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Feasibility Study on the Construction of Smart Classroom in Sichuan University of Arts and Sciences

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Abstract

In the context of implementing the strategy of "Internet + education" and deepening the reform of education and teaching, as the product of the deep integration of technology and education,smart classroom emerge as the times require. The construction of smart classroom is an inevitable choice for colleges and universities to innovate teaching environment and improve the quality of talent training. Smart classroom highly integrates the Internet, learning analysis, cloud computing and other information technologies, which builds an intelligent and efficient teaching platform for teachers and students. The learning environment of smart classroom can meet the multi-directional communication and interaction between teachers and students, and accomplish the teaching objectives scientifically and efficiently. Based on the analysis of the current classroom in Sichuan College of Arts and Sciences, this paper discusses the necessity on the construction of smart classroom in schools, and the principles and objectives to be followed. And puts forward the overall plan on the construction of smart classroom in schools, which provides reference for the future construction of smart classroom in schools.

Keywords

smart classroom, colleges and universities, feasibility Preface.

1. Introduction

With the development of information construction in colleges and universities, the class form supported by the traditional classroom is increasingly unable to meet the needs of the current teaching reform. Each university starts the road of pattern innovation on after another, as a result of the deep integration of technology and education, smart classroom emerges an the time require. The smart classroom is a new teaching form which is different from the traditional teaching and learning. As a typical smart learning environment, smart classroom is the internal appeal of the informationization development in colleges and universities to a certain stage, which is the inevitable choice of the smart learning[1]. The smart classroom highly integrates the Internet, learning analysis, cloud computing and other information technology, and builds an intelligent and efficient teaching platform for teachers and students, which is the main position for the implementation of smart education activities. The learning environment of the smart classroom can meet the multi-directional communication and interaction between teachers and students, and accomplish the teaching objectives scientifically and efficiently. The smart classroom breaks the fixed teaching structure of traditional classroom and provides basic conditions for students to meet the requirements of diversified learning, individualized learning and adaptive learning, which can overcome the disadvantages of the traditional class teaching system to some extent. During the learning process, students will leave a large amount of learning behavior data on mobile devices and web platforms. Through some effective ways to obtain and reasonably analyze these data, which can be used as the basis for teachers to

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understand students' learning situation, optimize teaching design, select teaching strategies, and implement individualized teaching.

2. Smart Classroom

Scholars all over the world pay great attention to the smart classroom. With the development of educational informatization, smart classroom has gradually become the focus of research in this field. At present, the concept of the smart classroom in China has not yet formed a unified and accepted definition.

2.1. Current Situation of Overseas Research

The smart classroom is also translated into Classroom Of Future and so on. The study of the smart classroom abroad was first put forward by Ronald Recino in 1988[2]. The research on smart classroom in foreign countries is earlier, it can be divided into two stages. The first stage is mainly from the basic hardware design of the smart classroom, it includes the configuration of the smart classroom and its effect; In the second stage, foreign researchers mainly focus on analyzing the design and practical application of the smart classroom from the perspective of teaching and learning. Such as the SCALE-UP project in the United States, it is implemented by the of North Carolina State University. It mainly uses simulation technology to construct learning space to realize in-depth classroom interaction, and guide students to carry out collaborative and experiential learning based on this space; The smart classroom project at the University of Toronto in Canada builds knowledge communities through the adoption of intelligent technology; The TEAL project of MIT is mainly aimed at physics classroom. With the support of computer technology, the traditional classroom and physical laboratory are combined to build an environment that can realize manual, cooperative and interactive learning environment; Australia has popularized smart classroom in state public schools. The smart classroom it creates is mainly to analyze the individual differences of students to set up corresponding courses for different types of students. Try to make full use of various presentation techniques, make teaching methods flexible, stimulate students' interest in learning, and realize multi-dimensional interaction at the same time.

2.2. Current Situation of Domestic Research

2.2.1. Research on Smart Classroom

The domestic experts and scholars' discussion on smart classroom is mainly aimed at the definition and understanding of the concept of smart classroom. They analyze the characteristics of the smart classroom and implement technology at the same time. Professor Zhiting Zhu believes that the smart classroom can break the effect ceiling and cognitive ceiling of the flipped classroom and solve the shortcomings of the flipped classroom[3]. According to Weixin Hu, the smart classroom is a new learning environment based on advanced technologies such as ubiquitous network environment. Its premise is appropriate digital surriculum and resources, the core is interaction. A new learning environment and space that optimizes the teaching and learning processes by integrating the above aspects[4]. Nie Fenhua and others from Tsinghua University believe that smart classroom is the sum of the teacher’s space and its hardware and software equipment that provide intelligent application services for teaching activities. It is also the latest form of classroom information construction driven by emerging information technologies such as the Internet of things, cloud computing and big data[5].

2.2.2. The "SMART" Model Professor Ronghuai Huang

Huang Ronghuai believes that the "Smart" of smart classroom involves the optimization of teaching content presentation, the convenient acquisition of learning resources, the deep interaction of classroom teaching, situational awareness and detection, classroom layout and

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electrical management, etc. It can be summarized as Showing, Manageable, Accessible, Real-time Interactive, Testing, forming a SMART model [6].

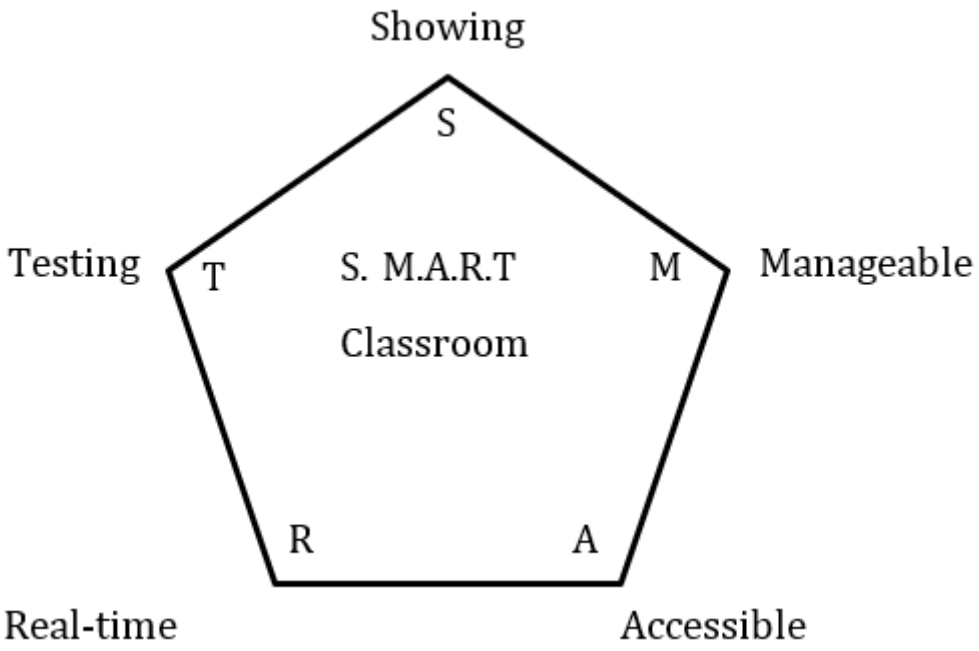

Figure 1: The "SMART" Model Professor Ronghuai Huang

Compared with the traditional multimedia classroom, the smart classroom has stronger intelligent and interactive characteristics. The learning content is presented intelligently, the learning resources are obtained ubiquitously, the interaction between teachers and students is more convenient and diversified, both the students' main role and the teachers' leading role can be brought into full play.

3. The Necessity on Construction of Smart Classroom in Sichuan University of Arts and Sciences

How to make use of the information concept and information technology to create a high level, intelligent and interactive smart classroom, optimize and reconstruct the teaching environment of the school, so as to improve the teaching effect has become a key topic to be solved urgently in Sichuan University of Arts and Sciences. Sichuan University of Arts and Sciences, located in Dazhou City, east of the land of abundance, Sichuan Province. School history can be traced back to the late Qing Dynasty Longshan Academy, began to hold higher education in 1976 and was called Da County Teachers College. In 1978, it was approved by the State Council as a full-time college, which has been renamed as Da County normal Teachers College, Da County Junior Teachers College. Approved by the Ministry of Education in February 2006 to become an undergraduate university, which is the only provincial administration of ordinary undergraduate unversity in eastern Sichuan. In 2016, it was designated as the "Pilot Unit for the Overall Transformation and Development of Colleges and Universities in Sichuan Province ". In 2018, it was added as the "Authorized Project Approval Unit for Master degree in Sichuan Province". The school has two campuses, Lianhu and Nanba, it covers an area of 507069 square meters and school buildings cover more than 310000 square meters. After years of efforts by the school, the investment in hardware and software of educational equipment has been increasing, and the multimedia classroom has become more and more popular. Although it has played a certain role in improving the teaching level, there are bottlenecks in the early planning

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and design, and the problems exposed in the aspect of use, management and maintenance become increasingly prominent, which seriously affect the teaching reform at present stage.

Although the multimedia classroom of Sichuan University of Arts and Sciences can meet the daily teaching to some extent, the classroom design concept is more traditional. The average level of students is low and the connotation construction needs to be enriched urgently. The level of Informatization is backward, which cannot effectively support the reform of education and teaching. The concept lags behind, and the concept of "student-centered" is not fully reflected in the teaching conditions. Faced with the challenges posed by individualized learning needs to large classes, the challenge of information technology changes to traditional teaching mode, and the challenge of "student-centered" to traditional teaching methods, the shortcomings of traditional classroom teaching in Sichuan University of Arts and Sciences are still obvious. At present, there are the following drawbacks in the classroom :(1) the construction of a single classroom is not conducive to the development of individualized teaching; (2) the environment is poor, rows of fixed tables and chairs can not carry out discussion class; (3) the equipment operation is complicated, which requires professional training and specially-assigned personnel to assist the operation, the teachers can not use; (4)the teacher needs to spend some unnecessary time before class to turn on a variety of devices. It's very inconvenient and poor experience; (5)Class is still in the form of "cramming education", "spoon-fed"with teachers as the main body. There is a lack of interaction between teachers and students and students, students' participation is not high. It can be seen that the traditional classroom can no longer meet the current needs of information teaching in Sichuan University of Arts and Sciences.

4. Principles of Smart Classroom Construction in Sichuan University of Arts and Sciences

Smart classroom is the high-end form of digital classroom and a form of future classroom. It intergates advanced ideas and technologies, pays attention to the needs of teachers and students, and sets the characteristics of multi-screen display, natural interaction, intelligent control, collaborative interaction and so on. Secondly, the smart classroom is a humanized classroom. The overall space layout is comfortable, flexible, concise, and the desks are freely combined and so on, which facilitates diversified teaching and interactive ways. Smart classroom is an effective integration of virtual classroom and real classroom, which can realize the effective docking of learner-centered online and offline learning.

4.1. Intelligent Advanced

Smart classroom is not a simple product accumulation combination, but a deep intergation of intelligent. The hardware and software are connected to realize the interconnection and collaborative work of all components. According to the teaching requiremwnts of different scenes, we can customize the pattern setting, such as recording and broadcasting mode, interactive teaching mode, Internet of things teaching mode, discussion teaching mode, etc. So that the teaching scene can be completedin one step. Create better classrooms and provide more effective teaching.

4.2. Environment Comfortable

Bright colors bring people a strong visual impact, comfortable environment enhance the enthusiasm of students to learn. The colorful color matching and free stitching tables and chairs are convenient for students to carry out group discussion and form a fully open and three-dimensional intelligent learning environment.

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4.3. Flexible Switching

In the smart classroom, content from mobile devices such as mobile phone and pads can be projected onto the big screen through wireless screen projection technology, so as to realize the interaction between the small screen and the big screen, try to make the classroom environment more free and easy. By using group Numbers and Numbers on the panel beside the platform, the teacher can directly call the screen content of the corresponding position group and switch the discussion group screen to the main screen with one key. The teacher can also broadcast the large screen content to the screen of each discussion group to realize the comprehensive and immediate sharing of classroom teaching information.

4.4. Utility

In the smart classroom, the teacher can automatically generate the orderly high-quality teaching video courses through the one-button course recording function. Students can watch video through mobile or learning platform to preview before class and review after class; Teachers through watching their own video in class to achieve the effect of teaching reflection and self-improvement. They can also try the teaching model of flipped classroom; School leaders can achieve the effect of teaching observation and network teaching and research by watch videos.

5. The Construction of Smart Classroom in Sichuan University of Arts and Sciences

5.1. Implementation of Integrated Data Services

With the help of the software and hardware platform of the big data center, it is fully connected with the smart classroom, online marking system, intelligent recording and broadcasting system, digital library, information management system and so on to form a database, which automatically gather the big data generated by various system to realize the data convergence, automatically mine and analyze the effective big data, and immediately structure the data and associate to the intelligent terminal.

5.2. Realization of Dynamic Open Classrooms

With the help of cloud computing, mobile internet and other emerging information technologies, by using smartphones, tablets, feedback devices and other intelligent terminal equipment, so that the classroom system transcend time and space. Dynamic exchange of information has realized more open classroom and more open classroom activities, which makes the pre-class, in-class, after-class become one. the single, closed classroom teaching will develop to the pluralistic open teaching.

5.3. Enhancing Efficient Classroom Interaction

By using intelligent mobile learning tools and application support platform, the communication and communication between teachers and students, students and students is more three-dimensional and timely. Through emotional awareness, data mining and other methods, learners' potential learning needs can be pre-estimated. According to the learning situation decision-making teaching strategy, push learning resources through resources push, real-time interaction and feedback. Try to achieve dynamic data analysis and information feedback, achieve effective interactive teaching applications, increase the depth and breadth of teacher-student interaction.

5.4. Promoting Collaborative Inquiry Learning

Based on the learning environment constructed by the information platform, the learning methods of group cooperative learning and problem-based learning are adopted in the smart

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classroom. Collaborative group service can help learners with the same learning needs and interests to automatically form a learning community. Through the platform, rich learning resources and information dynamics can be obtained, in-depth discussion and communication can be carried out, meaning construction of knowledge can be realized, and knowledge internalization can be promoted.

5.5. Enabling Individualized Learning

In the environment of smart classroom, the learning situation of each learner can be accurately grasped through pre-class evaluation and analysis and in-class quizzes and real-time analysis. To realize the evaluation of students' individuallized learning ability, so that each teacher can grasp each student's cognitive status of knowledge more clearly, which effectively promote the "student-centered" one-to-one teaching.

5.6. Realizing Scientific Teaching Evaluation

Through the network marking system, classroom data collection and big data analysis technology to promote the realization of data-driven decision in educational evaluation, which provides good support for the realization of developmental student evaluation. By collecting the data of the whole process of students' learning, it provides the data basis for the realization of educational evaluation and decision-making based on data analysis and rational evidence in the field of education; Teachers are no longer the transmitter and instiller of knowledge, but the guider and helper of learning, which plays a guiding role in the teaching process. Teachers can understand students' learning doubts through cloud service platform before class, give corresponding learning guidance, and promote self-solving of pre-class doubts; In class, group inquiry learning can be effectively promoted. Teachers can see students' learning thinking and give appropriate guidance immediately through intelligent terminals.

6. Value on the Construction of Smart Classroom in Sichuan University of Arts and Sciences

6.1. Innovating Teaching Methods and Promoting Teaching Quality

Through the novel teaching mode, we can improve students' interest and participation in learning, stimulate students' desire for independent learning. Give full play to students' subjective initiative in learning, let students learn from passive to active, and to strengthen the interaction between teachers and students, students and students. Cultivate students' spirit of teamwork, ability of independent thinking, ability of logical thinking and ability of innovation to let students achieve individualized self-cultivation, so as to improve the teaching quality of the schools.

6.2. Improving the Level of School Informatization

The smart classroom is the advanced stage of the school information construction, which is the inevitable choice after the school informationization develops to the advanced stage. Through the smart classroom, smart management and the smart teaching platform unified construction, the teaching mode is reformed to achieve the unified management of software and hardware, the collection, storage and sharing of teaching resources, the inspection and supervision of the teaching process, and the unified platform operation, so as to improve the level of the school information construction.

6.3. Smart Management of Teaching and Environmental Equipment

The smart classroom management platform can manage all teaching equipment in the classroom, such as projector, projection curtain, computer, interactive large screen, power amplifier and so on. It can also realize the smart management and intelligent science linkage of

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all environment-related devices in the classroom, such as the smart management of lights, air conditioning, curtains, fans, locks and so on. For example, the system will automatically adjust the room temperature when the temperature is perceived to be above or blew the set threshold.

6.4. Multi-platform Integration Management ---Reduce the Overall Cost of Information Construction

With the promotion of school information construction, more and more independent business systems are distributed in the classroom, such as: voice broadcast, voice telephone, video monitoring, classroom borrowing, study room reservation, student attendance, teacher attendance, information release, asset management, etc. These business systems are independently constructed and managed, resulting in high overall cost of user information construction, lack of a comprehensive management platform for unified management, and high cost of daily operation and maintenance management. Through the smart classroom management platform can realize the function of multiple with one platform, and the management of multiple platforms with one platform can reduce the overall cost of user information construction.

6.5. Visual Operations and Maintenance Management

In order to facilitate the daily operation and maintenance work of the school, the smart management platform provides a set of visual operation and maintenance management tools according to the school standard operation and maintenance system, which includes equipment self-inspection, fault alarm, fault handling system, knowledge base and various data analysis reports provided in different dimensions, etc.

6.6. General Management

With the rapid development of mobile internet, it can better serve school teachers and students. For example: the administrator and teacher control the running state of the equipment anytime, anywhere, the teacher can control the class attendance of students in time, students can carry out online classroom inquiries, classroom borrowing and so on. Provide mobile APP for school teachers and students, it is divided into teacher end, student end, among which the teacher end is divided into administrator, counselor, teacher and other roles according to different job nature and job responsibilities of teachers, providing different functions.

6.7. The Big Data Analysis of Teaching

The data generated in the teaching process and the teaching management process can be used as the data source of the future teaching big data analysis. The data generated in the course of teaching such as: learning knowledge progress data, peacetime results data, answer questions data, knowledge points grasp data, wrong questions statistics and so on. The data generated in the process of teaching management are as follows: student attendance data, teacher attendance data, equipment use data, classroom borrowing data, study room reservation data, equipment failure data, fault processing data, classroom usage data, etc.

7. Master Plan for the Construction of Smart Classroom in Sichuan University of Arts and Sciences

Smart classroom is the internal appeal of school informatization development to a certain stage. It has bid farewell to the traditional teaching method of cramming education, but adheres to the student-centered concept, which is more inclined to the form of interaction between teachers and students, students and students. It stimulates students' learning interest and autonomous learning ability. Different from traditional multimedia classrooms, smart classroom pays comprehensive attention to each teaching link, penetrates the whole process of

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pre-class preview, interactive learning in class and after class review, intergates teaching and learning processes, and ensures the real integration of modern technology and teaching. The first teaching building in Lianhu campus of SASU has 6 floors, which is mainly responsible for the undergraduate teaching of the school. The school plans to reshape the teaching space on the third floor of first teaching building. According to the needs of different classrooms, There will be 306 interactive seminar classrooms ,308 multi-screen seminar classrooms ,312 ladder interactive classrooms ,313 Remote immersive classrooms， 314 Fully automatic recording and broadcasting classrooms,315 long-distance interactive classrooms, 321 mobile interactive classrooms ,322 mobile interactive classrooms ,323 small innovative classrooms ,324 small innovative classrooms ,326 interactive contribution classrooms ,327 ladder interactive classrooms ,328 ladder interactive classrooms and smart shaping of public spaces (learning communication areas, reading rest areas, human corridor, guide system).

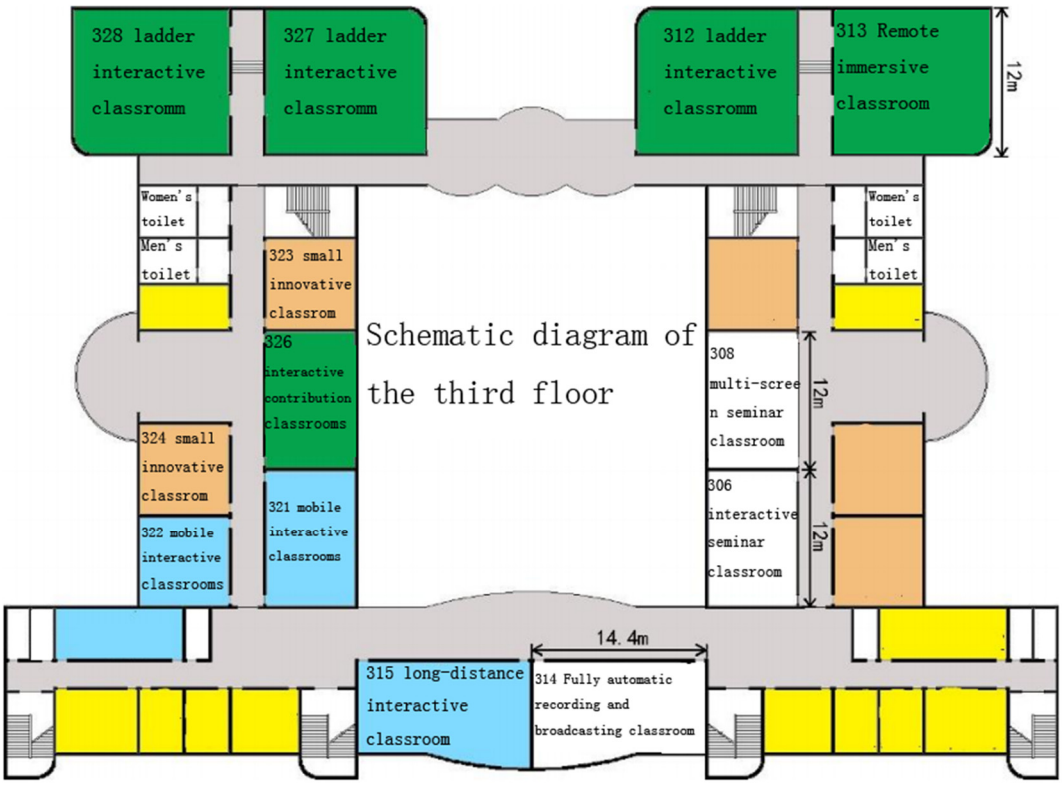

Figure 2: Schematic diagram of the third floor of first teaching building in Lianhu Campus

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Figure 3: Interior Chart of Wisdom Classroom

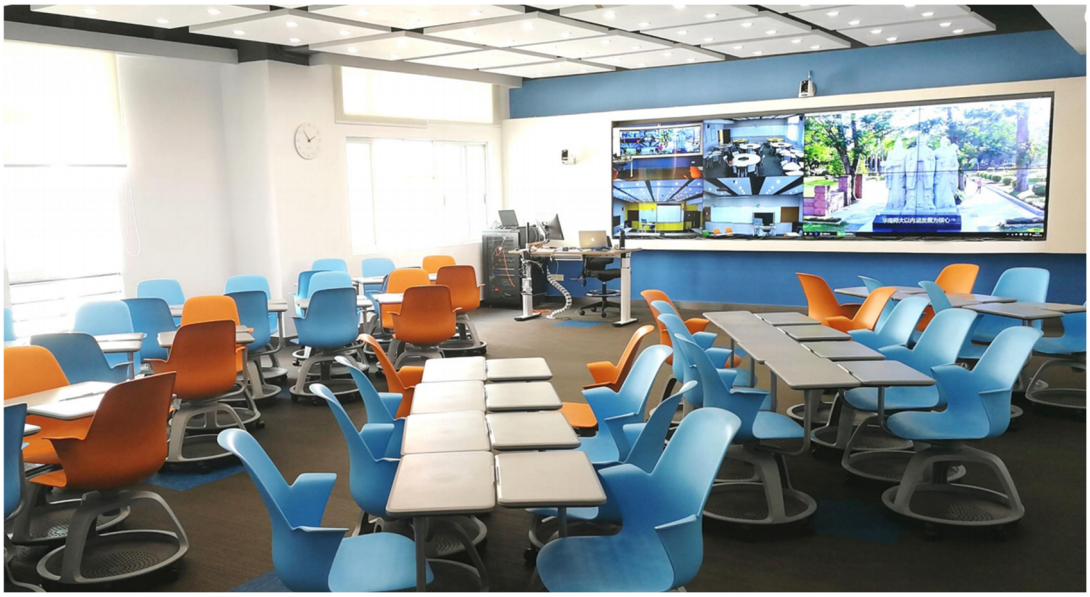

Figure 4: Interior Chart of Wisdom Classroom

8. Concluding Remarks

The construction concept and mode of smart classroom are not invariable, but a process of dynamic development and continuous improvement. The continuous progress of information technology, the connection and expansion of intelligent learning space, and the continuous deepening of teaching reform under the environment of intelligent learning will inject vitality into the application and development of intelligent classroom.

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