Design and Implementation for cMOOC-oriented Online Course Learning Community

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**Abstract.** The emergence of MOOC has fundamentally changed the traditional teaching methods. MOOC enables students obtaining high-quality course resources anytime and anywhere using internet technology, which has the characteristics of massive, open and low-cost. However, current MOOC systems have several problems to solve: (1) the lack of real-time interactions between teachers and students; (2) lack of individual learning management; (3) lack of opinion leader mechanism. This paper designed an online course community system towards MOOC, including real-time interaction service, opinion leader forming process and resource sharing framework.

**Introduction**

Since 2007, along with the leap development of network communication technology, it quickly raised a hot wave of massive open online education (MOOC) first in Britain, U.S. and other western developed countries. Many education scholars evaluate MOOC as a "digital tsunami in the education history,"an education storm" and "the most profound technological evolution of higher education in 500 years". Since 2013, the domestic scholars have sprung up and pay high attention to edX, Udacity, Coursera and other world famous massive open online course platform, and further focused on such xMOOC practice (eXtend Massive Open Online Course: take video, homework and test as learning ways, emphasizes acquire content and master knowledge, particular focused on knowledge transmission and replication) based on the behaviorism and cognitive education theory. While, cMOOC (connectivism Massive Open Online Course: emphasizes the learners' autonomy and basing on social network learning, typically oriented around a particular topic, focused on creation and formation of knowledge), which is based on *connectivism*, didn't received as much attention.

In cMOOC, *connectivism* considers that information is a node, knowledge is a connection. In order to explore the areas of knowledge, students establish the connection through information navigator and form a learning network ([EB/OL] Siemens G. Narratives of coherence: sense making and way finding in complex information ecologies [J]. 2013.03. http://www.slideshare.net/gsiemens/sensemaking-and-wayfinding). George Simmons, etc. thinks that learning is a continuous, knowledge network forming process. Knowledge is not only stay in human brain, also exist in human interpersonal interaction network ([EB/OL] Siemens G. Narratives of coherence: sense making and way finding in complex information ecologies [J]. 2013.03. http://www.slideshare.net/gsiemens/sensemaking-and-wayfinding).
cMOOC platform integrates a variety methods of education technology. It aims to build online learning environment of courses. Students can choose their own learning content, adjust learning pace during this seemingly loose structure, actually the topic-focused distributed curriculum and relatively decreased evaluation. In this MOOC, emphasized the learning channels establishment and SNS (Social Network Service) based interactive learning are two emphasized factor. Student are required to be highly autonomy, encouraged to change from passively accepting knowledge to initiatively participating in Lourse construction (Hua Li, etc. A framework for MOOC-Oriented Learning Management System. Journal of Modern Distance Education, 2013(3), pp.28-33). There is no definite "teacher" role in cMOOC. Teacher is acting as a initiator, a framework constructor and a activity organizer, which is more of a facilitator and a learner (Xiao-qiang Huang, Qing-chao Ke. The Elements and Structural Model of cMOOC. Journal of Distance Education, 2014, (6), pp.88-94). The contents are in the dynamic-evolving process, which make the curriculum has the characteristics of the distribution is changed.

The Confronting Problems during MOOC Development

Although MOOC present a “blowout boom” in recent years, but also exposed its weakness during the implementation.

Lack of Real Time Communication

According to the "the teaching activities of seven elements" theory, a complete teaching activities including teaching purpose, students, curriculum content, teaching methods, teaching environment, learning, feedback and teachers (Xi-bin Han, Wen-fang Zhai, Jiang-gang Chen. A Dialectical Analysis of cMOOC and Their Integration into the Ecological Chain of Higher Education. Journal of Modern Distance Education, 2013(6), pp.3-10). Students is the learning subject, all the activities, the distribution of teaching elements are around them; Teaching content is based on teaching purposes; The teaching design and methods is determined by teachers' subjective initiative and ability; The teaching environment is the necessary condition to build the teaching process; And the feedback is an important means to improve teaching works, forming the ecological-closed loop system. MOOC provides online chat to increase the interaction between teachers and students, but these functions do not provide real-time interactive. From the world-famous MOOC resources platform, Coursera quiz module statistics, the answer time is 22 minutes. In actual study, most students want their questions to be answered in the first time, to communicate and exchange opinions with peers and teachers in real-time. After a certain time communication provided by MOOC far from the actual needs of students. Students cannot receive timely feedback, which means the current MOOC also cannot replace the traditional "face to face" teaching mode (Liang Hong, etc. Design and Implementation of Online. Course Community System Towards MOOC. Journal of information resources management. 2014(3), pp.103-106).

Lack of Individual Learning Management

There is usually no standardized teaching content in MOOC. The learners in face of unstructured, dynamic evolution and uncertainty curriculum (Wen-qiang Fan. Connectivist MOOC and Its Learning Support. Journal of Distance Education in China. 2012(3), pp.31-36). This unstructured form also indirectly promote the formation of informal learning in the
MOOC. MOOC The course activity often carry out by discussion topic. The content includes the theme of discussion made by designer, prefabricated knowledge, material summarized from learner’s discussion as well as their notes and so on. It is studied that individual learning activities of institutions account for only 10% to 30%, the rest of the 70% - 90% learning activity was conducted through informal learning forms (Ming-Jie Tan, Pei-ji Shao. A Framework Design of Distance Learning Management Based on E-learning 2.0. Journal of Distance Education in China. 2011(9), pp.66-70). One of the reasons that students cannot receive timely feedback in MOOC, is the lack of effective and normalizing individual learning management. The way students use platform to communicate is more trivial than the way in offline learning. To further standardize the products from online process and resources created by learner themselves, we need to offer appropriate individual learning. In addition to providing courses certificate. There is no other humanized management mode in present MOOC platform. This is against learner to study systematically.

Lack of Opinion Leader

"Opinion leaders" is derived from the theory of “two-step “of communication which put forward by Lazarus field and Berelson. It is defined as "in a reference group, due to special skills, knowledge, personality and other characteristics such as factors can have influence on other members of the group (Meng Zhang. A Study on the Function of Leading Opinion debates of Virtual Community in Modern Distance Education. Journal of Distance Education, 2006, (4), pp.13-16). "In MOOC environment, opinion leaders generated from the virtual community can give high quality resources through discussion and promote sociability and understanding. At the same time, usually the opinion leaders have keen observation of environment. They can regulate and maintain different learning style, varieties ways of communication, which provide guarantee for MOOC development. It has no such a virtual character in the prevailing MOOC, The specification of platform relies mainly on the unified announcement. This work is the lack of a real human experience, does not grasp the concept of community and membership is relatively loose.

In this paper, we designed a MOOC course oriented learning community to effectively solve the problems facing by MOOC.

The Online Course Learning Community Based on cMOOC

This study proposes a platform of cMOOC-oriented online course learning community. This platform provide a optimize way of real-time communication between teachers and students, for students' personalized learning record and management, improve the effect of learning by use opinion leaders forming mechanism..

System Framework

This system sets course as model as a community. Teachers will organize discussion of different theme. The system will solve problems pointed before in this paper on the basis of new technology in the supporting functions of existing cMOOC. The system framework is shown in Figure 1. cMOOC online course learning community system has three layers, presentation layer, business logic layer and data layer respectively.
Figure 1. Online Course learning community system framework.

The presentation layer provide service to these three clients, students, teacher and administrators. The business logic layer and data service layer located at the server port. Data service layer can only be access to business logic layer, business logic layer can only be accessed the presentation layer. Users access to database to visit data through the presentation layer and return data in presentation layer in opposite order. This article will focus on service function of students' role and teachers' role. To be more specific, through community online communication, meet the needs of real-time interaction; Personal space is used to solve the personalized learning management problem; Personal rating is for the realization of opinion leaders guide mechanism. Besides, the UGC (UGC, User Generated Content. This concept originated from the Internet. User display their original resource through the Internet or provided to other users (translated from Wiki). In this article it refers to students’ learning curriculum resources, such as notes, BBS, homework, etc in MOOC community.) will be organizing and structuring represented in community after uploaded and shared.

**Real-time Interaction**

For the problem given in mainstream MOOC, our community offer mails and moderator for teachers and students to accomplish real-time communication. In the community Students login community with real-name way. They also can use a third party account to get in which will do good to the resources circulation, forming all people MOOC. Both teachers and students can post, send messages and @ someone to ask for help. The mails support teachers and students to chat in the real-time. The dialogue interface already features basic graphic chat mode and voice message, help to further promote dynamic communication between teachers and students. In the post classification management, we induce students to actively participate in discussion topics based on opinion leaders guiding mechanism, management, to form FAQ support groups, and establish a standard system of user level growth eventually.
**Individual Learning Management**

Learning resource is one of the particularly important resources in MOOC resources construction. However, curriculum knowledge is usually designed and released by teachers in advance. Therefore, this knowledge resource is limited by the teacher's knowledge structure. MOOC course-related resources cannot be expanded and reproduced according to the original course pace. These limits learners' knowledge area. So it's necessary to establish a personal learning management module based on MOOC course. We call it “personal space” in this paper.

There is a variety of social learning modules integrated in personal space. It forms the channel of resources. Students can produce an ask and answer post into BBS and eventually develop into learning resources. Students' performance will be synchronous updated in its personal space which considered as a personal assessment.

![Diagram](image)

**Figure 2. Personal space process.**

![Diagram](image)

**Figure 3. Source of resource management in personal space.**

**Found Opinion Leader**

The primary task for finding opinion leaders in the community is finding core members. It includes the discovery of community structure and core members on the basis of this structure
in local network. The core members have many definition in different networks. In general, there are two types of definitions to be summarized, one is based on the structure, this type is dependent on the network framework, such as PageRank and HITS, etc.; The other is based on the web content. This kind definition of core member is related to the area, such as have an academic experts in a certain field. This study use the algorithm based on spectral clustering PageRank to discover community structure, find similar user group. Making use from swarm intelligence to get a personalized information service for everyone in community. The algorithm firstly take similar matrix A to calculate the various points’ value of PageRank, choose the maximum k value as the initial clustering center, then take the method of spectral clustering. The clustering center nodes is chosen by blindly random selection, but is more close to the final result, so as to achieve rapid convergence. View is community, it has the same or similar emotions tend to review documents in the community. We apply the traditional spectral clustering algorithm—“Meila - Shi algorithm” to the similar matrix obtained from above thought to get the Laplacian of similar matrix, and calculating the eigenvalue and eigenvector of Laplace. Then select the maximum k eigenvalue with its eigenvectors to form feature subspace. Finally, applying iterative clustering algorithm to get a structure of view community.

Based on community organization discovered by spectral clustering, finding the corresponding child network, then to further find core members according to certain importance measure, which is opinion leader. The core measures adopted is PageRank. Specific algorithm is as follows.

\[
\text{DiscoverOpinionLeader (oNet, oCommunity)}
\]

\[
\text{Input: oNet /* View network corresponding similarity matrix*/;}
\]
\[
\text{oCommunity/* Community structure found in the discovery of view */;}
\]

\[
\text{Ouput: oLeader /* Return comment document number from opinion leader in every view */; Method:}
\]
\[
\text{num=oCommunity.size();}
\]
\[
\text{for i=1to num do}
\]
\[
\text{members=ocommunity(i);}
\]
\[
\text{subnet=getSubNetwork(oNet,members);}
\]
\[
\text{pr=getPageRank(subnet);}
\]
\[
\text{maximumInd=getMaximumPageRank(pr,members);}
\]
\[
\text{oLeader(i)=maximumInd;}
\]
\[
\text{end}
\]
\[
\text{return oLeader}
\]

The algorithm presents a discovery of opinion leaders in view community, Among them, oCommunity describe community agencies with the method of the map, which is composed of document number of each community. GetSubNetwork used to get the similar matrix for a given node in its corresponding subnet. In the end, According to the matrix calculate PageRank value, and find the document number which is maximum.
Summary

In mobile Internet change or control to a certain extent in the background of the People's Daily life, MOOC remote education has become an irreversible trend. However, in the process of understanding and use of MOOC also exposed some problems. The purpose of this paper is to support the current mainstream MOOC, on the basis of existing functions, from the real time communication, personalized learning management and puts forward some new ideas and opinion leaders’ framework, to provide a MOOC platform of teaching quality. Follow-up work of this paper will focus on personalized push mechanism, the question answering system and resources platform to do further into the overall user experience.

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References


