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WSN Teaching Construction Based on OBE*

Su Ying
Institute of Information Engineering, Binzhou University, Binzhou 256600, Shandong, China

Abstract: This paper deeply analyzes the gap between the current WSN teaching status and the OBE concept, and on this basis, proposes the teaching improvement of the curriculum, including the re-setting of the training objectives, the adoption of the hybrid teaching model, and the student-centered curriculum construction. Oriented assessment and reform, and based on output or results, apply CDIO's engineering ideas to the teaching process, use the project as a medium to break the barriers of the disciplines, and let the students integrate the knowledge of each professional discipline from the perspective of engineering and cultivate them. Engineering thinking, improving students' self-learning ability, hands-on practical ability, innovative ability and teamwork ability have certain practical significance for improving the quality of applied talents in applied local universities.

Key words: WSN, OBE, CDIO, educational reform, Course construction.

1. Introduction

Since engineering education certification has a high gold content in the international talent market and provides a basis for the training of engineering college students, at present, many engineering colleges in China are actively carrying out professional certification work.

With the rapid development of smart objects, mobile internet and computers, communications, electronic technology and other fields in recent years, the application of wireless sensor networks has become more and more extensive, and "WSN" has become the professional compulsory courses of Internet of Things project, automatic control, computer science and technology, communication engineering and other related majors of most higher engineering colleges. And in the fields of computer, Internet of things engineering, electrical and electronic, automatic control and other related fields, "WSN" is the core of training, application, development and design.

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Su Ying, Master, Lecturer, research fields: WSN; IOT.

2. The Gap between the Current Situation of the Curriculum and the OBE Standard

The engineering education certification is oriented to the needs of the society and takes the students as the core. On this basis, the graduation requirements are reversed to achieve the goal of cultivating qualified engineering talents [1]. The relationship between the various parts is shown in Fig. 1.

At present, undergraduate teaching in our school is actively developing to the applied talents, but most of the courses still have traditional teaching concepts such as exam-oriented education and professional teachers as the core of teaching work, which deviates from the OBE concept and makes engineering talents Training is seriously out of touch with social needs.

The traditional WSN course focuses on locating training objectives from the curriculum, focusing on the "energy" that the course itself can provide. The assessment also tends to require students to master the knowledge points assessment, lack of professional perspective and engineering perspective, and does not meet the needs of enterprises. Most of the courses adopt the traditional classroom face-to-face teaching method; the relatively single teaching mode makes

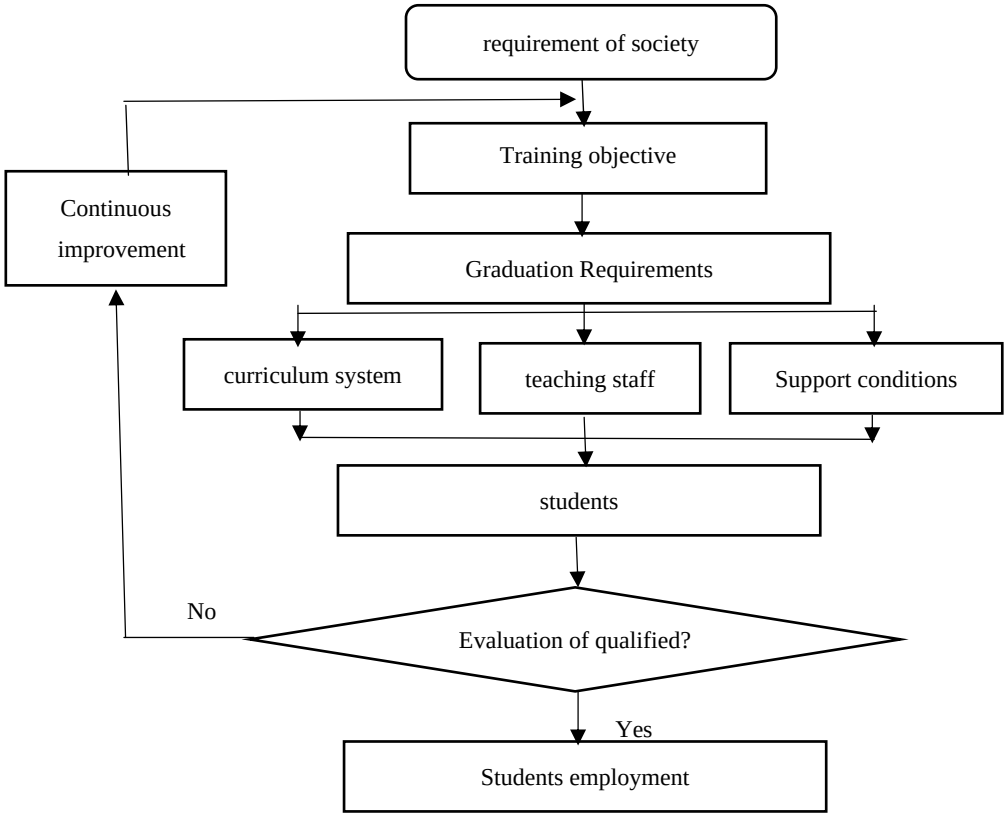

Fig. 1 OBE standard parts relationship.

students lack of the initiative of active learning, lacks the learning process of reviewing, summarizing and thinking, and cannot maintain the continuity of learning.

Obviously, these are contrary to the concept of "student-centered, output- or outcome-oriented, continuous quality improvement" in engineering certification standards.

2. Curriculum Reform Based on OBE Concept

2.1 Reset of Training Objectives in the Field of Engineering Certification

Make the training objectives of "WSN" and other courses and related abilities of the major as a whole, and clearly define the contribution to the cultivation of professional training objectives and related abilities, strengthen the systematic coherence of professional knowledge and the continuous attention of professional competence training, meet the needs of enterprises.

2.2 Adoption of Hybrid Teaching Mode

On the basis of the traditional teaching mode and method, combined with the online open course, realized the teaching mode of independent study, online and offline, and the combination of in-class and outside, the students' self-learning ability is cultivated, the learning process of summarization, review and thinking is strengthened, and the learning is maintained, improve the quality of personnel training.

2.3 Student-centered

Change the traditional teacher-centered education orientation, with the students as the main person in charge, carry out the conception, system design, debugging and packaging, and finally answer; while the teacher is only the project designer, design solution leader, the reviewer during the implementation process, and the evaluator during the

final run.

2.4 Under the Background of New Engineering, Optimize the Teaching Content and Improve the Teaching Method Based on Output or Results

OBE emphasizes that learning outcomes are the focus of the teaching process, and curriculum design is designed with “student” and “outcomes” as the core [2]. At the same time, practical teaching should promote the improvement of students’ engineering awareness and establish engineering concepts.

Based on the principle of reverse course design, aiming at the needs of society and enterprises, determine the professional ability of students to graduate; take the project as the carrier, optimize the theoretical teaching system and practice teaching system.

According to the cycle of modern engineering activities, that is, conceive, design, implement, and operate [3], develop students’ ability to solve complex and practical problems.

The course is based on the project, and each project is divided into four stages: conception, design, implementation, and operation. The teacher acts as the designer, guide, reviewer, and evaluator in each stage, and the student is the project leader and must plan the project, design the system, complete the debugging and package and finally answer.

In order to improve the independent innovation ability of each classmate, while learning the basic theoretical knowledge, it is necessary to find out the application examples of wireless sensor network in their professional field or daily life after the class to analyze and design the micro project.

Take the “Self-learning room smart lighting system” project as an example:

(1) Heuristic teaching, let students take the initiative to observe the characteristics of the system, connect the theory with the actual, and decompose the task;

Students are required to make a demand analysis, feasibility study plan, and preliminary design plan for this project within a certain period of time.

Students will break down the project into several sub-projects based on the characteristics of the self-study room lighting they observe, as shown in Fig. 2.

(2) group discussion, giving a design plan;

According to the wireless sensor network architecture as shown in the Fig. 3, the design of the “self-study room intelligent lighting system” includes the design of each sensor node, the construction of WSN network, the design of sink node, the design of WSN communication, the design of user application layer, etc.

(3) Decomposition tasks, completed item by item;

According to the design scheme, the design of each sub-project is completed in turn, such as: using the execution node to realize the control of the light on and off; multiple pyroelectric infrared sensors are randomly distributed for personnel detection, and multiple illumination sensors are distributed in various positions of the study room for illuminance detection. The ZigBee star network is used for networking.

(4) Display system, teacher-student exchange and mutual evaluation, summary and improvement.

Based on the above design, combined with the basic

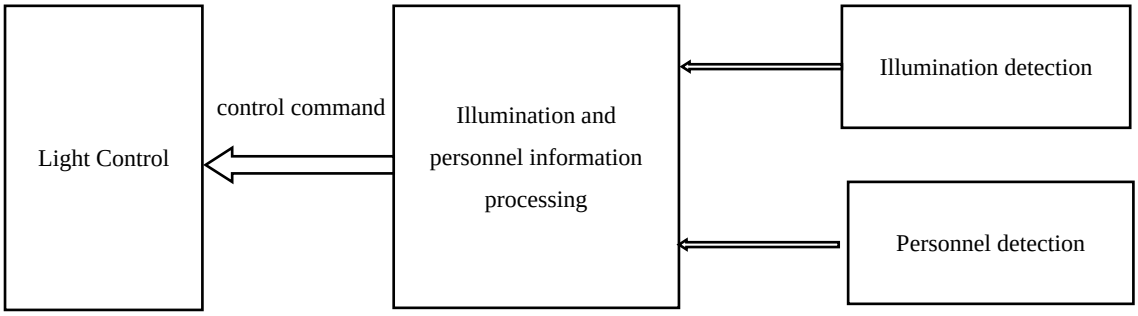

Fig. 2 “Self-study room smart lighting system” structure.

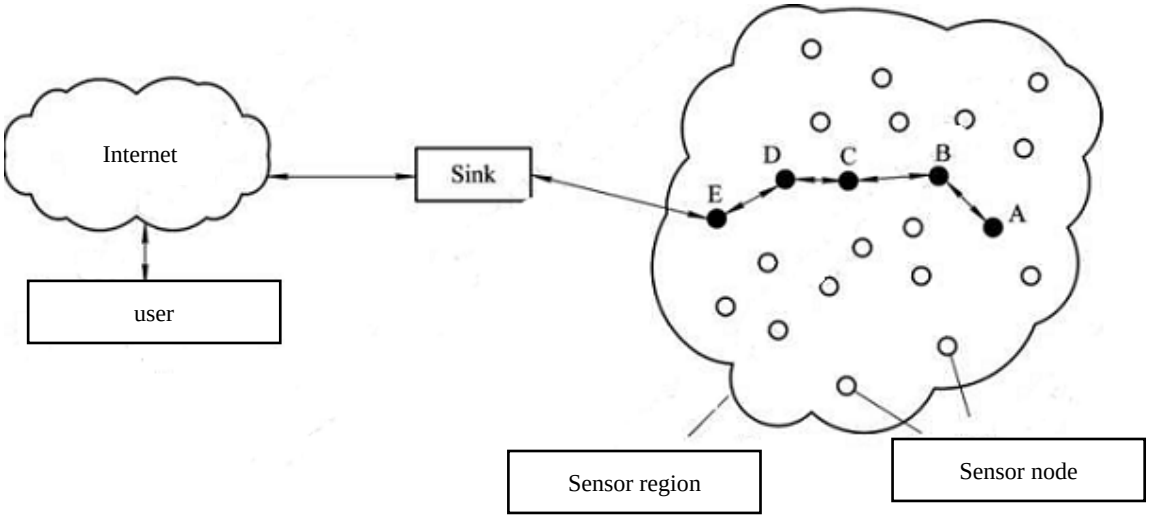

Fig. 3 Wireless sensor network architecture diagram.

knowledge of WSN theory and other related courses, such as "Internet of Things Communication Technology", "Sensor Principles", "Embedded System Design" and other knowledge, complete the design of "Self-learning room intelligent lighting system", and Through public display and defense, teachers and students finally summarized the problems in the project implementation process in order to achieve the sublimation of knowledge, application enhancement and the cultivation of innovative ability.

2.5 Diversified Assessment Methods

The concept of engineering education professional certification as the leading, based on the traditional assessment method, the engineering practice application assessment is carried out around the knowledge points, focusing on the process segmentation assessment and participation evaluation, so that it is more in line with the engineering certification requirements.

This kind of course reform can make students change from passive learning to active learning, which helps to improve students' self-learning ability, innovation ability, teamwork ability, break the discipline barriers, and integrate the knowledge of various professional disciplines from the perspective of engineering. In the process, students' engineering ideas are cultivated and students' hands-on practical ability is improved.

3. Conclusion

According to the development of the quality of talents in the industry, the WSN teaching reform based on the OBE concept is guided by the engineering ability learning outcomes, and students are the center to develop learning projects, the latest and most accurate positioning, review and combing of the curriculum, and the previous curriculum reform method has been carried out in order to achieve more positive reform effects and further improve the quality of applied talents in applied local universities.

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