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Design of Course Teaching Support System Based on BYOD

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Abstract That students bring their own device (BYOD) into the classroom is the big trend of emerging technology used in education. BYOD builds a learning environment based on emerging technology and digital resources, in which the learning can't depart from the learning support system. Took "five key demand time learning" theory as a guide, combined with the course teaching mode based on BYOD, the study explored the teaching support system architecture, structure model of course content and teaching activities, the main module and working process. The empirical research has proved that model of teaching support system is reasonable, the function is perfect, and helps overcome unfavorable factors to learning, improves the learning efficiency and effect.

Keywords: *BYOD, course teaching, teaching support system*

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1. Introduction

That students bring their own device (BYOD) into the classroom is the big trend of emerging technology used in education, which was put forward in NMC Horizon Report: 2014 [1] and 2015 [2] k-12 Edition, 2015 Higher Education Edition [3]. Auden and others believed that BYOD is not a single information product, also is not a single way of information application, but rather represents one kind of situation [4]. BYOD in the school is to provide a teaching scene: students bring their own equipment to enter the school, and participate in the study by BYOD based on the learning support system. A learning support system, which provides precise service, helps to overcome the unfavorable factors to learning, and improve the learning efficiency and effect.

2. Course Teaching Mode Based on BYOD

BYOD is introduced into course teaching, which is not only the change of teaching equipment, but also has a significant impact to the teaching time and space, the roles both teachers and students, teaching organization, interpersonal interaction, etc. [5] So, it must form a new teaching mode. Through exploration in three courses teaching, the study put forward flip teaching mode of "three sections and three classes" type under the support of BYOD, as shown in Figure 1. The flip teaching of "three sections of three classes" type includes three stages, which are "Basic learning before class - Deep learning in class - Extended learning after class".

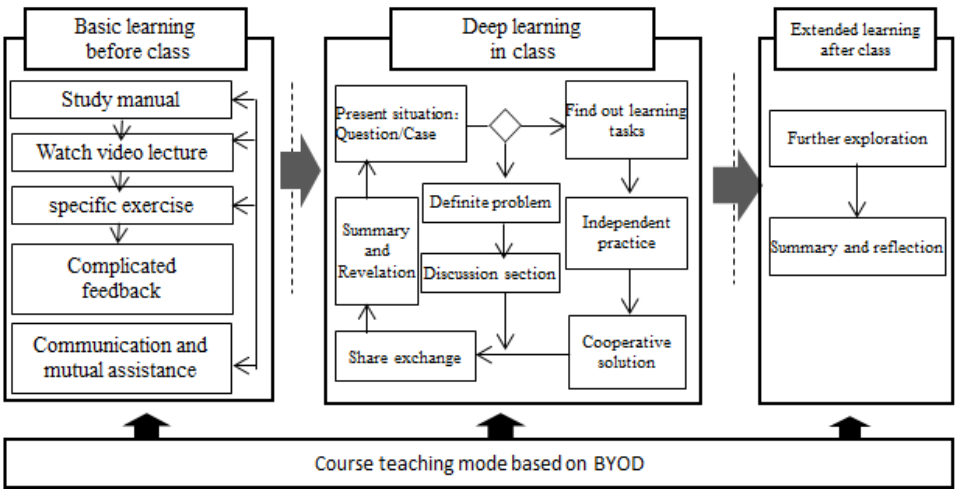

Figure 1. Course teaching mode based on BYOD

(1) Basic learning before class

Under the guidance of study manual, students conduct self-study by watching micro-video, and finish specific exercise. When meeting difficulties, online help and advice from teacher and partners are available. In this stage, students are supposed to memorize and understand fundamental conception and principles so as to make preparation in knowledge for deep leaning in class. The unresolved problems and difficulties are been feedback to teachers through the platform, which will provide important basis for teachers' classroom teaching strategy.

(2) Deep learning in class

Learners enter learning situations with pre-learned knowledge and pre-formed knowledge net. If it is a problem situation, students find the solution by group discussion. If it is a virtual project situation, independent exploring or collaboration is decided according to the project size. All the following factors like learners taking an initiative part in, seeking help of their teachers and classmates, making use of essential learning materials like information from the internet are necessary for meaning construction in both kinds of situations.

(3) Expanded learning after class

Expanded learning after class is a kind of spontaneous learning conducted by students having interests or need in which learners integrate theory with practice and make exploration. Learners are encouraged to record and share their exploration experience. For example, write a blog or make digital story.

(4)Teaching support system

Reasonable technology can not only reduce labor intensity, can also support for the decision of science teaching. Teaching support system can provide the following support as releasing learning materials, extracurricular learning supervision, communication and interaction, work sharing, online work, online tutoring, online collaboration, interaction evaluation and so on. In addition, it can also record the learning process, and format learning big data. According to big data, teacher analytics learning situation, organize teaching activities and evaluate the learner. A platform with perfect function and simple operation will greatly promote course teaching [6].

3. The Teaching Support System Model Based on BYOD

Conrad, who is Chief learning officer of APPLY Synergies and performance improvement experts for 30 years, thought that the learning is best in five key moment of study demand. Five key moments, respectively is learning new knowledge, learning more, change, problem solving, need to apply. Took “five key moment of the study demand” as a guide, combined with "three sections and three classes" type flip teaching mode, the model of teaching support system based on BYOD was constructed.

3.1. BYOD-based Teaching Support System Architecture

BYOD-based teaching support system adopts three-tier architecture based on Browse/Server [7], as shown Figure 2. The middle layer, which is the business logic layer of course teaching and the core of the whole system, mainly for teachers provides information release, resources management, process management and evaluation of learning, and for students provides learning resources, activity platform, communication platform and so on, ensures the smooth completion of the course teaching and learning. The underlying is data layer, which is used to store all kinds of information resources, and to provide data services to logic layer. The database of this system mainly includes the basic information, learning record database, micro-video repository and database of exercise, etc. Interface layer provides the entrance for teachers and students, which is presented in the web browse adapted to all kinds of terminal equipment of the web.

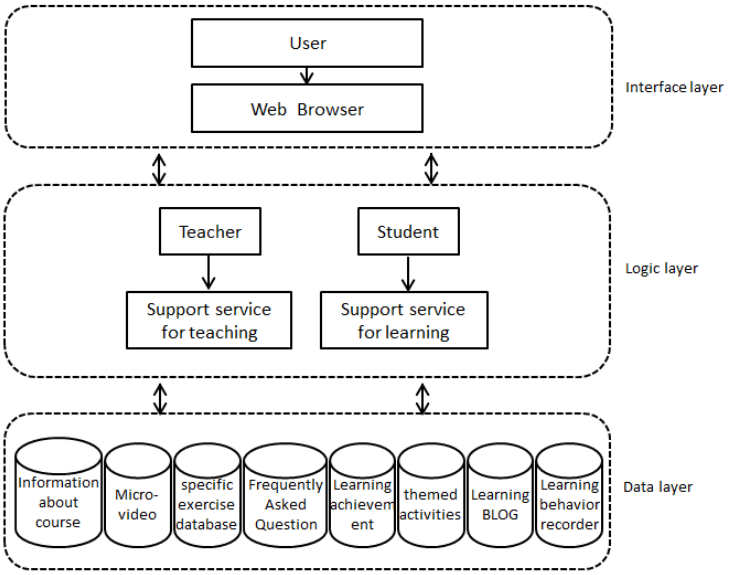

Figure 2. BYOD-based teaching support system architecture

3.2. The Structure of Course Content and Teaching Activity

According to the usual organization way of course contents, the content of a course has many chapters; each chapter is composed of multiple themes. BYOD-Based

curriculum teaching takes a theme as a teaching unit, and each teaching unit is divided into three stages, which includes lessons before, class and after class. Pre-class learning carries out based on a number of problems, each of which is explained by a micro-video, and with specific exercises. Learning activities in class is composed of a series of deep problem sets or themed activities, to raise students deep-learning. Extended learning after class is composed of a series of exploratory project. As is analyzed above, a theme is further refined by a series of problems, activities and projects [8]. Structure of course content and the "three sections and three classes" type teaching activity are shown in Figure 3 below.

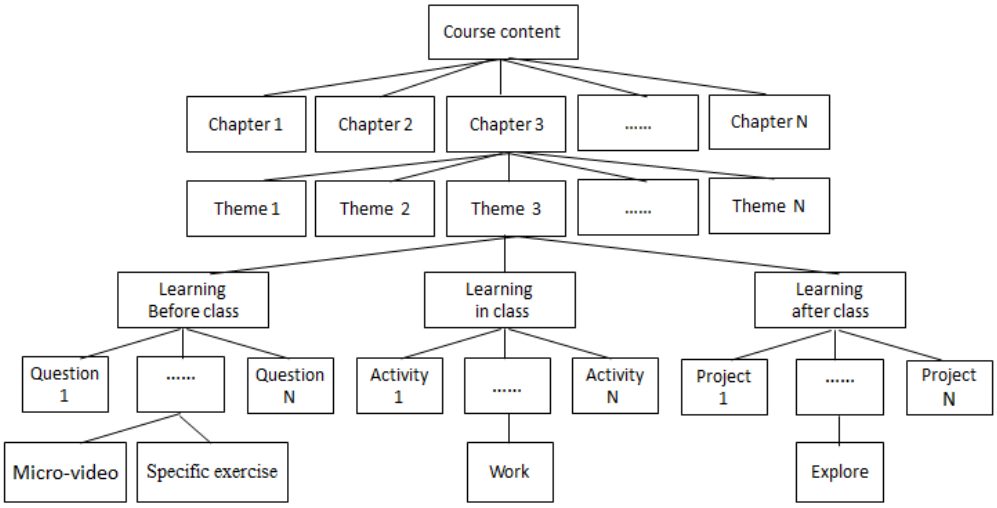

Figure 3. the structure of course content and teaching activity

3.3. Function and Working Process of BYOD-based Teaching Support System

BYOD-Based teaching support system includes two function modules for teachers' teaching and students' learning, specific function and work process are shown in Figure 4. When the user login into system, firstly system determines the identity of the user, if who is a teacher, directly link to the teacher management interface. Teachers can carry out resource distribution and management, activity management, learner evaluation and learning dynamic query, and so on. Learning dynamic query can be based on a certain learner, and also be a whole of class. After login into system, students select the corresponding learning theme in directory, and then according to the learning process enter into the corresponding modules: basic learning, deep learning and extended learning. Of course, the students can look up curriculum notice in bulletin board, online learners and learning dynamic.

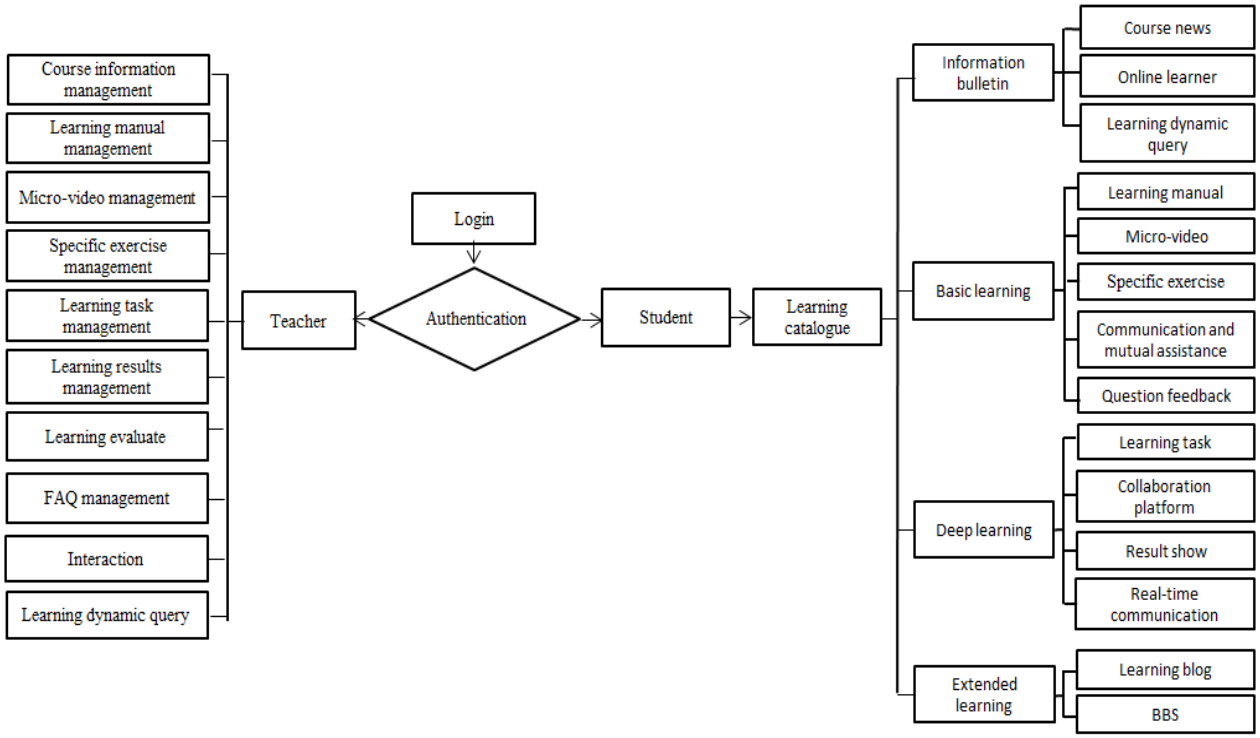

Figure 4. Function and working process of BYOD-based teaching support system

4. System Implementation and Application

4.1. System Implementation

The development of teaching support system based on BYOD includes client-side and server-side. Through client, Learners request learning resources or interaction activities to server after that identity information is verified on the server. The server is mainly responsible for validation information, management learning resources and processing interactive information, etc. The system was developed by MVC mode based on the J2EE technology in the Windows environment, deployment by running Apache Tomcat and MySQL [9]. The System is named "Lang-lang Teach", its interface of client as shown in Figure 5, server interface as shown in Figure 6.

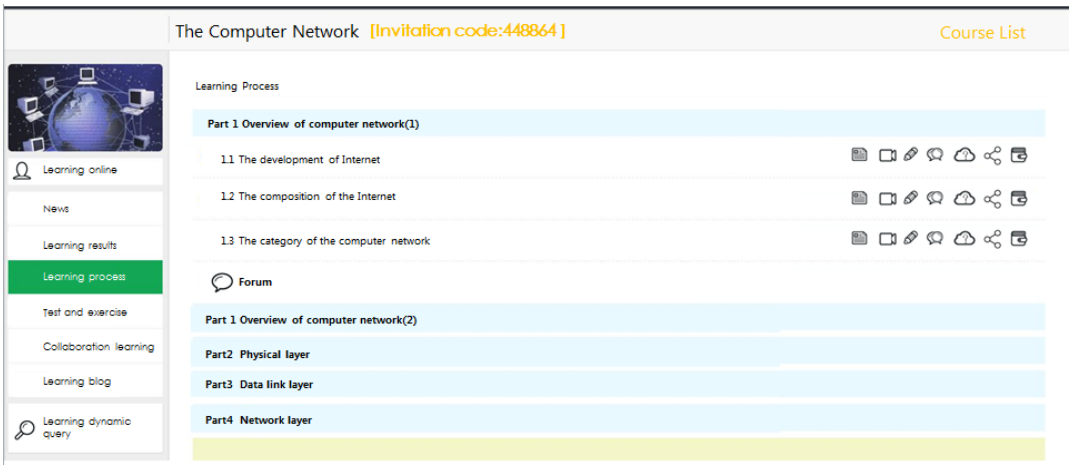

Figure 5. Interface of client

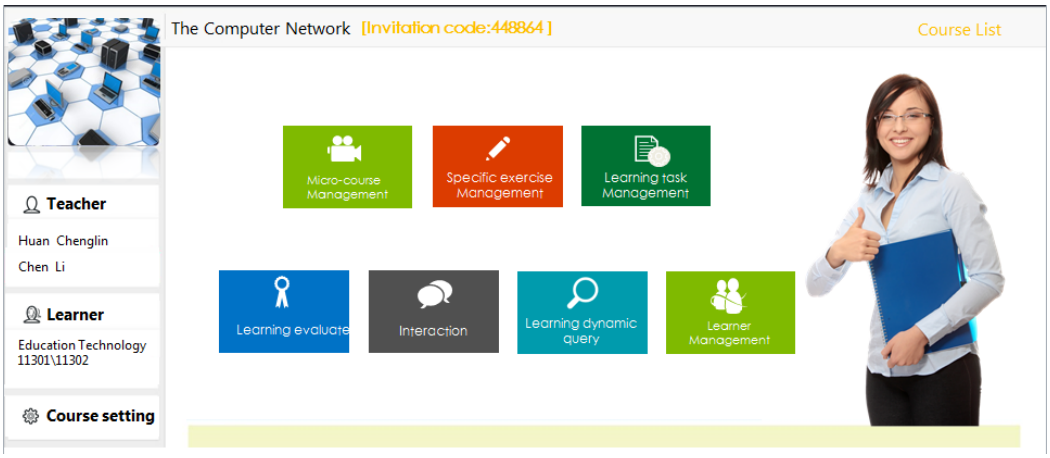

Figure 6. Interface of server

4.2. The Application of "Lang-Lang Teach" in Computer Network Curriculum

The computer network curriculum is a specialized elementary course of education technology professional. In 2015 spring terms, the course adopted flip teaching mode of "three sections and three classes" type under the support of BYOD. 31 students enrolled in this course are equipped with a laptop accessed "Lang-lang Teach" through the campus network. After finishing the teaching, we conducted a survey of application [10] and statistics about learning activities.

(1) The survey of system function design

The results of the survey are shown in Figure 7 below. 58% of the respondents think "sound", 21% of respondents thought "not perfect".

(2) The survey about experience of using

The survey results are shown in Figure 8 below. 90% of the respondents think platform structure is clear, rational layout, easy to use.

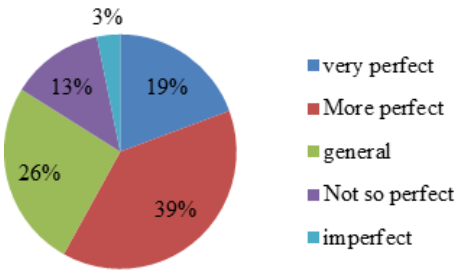

Figure 7. The survey of system function design

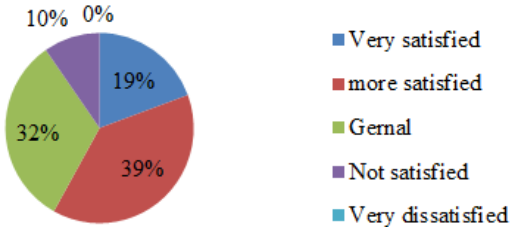

Figure 8. The survey about experience of using

(3) The investigation about learning support, are shown in Table 1 below.

(4) The statistical of learning activities. According to automatically record to the learning activity, learning activity participation are shown in Table 2 below.

Table 1. The investigation about learning support[1]

Help to master basic knowledge and skills	92.4%
Help to further study and the cultivation of advanced thinking ability	86.2%
Expand the horizons, cultivate the spirit of exploration and research	11.3%
Open, autonomous, and improve the learning efficiency	88.5%

[1]The calculation of the ratio: The total number of this activity multiply by the total number of students divide by the sum of students of each activity participation.

Table 2. The statistical of learning activities

View rate of learning manual	View rate of Micro-video	Completion rate of exercise	The number of question feedback	View rate of learning task	Completion rate of result show	The number of blog	The number of posts in BBS
92.8%	98.3%	72.6%	184	62.8%	87.6%	21	615

4.3. Application Analysis of "Lang-lang Teach"

(1) From the functional design, "Lang-lang Teach" Basically meets the requirements of flipped teaching based on BYOD. It can be seen through the questionnaire and face-to-face interview that the supports for basic learning is perfect, but the supports for deep processing and expanding learning is not enough. The mechanism to inspire learning passion and interest is needed.

(2) "Lang-lang Teach" helps to improve teaching efficiency and effect. For the learners' autonomous learning before class, platform provides support and protection, such as learners can facilitate access to learning resources, independent arrangement time, set the pace, etc. Thus, learners in classes focus on difficulty in learning, or to strengthen knowledge application and practice.

(3) "Lang-lang Teach" helps learners to overcome the disadvantage of learning. It is very important to monitoring and management learning process for the teaching based on BYOD. Statistics show that learners can easily presented difficulty to the teacher, and study BBS also provides interaction support for learners'. Interview with learners to reflect that the learning dynamic query urged role in learning to motivate yourself to learn. Targeted exercise, also let learners must keep attention in micro video learning.

5. Conclusion

Take integrated analysis of the above research, and the following conclusions can be drawn:

(1) Three layer architecture based on B/S, which mainly includes data layer, logic layer and interface layer, is suitable for BYOD-based teaching support system.

(2) Structure between course content and teaching activity is a hierarchical model. Its structure is “the curriculum - chapter - theme - learning sections - learning activities”.

(3) BYOD-based teaching support system has two kinds of roles, namely teacher and student. Tor teacher, the system provides many services, such as resource management, activity management, learner evaluation, etc. For student, the system meets the requirements of basic learning before class, deep learning in class and extended learning after class.

(4) "Lang-lang Teach" organically integrates inside and outside the classroom learning, teaching and learning, helps to the overall plan and the formation of system thinking to teaching and learning.

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