Upgrading and Transformation of Digital Instructional Resource of AI+ HVAC Course

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Abstract: The swift progress in the heating, ventilation, and air conditioning (HVAC) sector has heightened the importance of digitizing education, as traditional teaching methods no longer suffice for industry demands. Therefore, through in-depth analysis of the application principle of AI technology in education, the theoretical framework of digital instructional resource and the particularity of HVAC course, this study designed and implemented the digital instructional resource of AI+HVAC course. Firstly, this article constructs the theoretical framework of digital instructional resource, and defines the application path of AI technology in HVAC courses. Then, in view of the challenges faced in the implementation process, specific suggestions are put forward. The digital instructional resource of AI+HVAC course can significantly improve students' learning effectiveness and practical ability, and at the same time promote teachers' teaching reflection. This instructional resource not only conforms to the development trend of the industry and the requirements of educational reform, but also provides strong support for the HVAC industry to cultivate more high-quality talents with innovative spirit and practical ability.

1. Introduction

The HVAC industry is undergoing unprecedented transformations due to the swift advancement of science and technology [1]. From the wide application of intelligent control system, to the deep-rooted concept of green building, and to the continuous breakthrough of new energy technology, this series of changes not only promoted the technological progress of the industry, but also put forward higher requirements for the professional skills and comprehensive quality of employees [2-3]. In this context, the traditional instructional resource has been difficult to meet the urgent needs of the industry for talent training, and the digital transformation of education has become the general trend [4].

Digital transformation of education is the key way to meet the challenges of the times and improve the quality of education [5]. By introducing modern information technology, we can break the time and space constraints, realize the optimal allocation and sharing of teaching resources, and provide learners with more individualized, flexible and diverse learning experiences [6]. At the same time, digital transformation can also promote the innovation of teaching methods and means, improve teaching efficiency and learning effect [7].

As an important driving force for the digital transformation of education, AI technology has been widely used in the field of education in recent years [8]. From intelligent assisted instruction, individualized learning recommendation to intelligent assessment and feedback, AI technology has brought unprecedented changes to education [9]. Introducing AI technology into HVAC courses can not only help students better understand and master professional knowledge, but also cultivate their innovative thinking and practical ability [10]. In view of the development trend of HVAC industry and the necessity of digital transformation of education, this study aims to explore how AI technology can improve the instructional quality of HVAC courses. By analyzing the application cases of AI technology in HVAC courses, this article summarizes its advantages in teaching content optimization, teaching method innovation and teaching resource allocation, and provides useful reference for the teaching reform of HVAC courses.

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2. Theoretical basis of digital teaching mode of AI+ HVAC course

2.1. Application principle of AI technology in education

The application of AI technology in education is mainly based on its powerful data processing, pattern recognition and prediction capabilities [11]. In HVAC courses, AI can provide students with individualized learning paths by analyzing their learning behavior, knowledge mastery and homework completion. AI can also assist teachers to optimize and update the course content to ensure that the teaching content keeps up with the development trend of the industry. Through deep learning and other technologies, AI can build a knowledge map to help students better understand the complex concepts in the HVAC field.

2.2. Theoretical framework of digital instructional resource

The theoretical framework of digital instructional resource includes digitalization of teaching resources, informatization of teaching process, intellectualization of teaching assessment and automation of teaching management [12]. In HVAC courses, this means making full use of digital technologies such as multimedia and virtual reality to transform abstract theoretical knowledge into intuitive and vivid teaching content. At the same time, it can realize real-time monitoring and dynamic adjustment of teaching process through online learning platform, intelligent teaching system and other tools. In terms of assessment, using AI technology for intelligent assessment can reflect students' learning situation more accurately and comprehensively. The automation of teaching management will help to reduce the workload of teachers.

2.3. Particularity of HVAC course

As a highly specialized subject, the teaching content of HVAC involves many fields such as thermodynamics, fluid mechanics, control theory, etc., and the knowledge points are numerous and complex. Therefore, under the digital instructional resource, it is necessary to pay special attention to the systematicness and logicality of teaching content to ensure that students can build a complete knowledge system. The HVAC course is also very practical, which requires students to master certain design, construction and operation and maintenance skills. Therefore, in digital teaching, we should make full use of virtual simulation, remote experiments and other technologies to provide students with realistic working scenes and operating experiences, so as to cultivate their practical ability.

3. Practice of digital instructional resource of AI+HVAC course

3.1. Design and implementation of instructional resource

In the design and implementation of the digital instructional resource of AI+HVAC course, firstly, teachers need to make clear the teaching objectives and contents to ensure that the instructional resource matches the needs of the industry and the characteristics of students. Secondly, teachers should make full use of AI technology and digital resources to build a individualized learning environment and learning path to stimulate students' interest and enthusiasm in learning. At the same time, teachers should also pay attention to the collaboration of teaching process and encourage students to exchange knowledge and improve their skills through online discussion and group cooperation. In the process of implementation, we should constantly collect students' feedback and dynamically adjust the instructional resource.

3.2. Teaching case analysis

In order to verify the effectiveness of the digital instructional resource of AI+HVAC course, this section selects some typical teaching cases for analysis, as shown in Table 1:

Table 1: Analysis of Teaching Cases for Digital Instructional Resources in AI+HVAC Courses

Teaching Case	Applied Technology	Student Feedback	instructional effectiveness
Intelligent Assisted Teaching System	Machine Learning Algorithm	Students indicated that the system accurately identifies learning difficulties and provides individualized tutoring	Students' scores in understanding HVAC system principles increased by 20%
Virtual Simulation Laboratory	Virtual Reality Technology	Students fed back that experimental operations are more intuitive and vivid, helping to deepen understanding	Students' average scores for experimental operation skills improved by 15%
Online Interactive Learning Platform	Big Data Analysis	Students actively participated in online discussions, showing high enthusiasm for learning	Student participation in HVAC design courses increased by 30%
Individualized Learning Path Recommendation	Natural Language Processing	Students believed that the recommended learning resources closely matched their individual needs	Students' learning progress in HVAC courses generally accelerated by 10%
Intelligent Assessment and Feedback System	AI Assessment Model	Students fed back that assessment results were accurate, helping to promptly adjust learning strategies	Students' overall performance in HVAC courses improved by 18%

Table 1 shows five typical teaching cases, each of which describes the applied technology, students' feedback and instructional effect in detail. These cases fully verify the effectiveness of AI+HVAC digital instructional resource in improving instructional quality and cultivating students' ability.

3.3. Assessment and feedback of instructional effect

Instructional effect assessment is an important link to test whether the digital instructional resource of AI+HVAC course is successful. In the assessment process, we can use a combination of quantitative analysis and qualitative analysis to make a comprehensive and objective assessment of students' learning effectiveness, as shown in Figure 1:

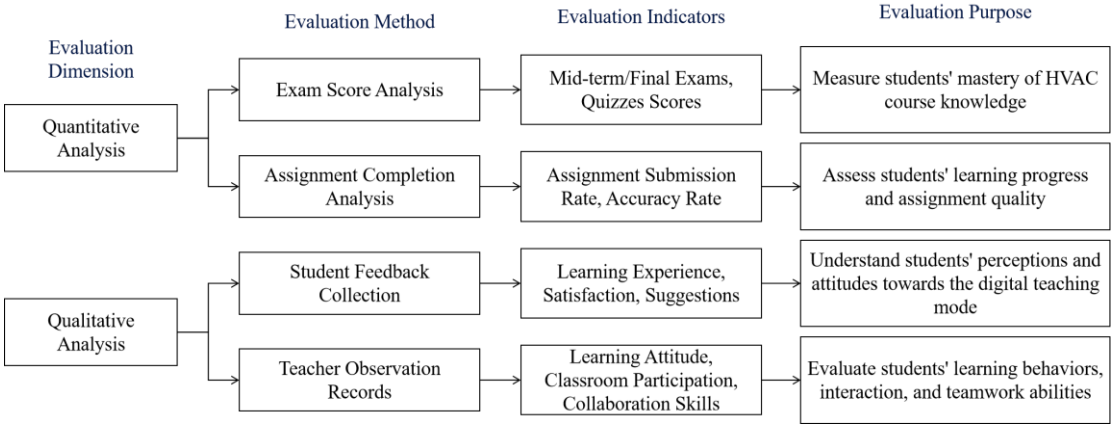

Figure 1 Assessment method of students' learning effect

Through the assessment results, we can find out the problems and shortcomings in the instructional resource in time and provide targeted suggestions for subsequent improvement. At the same time, we should also pay attention to collecting students' feedback and encourage them to put forward valuable suggestions and opinions in order to continuously improve and optimize the digital instructional resource.

4. Challenges and countermeasures of digital instructional resource of AI+HVAC course

4.1. Current challenges

In the process of promoting the digital instructional resource of AI+HVAC course, we will

inevitably encounter a series of challenges. The limitation and cost of technology application is a big obstacle. Although AI technology is widely used in the field of education, its specific application in HVAC courses is still in the exploration stage, and its technical maturity and stability need to be further improved. At the same time, the introduction of AI technology and digital resources requires a lot of money and manpower, which is a big challenge for some schools and educational institutions with limited resources. It is also a big problem for teachers to learn and adapt to new technologies. Digital instructional resource requires teachers to have certain information technology literacy and AI application ability, but the reality is that many teachers have a relatively weak foundation in this respect and need to spend a lot of time and energy on learning and training. The requirement of students' autonomous learning ability is also a big challenge. Digital instructional resource emphasizes students' autonomous learning and individualized learning, which requires students to have certain self-management and self-learning ability. However, for some students who lack self-discipline and autonomous learning ability, this may become an obstacle to their study.

4.2. Countermeasures and suggestions

A series of measures and suggestions can be taken to address the above challenges. This article believes that strengthening technical training and support is key. Schools and educational institutions should increase their training efforts for teachers to enhance their information technology literacy and AI application capabilities. At the same time, a professional technical support team can be introduced to provide technical guidance and consulting services for teachers, ensuring that they can proficiently master and apply new technologies in teaching. In the digital instructional resource, a combination of various assessment methods can be used, such as online testing, project assignments, group discussions, etc., to comprehensively evaluate students' learning effectiveness. This can not only more accurately reflect students' learning situation, but also stimulate their enthusiasm.

In order to address the challenge of students' insufficient self-learning ability, this article considers taking a series of measures to cultivate their self-learning ability. For example, teachers can provide students with rich learning resources and guidance materials to help them develop reasonable learning plans and goals; AI technology can also be used for intelligent tutoring and feedback, providing individualized learning support for students.

5. Conclusions

Integrating AI technology and digital instructional resource in HVAC curriculum education is not only an inevitable choice to conform to the development trend of the industry and educational reform, but also an effective way to improve instructional quality and cultivate students' ability. By deeply analyzing the application principle of AI technology in education, the theoretical framework of digital instructional resource and the particularity of HVAC course, this article explores the practical path of digital instructional resource of AI+HVAC course, and puts forward specific countermeasures when facing challenges. Driven by continuous technological innovation, teacher training and perfect assessment system, the digital instructional resource of AI+HVAC course will show a broader application prospect. It can not only provide students with a better and more efficient learning experience, but also cultivate more high-quality talents with innovative spirit and practical ability for HVAC industry. These talents will become an important force to promote industry development and technological progress.

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