Research on closed-loop quality continuous improvement system of "internet of things perception technology"

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Abstract. "Internet of Things Perception Technology" is a professional core course in the Internet of Things engineering department. It has many knowledge points, complex content. Therefore, Teaching is difficult. This paper studies the closed-loop quality continuous improvement system of "Internet of Things Perception Technology", including course objectives, course content, student analysis, teaching methods, scores evaluation, evaluation analysis, improvement measures and revised course goals. This closed-loop quality continuous improvement system not only improves the comprehensive ability of students, but also has strong promotion value.

1 Analysis of the current situation

Xi'an Eurasia University is an international application-oriented general undergraduate university approved by the Ministry of Education, focusing on management and economics, with coordinated development of arts, literature, education, and engineering. The Internet of Things (IoT) Engineering department was approved by the Ministry of Education in 2016, and enrollment began that year. There are currently two graduates. The Internet of Things engineering department is a typical cross-integrated major, which involves many fields such as computer, control, communication, electronics, information security and systems engineering. "Internet of Things Perception Technology" is a professional core course, which has a wide range of applications and is located at the bottom of the three-layer structure of the Internet of Things. IoT sensing technology consists of various devices with sensing capabilities, which are mainly used to sense physical events and data occurring in the physical world. The perception layer is the core of the Internet of Things and a key part of information collection. Therefore, they will play an important role in students professional practice and employment in the future.

In September 2018, the course "Intelligent Identification and RFID Technology" was offered in the IoT engineering department. In 2020, a comprehensive application training platform for the Internet of Things will be introduced. The "Intelligent Identification and RFID Technology" course will carry out project-based teaching, and the course content will be reconstructed according to the project. Students will complete the project in groups and pay attention to the process assessment. In order to open up the perception layer, the

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content of the "Intelligent Identification and RFID Technology" course will be expanded in 2021, adding sensor and positioning technology content, and the course name will be changed to "Internet of Things Perception Technology". This course continues to deepen project-based teaching. On the previous basis, the proportion of final exams has been reduced and project assessment has been increased.

2 Reform measures

According to social needs and professional training goals, and based on the OBE concept, Closed-loop quality continuous improvement system of "Internet of Things Perception Technology" is constructed, which consists of course targets, course content, student analysis, teaching method, scores evaluation, evaluation analysis, improvement measures, revised course targets.

2.1 Course targets

The targets of this course is divided into three parts, namely knowledge target, ability target and literacy target.

Knowledge target: Be able to repeat, explain and analyze related concepts and principles of sensors, barcode recognition, RFID, positioning, etc.

Ability target: Be able to use the relevant knowledge of sensors, barcode recognition, RFID and positioning to reasonably decompose the system requirements, complete the design scheme and verification of the system requirements in groups.

Literacy target: to cultivate students' teamwork ability, professional quality of excellence, and innovative spirit.

2.2 Course content

This course has a total of 64 class hours, 48 class hours of theory and 16 class hours of experiment, 2-3 times a week. The course content mainly includes three parts: sensing and detection technology, object recognition and identification technology, and positioning technology. Sensing and detection technology includes the working principle, structure, performance, measurement circuit and application of various sensors such as temperature and humidity, mechanics, photoelectricity, gas sensitivity, sound wave and magnetic sensitivity; Object recognition and identification technology includes barcode identification technology, and the working principle, structural composition, design implementation and application of RFID technology; Positioning technology mainly includes the working principle of satellite positioning, cellular positioning and indoor positioning.

2.3 Student analysis

The teaching object of this course is the third-year students of the Internet of Things engineering department. The students of this grade are surveyed in the form of questionnaires. A total of 96 questionnaires were distributed, and 82 valid responses were recovered. According to the analysis of the research report, the students have weak mathematical foundation, poor programming ability. In addition, the students like hands-on practice, but their ability to apply theory to practice is weak, and they have a strong willingness to work.

2.4 Teaching method

This course is based on the OBE teaching concept, combined with the CDIO teaching mode, and carries out teaching design according to the idea of "project-based, teacher-led, and student-centered". The specific teaching design is divided into three parts: before class, during class and after class.

Before the class, the teacher publishes the knowledge that the students have learned related to this course on the teaching platform TronClass platform, and provides relevant learning resources or design activities to help activate the prior knowledge.

In the class, cooperate with enterprises to jointly develop projects, and use the project as the lead to learn knowledge points. Teachers introduce cases to guide students to think deeply, analyze and find solutions, and internalize basic knowledge. Then, the teacher issues a new project task and learning task list, students form a project plan and implement it in groups, and the teacher gives corresponding guidance and help at the same time. After students complete independent learning and plan realization, they need to output relevant reports, defend and share, so that students can form their own final learning results. While imparting knowledge, cultivate students' correct ideological, moral and scientific values.

After class, students can reflect and re-digest basic concepts and principles through tests. The project is carried out in groups, and members of the group can discuss and help each other to solve the problems encountered. At the same time, teachers and students, students and students can also discuss and exchange problems through the TronClass discussion area.

During the 2020-2022 epidemic, suspension of classes without stopping studying. Learning videos will be uploaded on TronClass, learning tasks will be arranged, classroom tests will be conducted, and live classes will be used to explain difficult points. After class, the TronClass platform will be used to complete post-class tests, homework submission and feedback. Student feedback on learning is good.

2.5 Scores evaluation

The scores are composed of two parts: the usual scores and the final scores, each accounting for 50%. The usual scores includes 10% test and 40% project practice. The test is automatically evaluated on the TronClass platform, and the project practice is scored through the main lecturer, the teaching team teacher and the mutual evaluation of the students. The evaluation of the main lecturer runs through the whole process of the project; the teachers of the teaching team mainly evaluate the completion of the students' project on an oral examination; the peer evaluation is mainly to evaluate other students' project and the project implementation process in the form of a report meeting.

2.6 Evaluation analysis

The project-based teaching method has obvious effects in promoting students' learning of theoretical knowledge. The mastery of difficult knowledge points can be driven by projects, which can stimulate students' desire for knowledge and expand their thinking.

According to the project-based teaching method in this course, the failure rate and low score rate of students in the closed-book test have decreased, the excellent rate has increased. The learning effect has improved significantly.

Relying on the course achievements, the team teachers have guided more than 70 students to participate in various competitions, such as the "Computer Design Competition for College Students", etc. The students have won 4 national awards and 26 provincial awards. In addition, this course also has a certain demonstration effect. Relying on the

course achievements, students have won a number of national awards such as "Internet +" and have been recognized by the society.

2.7 Improvement measures

Although this reform has good results in terms of student scores and competition, it also has some shortcomings. For example, individual projects are too difficult for some students, and students cannot keep up. Although real projects from enterprises have been introduced, the execution process is not strictly implemented in accordance with the real environment of the enterprise. In view of the above problems, the following improvement measures are proposed.

Based on project-based teaching, gradually improve practical ability in layers

Design projects based on course content and practical life problems, and then divide the overall project into several small projects, which are gradually carried out from simple to difficult. In order to meet the goal of layered teaching, the project objectives are designed in layers to meet the learning needs of students at different levels, thereby greatly mobilizing the enthusiasm of students.

The project practice is carried out in accordance with the real environment of the enterprise, integrates engineering literacy

While integrating knowledge into practice, it cultivates students' corresponding engineering literacy and enhances their employment competitiveness, in order to help students find high-quality employment.

2.8 Revised the course targets

Summarize the advantages and disadvantages of the reform and update the curriculum objectives. While learning knowledge points, this course pays more attention to the cultivation of students' engineering ability and professional quality. Therefore, the improved course objectives are divided into three parts, namely knowledge objectives, engineering ability and professional ability.

Knowledge objectives: Be able to memorize, interpret and analyze related concepts, principles and basic structures of IoT acquisition, identification and location technologies.

Engineering ability: Be able to use the relevant knowledge of the Internet of Things collection, identification and positioning technology to reasonably decompose the application system requirements, complete the system design in groups, in order to improve the students' hands-on ability, and improve the students' ability to discover, analyze and solve problems.

Professional quality: Develop students' communication skills, teamwork skills and time planning skills, etc.

3 Conclusion

The closed-loop quality continuous improvement system of "Internet of Things Perception Technology" determines the course objectives of this course according to social needs and professional training objectives; According to the course objectives to determine the course content; According to the teaching content and student characteristics to determine the teaching method; According to the teaching method, update the performance evaluation method. Based on student performance, teaching evaluation and competition, the reform will be evaluated and be analyzed; Based on the evaluation and analysis, the improvement measures will be determined, and the course objectives will be revised. After evaluation

and analysis, the closed-loop quality continuous improvement system of "Internet of Things Perception Technology" has a good effect. It not only improves students' performance, mobilizes students' enthusiasm for learning, but also provides reference for other courses, which has certain promotion value.

This work is supported by Special scientific research plan of Education Department of Shaanxi Provincial Government (Project No. 21JK0817), University-level key course project “Big Data Analysis and Visualization” (Project No. 2019KC001), University-level teaching reform project (Project No. 2021ZD008), Industry-University Cooperation Collaborative Education Project (Project No. W202110002).

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