Research on teaching reform of "Internet of Things Technology Application" course in higher vocational colleges based on basic course teaching platform

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Abstract. With the rapid development of information technology, the application of Internet of Things (IOT) technology has become an essential part of vocational college information technology teaching. However, how to effectively reform the teaching of the "Application of IOT Technology" course to better meet the learning needs and career development of contemporary students remains a worthwhile research problem. This study aims to explore the teaching reform of the "Application of IOT Technology" course in vocational colleges based on the basic course teaching platform. Using a research method combining quantification and qualification, data was collected through questionnaires and in-depth interviews, and the teaching effects before and after the reform were compared and analyzed. This study found that the use of the basic course teaching platform effectively improved the teaching effect of the "Application of IOT Technology" course, and increased students' learning enthusiasm and efficiency. Based on this, this study puts forward a series of strategies and suggestions for the teaching reform of the "Application of IOT Technology" course, in order to further promote the development of information technology teaching in vocational colleges. At the same time, we also realize the limitations of this research, and look forward to future researchers continuing to expand the sample and explore more possible teaching reform strategies.

Keywords: Basic Course teaching platform, Higher Vocational Education, Application of Internet of things technology, Teaching reform

1   Introduction

As an important driving force for the development of today's society, the Internet of Things technology has a wide range of application scenarios, involving various fields of production and life. With the rapid development and application of Internet of Things technology, the teaching task of "Internet of Things Technology application" in higher vocational colleges is becoming more and more important. This course aims to train students to master the basic theory of the Internet of Things, proficient in the application

of Internet of Things technology, and have a certain ability to design and implement Internet of Things solutions. However, traditional teaching methods can not meet the needs of students for a deep and comprehensive understanding of the Internet of Things technology, so seeking new teaching reform programs to improve the learning effect of students has become an important issue faced by higher vocational colleges. This study aims to explore the possibility and effect of the teaching reform of "Internet of Things Technology Application" based on the basic course teaching platform, and aims to solve the following research problems.

1. How to apply the basic course teaching platform to the teaching of "Internet of Things Technology Application".

2. Whether the teaching reform based on the basic course teaching platform can improve the teaching effect of the Application of Internet of Things Technology.

3. How to quantify the teaching effect after the teaching reform.

4. How to further optimize the teaching strategy of "Internet of Things Technology Application" according to the feedback of the teaching platform?

2 Research progress of curriculum teaching platform in teaching reform

2.1 Current situation of course teaching platform

The research and application of various education and teaching platforms have shown important influence in teaching reform. Coursera [1], edX [2], Udacity [3] and so on are the most widely used in the world. China's online education platform began in 2012. With the impact of the COVID-19 epidemic in 2020, major universities, primary and secondary schools in China have launched online teaching, which has greatly promoted the development of online platforms. At present, the "Xuetang Online" of Tsinghua University, the "China University MOOC" jointly launched by the Higher Education Association and NetEase, the "Dingding" and "Tencent Conference" of Tencent, and the "Good University Online" of Shanghai Jiao Tong University, etc., the software is powerful, the number of users is large, and the role is very significant. These teaching platforms have greatly promoted the innovation of teaching methods by providing rich teaching resources and powerful interactive functions. In fact, research has shown that blended teaching using online teaching platforms can significantly improve student learning outcomes and satisfaction.

2.2 Application of Internet of Things technology in higher vocational education

The application of Internet of Things technology in the field of higher vocational education has also begun to achieve results. Wang (2021) studied the application of information technology and Internet of Things in the intelligent construction of gymnasiums and stadiums, and emphasized the importance of Internet of Things technology in the

construction of educational facilities [4]. Patel et al. (2016) proposed an energy efficiency integrated identity authentication and access control mechanism for the Internet of Things, providing a new solution for the information security management of higher vocational education [5]. Madhu and Vyjayanthi (2018) successfully implemented a cost-effective smart home controller using Node MCU and Internet of Things (IOT). This study not only explored the possibility of iot technology in practical application, but also provided a vivid case for practical teaching in higher vocational education [6]. Jami Pour et al. (2020) focused on identifying and optimizing the application of the Internet of Things in the field of education and learning. They used best-worst method (BWM) to optimize the specific application of the Internet of Things in teaching, which provided important ideas for the systematic application of the Internet of Things technology in the field of education [7].

However, how to apply these teaching platforms to specific courses more effectively, especially in applied technology courses such as "Internet of Things Technology Application", is still a problem that needs to be further studied. This requires us to explore its integration with the teaching platform on the basis of understanding the Internet of Things technology, so as to make full use of the advantages of the Internet of Things technology while improving the teaching effect, and provide more possibilities for the development of higher vocational education.

3   Research Methods

3.1   Research Design

This study adopts a mixed method of research design, combined with qualitative and quantitative research methods, in order to carry out a comprehensive and in-depth analysis of the teaching reform of "Internet of Things Technology Application" in higher vocational colleges. The qualitative research mainly relies on teacher interview and classroom observation to obtain teaching status and teachers' understanding of teaching reform. In the quantitative research section, students' satisfaction with current teaching methods and expectations for teaching reform are understood through questionnaires.

3.2   Methods of data collection and analysis

Data collection was mainly carried out in three ways: (1) Teacher interviews: semi-structured interviews were conducted to understand teachers' teaching status of IOT technology application courses and their views and suggestions on teaching reform; (2) Classroom observation: Through participation in classroom activities and field records, in order to better understand the problems in the teaching process; (3) Student questionnaire survey: Questionnaires are designed to investigate students' satisfaction with the current teaching methods and their expectations for teaching reform. Questionnaires mainly include multiple choice questions and open questions.

For data analysis, we first carried out data cleaning, deleted invalid and duplicate data, and then used SPSS to conduct descriptive statistics and inferred statistics of quan-

titative data, such as frequency, percentage, mean, standard difference, etc. For qualitative data, we adopt the content analysis method, firstly encode, then extract the topic, and combine the quantitative data for comprehensive analysis.

3.3   Research limitations

Although we did our best to control for the various influencing factors in the study, there were some limitations in this study. First of all, the samples of this study are mainly from our university, which may not fully represent the situation of all higher vocational colleges. Secondly, due to time and resource constraints, we are unable to interview and survey all teachers and students, which may affect the comprehensiveness and accuracy of the results. Finally, due to the continuous evolution of IOT technology and educational methods, the results of this study may become inapplicable over time. Therefore, these limitations need to be taken into account when interpreting and applying the findings.

4   Research results and analysis

4.1   Data analysis results

After analyzing qualitative data from teacher interviews, we identified several major themes. First, teachers generally believe that the application of Internet of Things technology is an important part of modern teaching, which can improve students' learning interest and hands-on ability. Secondly, most teachers said they faced some challenges in the teaching process, such as fast technology update, lack of equipment, and large differences in student base. In addition, the teachers made some suggestions on how to carry out the teaching reform, such as introducing more practical projects, improving the curriculum structure, and providing more training.

The quantitative data of student questionnaire survey shows that students' overall satisfaction with the current course "Internet of Things Technology Application" is 3.5 (full score is 5). For the course content, the satisfaction rate of students is 3.3; For the teaching method, the satisfaction rate is 3.7, as shown in Figure 1 below. In addition, the majority of students (70%) said they would like to add more hands-on projects and experiments; 50% of students believe that the curriculum structure needs to be improved to make it more systematic; 30% of students want more technical lectures and industry exchanges.
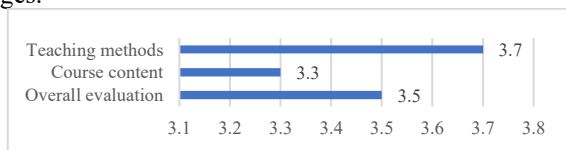

Fig. 1. Survey and analysis chart of the satisfaction degree of the course"Application of Internet of things".

4.2   Result Discussion

According to the results of teacher interviews and student questionnaires, we can see that the Internet of Things technology application course has played an important role in higher vocational education, but there are still some problems and challenges in the actual teaching process. This is mainly reflected in the following aspects.

First of all, technology changes quickly, and teachers' knowledge and skills are difficult to keep up. This makes it difficult for teachers to grasp the latest technological developments in the teaching process and at the same time to provide effective teaching. Therefore, it is necessary to provide more professional training and learning resources for teachers to enhance their professional quality and teaching ability.

Secondly, the lack of equipment and facilities limit the teaching effect. IOT technology application courses require a lot of practical operation, but due to the limitations of school equipment and laboratories, often can not meet the teaching needs. Therefore, it is necessary to increase the investment in teaching equipment and laboratories to ensure the quality of teaching.

Thirdly, students' basic knowledge is very different, resulting in uneven teaching results. Because IOT technology involves a wide range of fields, students' basic knowledge and skills often differ greatly, which brings difficulties to teaching. In order to solve this problem, teachers need to adjust their teaching strategies flexibly according to the actual level of students, and at the same time, they can help students improve their basic abilities through after-class tutoring and online learning resources.

In addition, student feedback on teaching methods and curriculum content also provides important directions for reform. Most students expect to add more practical projects and experiments, which will not only enhance their hands-on skills, but also help them better understand and master IOT technology. In addition, the improvement of the curriculum structure is also a common concern of students. They want the curriculum to be more systematic, covering basic theoretical knowledge as well as technical application and practical operation. This requires teachers to carry out more detailed planning and arrangement in the course design.

Students' demand for technical lectures and industry exchanges is also a concern. The development of IOT technology is closely related to practical applications, so introducing industry experts to give lectures, or organizing students to visit relevant enterprises can not only broaden students' horizons, but also help them better understand and apply what they have learned.

In general, the results of this study provide a deep understanding of the teaching status of "Internet of Things Technology Application" in higher vocational colleges, and point out the main direction of teaching reform. However, these results need to be interpreted and applied in light of the actual situation, and the teaching reform program needs to be further optimized and perfected through continuous research and exploration.

5 Conclusions and Recommendations

5.1 Main research findings

Through in-depth interviews with teachers and a large-scale questionnaire survey of students, this study reveals the current situation and main problems in the teaching of "Internet of Things Technology Application" in vocational colleges. We found that although the Internet of Things technology is widely regarded as an important teaching content in higher vocational education, in the actual teaching process, teachers and students are faced with some challenges due to factors such as fast technology update, lack of equipment, and large differences in student foundation. At the same time, students also expressed some expectations and suggestions for the teaching methods and course content, such as adding more practical projects, improving the course structure, providing more technical lectures and industry exchanges.

These findings reveal the need and direction of the teaching reform of "Internet of Things Technology Application" course in higher vocational colleges. First of all, we need more professional training for teachers and more learning resources to enhance their professional quality and teaching ability. Secondly, we need to increase the investment in teaching equipment and laboratories to ensure the quality of teaching. Thirdly, we need to flexibly adjust the teaching strategy according to the actual level of students, and provide extracurricular tutoring and online learning resources to help students improve their basic abilities. In addition, we need to make more detailed planning and arrangement in the course design. At the same time, we can also introduce industry experts to give lectures, or organize students to visit relevant enterprises to enhance their practical ability and industry vision.

5.2 Suggestions on the teaching reform of "Internet of Things Technology Application" course in higher vocational colleges

Based on the above research findings, this study puts forward the following suggestions for the teaching reform of "Internet of Things Technology Application" in higher vocational colleges.

(1) Strengthen teacher training: Schools should regularly organize teachers to participate in professional training on IOT technology to update teachers' knowledge and skills. At the same time, more learning resources and communication platforms can be provided through online platforms to help teachers improve themselves.

(2) Increase equipment investment: Schools should invest more equipment and laboratories according to teaching needs to meet the practical operation needs of IOT technology application courses. At the same time, the management and maintenance level of the equipment should be improved to ensure the effective use of the equipment.

(3) Adjust teaching strategies: Teachers should flexibly adjust teaching strategies according to the actual level of students. For students with weak foundations, teachers can help them improve their basic skills through after-school tutoring and online learning resources. For students with a solid foundation, teachers can design higher-level learning tasks that challenge their innovation and problem-solving skills.

(4) Improve the course structure: Teachers should make detailed plans and arrangements for the course content and structure according to the development and application of the Internet of Things technology. Courses should cover both basic theoretical knowledge and technical application and practical operation to help students fully understand and master IOT technology.

(5) Provide opportunities for industry exchange: Schools should establish cooperative relationships with relevant enterprises and institutions, regularly invite industry experts to give lectures, or organize students to visit and practice, in order to enhance their practical ability and industry vision.

5.3   Recommendations for future research

For future research, we suggest paying attention to the following aspects.

(1) Follow-up research: On the basis of this study, long-term follow-up research can be conducted to observe and evaluate the effect of teaching reform. By comparing the teaching effect before and after the reform, we can evaluate the effect of the reform more accurately and provide the basis for further reform.

(2) In-depth research: This study mainly focuses on the current situation and main problems of teaching, but for some specific issues, such as the choice of teaching strategy, the method of course design, the form of industry communication, etc., more in-depth research is needed.

(3) Expand the scope of research: This study mainly focuses on the application of Internet of Things technology courses, but other courses, such as big data technology and artificial intelligence technology, also face similar teaching challenges. Therefore, the teaching status and reform plan of these courses are also worth further research.

In general, the teaching reform of "Internet of Things Technology Application" course in higher vocational colleges is a complicated and long-term process, which needs the joint participation and efforts of teachers, students, schools and society. We expect that the findings and suggestions of this study can provide some references and enlightenment for this purpose, promote the teaching reform, improve the teaching effect, and ultimately help students better grasp the Internet of Things technology and adapt to the future career development needs.

While our research makes some valuable observations and suggestions for improvements, we are also aware that there may be challenges and difficulties in implementing these improvements. For example, it takes time and money to invest in professional training and equipment for teachers, and the resources of the school may be limited. In addition, changing the teaching strategy and curriculum structure also requires teachers' innovation and change, which may require breaking through the traditional teaching mode and overcoming some inherent concepts and habits.

In addition, we are also aware that although our study collected a large amount of data and made every effort to conduct in-depth analysis, due to the time and resource constraints of the study, we may not be able to fully understand and address all the issues. Therefore, we suggest that future researchers and educators can conduct more in-depth and detailed research on the basis of this study to discover more problems and solutions to further promote the progress of teaching reform.

In general, we believe that the teaching reform of "Internet of Things Technology Application" course in higher vocational colleges is a necessary and urgent task. Through the professional development of teachers, the renewal of equipment, the adjustment of teaching strategies, the improvement of curriculum structure, and the enhancement of industry communication, we are confident that we can achieve this goal and provide students with a higher quality teaching experience to help them succeed in their future careers.

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