

The Discussion and Practice of Wireless Sensor Networks Wisdom Course based on Rain Class Tool

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Abstract

The course of wireless sensor networks (WSNs) is the core course for internet of things (IoT) engineering, it is necessary to promote the classroom teaching effect. The wisdom classroom teaching mode based on the rain class technologies was discussed firstly in this paper. And then, the implementation process and the teaching strategies of wisdom classroom based on learning data analysis of WSNs course were represented. Lastly, the practice results of WSNs wisdom classroom show that the wisdom classroom based on rain class technology can fully arouse the enthusiasm of students, improve teaching efficiency.

Keywords

Wireless sensor networks; Wise classroom; Rain class; Classroom teaching design.

1. Introduction

The internet of things(IoT) was included in the "Government Work Report" in 2010, which was officially listed as one of the five national new strategic industries[1]. At present, more than 500 colleges and universities across the country had set up the major of IoT Engineering, which had an enrollment of more than 20000 students[2].the WSNs technologies is one of the core technologies of the IoT, and the course of WSNs is not only listed in the core courses of the IoT Engineering by most of colleges and universities, but also included as the compulsory courses for the graduate or senior undergraduate of computer, electrical communication, and other related majors by many colleges and universities[3].

Yangtze university opened the WSNs seminar course for computer class graduate students in the first place. In September 2014, Yangtze University began to enroll the students into IoT Engineering major from the candidates of college entrance examination. There are about 80 students each year and more than 300 undergraduate students in school up to now[4]. Many special sensor network curriculum constructions were discussed in the teaching and researching activity of Internet of things engineering department. Everyone agrees that it is necessary to improve the effect of classroom teaching.

2. Wise class and rain class

Under the background of the big data era, the traditional classroom teaching is facing new challenges and opportunities, the wisdom classroom based on learning data analysis technology is used to improve the teaching behavior, which is the effective measure to change the traditional classroom.

Smart classrooms[5] refers to take advantage of big data, mobile Internet, cloud computing and other new technologies in the era of Internet+ to construct informatization, wisdom and efficient interactive classroom, which applies "cloud + computer end" service mode. It can realize comprehensive teaching decisions based on the data, real-time teaching evaluation, whole process of interaction and personalized resources pushing to reform and improve the classroom teaching structure and mode

through the study of intelligent push, dynamic learning data acquisition and real-time analysis. Wisdom classroom is the depth fusion product of information technology and education teaching, and it is also a new embodiment development trend in the flip classroom. The comparing with the traditional classroom, flip classroom and wisdom classroom is following as table 1.

Tab.1 Traditional classroom, flip classroom and wisdom classroom

Type	Teaching process	
traditional classroom	Teaching first	Learning behind
flip classroom	Learning first	Teaching behind
wisdom classroom	Learning first Assessment before class, teaching based learning	Teaching behind Real-time detection and adjustment teaching

In April, 2016, Tsinghua university jointly with xuetangx.com released a free online teaching tool named rain class[6], which connects teachers' intelligent terminal and students' intelligent terminal through WeChat. And rain class can realize the dynamic study data collection and analysis in the whole teaching process including pre-class, lesson and after-class, which can provide environmental and technical support for wisdom classroom building. Using the rain class tool to build wisdom classroom based on learning data analysis can adapt the demand of the school classroom teaching reform and innovation under the background of education informationization and big data, which have important practical significance and value. The general process of wisdom classroom design and development based on the rain class is shown in figure 1.

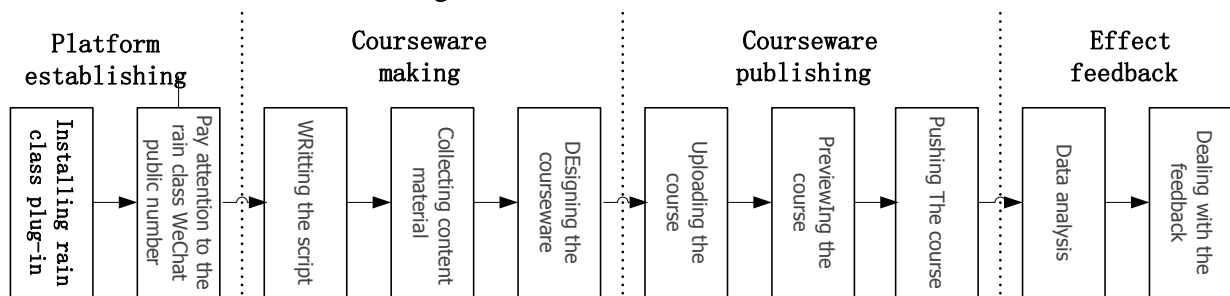


Figure 1. The basic flow of wisdom classroom design and development based on rain class

3. Traditional teaching pattern of WSNs course

WSNs course in colleges and universities is important professional required course of the Internet of things engineering major. And it involves computer, microelectronics, sensor, network, communication, data analysis and processing, and many other areas, which is a comprehensive curriculum of practical application oriented, and high interdisciplinary [7].

Wireless sensor networks curriculum in college of computer science of Yangtze university used combination teaching form of lectures (theory class) and experimental operation (experiment class). Theory class carries on the explanation and demonstration of theory knowledge and the algorithm by teachers' teaching. Experiment class arranged the corresponding experiment to achieve the goal of learning and consolidate the knowledge through the teaching by teachers and experiment actively engaged by students. The course usually used usual assessment and final inspection to assess students. Among them, the usual assessment included three parts: attendance, experiment and homework, which accounts for 20% of the final total grade. The final assessment generally adopts mode of close-book exam, it's grade accounts for 80% of the total grade.

The traditional teaching method exists a few problems, first of all, it is hard to stimulate students learning initiative. Student's study is carried out in accordance with the teachers' teaching arrangement orderly, due to the limitation of class hour, there are no good supervision and inspection mechanism, it is difficult to achieve good effect in preparation before class and review after class, which are usually stressed by teacher. Secondly, teaching is limited by the time and space, students can only communicate with teachers in the classroom interaction, it is difficult to communicate with teachers after classes, that is the common problem of all offline courses. Therefore, using rain class to class learning content push and supervision, and using the online learning to break the limitation of space and time to study can realize the real-time interaction between the teachers and students, which is particularly urgent.

4. Wisdom class designing of WSNs based on rain class tool

4.1 Before class

(1)Presetting teaching content

Teachers preset teaching goal and content [8] according to the analysis of pre-course content and students' learning situation, the specific contents are shown in table 1.

Tab.2 Contents and schedules of WSNs course

Chapter	Main contents	Class hours
Chapter 1	Basic concepts, characteristics, performance, application and development history of WSN	4
Chapter 2	Development environment for WSN	2
Chapter 3	Topology control and covering technology of WSN	4
Chapter 4	Communication and networking technology (MAC protocol, routing protocol) of WSN	10
Chapter 5	Support technology (time synchronization, positioning) of WSN	6
Chapter 6	Data administration of WSN	4
Chapter 7	Agreement technical standards(ZigBee) of WSN	4
Chapter 8	WSN Application	2
	total	36

(2)Issuing teaching materials

Teacher uses PowerPoint and rain class plug-in to rapidly converted the courseware PPT into online courseware. Teacher can push prepared courseware to the online class and student in the class can review the courseware at mobile phone WeChat endpoint at any time. Student in the class can proceed mobile learning, complete forecast and get automatic grading anytime and anywhere. In addition, students can put forward ideas or questions after read previewing material. Teachers can view the number of students who has been read previewing material readily, examine answering question situation, browse the student feedback and communicate with students at pre-class.

(3)Optimizing teaching design

Teacher can view the whole preview situation in the mobile terminal in real time, and then optimize teaching materials designing. At the same time, the teacher can get detailed statistics data (such as viewing pages number of per-student, the pages of per-student, the preparation time etc.) through email and accurately grasp the preparation situation and learning behavior of each student, and treat them as the basis of one-to-one personalized guidance and process evaluation.

4.2 In the process of class

(1)Open classes

Teachers open online classroom and teach on the rain class platform, and then students can receive courseware data through mobile phone WeChat end, who enter the rain classroom through WeChat sweep code and enter invite code. Teacher gets detailed statistics data to understand the students' status by email.

Teachers show the results of student self-study firstly such as the voting results and prepare situation, which help our students make a comparison and positioning among students and make them have a psychological preparation to classroom learning. Secondly, teachers show the class teaching content and target, and then carry a deeper learning.

(2)Teaching

Teachers use the function such as don't understand and barrage in rain classroom tools to teach course, and then realize the classroom interaction between teachers and students, creat harmonious atmosphere.

(3)Real-time assessment and summary

Teachers push in-class test to students on the mobile terminal and then get instant statistics. Students can immediately see the score and the answer in the big screen, which let students clearly aware of their own level in the class and consolidate knowledge after class.

4.3 After class

(1)Discussion and development

In order to let students thinking sensor network knowledge combined with the engineering practice, the teacher publish jobs (as shown in table 3) after class, students submit reports to express their ideas. Therefore, teachers and students can discuss problems effectly, thus students can deepen the learning, cultivate the students's explore ability. At the same time, the teacher can also issue voting to investigate students' feedback about course content, teaching method and effect.

Tab.3 Contents of WSNs comprehensive assignments

No	Assignment contents
Assignment 1	Logging information acquisition system
Assignment 2	Building security information acquisition system
Assignment 3	Forest fire monitoring system
Assignment 4	The flood monitoring system

(2)Conclusion and improved

Teachers review and summarize the whole teaching process, record the teaching design, optimize the teaching design, improve teaching strategy according to students' classroom learning situation, class discussion and voting after class.

5. Conclusion

The course of wireless sensor networks is a systematic course, its teaching content with large span, the characteristics of strong practicality to teachers' teaching, students learning present a double challenge. Hence, it is necessary to improve the effect of classroom teaching. This paper firstly introduced the basic meanings of wisdom classroom and the basic function of rain class. And then, the implementation process and the teaching strategies of wisdom classroom for wireless sensor networks based on learning data analysis were represented. the practice results show that the wisdom classroom based on rain class technology can tremendously arouse the enthusiasm of students and signally improve teaching efficiency.[8]

Acknowledgments

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References

- [1] Wen jiabao. the government work report in the third meeting of the 11th National People's Congress [EB/OL]. Beijing: xinhua news agency, 2010. http://www.gov.cn/2010/11/content_1555767.htm
- [2] Yu Li, Zhao jian, Huang chuan-he and Xu Shuang. The professions construction and teaching practice of Internet of things engineering [J], Computer education, 2013, 8 (15):94-97.
- [3] Feng Li. Characteristics and Development Tendency of Wireless Sensor Network[J]. Research & Application of Building Materials, 2011(8):18-19.
- [4] Yangtze university students enrollment information network. The enrollment plan of Yangtze university in different province[EB/OL]. Jingzhou Hubei,China, 2017.01 <http://zszc.yangtzeu.edu.cn/page.html>.
- [5] Shuyao Sun, Bangqi Liu. The wisdom classroom mode based on dynamic learning data analysis [J]. The Chinese Journal of Ict in Education, 2015(22):21-24
- [6] WANG Shuai-guo. Rain Classroom: The Wisdom Teaching Tool in the Context of Mobile Internet and Big Data[J], Modern Educational Technology, 2017,27(5):26-32.
- [7] Sun Jie.The Construction of Sensor Network Curriculum Group for Specialty of Internet of Things[J], Higher Education Forum, 2016,4(4):78-79.
- [8] Huaping Yu, Peng Liu. The Curriculum Construction of Wireless Sensor Networks for the Internet of Things Engineering[J], International Core Journal of Engineering,2016(3):27-34.