

Exploration on Management Model of Electrical and Electronic Innovation Laboratory Based on Wechat Mini Program

Yongsheng Wang^{1,a}, Dingyuan Xia^{1,b}, Jialiang Zhang^{1,c}, Xiaoxu Wei^{2,d,*}

¹Electrical and Electronic Experiment Center, Wuhan University of Technology, Wuhan, China

²School of Automotive Engineering, Wuhan University of Technology, Wuhan, China

^a wysh320@163.com, ^b wkxiady@whut.edu.cn, ^c 18672322399@163.com, ^d wx2014@whut.edu.cn

*corresponding author

ABSTRACT. With the development of modern information, the development and popularization of personal terminals have made network laboratory management services possible. The Electrical and Electronic Innovation Laboratory is the main training base for innovative and entrepreneurial talents in university. The laboratory attempts to focus on the independent management model offered by students using mobile terminal information, which promotes quality education such as innovative thinking and responsibility awareness of students. This paper analyzes the necessity and functional requirements of developing a management system based on WeChat mini program. Through more two-way information interaction function, the management efficiency of the laboratory is improved and more convenient services are provided for teachers and students.

KEYWORDS: Electrical and electronic innovation laboratory, Management system, Wechat mini program, Two-way information interaction

1. Introduction

The Electrical and Electronic Innovation Laboratory is an important platform for discipline competitions and innovation activities in university. It is also an important place to cultivate practical innovation ability of students. The Innovation Laboratory is open to students, and it provides students with more places for learning, communication and discussion. In the laboratory, students can explore independently, enhance their interest and hands-on skills, and also play a very important role in the consolidation and application of knowledge, so as to enhance the subject competition skills and create creativity for cultivating innovative talents and enhancing competitiveness condition[1].

The management model of the Electrical and Electronic Innovation Laboratory can improve the quality education of students' innovative thinking, sense of responsibility, scientific exploration spirit and teamwork spirit. The development of the laboratory management model can be roughly divided into three stages: The first stage refers to all laboratory management information that completely relies on paper, and management functions such as laboratory arrangements and the operation and maintenance of instruments and equipment completely rely on record books for registration management; The second stage refers to the addition of Internet technology to the laboratory management of the first stage, integrating laboratory arrangements, laboratory construction conditions and experimental innovation activities through an information platform to realize the unidirectional opening of laboratory information ; The third stage refers to the innovation of laboratory management caused by the mobile portal application platform. This model can further expand the symmetry of information, realize the two-way opening of information, increase the utilization rate of innovative laboratories, share experimental resources, and provide more services for teachers and students[2].

University campus life has also changed with the development of information technology and the popularization of mobile Internet and smart phones. WeChat mini program has also been widely used in campuses, such as online learning systems[3, 4], campus navigation, code scanning attendance and campus services. These applications have brought great convenience to teachers and students. According to the management need of the Electrical and Electronic Innovation Laboratory, this paper designs a relatively complete laboratory management system based on WeChat mini program, which not only has the laboratory appointment function, but also records the students' participation in scientific and technological innovation activities. The management system can also manage public learning resources such as electronic devices and studying boards in the open laboratory.

2. Necessity of Laboratory Management Model Reform

At present, quality education is receiving more and more attention, and the demand of students for independent learning is also increasing. Innovative and open laboratory is more conducive to the development of students, the cultivation of thinking and the exercise of practical ability. The main body of traditional innovation laboratory is the teacher, which is not conducive to exert the initiative of students. It is necessary to take the student's independent management as the main body to be the master of the laboratory. It is helpful to encourage students to participate in the innovation open laboratory. Students' ability to discover, analyze and solve problems can be cultivated by project development and research.

2.1 Improve Laboratory Utilization

The Electrical and Electronic Innovation Laboratory plans to recruit undergraduates from multiple majors in the school every year. These students who have the ability to study are provided opportunities to participate in scientific research and guided to the forefront of science. It can cultivate the innovative and practical capabilities of students, and also reserve talents for various discipline competitions and innovative practice projects. The Electrical and Electronic Innovation Laboratory which plays an important role in undertaking student competitions has always been adhering to an open management model and becoming the main training base for innovative and entrepreneurial talents. In recent years, various subject competitions for college students have shown an increasing trend in types and scales. This is bound to result in insufficient competition training venues and shortage of high-precision equipment.

Based on the two-way information interaction management model of the WeChat mini program can break the traditional model assigned a fixed workstation to each student which may result in unreasonable laboratory resource allocation. Students who make an appointment can freely book the laboratory through the WeChat mini program. They can clearly check the free workstations in the laboratory, arrange their spare time reasonably, and also see the situation of studying and research during the experiment from others. This public information can supervise their own learning status and improve the laboratory to a certain extent. The utilization rate maximizes resource utilization.

2.2 Optimize Management System of Experimental Resource

The Electrical and Electronic Innovation Laboratory will provide students with basic electronic components and other experimental consumables including development boards, learning boards and other basic experimental resources. It is difficult to manage them because of many types and quantities. If poorly managed, it would cause waste of resources. Based on the management model of the WeChat mini program, every student who comes to the laboratory can query various resources of the laboratory through the page, actively comply with the rules for the use and borrowing of experimental consumables and experimental resources, consciously participate in laboratory management, and pay attention to the experiment room building. Relying on the two-way information management platform, the laboratory management system can be improved and the laboratory's experimental resource use and management authority is assigned to the users. Therefore, the complicated management work is orderly but not chaotic, which can reasonably optimize the experimental resources, reduce the management workload and master accurate and effective information as well.

2.3 Improve Training and Assessment Mechanism

The Electrical and Electronic Innovation Laboratory undertakes the training and selection of multiple discipline competitions. The key to training and selection is all-round inspection of students from teachers. The WeChat Mini Program can record the learning activities of students in the laboratory in detail, such as the content and frequency of entering the laboratory, the content and frequency of training activities, and the borrowing information of experimental resources. The instructor draws on the learning trajectory of the students in the innovation laboratory to develop a targeted training plan for the students and effectively carry out practical innovation activities. Based on the above considerations, the Electrical and Electronic Innovation Laboratory will propose an exploration of a management model based on WeChat mini program.

3. Wechat Mini Program Technical Foundation

Working and learning methods used by the Internet and mobile devices are becoming more and more common. The introduction of a teaching management model based on the WeChat public platform has made people's learning and life more convenient and will be widely used by teachers and students[5].

3.1 Advantages of Wechat Mini Program

As a function derived from WeChat, WeChat Mini Program has obvious platform advantages. For developers, the small program development method is simple and low in complexity, it can save the technical cost of traditional APP development. WeChat Mini Program is suitable for school management system development because of low operating and service cost. The design and development of application based on the WeChat public platform can be implemented across IOS and Android platforms in the same time, with strong versatility. Secondly, the WeChat mini program is only a service based on WeChat, no need to download or install, and it takes up less memory on the phone. Students can directly use the management system by scanning the code. The user interface is friendly and simple, easy to use, which makes two-way information transmission possibly.

3.2 Framework of Management System

The management system of the Electrical and Electronic Innovation Laboratory uses the MINA framework[6]. MINA is divided into three parts: view layer, logical layer and system layer. The logical layer is composed of js files. The writing language is JavaScript. It is used to realize the logic processing of WeChat mini program. The data after the logic processing is presented to the view layer; the view layer includes two files: wxml and wxss. The former represents the page structure; the latter represents the page style. The system layer will use JSBridge to implement API calls, including offline storage, network request, and other WeChat functions. The MINA framework used in the development of the laboratory management applet is shown in Figure 1.

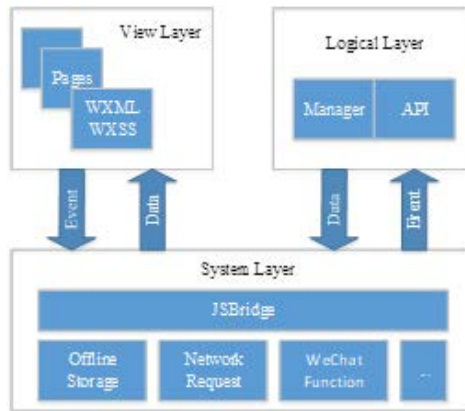


Fig.1 Mina Framework of Management System

4. Function Analysis of Management System

The WeChat mini program can be easily acquired and disseminated within WeChat. It is great advantages. And it is convenient for students to use and easy for teachers to view and manage. This paper proposes to design and develop an innovative laboratory management system based on WeChat mini program as shown in Figure 2. It mainly includes five functional modules: laboratory appointment function, learning activity tracking record, experimental resource borrowing management, electronic component inventory management and system background functions.

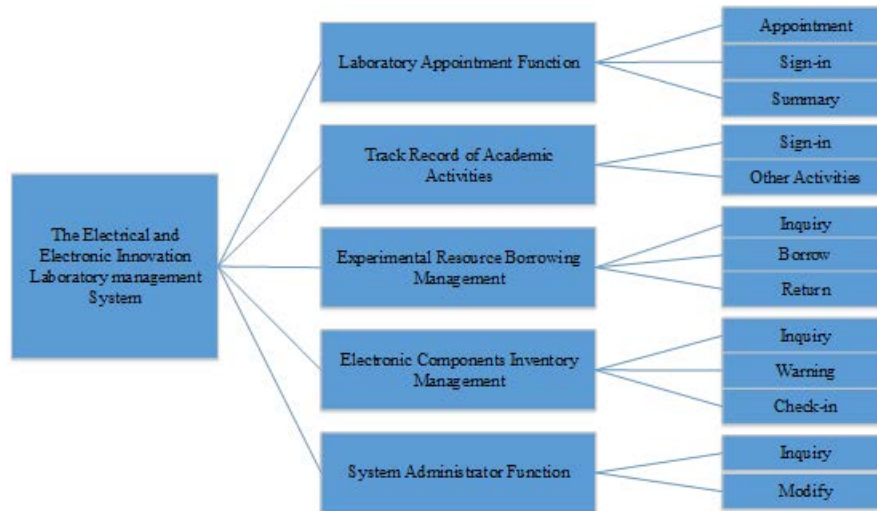


Fig.2 Function of Management System

4.1 Laboratory Appointment Function

Students pay attention to the mini program. First of all, they must complete their personal information, and then they can make an appointment. You can make an appointment by choosing a time. If the laboratory workstation is full, you cannot make an appointment. Users can check their appointments, and cancel the appointment if they cannot fulfill the appointment. The user goes to the laboratory on time and signs in according to the sign-in code for learning activities. When leaving, he scans the code to sign out, and submits a study summary, so as to guide the teacher to grasp the student's learning content and progress. If the number of missed appointments reaches the upper limit specified by the system, the user will not be able to make an appointment again.

4.2 Track Record of Academic Activities

The Electrical and Electronic Innovation Laboratory regularly organizes professional technical lectures and senior experience sharing activities for students who plan to participate in subject competitions. Scanning the QR code on the spot can record the participation of students in academic exchange activities. Under this functional module, students can manually enter the innovation and entrepreneurship practice projects, scientific research projects, elective courses and other academic activities they have participated in to construct an information sheet of academic activities for each student during school.

4.3 Experimental Resource Borrowing Management

Through the experimental resource borrowing management function module, users can inquire all the experimental resources provided by the Electrical and Electronic Innovation Laboratory, such as: STM32F4 arm learning board, FPGA series development boards, ESP series wireless debugging system, robotic arm, four-axis Aircraft and various types of simulators, etc. After the user determines the return time, the corresponding experimental resources can be borrowed from the laboratory. Before the return date, the management system will remind users to return the loaned equipment on time.

4.4 Electronic Components Inventory Management

Electronic components are consumable materials. It is very difficult to accurately count inventory management. Electronic component inventory management adopts an early warning management mode. When users find that the inventory is below a certain amount, they can choose to apply for their own purchase, or they can choose to wait for the administrator to purchase. At the same time, the inventory management system is equipped with the storage function. The components purchased by the user must be reimbursed under the management function.

4.5 System Administrator Function

The administrator needs to modify and delete user information, manage user permissions, and enable and disable certain functions. The administrator can query all activity records under each user account for statistical analysis. The administrator can modify the parameters of the management system, add and delete experimental resources, etc.

5. Conclusion

With the continuous deepening of education reform, the traditional one-way information release. The management model of the Electrical and Electronic Innovation Laboratory with teachers as the main body can no longer meet the current needs of talent training. Reform should be carried out in accordance with the actual development situation. The Electrical and Electronic Innovation Laboratory management model based on the WeChat mini program is based on student management, supplemented by teacher management. Daily innovative practice activities are carried out through the information management system to improve students' sense of ownership and independent learning ability.

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