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Research on the Construction and Application of Smart Space Teaching System

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Abstract: *In view of the disadvantages of the traditional teaching model, based on a variety of educational ideas such as system theory, constructivism, multiple intelligences and educational equity, this paper studies the construction and application of smart space teaching system. It includes the construction of smart resource database, smart online course, data analysis and evaluation system, and applies it to the course of Electrotechnics in practice. The research and implementation of this system will help to improve the teaching effect of colleges and universities, mobilize students' learning initiative, improve teachers' professional level and comprehensively improve the quality of education and teaching.*

Keywords: *smart space teaching system, on line course, construction, application*

1. Introduction

Smart learning space is the learning space in the smart learning environment. It allows learners to obtain continuous services when accessing in any form on any device, and can obtain opportunities to learn at any time, anywhere and on demand. It can also perceive the learning situation (even the location and social relationship of learners), deeply explore and analyze the recorded learning historical data, give learners scientific and reasonable evaluation, and push high-quality learning resources and the most appropriate learning tasks in the real situation, so as to help learners make correct decisions and promote the development of learners' thinking quality, the promotion of behavior ability and the stimulation of creative potential.

Smart space teaching system is not only a physical space that provides learners with basic support for free practice, but also a social space that can support learners to carry out learning related interactive activities in order to pursue self liberation. Naturally, it is also a psychological space for learners to develop their internal spirit.

With the development of information technology and the advent of internet plus era, learning space is no longer confined to physical environment. Teachers and students are beginning to try to use virtual learning space to develop teaching and learning activities.

In foreign countries, Lee (2014) and others described the smart space from three aspects: hardware, service and function. They believe that the smart space should include embedded network sensors and smart devices to provide users with a variety of useful services, and tracking and identifying users is its most important function. Koper (2014) described the smart learning environment in terms of hardware and function, and believed that the smart learning environment should be rich in digital, context aware and adaptive devices to promote learners to learn quickly and well. Kim (2013) and others pointed out that the smart learning environment aims to provide learners with autonomous learning, self motivation and personalized services from the perspective of function and goal. The focus of smart learning is learning content and people, not equipment.

Domestically, Zhu zhiting (2016) believes that smart learning space is a learning space under the smart learning environment. It should have ten functional features, such as location perception, context perception, social perception, interoperability, seamless connection, adaptability, universality, whole process recording, natural interaction and in-depth participation. Huang Ronghuai et al. (2012) defined the smart learning environment from two aspects: function and construction objectives. They believe that the smart learning environment is a learning place or activity space to promote effective learning, and the smart classroom is a typical smart learning environment. Its smart should be reflected in optimizing

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the presentation of teaching content, facilitating the acquisition of learning resources, promoting classroom interaction, situational awareness and environmental management. Zhang Chunlan et al. (2016) proposed that the construction of future learning space should integrate process and result.

2. Theoretical basis

The research on the teaching mode based on smart space contains a variety of educational ideas such as system theory, constructivism, multiple intelligences and educational equity. These theories are an objective reflection of the teaching practice of smart space, and in turn play a guiding role in the teaching practice of smart space under certain conditions. Therefore, the research of this topic has important academic value.

2.1. System theory

According to the viewpoint of system theory, everything is an organic whole. The elements in the system do not exist in isolation. They are interrelated and form an indivisible whole. The core content of system theory is the overall concept, and the interaction of elements is its basic feature. The essence of the teaching model based on smart space is a system. It is a process of systematic optimization and cooperative teaching of various space resources (including teachers' and students' personal space).

2.2. Constructivist learning theory

Constructivist learning theory advocates learner centered learning under the guidance of teachers. Teachers are helpers and promoters of meaning construction, not imparters and indoctrinators of knowledge; students are the subject of information processing and the active constructor of meaning, rather than the passive receiver of external stimulation and the object of indoctrination. If students want to become real active constructors, they should learn to study independently and play a main role; teachers should also change from traditional knowledge disseminators to tutors for students' learning and become students' learning partners or collaborators. Under the theory of constructivism, teachers must create a learning environment that can meet the needs of modern teaching and provide students with a resource platform that can meet "learner centered learning".

2.3. Multiple intelligence theory

The theory of multiple intelligences holds that human intelligence is diverse, including spatial intelligence, sports intelligence, music intelligence, interpersonal intelligence, introspective intelligence and other intelligences. Different intelligences are in the same important position and should be paid equal attention to and developed. The teaching model based on smart space contains rich multiple intelligences theory. Its concept of intelligence, talent, teaching and evaluation is completely different from the traditional education and teaching concept.

3. Construction of smart space teaching system

The smart space teaching system breaks the fixed time and space constraints, so that education is everywhere, all the time, and follows students like a shadow. This is not only a classroom that never ends, but also a classroom that never turns off the lights. In such an open classroom, students can choose suitable learning resources from a large number of teaching resources anytime and anywhere according to their own needs, and truly realize "learner centered" autonomous learning, so as to provide a possible and realistic way for the realization of educational equity.

3.1. Research object

The research object of this subject is the smart space teaching system. Through the analysis, investigation and research of the course, build the smart space teaching system of the course, including the construction of smart smart resource database, smart online course, management and evaluation system, etc.

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3.2. Overall framework

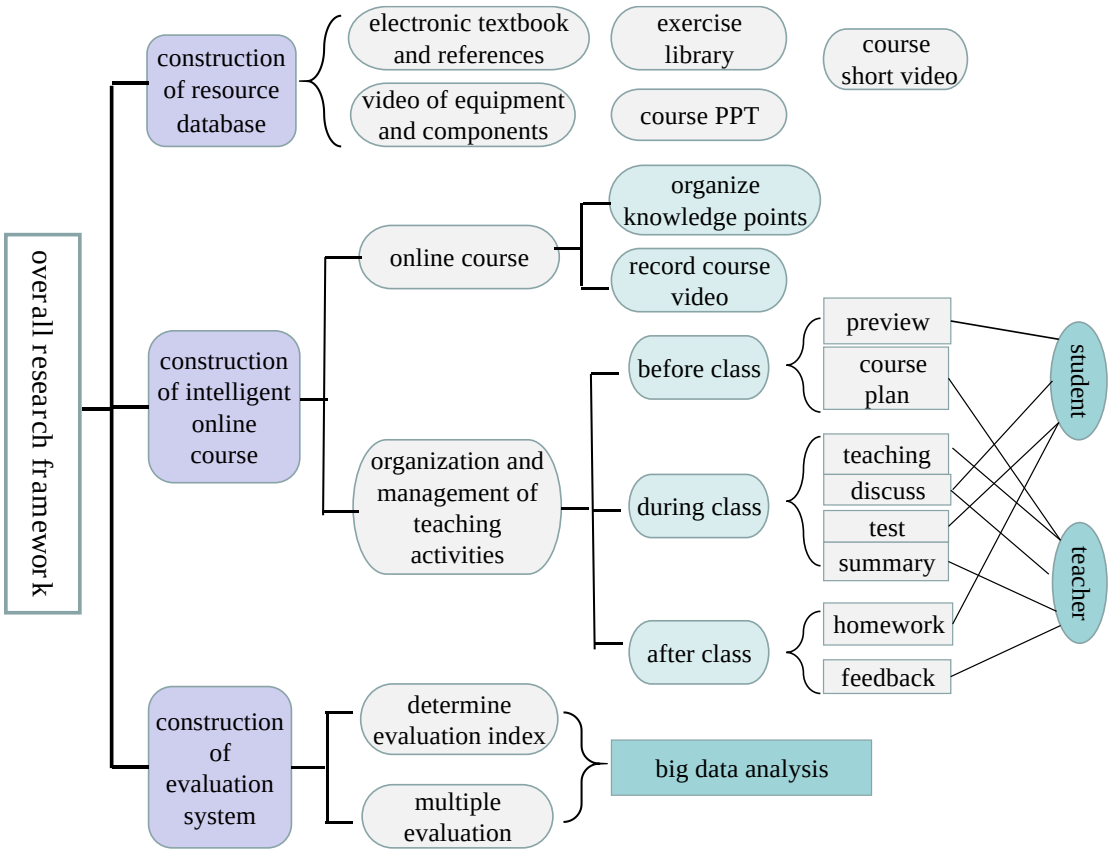

Figure 1 Experimental teaching

3.3. Research plan

(1) Construction of smart space resource database

Build a three-dimensional resource database in the smart space platform. It includes course outline, course PPT, online video course, course related reference books, network resources, international cutting-edge knowledge, animation demonstration of some components, equipment or circuits, AR demonstration, etc. Various forms of learning resources are diversified to realize interesting learning, turn boring learning into pleasant enjoyment, broaden students' horizons, and enable students to understand knowledge beyond books.

These resources are classified and stored in the resource database of the space platform. Students can access all kinds of resources anytime and anywhere and study anytime and anywhere. Not limited by time and space.

According to the teaching content and progress, each chapter is designed with exercises and answers matching the chapter, and an exercise library is built in the space platform. Students can conduct self-examination and self-evaluation anytime and anywhere. The system will automatically score and form test paper analysis and evaluation report.

(2) Construction of smart online course

According to the micro learning theory and following the systematic principle, the knowledge point relationship diagram of the whole course is established to link the relevant knowledge points, so that students can have a systematic understanding of the distribution of knowledge points of the whole course, which is convenient for the construction of learners' knowledge system.

(3) Organization and management of teaching activities under the smart space teaching system

Realize the tasks of preview before class, organization of teaching activities in class, tracking and guidance after class, interactive Q & A, teaching management and so on. Truly realize the informatization

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of education and teaching.

(4) Construction of data analysis and evaluation system

In the process of learning, learners will generate a large amount of behavior data. These big data are the scientific basis for providing personalized learning services such as personalized learning diagnosis, learning decision-making, accurate push and multiple evaluation. Learning analysis based on big data can describe and explain past phenomena, early warning and intervention, ongoing learning development trends and predict the future, so that learners can understand their learning situation and possible consequences, so as to guide learners to develop in a healthy direction. In addition, through the in-depth mining and analysis of big data, the smart learning space can enrich the evaluation index, strengthen the process evaluation and the subjective evaluation based on learners' self-evaluation and mutual evaluation, and implement multiple evaluation.

3.4. Research methods

(1) Literature research method

Literature research method refers to the method of searching and sorting out relevant literature, reading and combing the literature, and forming a scientific understanding of facts. This paper uses the literature research method to find the relevant materials of smart learning space at home and abroad, sort out, summarize and analyze the theoretical basis, research status and development trend of smart learning space, so as to lay a solid foundation for the follow-up research work.

(2) Experimental research method

Experimental research method is a research method to discover and confirm the causal relationship between things by changing and controlling the experimental objects. In the research process, this topic selects all the students studying Electrotechnics in Qilu University of Technology as the research object, applies the smart space teaching system to the actual teaching, and demonstrates the feasibility and effectiveness of the smart space teaching system by comparing the students' academic achievements and learning experience before and after the application of the mode.

(3) Investigation and research method

Investigation and research method refers to the research method of directly obtaining relevant materials and analyzing these materials by investigating and understanding the objective situation. Through questionnaire survey, network survey and interview survey, understand and analyze the situation of the respondents, so as to carry out the research.

(4) Case analysis method

It is a scientific analysis method that makes a thorough and careful study of representative things to obtain an overall understanding. This system takes the course of Electrotechnics and its typical knowledge points as an example, so as to play an exemplary role in the construction of the whole smart space teaching system.

4. Application of smart space teaching system

Based on the research on the teaching system of smart space, this paper applies the research results to the teaching practice of Electrotechnics in colleges and universities. Electrotechnics is a compulsory or elective course for non-electrical engineering majors, involving a wide range of majors and a large number of students. The research and application of this topic can benefit more than 1000 students in Qilu University of Technology every year. The research results can also be further popularized and applied to various courses of other majors in the university, and can also be used for reference to the smart space teaching model of similar universities in China. The research results are not limited to colleges and universities, but also can be popularized to more groups interested in Electrotechnics. It is not only a teaching resource, but also a social resource, which has high application value.

5. Conclusion

Smart space teaching system is a new teaching system combining online education and traditional teaching mode. It can avoid various disadvantages of traditional teaching mode and realize the

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diversification of teaching methods. It is convenient for students to learn online, facilitate the communication and interaction between teachers and students, and conduct statistical analysis on students' learning status through the statistical analysis function of the online platform, so that teachers can timely correct the teaching direction or supplement teaching resources, effectively improve the teaching effect, enable students to get evaluation in time and give suggestions for further learning. It is of great value to apply the research results to the teaching activities in colleges and universities。

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