Construction of Collaborative Learning Environment Supported by Cloud-computing

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***Abstract*—In the field of education, cloud computing, as a basic environment and platform for the future network learning, will bring positive effect on construction of the learners' personal learning environment, on construction of school resources, on development of the educational information system. Based on the analysis of the cloud-computing influence on collaborative learning, this paper puts forward the construction strategy of collaborative learning environment supported by cloud-computing and the specific application case, which will provide reference for cloud-computing application in education informatization and social network learning.**

Keywords- cloud computing; collaborative learning; learning environment

I. INTRODUCTION

The coming of cloud computing has brought new development ideas to education information construction of our country---from the computer assisted instruction in the nineties of 20th century to the present social network learning with characteristics of cloud computing. Network learning has changed its focus from the content attention to the individual attention, and finally to the group attention [1]. Cloud computing has brought huge change not only to people's work and life, but also has a tremendous effect on the education mode and method. In the field of education, cloud computing, as a basic environment and platform for the future network learning, will bring positive effect on construction of the learners' personal learning environment, on construction of school resources, on development of the educational information system.

II. CLOUD COMPUTING

Cloud computing refers to migration of the large number of computer application to the Internet, which can store users' data and run the application program through the service providers' large-scale server-cluster mass storage and processing capabilities, while the users can have access to these application just through the browsers anytime and anywhere [2]. From the user's point of view, cloud computing is a kind of computer ability with the service mode, where people can use these services on any computers connected to the Internet at any time, any place, without downloading, installation, maintenance, upgrades of any software or platform. For instance, at present, people often apply cloud computing to information search, e-mail, network hard disk, uploading and online photo editing, writing online documents.

Cloud computing, because of its characteristics like powerful computing and storage capability, high sharing, high reliability and safety, low cost and high efficiency, has been increasingly applied in the teaching practice. Many teachers use cloud computing services to construct the network courses and the development of collaborative learning environment, to store teaching resources and make teacher-student interaction. For instance, Dr. Zhuang Xiuli from Beijing Normal University created a study website (sociallearnlab.org/) named "Social Learn Lab", which uses Good-looking Book, Wiki, Google code, Google group, SVN, Everydo and other cloud servers to connect the students, teachers and experts, who pay attention to education technology, with the current resources, forming a learning and research community [3]. That makes a good research for cloud-computing application in education.

III. COLLABORATIVE LEARNING

A. Concept of Collaborative Learning

Collaborative Learning refers to a teaching strategy where the learners can form a learning group according to certain rules and learning objectives in order to improve personal and team learning achievements through communication, cooperation and collaborative knowledge construction [4]. Each member of the collaborative learning team can share their information researched or found during learning with other members or other groups or the whole class. In this course, students can use dialogue, discussion, debate and other forms to prove the problems in order to achieve the learning objectives.

Cooperative learning is beneficial to the development of individual students' thinking ability, enhance students' communication with others and improve their ability to tolerate individual differences. At the same time, it has a significant positive role to improve the academic performance of students, to form students' critical thinking and creative thinking, to help their optimism towards learning content and schools, to deal with their self-respect and mutual respect between students.

B. *Concept of collaborative learning environment*

Cooperative learning has become a learning mode and has been widely used. It consists of 4 basic elements: cooperative group, members, tutors and collaborative learning environment.

The collaborative learning environment is an external condition to support learners to make collaborative learning activities, including the organization environment, the space environment, the hardware environment and the resource environment. The organization environment refers to the organizational structure of the members, including group division and function distribution of the members. The space environment refers to collaborative learning sites, like classrooms, Internet environment, etc. The hardware environment refers to the hardware used in learning, like computer-supported collaborative learning, collaborative learning based on the Internet and so on. The resource environment means the resources for collaborative learning, such as a virtual library, Internet etc.

C. *Cooperative learning supported by cloud-computing*

Professor Li Jiahou believes that cloud-computing-assisted instruction refers to "the educational cloud service supported by the teachers and students through cloud-computing in order to construct the informatization environment of personalized teaching, to support teachers' effective teaching and students' active learning, to promote students' higher thinking ability and group wisdom development and to improve the quality of education."

Cloud-computing- assisted collaborative learning is a kind of technique, which can establish "cloud environment" for collaborative learning, to assist teaching and support collaborative learning through cloud-computing in order to facilitate learning and communication between teachers and students, between students. Cloud-computing- assisted collaborative learning is the extension and development of computer-assisted collaborative learning [5].

IV. INFLUENCE OF CLOUD-COMPUTING ON COLLABORATIVE LEARNING

A. *To help teachers create online group collaborative learning environment*

In the cloud computing environment, technical problems are no longer teachers' burden to create a collaborative learning environment, so it can arouse the teachers' enthusiasm to carry out collaborative learning. Many current cloud computing platforms can provide the latest service with simple operation and with no need to download or install any software. The teachers can, by using the free platforms or software provided by the cloud-computing suppliers, establish online collaboration platforms to create a learning space with rich resources and collaborative interaction. For example, in the Google collaboration platform and the Baihui notebook, the teachers can not only present data on the platform, but also invite students to participate in the discussion or interaction, and even build a learning environment together to fully reflect the characteristics of group collaborative learning. The creating of platforms is no longer a complex code, but a window edit form which is easy to set up.

B. *To effectively integrate the network of educational resources*

Cloud-computing usually relies on supports of hardware like large-scale high-speed computer clusters, mass storage devices, high-speed bandwidth. Their powerful storage capabilities can provide richer learning resources to learners and teachers, and enable learners and teachers to search for learning resources more quickly and conveniently in order to improve the effectiveness of collaborative learning goals. Take Google as an example, its searching function is very powerful, including a blog searching, image searching, web searching, book searching, college searching, life searching, code searching, personalized searching, academic searching, SMS searching.

C. *To provide more effective ways of cooperation*

Cloud services provided by cloud-computing are not restricted by hardware environment. As long as the Internet can be connected, cooperative learning can be achieved anywhere, anytime. Cloud-computing is able to get strong multimedia capabilities without requiring the users to have a high level of client configuration. This feature makes the students be able to have access to the application system on Internet only via cell phones, PDA, portable net-books and other devices, thus they could gain knowledge or skills they want to learn.

D. *To make equal relationship between teachers and students*

The students construct learning actively as the organization designers of collaborative learning activities, but also as performers. Teachers can be act as involvers in collaborative activities, but also as guiding roles [6].

E. *To make learning evaluation more just and equitable*

Under the cloud computing environment, evaluation methods are more various and more accurate. The Learning Evaluation considers not only learning results, but also learning process. In traditional learning, the performance of the learning process can't be measured easily but be ignored easily. The evaluation of learning results merely refers to teachers' evaluation on the students. Under the cloud-computing-supported environment of collaborative learning, we can save the students' online history records as proof of evaluating the learning process. The evaluation of the learning results can be very convenient for the teachers and students to evaluate each other, to evaluate between the students, to evaluate between groups. To make more just evaluation, anonymous assessment can be made.

F. *To improve the students' personality development and team awareness training*

Under cloud-computing-assisted teaching and learning environment, collaborative learning is more convenient with immediately effective communication tools. The students

can share information whether they are online or not, which is able to mobilize the learning enthusiasm of the students. In collaborative learning, students can form their own emotion, personality, thinking ability while experience team culture and form team spirit.

V. CONSTRUCTION OF COLLABORATIVE LEARNING ENVIRONMENT SUPPORTED BY CLOUD COMPUTING

Carrying out the collaborative learning supported by cloud computing aims to develop the "collective wisdom" through collaboration, but not only promote the individual wisdom. The advantages and characteristics of cloud computing are fully brought to play to create a group collaborative learning environment that can encourage teachers to focus on learners instead of content, and focus on group collaboration instead of individuals.

A. Thinking of constructing the collaborative learning environment supported by cloud computing

Cloud computing is a core technology for next-generation network computing platform which brings great changes to the education, meanwhile the construction modes of collaborative learning environment shall be changed with the characteristics and advantages of the new technology. With the wide application of cloud computing, collaborative learning environment should also be at the core of interaction and service, outstanding the sharing of resources, throwing away spending a lot of time and effort to develop the course management system independently, or the mode of using a single open source systems (such as Moodle Blackboard, sakai, etc.), and taking full use of the platform supported by cloud computing, integrating various resources to improve its usability. On building resource contents, the developers and the users should be together, so that each user can become the builder of the resources, designing and managing the interaction between managers and learners, between learners and teachers.

B. Constructive platform of clouding computing collaborative learning environment--Baihui Online

Currently, what can be applied to the teaching cloud computing platform are Google Sites, Baihui, Ning, good-looking book and so on, and some other platforms widely used, such as QQ group, watercress network which can also be as the collaborative platform cases. Google Sites is a pioneer in teaching applications, and now many teaching practice and researches supported by cloud computing are conducted on Google Sites. However, in March 2010, Google moves the mainland business from the Chinese mainland to Hong Kong, making collaboration platform for access to restricted. Through research and comparing, the author of this article finally finds a suitable cloud computing network collaborative learning environment--Baihui online, as the collaboration platform of practical research.

Baihui Network, a leading enterprise cloud computing service provider, providing more than 20 models of cloud computing applications, has become an important platform for many SMEs, including Baihui Office, Cloud-mail, document-storage collaborative, instant messaging, calendar, forum, knowledge management, cloud development platforms and so on. In teaching, under specific circumstances, teachers and students can free combine Baihui cloud computing applications, creating opening and personalized teaching environment to bring to play a huge advantage in teaching. Baihui Office supports multiple users simultaneously and edit documents online, taking advantage of this service function of effective collaboration between teachers and students learning together to accomplish tasks through collaborative learning; the Baihui document offers free online storage space to users to store documents; Baihui chatting, Baihui conferrence, Baihui forum, Baihui WiKi can provide a variety of communication tools, which can help complete the teacher-student interaction and other tasks.

C. Collaborative learning platform function supported by cloud computing and collaborative process

Cloud computing collaborative learning platform takes Baihui wiki and Baihui online office as the main body, Baihui calendar, Baihui notebook and Baihui forum as the supplements, making full use of each platform's function, so that they are organic together to build a quick and easy using interactive collaborative learning platform. This platform is made by the author of this article. The main function modules of the platform are shown in Figure 1. Collaborative learning process is as follows:

(1) Using Baihui Forum, the students are grouped under the guidance of teachers. After the leadership of the team leader, the learning tasks are subdivided.

Generally speaking, the persons in the collaborative group preferably are 2 to 4. The dispatch of the team members with complementary form can improve the effect of collaborative learning. For example, the match of good academic students and poor students is not only conducive to the conversion of the poor, but also promote eugenics mastery of knowledge to the good; the match of students with different cognitive style is conducive to the advantage of the different cognitive types of students, thereby promote students' cognitive style to the "mutually reinforcing."

(2) Through modifying the Baihui wiki edit permissions by teachers, the permissions are given to each team leader who can add page type "file memory" sub-page in the learning database page, and named as "collaborative group A , collaborative Group B, etc. " to facilitate the group members to upload and download files. The group members upload learning materials by the data group established by each group, and the teachers should check the validity of the learning materials.

(3) The members in the group use Baihui online software for collaborative learning. Let us take Baihui writing as an example. The team leader in Baihui writes shared documents, and the group members use instant messaging IM to communicate and complete their tasks. The joint participation of the members makes the knowledge integration, solicit the opinions of members of the group. If any member is not satisfied with the learning outcomes, the shared documents can be downloaded again to modify and perfect. If agreed, then this phase of learning outcomes as represented by the team leader are through Baihui Write

links posted to the group blog, to accept the review of the teachers and other students. Appropriate feedback are given by the teachers and other students in his blog, according to the feedback, the team under the leadership of the team leader again improves the learning outcomes.

(4) The members of the group with total conclude the front stage of learning, to submit a learning log including the problems encountered in the learning process, the process of discussion and collaboration, as well as the formation of the solutions and the members of the group self-evaluation. After submitting the learning records and learning outcomes to Baihui Wiki, the excellent learning works are selected by teachers and students.

(5) Through modifying the website editing permissions on Baihui Wiki, the excellent learning works of the group are released to Baihui Wiki, and checked by teachers and students again. If any individual team is not satisfied with the outcomes of the learning, they can do the collaborative learning again at other times.

Based on the advantages of cloud computing, collaborative learning environment is: organic combination of multi-platform, creating the collaborative learning virtual area for students to make the learning environment more realistic and stimulate students' interest in learning and promote students' effective learning. Frequent communication and feedback of teacher-student and student-student not only give help on student learning, but also cultivate a spirit of collaboration, communication skills and expression between students, teachers. The diversified evaluation mechanisms are adopted and comprehensive tracking of students' learning process, and provide timely evaluation feedback. Centered with students, the dominance of students is given full play and the dominance of teachers is reflected.

VI. CONCLUSION

In the background of the rapid development of educational technology "cloud services", according to the actual situation of the local teaching, teachers should take full advantage of cloud computing software, storage, security, and other elements to construct personalized teaching environment, support teachers' active teaching and students' learning, and cultivate students' high-level thinking skills and the development of collective wisdom to improve the quality of education.

Cloud computing is evolving, constantly updated technology for the teachers and students more choices. Flexible innovation and construction of a suitable learning environment and the promotion of further development of informative teaching are needed to be more actively involved in front-line teachers.

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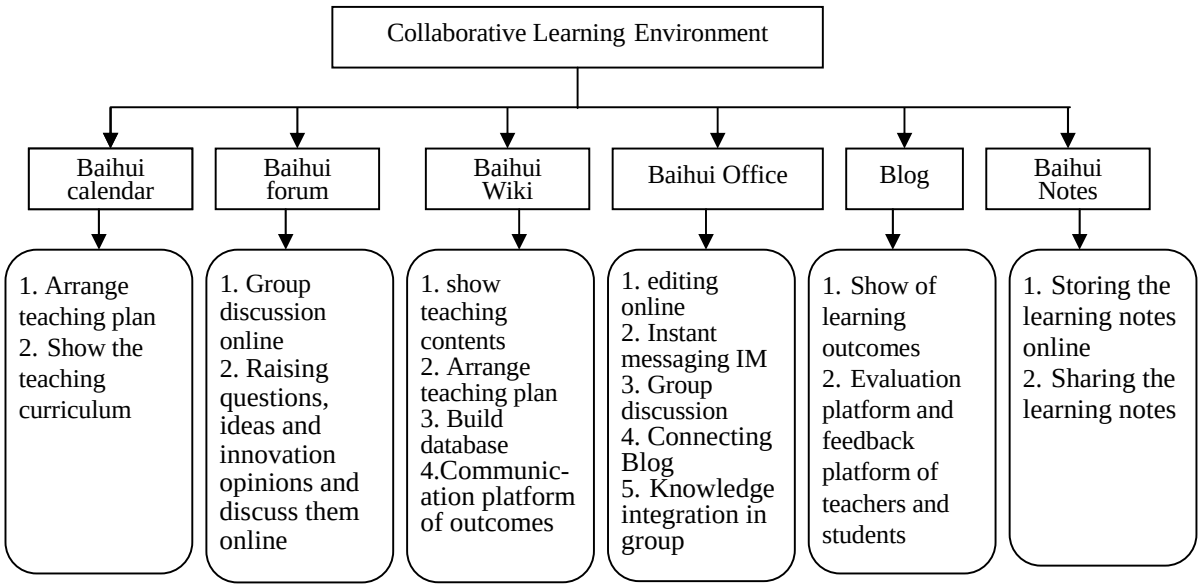

Figure 1. Collaborative learning platform function supported by cloud computing.