

## Design construction and application of mobile laboratory under wireless signal coverage of campus network

Xiaojun Lu

Harbin University of Commerce, Harbin, China

lxjharbin@126.com

**Keywords:** Campus network; Mobile laboratory; The wireless network

**Abstract:** Theory of teaching space, through the combination of campus wireless signal and mobile terminals, set up mobile laboratories, can thoroughly ease the growing tension hardware resources shortage of teaching and practice teaching demand, the contradiction of the protection practice teaching work, fully expand the students' experimental teaching space, improve the experimental teaching environment and conditions. Mobile laboratory not only reduce the construction cost, but also reduces the follow-up maintenance of a series of spending, aimed at school classroom in theoretical teaching at the same time, both the purpose of the experiment teaching, in order to realize the double efficiency of school teaching space resources.

### 1. Introduction

With the popularization and acceleration of mobile Internet, the functions and resources of mobile intelligent terminals are increasingly integrated into daily work, study and life. 2012 national push to carry out the "Three links and Two platform" education informatization construction, 3G,4G and wireless campus construction of rapid development, the education information technology progress and education teaching reform, promote each other, through constant practice and summarizes the informationization teaching, combining with the laptop, mobile phone, tablet, ebooks as a representative of mobile personal learning equipment, the modification of the classroom, add network mobile laboratory function, starts to take on the appearance of the new classroom teaching activities. Using mobile technology to innovate teaching methods, means and modes will also be the forefront of education teaching reform in modern higher education. Among them, the construction of a suitable teaching environment to carry out mobile teaching and experimental activities, teaching innovation will be twice as effective with half the effort. This paper attempts to propose a method to improve the mobile teaching environment and to promote the optimization of teaching effect through the reasonable use of relevant equipment.

Mobile experimental teaching based on "Mobile Internet +" is an important problem in education teaching research. Easy to take with laptop, smart phone, tablet PC, ebook mobile devices such as the function of increasing and more and more low price, Wifi, 4G network connection mode is more and more popular, the development of mobile laboratories can greatly satisfy the needs of personalized learning, mobile learning and flip gradually integrated classroom teaching mode, "mobile Internet +" new thinking, new path of teaching information technology, in the process of education informationization is of great significance. Mobile laboratory construction broke through the traditional classroom/room fixed location, fixed position, fixed way of learning experience, teachers and students interact also more flexible and convenient, less investment and benefit is bigger. Student's notebook, flat computer and mobile devices such as smartphones have basic popularization, the ability to computing, storage, and network hardware with the foundation of mobile learning, mobile anytime and anywhere experiments need to make full use of the individual bring their own equipment, this is the "mobile Internet +" education popularization of important opportunities. Experimental teaching content and interactive communication platform can increase the learning stickiness of students, and mobile devices can help students develop mobile experimental tasks. With

networking environment in the campus, lets the student mobile devices become learning tools, and not only in the social and game, serves the common expectations of colleges and universities, teachers and parents, is also a "mobile Internet +" experiment teaching mode and the autonomous learning mode research important topic.

Mobile Internet is not the expansion of traditional Internet, but the reconstruction of classroom function based on mobile thinking. The teaching conditions of mobile laboratory require that the platform and terminal should be built for the future mobile environment to match the content and teaching mode of experimental courses, as well as the traditional PC architecture. Mobile laboratory construction is not easy to own experiment teaching content and the integrated platform, especially can realize: all-weather access at any time, and instant feedback interaction, and other functions, the feasible direction of experimental teaching reform, this is the future at the same time is low enough to begin immediately action plan. Mobile experimental classroom building, facilitate fast, flexible deployment, for tablets and other mobile terminals, compatible with PC, support online use and management of teaching resources, students can learn and do in ordinary classrooms, and show better effect and interaction, with the expansion of field experiment teaching practice, can greatly promote the mobile digital teaching resource construction, testing and development. Based on this environment, we can further develop or purchase a virtual simulation laboratory based on tablet computer to meet various professional requirements. Mobile terminals used in mobile interactive classrooms should operate smoothly to bring a good learning experience. The main features of mobile interactive teaching are stability, simple operation, portability and adaptability to future development.

## **2. Research status**

Komaba Active Learning Studio (KALS) is at the university of Tokyo in May 2007 to practice a future classroom, based on reinforcement Learning space infrastructure and a large number of the cutting edge of information and communication technology integration practices, support includes discussions, group collaboration, speech presentation and other types of Active Learning; At the same time, the optical fiber communication, multi-function terminal display, the rapid development of multimedia electronic technology such as audio systems, it has been into the "Internet +" era, the use of advanced electronic communication technology, software engineering technology development such as multimedia classroom information system, can realize the teaching resources sharing and intelligent. Mei-xia Zhang (2016), from the perspective of global education informationization, how to use the information thinking to guide the construction, management and service of college multimedia classroom, to break the existing planning, investment, security problem put forward the train of thought of dong-hui Zhang (2017).

Comprehensive research at home and abroad, "wisdom" of the classroom, "classroom" future although for informatization practical teaching provides the ideal form of teaching form, but widespread long construction period, high cost, etc, this kind of characteristic cannot solve the plight of the current in the practice teaching in our school.

To the traditional classroom informatization modification, with the aid of network communication technology, the traditional classroom teaching task, ease the growing tension hardware resources shortage of teaching and practice teaching demand contradiction, to carry out the experimental teaching idea, guarantee normal to carry out the practice teaching and practice teaching reform in colleges and universities is imperative.

## **3. Purpose and meaning**

Based on the status of each college practical teaching hardware resources, using existing basis of campus network, put forward the corresponding solutions and implementation, the traditional classroom informatization modification, aimed at the practical teaching in colleges should be resolved in the process of teaching hardware resource shortage problem of reality.

The construction and realization of mobile laboratory, exploring and improving the theory and method of traditional classroom information construction. Will the school teaching hardware resources on the basis of the existing low cost, high efficiency renovation, expansion of existing functions, add new functions, improve the utilization of teaching resources, and puts forward a new solution and the solution, has the high generalization and realistic significance.

#### **4. Feasibility analysis:**

(1) The cost of the feasibility analysis: based on the traditional classroom for wireless AP network terminal cover, don't need to make structural modification of the original classroom, as well as the high technology and equipment investment, reduce the cost of the project, improve the feasibility of the project.

(2) The technical feasibility analysis: buy ARUBA wireless controller, and establish a set of Airwave network management system, make it to all wireless network equipment and wireless user management and monitoring, achieve the project's technical requirements.

(3) Feasibility of application scope: through diversified application of wireless terminals, the wireless network coverage of colleges and universities is utilized to carry out experimental teaching tasks with multiple hours and Numbers of students.

#### **5. Implementation plan**

##### **5.1 Core terminal design of mobile laboratory**

In the planning of mobile laboratory core side, on the premise of full size of the wireless network analysis, on the basis of wireless network design standard specification requirements, we will be in this project USES the original Aruba controller as a wireless network center core equipment.

##### **5.2 Construction of access terminal of mobile laboratory**

By covering the area of the mobile laboratory analysis and debugging of the investigation, the design of the network access client AP Suggestions to the equipment, according to different installation location using built-in antenna AP model.

##### **5.3 Planning of indoor coverage mode**

Under the condition of without changing the traditional classroom structure, using the principle of the wireless AP indoors, the indoor AP information point using has provided at the end of the cable RJ45 connection head directly connected to the AP installation seamless roaming consideration: on the premise of meet the signal without blind area design between the AP and AP overlap area of 20-25% of the signal to ensure seamless roaming function. The ARM function of Aruba system is used to dynamically adjust the channel and power between AP, and the effect of the same frequency interference on wireless network performance is minimized.

#### **6. Effect and promotion**

Through wireless AP access terminals, mobile operation in lab was realized, the design of the wireless network can realize the core end at the same time to carry out various campus practice teaching content, make the practice teaching is no longer restricted by laboratory geographical position and seating capacity. In the use of wireless controller based on the original, by increasing the density of the wireless AP, lets the student in the classroom to achieve large-scale, big flow quick access, fully meet the modern teaching, study and research aspects of information, such as functional requirements. ManYouShi of wireless AP technology to achieve the teaching, rich in the teacher's teaching way, mobile laboratories will provide more convenient and quick for the teachers and students in colleges and universities in the network environment and the teaching environment, fully realized the transformation of the traditional teaching mode.

After completion of construction, can be fully realizing a complete coverage of the campus at the university of type any theory free classroom quickly "transformation" as the mobile laboratories, thoroughly ease the growing tension hardware resources shortage of teaching and practice teaching demand, the contradiction of the protection practice teaching work. At the same time, it can also solve the shortage of laboratories for colleges and universities across the province and even the whole country.

## **7. Enlightenment and discussion**

The construction of mobile laboratory integrates offline and online teaching, which is in line with the general trend of mobile. If it is gradually integrated and adapted over a period of time, there will be a very broad development prospect in the future. Accelerate the construction of mobile laboratories, to provide convenient and quick application platform for teachers and students, the construction of "everywhere, all the" learning campus, construction integration happy happy teaching, learning and life as one of the educational environment, to promote education reform and innovation, to build a personalized college education system and lifelong training system, to cultivate innovative talents with high quality.

## **Acknowledgements**

This project is supported by the practical teaching reform and research project of Harbin Commercial University in 2018 (subject name: mobile laboratory design and construction and application) and the higher education teaching reform research project of Heilongjiang Education Department in 2018 (subject name: mobile laboratory design and construction and application).

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