines the classroom space and teaching method mode, and is a new type of education and teaching place under the information technology. Australian professor Radcliffe proposed a PST framework based on the next generation learning space in 2009.

The smart classroom is composed of six systems: infrastructure, network sensor, visual

management, augmented reality, real-time recording, ubiquitous technology. The initials of the six keywords are extracted, which can be abbreviated as "ISmart" [5].

From the perspective of actual functions, smart classrooms should not only meet the functions of media sharing and application, cross media interaction, multi-end collaborative learning, visual management, but also have the characteristics of multi-function, easy maintenance, multi platform, easy expansion and exhibition, so as to achieve a comprehensive upgrading of teaching and management. Therefore, the smart classroom needs to be closely combined with the new generation of information technology, grasp the core needs of teaching subjects, and transform and upgrade the smart classroom.

With the advent of the intelligent era of artificial intelligence, big data, industrial Internet and so on, the deep integration of human and information physical systems has given birth to social physical information systems. The integrated teaching and doing system is a typical CPSS. The parallel system provides CPSS with clear new ideas, methods and implementation ways, and solves the current situation that experimental training is excessively dependent on the number of equipment, student training is seriously restricted by time, and on-site social training is easy to generate many safety problems.

### 3.1. Parallel Technology

CPSS (cyber physical social systems) is an artificial system information that further integrates social information and virtual space on the basis of information physical systems, and extends the research scope to social network systems. It includes system engineering such as ubiquitous embedded environment perception, personnel organization behavior dynamics analysis, network communication and network control in the future, Make the physical system have the functions of computing, communication, precise control, remote cooperation and autonomy, pay attention to the close combination and coordination of human brain resources, computing resources and physical resources, and will be applied in many fields, such as intelligent enterprise, intelligent transportation, intelligent home, intelligent medical treatment, etc. It realizes the organic combination of personnel organization and physical entity system through intelligent human-computer interaction, and enables personnel organization to control physical entities in a reliable, real-time, safe and collaborative way through networked space.

Parallel philosophy - the process of parallel interaction and entanglement between virtual and real, is a world outlook formed by the interweaving of the physical world, psychological world and artificial world. Among them, closed-loop feedback is formed by building parallel scenes and their parallel spaces, and real-time interaction between "virtual bodies" and "entities". Integrate the computing thinking, parallel learning and parallel intelligent management decision-making methods based on the third artificial world and the artificial world, so that parallel thinking becomes a solid foundation for building the culture and behavior of knowledge automation in CPSS.

### 3.2. Multi-agent Systems

Multiple agents have the characteristics of autonomous distribution and coordination with learning reasoning and self-organization ability. In order to solve the problems of high dimension and large number of agents, the multi-agent depth reinforcement learning method has made some progress in dealing with complex intelligent game confrontation with the breakthrough of deep learning technology and the success of its combination with traditional reinforcement learning algorithm. [6]

### 3.3. Big Data

In the future, with the increase on computing power, data volume and algorithm, machine intelligence will be advanced from perception, memory and storage to cognition, autonomous learning, decision- making and execution in big data. [7].

In teaching, through the collection, recording and analysis of dynamic learning data in the whole process, we can accurately grasp the individual characteristics and differences of students, and teachers' teaching decisions are changed from experience to teaching data. Teachers conduct differentiated teaching, accurately analyze learning situations, and truly implement accurate teaching.

## 4. Design Idea of Smart Classroom

At present, educational informatization has entered the stage of rapid innovation, integration and penetration, and sharpening fusion. The information-based teaching technology is in a blowout state. In the process of building smart classrooms, based on the mainstream technology, we continue to break the original rigid and outdated teaching relationship, pay attention to the current hot spots, and the innovation of teaching reform is also deepening. Creating a smart teaching environment with a good interconnection environment has become a hot spot in the construction and development of educational informatization.

This paper focuses on the development and application of parallel practical training system, which aims to solve the current online practical training problems. The focus of this topic is to expand the implementation space of vocational education and training, reform the assessment and evaluation system, and realize the training of all-round high-quality compound skilled talents.

This paper takes the research on online teaching mechanism as the main line and aims to promote the high- quality development of vocational education. By analyzing and combing the current situation and shortcomings of online skills training of intelligent manufacturing majors in Vocational Education in China at the present stage, drawing lessons from parallel system technology, this paper innovatively proposes to build a new integrated teaching system integrated into parallel system; Crack the application of key technologies of Intelligent Manufacturing in teaching, and establish the operation mechanism of the new engineering training system with efficient human-machine and material cooperation, so as to provide guarantee for the theoretical and practical research of building a highland of innovative development of vocational education.

### 4.1. Authorstetchnical Framework

The standard system of smart classroom is not unified and perfect. The transformation of smart classroom from a concept to a reality of a given scale needs to be based on powerful technology and capital carriers to expand diversified teaching modes, create an efficient, interactive, friendly and integrated teaching environment, transform everyone into the main body of the classroom, and work together with multiple platform modules such as the same screen display, big data visual platform, multi window comparison, teacher remote monitoring module and so on. Identify and connect with each other to improve technology application and product scale development. The smart classroom technology framework is designed with a hierarchical architecture, creating a good interconnection environment, avoiding the system being too complicated, and realizing the engineering modularization of standard interfaces between all levels.

## 4.2. Interactive Realization Ideas

Although academia has not formed a unified concept of smart classroom, interactivity is one of the essential characteristics of smart classroom. Different educational space-time backgrounds lead to the need for teaching to have the interactive function of breaking the space-time gap, build a new model of "pre class guidance, in class interaction, after class guidance", stimulate interest in learning, and promote the reform and innovation of teaching methods and models. The interactivity of smart classroom not only emphasizes the communication and interaction between teachers and students in the physical space of the classroom, but also pays special attention to the derived space of education, that is, the virtual space that describes learning, guides learning, and predicts learning. The classroom is no longer a closed place, but a learning environment that spans time and space. Learners interact with physical space and virtual space in a multidimensional way. Using the integrated cloud platform of teaching and control, they use multiple functional modules such as one click sign in, bullet screen questioning, real-time testing, group and layered teaching. It is helpful to diagnose and evaluate the teaching effect.

## 4.3. Intelligent Realization Ideas

In response to the needs of personalized learning and lifelong learning, compared with traditional classrooms, smart classrooms realize the interconnection of space, teaching and technology. The construction of smart classroom needs to adapt to personalized teaching and highlight systematization. It can not only be the superposition of various hardware technologies, but also improve the expected effect of teaching, so as to promote the reform and innovation of teaching methods and models. Hybrid teaching combines the advantages of online and offline teaching. It is a subversion of the past teaching. It is a new teaching method full of vitality in the information age. It can teach students according to their aptitude from the reality of teaching, real-time interactive communication and timely feedback, promote students' comprehensive and free development, and help to improve the teaching level and precipitate teaching resources.

With the support of intelligent technology, VR technology and 5g technology, teachers and students use natural means and methods such as screen broadcasting, rebroadcasting and students' independent demonstration to statistically analyze students' specific learning dynamics. Teachers and students can fully carry out collaborative communication, get rid of the limitation that hands cannot do without keyboards in Online classrooms, and get rid of the reality that hands must touch practical equipment, Record the interaction between teachers and students in detail, and fully and accurately grasp the teaching situation.

## 5. Realization of Technical Module

Comprehensive data collection, screening and analysis are the premise of forming an intelligent teaching system. The smart classroom must also be equipped with face recognition, artificial intelligence, online training, visual analysis and other equipment, which can not only help teachers complete activities such as atmosphere creation, situation creation, explanation and annotation, practical operation, online practical evaluation, and micro video resource generation in the online and offline barrier free teaching process, but also analyze effective data through big data system, Feedback students' personalized learning reports, so as to provide more scientific basis for engineering teaching.

### 5.1. Online Management Module

The smart classroom can manage students through smart access control, machine vision, voice control and other devices. The corresponding data can be directly uploaded to the cloud teaching platform, and feedback can be given to students' attendance problems, head up rate, equipment usage, practical operation, etc., so teachers can directly manage students in class through online feedback.

In the process of building smart classrooms, colleges and universities should give full play to the cutting-edge technologies such as industrial Internet, big data and cloud computing, and combine the teaching needs of teachers and students to create a multi-dimensional space system of hardware, software and online intelligent services, so as to provide teachers and students with comprehensive, systematic, convenient, intelligent and behavior visible services, And then promote the continuous improvement of information-based teaching level in modern colleges and universities.

The construction of educational informatization has become the main development trend of current higher education, and information-based teaching has achieved a comprehensive upgrade. Colleges and universities should closely follow the development progress of the new generation of information technology, learn from the relevant successful experience in the design and construction of smart classroom technology framework, based on the deep integration of education and informatization, and constantly verify and improve in the actual teaching environment, so as to explore the construction direction of smart classroom that is consistent with the reality of Engineering Education in China.

### 5.2. Intelligent Teaching Module

The smart classroom is planned, designed and constructed. With the support of new technologies such as the Internet of things, big data, virtual reality and cloud computing, through the transformation of teaching space and the updating of teaching methods, the organic combination of teaching method, space and technology has realized the simple classroom participation, discussion, intelligent interaction. The implementation path of "student-centered" hybrid teaching in teaching intelligent environment.

The basic goal of smart classroom construction is to realize intelligent teaching, and the use of information-based teaching equipment must be driven by corresponding software modules. For example, multi screen demonstration system, interactive teaching module, multimedia application technology, student information statistics, classroom data statistical analysis, etc. through various intelligent teaching service functions, it can promote the interactive relationship and effective feedback between teachers and students, deeply integrate the network, resources, classroom and technology, and create a multi-mode, immersive and situational learning experience, So as to improve the efficiency and quality of teaching.

### 5.3. Parallel Training Module

In the future, with the increase on computing power, data The parallel training system is actually a digital quadruplet architecture, and the virtual space is interactively optimized with the physical space through platform components such as scene generator, visualization tools, algorithm analysis tools, etc. Through the docking, upgrading and updating of hardware and network platform, students can interact with online training service platform, unmanned training room, mobile Internet platform and other ways, and realize the transformation of traditional teaching methods to systematic, real-time, open and innovative practical teaching methods. As an important part of teaching, teachers play the functions of supervision, management, evaluation and decision-making

in the parallel system. Therefore, the parallel training system can help improve the training preview, the training teaching effect and the teaching integration effect.

The parallel training system runs in the opposite direction from the two perspectives of pedagogical law and data aggregation, uses the objective behavior data and state data recorded on the platform to build a scientific and feasible student evaluation system, carries out evaluation, diagnosis, prediction and intervention, and forms a logical and intelligent learning monitoring system to provide support for subsequent learning design.

## 6. Conclusion

Smart classrooms should help students carry out autonomous, ubiquitous and diversified learning, and help teachers collect data in the process of evaluation and observation. In the smart classroom environment, learners and teachers can easily obtain information without being limited by equipment, and devote themselves to learning and teaching activities. Digital and information-based teaching has become the mainstream at present, which has led to great changes in teaching. Teachers and students urgently need a convenient and fast teaching communication space. Smart classroom came into being and has become an inevitable trend of information construction. In addition to considering the overall situation, system topology, functional requirements and other related factors, the construction of smart classrooms should also integrate teaching, space and technology.

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