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MOOCs (Massive Open Online Courses) Mode Construction Based on WIFI M-Learning

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Abstract

In future, almost half of the undergraduate universities will transform towards the direction of application technology and vocational education and meanwhile accordingly assume the mission of cultivating high-quality skilled talents for the country together with existing colleges and universities. The basic educations of existing universities are restricted by such problems as shortage of teaching staff and high-quality courses for a long time, and the combination of M-learning and MOOCs will provide an effective approach for solving above problems. Large-scale and complete-coverage WIFI construction has been basically completed in university campuses and the number of students with intelligent terminals has been significantly increased, thus to basically form a good M-learning environment and promote M-learning from discussion stage to large-scale practice stage. Therefore, it is necessary to create MOOCs with higher education characteristics and establish M-learning environment in universities in order to make learners achieve effective M-learning.

Keywords: *University Characteristics; MOOCS; M-Learning; Platform Construction*

1. Introduction

It is impracticable to simply transplant MOOC in China, and we need to create Chinese style MOOCs.

Meanwhile, it is also impracticable to simply transplant MOOCs development pattern of common universities to higher vocational education, and we still need to create MOOCs with university education characteristics.

Development and progress of information technology have brought significant revolution to the learning style and meanwhile the change of learning style at each time has also promoted the progress and development of education. From D-learning to E-learning and then to M-learning, the teaching style of teachers and the learning style of students have also been changed along with the development of ubiquitous "cloud computing" and "mobile internet thought", and MOOCs can adapt to the above changes. Actually, the seamless coverage of WIFI in campuses and the popularity of smart mobile terminals among the students in universities have provided guarantee for M-learning realization.

2. Current Situation of M-Learning and MOOCs in China

2.1. The First Ten Years of M-learning in China

In China, "M-learning" concept was firstly introduced by international remote educators Doctor Desmon dKeegan in the academic report themed as *D-learning E-learning M-learning* to the 40th anniversary of Shanghai Television University in 2000. The report aimed at adopting the three concepts, namely D-learning, E-

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learning and M-learning to explain the past, the present and the future of distance education [7]. Additionally, M-learning was officially concerned in the theoretical and practical research for developing "M-learning" carried out by the High Education Department of Ministry of Education in December 2001, wherein the core contents of the research included two aspects: namely the establishment of "M-learning" information network and the establishment of "M-learning" service station system. However, due to the limitation to the wireless network construction and the holding quantity of intelligent mobile terminals in campuses in the past, M-learning was basically in the exploratory development stage.

2.2. MOOCs Situation in China

(1) MOOCs situation in common universities

As new teaching style, MOOCs are impacting the traditional teaching style in universities, thus to force teachers to change their teaching styles.

In recent two years, MOOCs have been widely applied in such economically advanced counties as European countries, North America and Japan, and the typical MOOCs include Coursera, Udacity, EDX, *etc.* In order to respond to the challenge of foreign MOOCs to Chinese higher education, such universities as Tsinghua University and Peking University have also joined EDX. Specifically, Peking University issued the first batch of MOOCs in EDX platform on September 23, 2013; Tsinghua University promoted MOOCs platform "Online School" on October 10, 2013 in order to internationally provide online courses [8]; subsequently, other universities in China have also promoted their own MOOCs, thus to form Chinese style MOOCs.

MOOCs platform developed by Southwest Jiaotong University together with National Chiao Tung University, Shanghai Jiaotong University, Xi'an Jiaotong University and Beijing Jiaotong University can be regarded not only as the model of MOOCs with university characteristics, but also as the example of MOOCs construction objective for higher vocational colleges with highly industrial characteristics.

(2) MOOCs situation in higher vocational colleges

The development of MOOCs in higher vocational colleges is still in recognition and exploration stage, research and application of MOOCs in higher vocational colleges are lagged behind those in common universities. Of course, a batch of higher vocational colleges are exploring the way for applying MOOCs to higher vocational education.

On March 22, 2014, Lv Xin, the Deputy Director of Ministry of Education, revealed in China Development Forum that the Ministry of Education would transform more than 600 local undergraduate universities towards the direction of application technology and vocational education. This means that 50% of the universities among about 1,200 common universities will more focus on specialties rather than subjects so as to cultivate high-end professional talents according to the demands of enterprises and society. These common universities are much stronger than common higher vocational colleges in the aspects of teacher quality, practical training conditions and information learning conditions, and the entering of these universities to the vocational education field will not only bring survival pressure to higher vocational colleges, but also promote higher vocational colleges to deepen the transformations in various aspects, thus to accelerate the construction, application and development of MOOCs in higher vocational colleges. The opening ceremony of "Nationwide MOOCs Teacher Training Class for Higher Vocational Colleges" held by the Vocational College Information-based Teaching Steering

Committee of Ministry of Education and Higher Vocational Committee of AFCEC (Association of Fundamental Computing Education in Chinese Universities) and undertaken by Electronic Information School of Shandong Institute of Commerce and Technology in March 2014 may be the official key step in MOOCs construction for higher vocational education.

2.3. Availability of M-learning Realization Condition for Higher Vocational Education

(1) Large-scale networked mobile terminals in higher vocational colleges

The survey data of the research subject "2011 Information Construction and Application Status in Universities" carried out by Science and Technology Center of Ministry of Education indicates (as shown in Figure 1) shows:

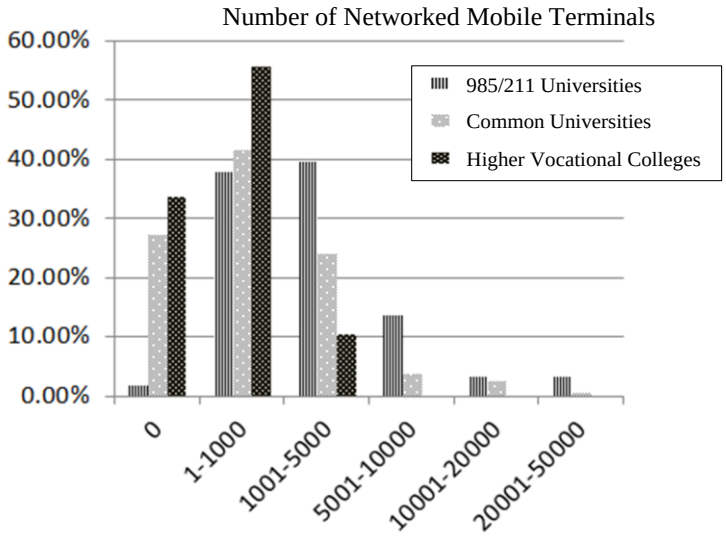

Figure 1.

Along with the promotion and the popularity of mobile internet in campuses, the application of mobile terminals tends to be widened, wherein the application of mobile terminals in 985/211 universities seems more mature, namely averagely 4,505.404PCS/school, and the quantity of networked mobile terminals in 985/211 universities is mainly centralized in the two ranges of 1-1,000 and 1,001-5,000, with the maximum value of 20,000, and the quantity of the mobile terminals in common universities and higher vocational colleges is mainly centralized in the range of 1-1,000[9]. However, in consideration of the scale and the number of students in higher vocational colleges, the proportion of the networked mobile terminals to the students in higher vocational colleges is relatively high.

(2) The mobile terminals owned by the students in higher vocational colleges can basically meet M-learning condition

The proportion of the students with mobile phones, especially with smart phones, in higher vocational colleges is very high. The survey result of various information terminals owned by the students in our university is as shown in Table 1.

Table 1. Survey of Various Information Terminals Owned by Students in Changsha University of Science and Technology

Number of Interviewed Students	Number of Students with Computers	Number of Students with Smart Phones	Proportion of Students with Computers	Proportion of Students with Smart Phones
7936	6199	7313	84.71%	92.15%

Note: ① Survey date: January 2015.

② Our university has about 12,000 students from economically backward regions, and the number of the personal computers owned by the students could not represent the corresponding situation in economically developed or relatively economically developed regions. Most students have smart phones with bearable prices in order to conveniently contact with their families, and the proportion of the students with smart phones should be slightly different from that in developed regions.

The survey result shows that a small amount of students have personal computers, because most students in the university are from rural poor families. Obviously, this is very unfavorable for the learning under E-learning style. Although the university has invested a lot of money to construct campus network, the students still fail to independently learn or support learning through the campus network due to the limited number of computers owned thereby. As a result, the digital campus sharing platform fails to give a play to its expected function.

Meanwhile, the survey shows that the proportion of the students with smart phones is very high and M-learning condition is basically mature, thus ensuring the conversion of learning style in higher vocational colleges from E-learning style to M-learning style and making the digital campus sharing platform give a full play to its advantages.

3. Purpose and Significance of M-Learning Application and Establishment of Moocs with University Characteristics

MOOCs with university characteristics shall have MOOCs standards and connotation, serve the higher vocational education and integrate interactive learning, practical training, virtual simulation technology, *etc.*, thus to fully present the industrial characteristics.

Firstly, it is necessary to take MOOCs to reconstruct the open vocational education system and establish the excellent MOOCs with regional and industrial characteristics for the higher vocational education.

Secondly, the higher vocational colleges can comprehensively and systematically promote the mixing education revolution in the aspects of theory, technology, practical training, *etc.* by virtue of MOOCs. Meanwhile, it is necessary to adopt M-learning and MOOCs to improve teaching, lerning and management in order to provide the university students with the interactive learning style which is more practical and is more different from E-learning.

Higher vocational MOOCs are oriented to all audiences, namely university students and employees. M-learning is an approach for the university graduates with learning wish to continue to learn after graduation, thus to establish a really open life-time vocational learning platform. Such education mode combining university education, practical training of enterprises and life-time learning can be realized for the vocational education by MOOCs, thus to seamlessly connect universities and enterprises, students and employees, learning time and learning space, students and teachers. In this way, the vocational abilities of the students and the teachers will be well improved [10].

Due to the openness of MOOCs, the boundary of the adjacent disciplines becomes fuzzier. For example, the students majoring in clinical medicine may take the

traditional Chinese medicine courses as the optional courses, and the students majoring in medical image may take electromechanical information courses as the optional courses, thus to deeply learn their courses in a personalized way and widen their knowledge scopes through self-learning.

Finally, it is necessary to further promote the achievements based on information technology, communication technology and scientific learning in the higher vocational colleges, continuously optimize course design, share the high-quality education resources, converge various assets and technological resources, strengthen the social service function of the higher vocational colleges and promote the cooperation between universities and enterprises so as to continuously improve the quality of the higher vocational education and the talent cultivation, and promote the revolution of the concept, the learning style and the education style of the higher vocational education.

4. Main Contents of M-Learning Application and Establishment of Moocs with University Characteristics, and Key Problems to be Solved

4.1. Main Contents of M-Learning Application and Establishment of MOOCs with University Characteristics in Higher Vocational Colleges

(1) Establishment of MOOCs with vocational characteristics;

Viewed from a small scope: various colleges and universities have currently established college-level, provincial-level and national-level excellent sharing courses with their own characteristics, and more excellent sharing courses and teaching resources will be provided in future. On this basis, these universities can firstly establish their own MOOCs and cultivate a large batch of teachers to apply such modes as M-learning and “Flipped Classroom” so as to convert teachers’ role and change students’ learning style, thus to maximize teaching and learning benefits.

Viewed from a large scope: based on the excellent resource library for various national courses, it is necessary to firstly integrate the university courses with industrial characteristics and then convert or remake these courses through technological means into the online courses suitable for M-learning application and able to meet MOOCs standards, thus to form university MOOCs with the vocational characteristics for the fields of machinery, electronics, architecture, medical science, tourism, *etc.*

4.2. Key Problems to be Solved

Firstly, MOOCs under M-learning style not only widens students’ learning style, but also brings strong impact to university teachers’ intrinsic teaching style. Teachers shall regard the micro-courses as the important teaching link and request the students to “attend the class” outside the classrooms, and then focus on guiding the students to explore and solve problems in actual classrooms. Actually, such “flipped classroom” will be favorable for promoting teachers’ role to be converted from lecturers and explainers to learning inspirators, developers and guiders and further to counselors for students’ knowledge acquisition [12].

Secondly, the platform construction for MOOCs under M-learning style needs project funds which are very difficult for many universities to obtain.

Thirdly, it is necessary to cultivate a team combining training and introduction, association and cooperation, as well as professional teachers and teaching designers & producers.

MOOCs bring revolution to teaching design and promote teachers to change teaching method. Actually, it is difficult for most teachers to make micro-courses, so it is necessary to strength training and the best way is to establish a team combining professional teachers and teaching designers and producers in universities.

5. Construction of WIFI, M-Learning and MOOCs Platforms in University Campuses

5.1. WIFI Platform Construction in Campuses

(1) WIFI is a WLAN standard

With the full name as Wireless Fidelity, WIFI is an industrial standard defined by IEEE (Institute of Electrical and Electronic Engineers) for wireless network communication. As a part included in WLAN (Wireless Local Area Network), WIFI is a new technique based on WLAN protocol and is composed of AP (access point) and terminals with wireless access function [13]. The places including available WIFI network are called hot spot areas, the coverage area of WIFI is about 100M (related to AP hot spot source power) while that of WLAN (equipped with antenna) can be expanded to several square kilometers. Any wireless network terminal such as notebook computer and panel personal computer as well as the smart phone with WIFI function, can wirelessly and speedily access to WLAN through AP in WIFI coverage areas, thus to expand M-learning scope and meanwhile make teachers and students really experience M-learning and MOOCs.

(2) WIFI technology is compatible with Ethernet

Due to the adoption of software radio technology, 802.11n has completely programmable platform, so the wireless base stations and wireless & mobile terminals based on different systems can adopt different software to realize mutual communication through this platform, thus making WLAN have strong compatibility. WIFI technology is structurally consistent with Ethernet, so WLAN can be easily and seamlessly connected to the wired broadband network. In this way, the existing wired broadband frameworks in campuses can be adopted to rapidly establish the seamlessly covered WLAN networks in campuses. Then, after being slightly processed, the learning contents in the existing digital platforms in campuses can be put in campus WIFI for teachers and students to freely experience M-learning in campuses.

(3) The best way is to cooperate with mobile company for campus WIFI construction

At present, the colleges in various places choose to cooperate with mobile companies who are completely responsible for WIFI construction and do not obtain any investment from colleges, thus to realize complete WIFI coverage for dormitory, library, teaching building, administrative building, student center, *etc.* in campuses through wireless access equipment APs of mobile access providers. Through wireless switches, mobile data interface servers and digital teaching platforms in campuses, teachers and students can freely use WIFI access to link to the mobile courses of their universities, thus to realize free M-learning but paid Internet access service in campuses as well as win-win cooperation between mobile access providers and universities.

5.2. M-Learning and MOOCs Hardware Platform

M-learning and university MOOCs hardware platforms shall be able to meet MOOCs standards, and meanwhile the hardware platforms for campus WIFI and mobile internet shall be also introduced therein in order to enable users to learn, communicate and discuss at any time and at any place through smart phones, panel personal computers, *etc.*, Additionally, such platform shall be able to support common mobile terminal systems, such as iOS, Android and Windowsphone, and shall have following features [14]:

1. Highly salable;

2. Massive number of concurrent users, and concurrent online learning;

3. Good online system response;

4. Stable enough to ensure online login at any time (7X24);

5. Global access; open for any person at any place;

6. Portability; available for multiple terminals and any browsers;

7. Based on J2EE technical system and three-layer structure; adoption of centralized management data resources.

At present, the servers, the core routers, the core switches and relevant protection equipment in the network centers of many colleges and universities have enough remaining capacity to access thousands of terminal users at the same time. Therefore, on this basis, such equipment as stream media server for micro-videos, resource library server for virtual simulation or other practical resources, mobile interface servers, wireless switches and wireless access APs can be added to meet the smooth interaction and video requirements for the courses. Framework and topology of M-learning and MOOCs hardware platform are as shown in Figure 2.

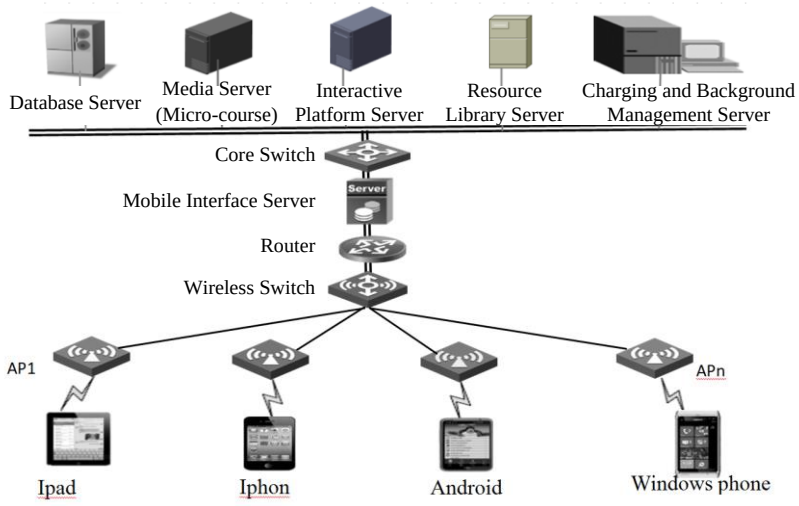

Figure 2. Framework and Topology of M-Learning Hardware Platform System

5.3. M-Learning and University MOOCs System Platform

We intend to create a MOOCs system platform able to cover such important teaching links as "teaching, learning, management, assessment, evaluation and source" and meanwhile have university characteristics, as shown in Figure 3 [15].

University M-learning and MOOCs system platform shall have following characteristics:

1. MOOCs shall combine the excellent university courses and the industrial characteristics, and the platform shall be able to extend the course access and the interaction between teachers and students to various terminals and accordingly support learning at any time and at any place through any method.

2. The platform shall cover such core teaching links as "teaching, learning, management, assessment, evaluation and source" and shall be perfectly integrated with the university subject teaching through information technology.

3. The platform shall present the university teaching and learning characteristics for vocational ability cultivation, thus to cover students' weakness in imagination and logical thinking ability during vocational education process.

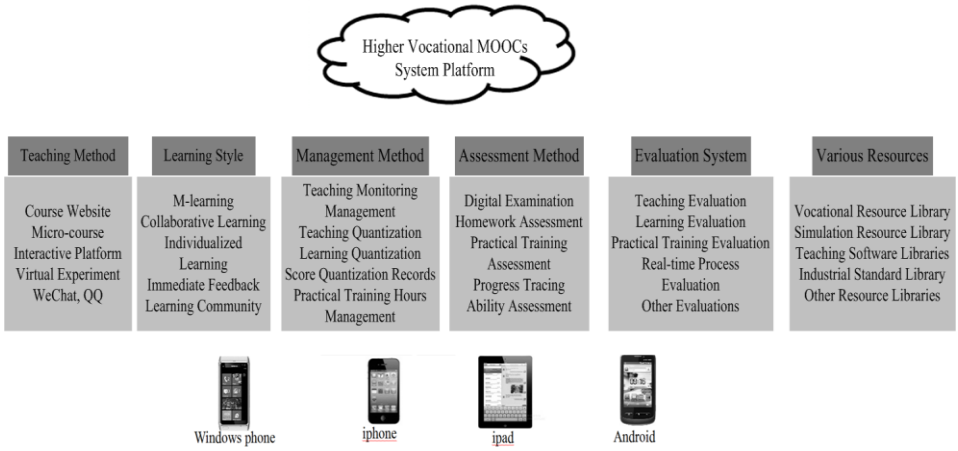

Figure 3. Higher Vocational MOOCs Application System Platform Module

4. The teaching system platform based on big data shall be able to automatically record all behaviors of teachers and students in the platform and give corresponding quantitative evaluation.

5. The platform shall be provided with high-quality digital resource libraries integrating various industrial big data for teaching and learning, such as videos, animations and simulation teaching software able to more vividly present knowledge and skills, so the students can solve practical problems in vocational scenes through M-learning.

At present, we have preliminarily established M-learning platform with higher vocational course characteristics based on above design idea, so teachers and students can open browsers on mobile terminals to access the website for M-learning. The platform has been provided with such modules with our own characteristics as the learning courses, micro-course display, virtual simulation, homework issuing, interaction, online test, QQ & Wechat, MOOOC College, online course of Tsinghua University and open class of Netease. Relevant test shows that such mobile terminal systems as iOS, Android and Windowsphone can normally access the website, as shown in Figure 4.

Figure 4. M-Learning Platform of Changsha University of Science and Technology

With strong background management ability, the platform can provide corresponding course management functions to different teachers in order to facilitate teachers to issue courses, homework, micro-course videos, *etc.*, and it has obtained good effect ever since the trial operation thereof. In future, we will not only focus on managing and evaluating the system platform, but also focus on constructing and developing the resource libraries, thus to continuously perfect the platform.

6. Conclusion

The first key point for creating MOOCs with university education characteristics for M-learning through campus WIFI is to establish higher vocational college MOOCs alliance with distinct vocational characteristics (machinery, electronics, agriculture, medical science, tourism, finance and economics, *etc.*). Although it is very difficult for western countries to establish such alliance, but for China ---- an education orientated country, such alliance can be established under the coordination of the educational competent department to “publicize” the network micro-courses with industrial characteristics and further link these courses into “large-scale” course cluster in order to not only form MOOCs with Chinese vocational education characteristics, but also effectively remove school-major barriers, thus to establish the “flyover” among different vocational education layers and between diploma and non-diploma educations and integrate academic education with life-long education and vocational training as well as establish a new higher vocational education system. The second key point is to construct a WIFI network covering the whole campus, and WIFI network shall have two access functions, wherein the first function is the free access of digital campus network and resources in M-learning platform, and the second function is the internet access for more MOOC resources.

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