Exploration on the Application of Blended Learning Model in Practical Training Teaching—Taking "Data Communication in Wireless Sensor Networks" as an Example

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Abstract. As an important part of Higher Vocational Education, practical training teaching combines blended learning with online learning and traditional classroom teaching methods. Meanwhile, it uses various teaching resources such as online learning platform resources, online simulation system, experimental equipment and so on. Practical training teaching is divided into three stages: pre-class guidance, in-class learning and after-class expansion. It achieves good teaching effect and realizes the student-centered learning style.

Keywords: Blended learning · Practical training teaching

With the development of network and multimedia technology, new information-based education methods are constantly emerging, and the application of blended learning in higher education is becoming more and more popular. From the definition of blended learning, it can be seen that blended learning aims to combine the advantages of traditional teaching and online learning so as to reduce teaching costs and improve teaching benefits [1]. For different learning environments and activities, teachers should provide different learning resources [2]. On one hand, teacher can monitor the whole learning process; on the other hand, students, as the subject of learning, can show their independence, initiative and creativity [3]. During their learning process including self-consultation, observation, prediction, adjustment, and reflection, students become capable of accumulating knowledge, developing learning methods and abilities, resulting in the achievement the learning goals [4]. Blended learning in practical teaching can not only support teachers to play a leading role in the teaching process, but also give full play to students' initiative and enthusiasm, and derive the learning process steadily outside the classroom to achieve student-centered learning.

1 Instructional Design

The reason why teaching design of the blended learning of "Wireless Sensor Network Data Communication" begins with the analysis of the learner is that the level of students' previous knowledge is the key factor of predicting their performance [5].

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1.1 Learner Analysis

The object of study of this content is the second-year students of Internet of Things application technology specialty. After one and a half years of professional study, the students at this stage have a certain understanding of network communication, sensors, programming languages and other professional knowledge, who can use professional tools such as microcontroller and computer, and can use information technology means to study independently.

1.2 Design of Training Objectives

The design of blended learning defines the teaching objectives of this course [6]. According to the professional training objectives, curriculum objectives and professional needs, the core objectives are abstracted: to train students' engineering application ability in the design, installation, networking and debugging of the Internet of Things; to clarify the focus of training is the installation, networking and debugging of ZigBee nodes, and to identify the difficulties in the process of debugging: fault detection and analysis debugging.

1.3 Design of Training Strategy

In practice, the mode of task-driven and blended learning is adopted to cultivate students' engineering application ability and professional quality. Taking "Home Internet of Things" as the content of the training project, students are required to simulated design and install a small Internet of Things system suitable for families according to this task. The whole training process is divided into three stages: pre-class guidance, in-class learning and after-class expansion. In these three stages, online learning runs through the whole process. The purpose of blended learning activity design is the integration of autonomy and interaction [7]. Teachers guide students to study by themselves, supervise learning progress, and answer students' questions through the network. Teachers derive their leadership outside the classroom, and students' consciousness and initiative are also enhanced. The content of online learning should be organized pertinently by teachers according to teaching objectives and students' cognitive process, and students should be the learning agent. The design of learning module arranges content around the training objectives, constructs a network knowledge structure framework, and enhances students' enthusiasm and sense of achievement by designing various interactive activities. At the same time, attention should be drawn to the fact that the learning distraction could be caused by poor teaching design, misguidance of course and improper interaction [8].

Online learning is implemented by means of online learning platform and online simulation system developed by Wuhu Institute of Technology. In the practical classroom teaching, relying on the integration of theory and practice in the wireless sensor network training room, students are guided to carry out standardized training operation steps through teachers' personal demonstration, students' mutual evaluation, fault evaluation and other ways.

1.4 Design of Training Evaluation

According to the purpose of the training and synthesizing learning process and learning results, the effect of mixed learning is evaluated: the process is evaluated according to the degree and performance of students' active participation, and the learning results are evaluated according to the completion of students' practical training, homework and so on. In the implementation of mixed training, by using online platform testing, teacher inspection, student mutual evaluation, platform homework, enterprise tutor scoring and other evaluation methods, teachers refine evaluation indicators according to actual work needs, cultivate students' professional quality, conduct multi-dimensional comprehensive evaluation of students, use a variety of teaching means and methods to consolidate teaching focus and break through teaching difficulties.

2 The Implementation Process of Hybrid Training

The teaching process is divided into three stages: pre-class guidance, in-class learning and after-class expansion, as shown in Fig. 1.

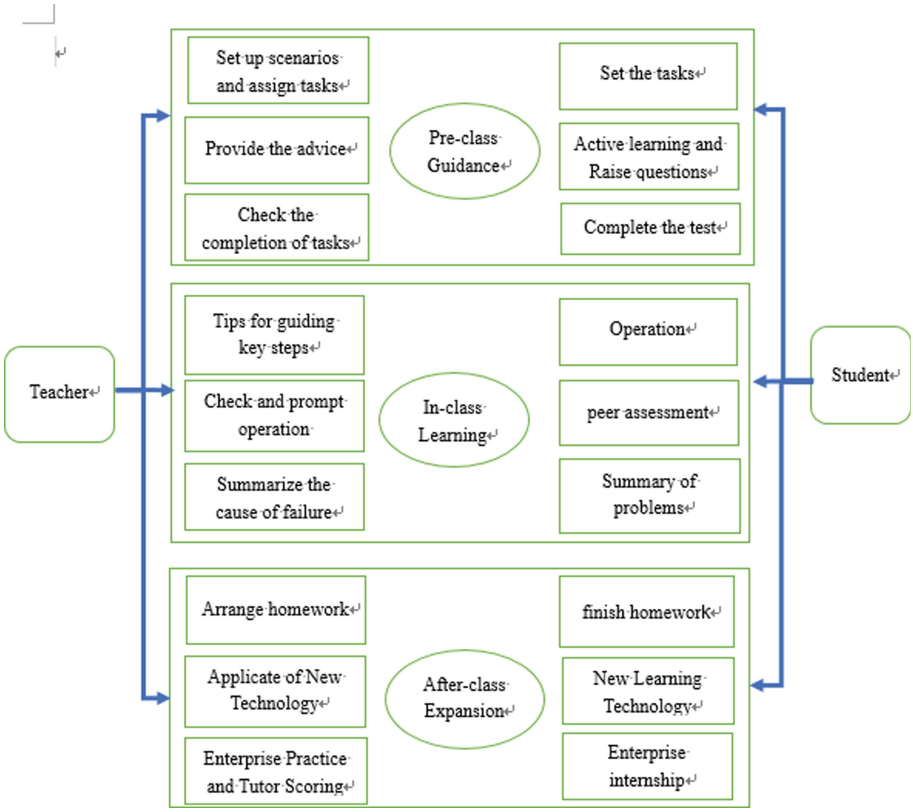

Fig. 1. The implementation process of hybrid training

2.1 Pre-class Guidance

Pre-class tasks are published by APP, so students can make clear their learning objectives and requirements according to pre-class tasks, then use the resources of online learning platform to learn autonomously, understand the layout of Zigbee nodes, wiring specifications and knowledge of electrical detection, as well as the role and difference of coordinator and terminal nodes. Through operating on-line simulation training system to simulate the real work task feeling workflow, students can understand the difficulty of fault detection, analysis and debugging in node communication. With the help of online learning platform, teachers can real-time view students' learning status, publish test tasks, and check students' learning performance.

2.2 In-class Learning

Teachers instruct students to arrange nodes, regulate wiring, check power on, use simulator to complete program burning, install ZigBee nodes, set up networks and debug by prompting key steps. Students can watch circuit wiring diagram and operation specification prompt in online simulation system repeatedly during operation. Teachers can guide students' operation process and specification on the spot through testing tools.

Fault detection, analysis and debugging are difficult problems in practical training. Because there are many kinds of faults and the forms of faults are similar, it is difficult for teachers to guide each group at the same time in traditional teaching. The problem that students' feedback is not clear or the problem of feedback can not be solved in time is more prominent. Mixed learning can solve this problem. In the pre-class tutorial, teachers make videos, pictures and animations to emphasize the common faults and solve them in advance, and check them through the test task. In class, students can also repeatedly check the online learning platform and the operation video and tips in the simulation training system to try to solve the problem by themselves. At the end of the training, teachers train students' ability of fault detection and analysis by organizing students' mutual evaluation. Finally, teachers use fault monitoring tools to collect students' fault content, and summarize the causes of the failure and analyze the solutions.

2.3 After-class Expansion

Teachers deliver homework after class according to the summary of the training content. Through providing rich resources on the online platform, students who have learning capability can be guided to learn the new technology of the Internet of Things and the application in the production process of enterprises, so as to stimulate students' enthusiasm for learning. Students' consciousness of career is inspired by their tutor for he or she has rich industry resources and working experience [9]. Students are organized to visit relevant enterprises for internship, compare real work scenes and processes, and enhance the ability of engineering application.

3 Conclusion

This paper takes "data communication in wireless sensor networks" as an example to discuss the design and practice of training activities under hybrid learning. Hybrid learning combines online learning with traditional practice through teacher's design, gives full play to their respective advantages, and solves the shortcoming of online learning testing students' consciousness through the comprehensive evaluation of learning process and learning results. The effectiveness of online learning activities is closely related to the participation of teachers [10]. In the part of warm-up, quality of topic discussion should be improved. Hybrid learning can be well applied to students at different levels in practical teaching. It can not only play the leading role of teachers, but also realize the student-centered learning mode.

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