Research on the Construction of Smart Classrooms for Automotive Majors in Vocational Education

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Abstract. Smart education, as an educational behavior system that provides high learning experience, high content adaptation, and high teaching efficiency, is regarded as a high-end form of educational informatization development. In response to the prominent problems of outdated textbooks and learning resources, single teaching methods and content in current vocational education automotive professional classrooms, we build smart classrooms, design an integrated smart teaching environment for automotive teaching, learning, and practice, integrate various information technology resources, and promote the development of students' innovative thinking and the improvement of their vocational skills.

Keywords: Vocational education; Automotive related majors; Smart Classroom.

1 Introduction

From the Ten Year Development Plan of ICT in Education (2011-2020) issued by the Ministry of Education in 2012, the Action Plan of ICT in Education 2.0 in 2018, to the development plan of ICT in education in the 14th Five Year Plan in 2021, the modern new ICT education system is gradually improving, and the "Internet plus Education" model has become the key development direction of future education[1].

Smart classrooms represent the modernization and innovation of educational forms, forming a sharp contrast with traditional teaching methods. In the smart classroom, students will preview in advance before class, and deepen their learning through group discussions and real-time tests during class. As a result, teachers can quickly grasp the learning progress and understanding of each student, and provide targeted guidance[2]. From a more macro perspective, smart classrooms are a concrete representation of digital classrooms and future classrooms. Smart classrooms not only focus on teaching, but also penetrate into the core business of schools, including teaching, learning, management, evaluation, research and other aspects. It fully utilizes modern network technology, multimedia technology, Internet of Things technology, artificial intelligence technology, and modern educational technology equipment, combined with modern excellent teaching theory achievements, to promote the deep integration of these advanced

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technologies with education and teaching[3]. This integration not only promotes innovation in learning methods and teaching modes, but also provides an effective way to improve the quality and level of education and teaching.

Through in-depth discussion on the relevant theories of the construction of smart classrooms for vocational education, and focusing on the analysis of the construction practice of smart classrooms for automotive majors in vocational education, we hope to promote the deep integration of information technology and vocational education teaching, build an information system suitable for the modernization of vocational education, and create a good atmosphere of "Internet plus vocational education".

2 The Connotation of Smart Classrooms

Smart classroom refers to a modern and interactive teaching space created by utilizing advanced information technology and intelligent equipment, combined with educational and teaching concepts. Smart classrooms usually include high-definition intelligent electronic whiteboards, multimedia teaching equipment, wireless network coverage, interactive learning software and other technical facilities, which can achieve digitalization, visualization, personalization, and interactivity of classroom teaching, enhance interaction and participation between teachers and students, and promote the improvement of learning effectiveness[4].

Smart classrooms have multiple functions, mainly including the following aspects:

Interactive function: The smart classroom provides various interactive teaching tools, such as intelligent electronic whiteboards, teaching software, etc., which can help teachers and students achieve interactive teaching and enhance interaction and participation between teachers and students.

Multimedia function: Smart classrooms can support the display and use of various multimedia teaching resources, including images, videos, audio, etc., enriching students' learning experience and improving teaching effectiveness.

Time interconnection function: Smart classrooms are usually equipped with network connection devices, which can achieve real-time interconnection of information inside and outside the classroom, and exchange and share knowledge through network platforms.

Personalized learning function: Smart classrooms support personalized learning, and teachers can provide personalized learning resources and guidance according to the different needs and levels of students, helping them better achieve personalized development[5].

Data analysis function: Smart classrooms can collect and analyze student learning data, help teachers better understand student learning situations and needs, and develop more scientific teaching plans and strategies.

Overall, smart classrooms are mainly aimed at improving teaching effectiveness, increasing teaching interactivity, enriching student learning experiences, and supporting personalized learning and data-driven teaching management.

3 Comparison Between Traditional Classrooms and Smart Classrooms

Compared to smart classrooms, traditional classrooms have some shortcomings, As shown in Table 1, mainly reflected in:

Table 1. Comparison between Traditional Classrooms and Smart Classrooms

Aspects	Traditional classrooms	Smart Classroom
Teaching resources	Limited teaching resources	Rich teaching resources
Interactive quality	Lack of interactivity	Sufficient interactivity
Teaching efficiency	Low teaching efficiency	High teaching efficiency
Personalized learning	Difficult to satisfy	Very satisfying
Teaching evaluation	Lack of data support	Effective evaluation

In terms of teaching resources: Traditional classrooms usually rely only on verbal explanations from teachers and textbooks, and teaching resources are limited, making it difficult to achieve diversified and multimedia teaching methods[6].

In terms of interactivity: In traditional classrooms, students mainly acquire knowledge through listening to lectures and taking notes, which results in insufficient interactivity and lower student participation and learning interest.

In terms of teaching efficiency: Traditional classrooms require teachers to spend a lot of time preparing courseware and teaching materials, resulting in low teaching efficiency and inability to quickly respond to student learning needs.

In terms of personalized learning: In traditional classrooms, teachers often have to face the entire class, which is difficult to meet the personalized learning needs of different students and cannot effectively implement personalized teaching for each student.

In terms of teaching evaluation: In traditional classrooms, teachers find it difficult to comprehensively and accurately evaluate the learning situation of students, lack data support, and teaching evaluation is not scientific and objective enough.

The advantages of smart classrooms compared to traditional classrooms mainly include:

Teaching method: Traditional classrooms mainly rely on teacher lectures, while smart classrooms focus on student participation and interaction, including real-time feedback and personalized teaching[7].

Technology application: Smart classrooms can utilize advanced technological equipment such as electronic textbooks, interactive whiteboards, projectors, etc. to provide more vivid and vivid teaching content, while recording student learning behavior and feedback, providing teachers with objective evaluation and improvement basis.

Classroom atmosphere: Smart classrooms focus on creating a positive and interactive classroom atmosphere, encouraging students to participate in discussions and cooperation, and stimulating their initiative and creativity[8].

Teaching efficiency: Smart classrooms can save teachers time correcting homework and writing on the blackboard, improve teaching efficiency, and also allow students to learn in a relaxed atmosphere, improving learning efficiency.

The smart classroom aims to improve teaching quality, change the traditional teacher centered teaching method, and shift towards a student-centered knowledge innovation learning method, achieving intelligent identification, tracking, monitoring, and management of the teaching process[9].

4 Construction of Smart Classrooms for Automotive Majors

The intelligent classroom for automotive majors mainly includes: AR self-learning area, automotive construction teaching area, intelligent training area, interactive intelligent teaching system (platform), recording audio and video collection system, knowledge system posters, etc.

4.1 AR Autonomous Learning Area

Through the AR self-learning function, students can use their mobile phones or tablets to scan labels such as textbooks, parts, devices, and cultural walls. The platform will automatically present corresponding knowledge, principles, structures, and other learning content, with strong vividness and intuitiveness, allowing students to independently complete the cognitive learning of basic knowledge.

4.2 Interactive Intelligent Teaching System

The system fully utilizes modern information technology and can organically integrate course resources, smart textbooks, virtual simulation, practical training assessment, and teaching management into a smart teaching system. Teachers and students can use mobile terminals such as mobile phones and tablets to comprehensively utilize teaching resources, practical training resources, and assessment resources. Through a combination of online and offline methods, innovative teaching modes can be created to enhance their interest in self-directed learning and meet the comprehensive needs of teachers and students in integrating information technology teaching, self-directed learning, virtual training, simulated assessment, and comprehensive evaluation[10].

4.3 Automotive Construction Teaching Area

The automotive construction teaching area mainly focuses on cognitive learning of engine parts. Enable students to understand the two major mechanisms and five major system components of engines, as well as the basic knowledge of component structures and assembly. They are composed of crank connecting rod mechanism, valve distribution mechanism and cooling system, lubrication system, fuel system, starting system, and ignition system. The relevant components in each system are arranged in order of disassembly. As shown in Figure 1.

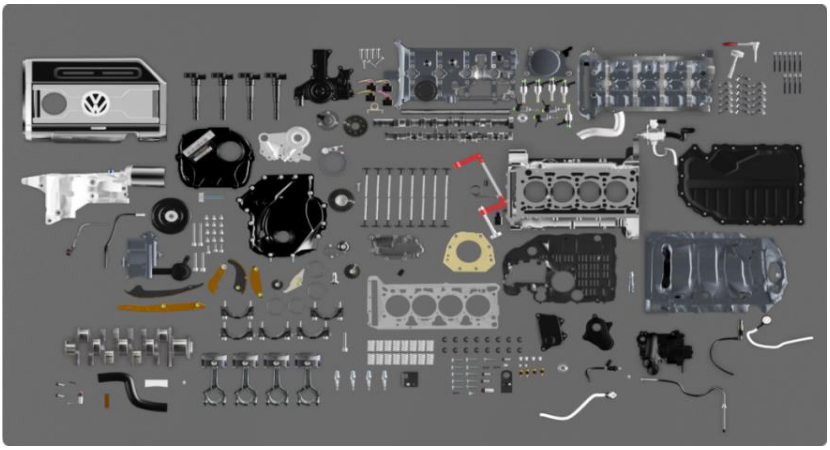

Fig. 1. Automotive Construction Teaching Area

4.4 Intelligent Training Area

Fig. 2. Intelligent Training Area

The intelligent training content is based on a teaching design that combines virtual and real elements, integrating teaching, learning, and practice[11]. It combines simulation technology, specialized tools, and practical equipment to comprehensively integrate intelligent guidance, process steps, and standard processes. Through intelligent guidance, virtual and real integration and other human-computer interaction methods, a guided, autonomous, and progressive training teaching mode has been achieved, which makes up for the shortage of training teachers, standardizes the operation process, reduces the loss of training equipment, and improves the efficiency of training teaching[12].As shown in Figure 2.

5 Conclusions

With the development of emerging information technologies such as cloud computing and big data, modern teaching concepts have gradually shifted from the traditional "teaching oriented" teaching model to a "leading subject" combined teaching model, which increasingly emphasizes the cultivation of students' problem-solving ability, critical thinking ability, and innovation ability. Smart classrooms are the foundation of educational informatization in China and an important lever for deepening educational reform, in sharp contrast to traditional classrooms. But currently, smart classrooms still face some challenges, such as insufficient digital skills of teachers, imbalanced allocation of educational resources, and information security issues. To overcome these challenges, we can start from the following three aspects: (1) Strengthening information security guarantees. Schools can strengthen education on information security awareness, establish information security management systems, improve information security measures, and ensure school information security. (2) Strengthen the cultivation of digital skills for teachers. Schools can carry out relevant training and exchange activities to improve teachers' digital skills and proficiency, enabling them to better respond to the challenges of digital teaching. (3) Strengthen the sharing and allocation of educational resources. Schools can optimize the allocation structure of educational resources by building educational resource platforms and sharing mechanisms, making the distribution of educational resources more fair and reasonable.

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