

# *Construction and Practice of All-opening Shared Platform for Pocket Laboratory*

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**Abstract**—Pocket laboratory with great significance in cultivating innovative talents is one of the brand-new teaching ideas and is the real practice to the idea of "all-opening laboratory". Basing on the management idea of library, Harbin Engineering University (hereinafter referred to as HEU) proposed to construct a school-wide Pocket Laboratory Service Center which made it possible to borrow, return, make an appointment and renew pocket experimental resources by using the library information management system. It solved the problems of pocket laboratory resources sharing and management in an innovative way and contributed to a better implementation of the teaching concept of pocket laboratory. Its construction achievement has great significance and extension value.

**Keywords**—Pocket laboratory, all-opening laboratory, innovative talents, book form

## I. INTRODUCTION

Pocket laboratory- the "laboratory" in a pocket with the advantages of small size, low cost, rich function, etc., which builds distributed laboratories in dormitory, library, study lounge and anywhere students want to work and learn. Pocket laboratory is a new teaching philosophy and the true meaning of "all-opening laboratory" [1-3] which makes maximum use of experimental resources, provides students with the largest free learning space. Pocket laboratory broadens the time - space concept of experiments, as it meets the learning demands of students and leaves enough time for autonomous learning arrangements. It's a better solution to the time contradiction between fixed curriculum hours and increased experimental contents. It contributes to students' personality development, benefits to the cultivation of high-quality talents with innovation and practical ability, and provides conditions and space for top-notch talent in scientific and technological area.

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Research on the "structured interview" for the second examination of the Master's Graduate students.

At present, the "pocket laboratory" teaching philosophy [4-9] has been adopted by many universities in China, such as the MCU course of Tsinghua University [10], the digital electronic technology course of Xi'an Jiaotong University [11]. The common implementation method of these courses is to provide pocket experiment boards to students during the curriculum time and the boards should be returned by the end of the course. It leads to low resource utilization for only the students who attending the courses can make use of pocket experimental resources while the others cannot.

## II. THE CONSTRUCTION AND PRACTICE FOR POCKET LABORATORY SERVICE CENTER

The national electric and electronic experimental teaching demonstration center of HEU proposed to construct a school-wide pocket laboratory service center aiming at providing an all-opening, fully shared practice platform for autonomous learning inside and outside the class and it was initiated to construct in November 2014. By using the library information management system the service center achieved a series of pocket experimental resources management functions including borrowing, restitution, appointment and renewal. It innovatively solved the sharing and management difficulties of pocket laboratory, and finally realizes a wide range of implementation of the teaching philosophy of pocket laboratory. In this model, according to the demands of course and technological innovation students can borrow the resources freely.

The construction of hardware platform, information management system, information promotion platform for the pocket laboratory service center had been initially completed under the strong support of Texas Instruments, the endeavor of Laboratory and Asset Management Department and HEU Library. The center was formally opened to all of the teachers and students within the university in June 2015.

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### A. The Construction of Hardware Platform

The pocket experimental resources are the carrier of pocket laboratory service center. The top priority is to meet personnel training demand while building the pocket experimental resources. Comprehensively considering the restrictions of all aspects, especially the fund restriction, the resources had been built mainly to school-enterprise cooperation donations, meanwhile resources purchase and teacher development to add. The hardware platform covered electronic technology, digital circuits, communication circuits, MCU technology, DSP technology, ARM technology, FPGA technology, and provided chain-style resources for students to learn autonomously.

Importing pocket experimental resources through school-enterprise cooperation may solve the shortage of school educational resources by importing the resources through school-enterprise cooperation [12], and provide more teaching resources for teachers and students to master the world's leading technology in practice. The electric and electronic experimental teaching demonstration center of HEU had established cooperation with several international well-known technology companies such as Texas Instruments, Agilent, Xilinx, Altera, etc. Texas Instruments had given a great recognition to the philosophy and management style of pocket laboratory service center and provided strong support. As of March 2015, Texas Instruments had donated more than 5,000 sets of pocket laboratory kits which involved analog technology, MCU technology, ARM technology, DSP technology, with a total value of more than 150 million. So that the pocket laboratory service center reached to a school-wide opening scale.

Pocket experimental resources and related technology donated by school-enterprise cooperation subject to the enterprise production line, it is difficult to fully meet the needs of personnel training, self-development and university purchase are the effective complements to the resources. Taking into account the electrical courses training plan, self-development for analog pocket laboratory and university purchase plan of FPGA pocket laboratory had been proposed. It was a good solution to the problem of corporate donations.

### B. The Construction of Information Management System

In order to achieve efficient management and maximize use of the limited resources, it's the key issue to establish an information management system. Therefore the establishment model of HEU Pocket Lab Service Center basing on the "Library" management concept, sharing the library information management system is the most effective solution. Through using the library database management system, resources borrowing, restitution, appointments, renewals and other management functions had been ensured, and it was also possible for students and teachers to view the remaining resources through network, which greatly facilitated the pocket experimental resources circulation and sharing.

### C. The Construction of Information Promotion Platform

In order to make sure all students can keep abreast of the information issued by the pocket laboratory service center and make better use of the resources, the micro-channel public platform for pocket laboratory service center had also been built, including profiles (Introduction, rules and regulations, open time,

building documentary), resources (new releases, resource overview, classification navigation), service (bulletin news, guide service, technical support, FAQs, feedback).

### D. The Construction of Operation and Management Regulations

As a kind of new-style "book", it brings many challenges for pocket experimental resources' management and maintenance. To strengthen the management, the "pocket laboratory service center Management Regulations" had been established, in which resources borrowing, restitution, appointments, renew, overdue reminders etc. had been clearly defined, especially the approaches for lost, damaged, overdue of pocket experimental resources. "Pocket Lab Service Regulations" provided an effective protection for pocket laboratory service center's running.

## III. THE SIGNIFICANCE IN PERSONNEL TRAINING OF POCKET LABORATORY SERVICE CENTER

It could be seen from the operation of the past four years that the all-opening pocket laboratory service centers were greatly welcomed by the students, which provided more independent learning resources for students and had great significance for innovative talents. The loan quantity of pocket laboratory service center is more than 2500 units a year.

Especially, the management philosophy of pocket laboratory service center builds an open resource sharing platform, innovatively solved the difficulties of pocket laboratory sharing and management, which contributes to a better implementation of pocket laboratory teaching philosophy. The construction achievement provides certain reference and is worth popularizing.

Based on the pocket laboratory service center, the teaching reform of analog electronic technology and electronic system design (FPGA) had been carried out in our university, and good teaching results had been obtained

Looking into the future, relying on the pocket laboratory service center, teachers could practice the education reform and promote the construction of MOOCs, micro-class, digital textbooks, multimedia textbooks and other network-based, digital learning resources. Meanwhile, school-enterprise and inter-college "pocket labs" innovative education platform will be synergistically built to complement each other's advantages by sharing digital teaching resources. It will achieve maximum use of teaching resources, and has great significance for cultivating students' innovative spirit and practical ability.

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