

Learning Mechanism and Function Characteristics of MOOC in the Process of Higher Education

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ABSTRACT

At present, the practice development of massive open online Courses (MOOC) is prior to the theoretical research about MOOC in academic circles. Through document analysis, participant observation and case analysis of MOOC, we find that the connotation of MOOC is mainly annotated from three dimensions: curriculum form, education model and knowledge innovation. According to the learning theory and teaching practice of MOOC, the teaching mode of MOOC is divided into three kinds: MOOC based on content, MOOC based on network and MOOC based on task. Compared with the traditional courses, MOOC has intrinsic characteristics such as large scale, openness, networking, personalized and participation, which includes the online learning effectiveness, the mastery learning, the interactive cooperation and the learning mechanism of complex system self-organization core. Through the analysis of MOOC learning mechanism, goal, characteristics and advantages, according to the investigation on the use of MOOC at home and abroad, combined with the characteristics of computing discipline, the two aspects of MOOC teaching function: one is to use the learning records on MOOC to study pedagogy, and create new educational theory; another is to use MOOC for the flipped classroom.

Keywords: higher education, MOOC, learning mechanism, function characteristics

INTRODUCTION

The massive open online course is the Chinese translation of Massive Open Online Course (MOOC), which is also called "MOOCs" in China. Colloquially, MOOC is a large-scale network open course, which is the open course on Internet to enhance the knowledge dissemination (Ezen-Can et al., 2015). Since 2012, the large-scale online open course has become popular in the world university, which brings a significant impact on the global higher education (Watson et al., 2017). In 1997, Professor Li Jiahou pointed out that four revolutions in education were caused by the development of production tools. The media education and information dissemination has changed, which will cause the reform of education mode. The rapid development of modern electronic communication media will cause the reform of the carrier of course materials, the organizational methods and the teaching methods (Wang et al., 2017; Luo et al., 2017; John et al., 2017). The target of MOOC is to enable learners to use the Internet and learn from the best courses in the world to eliminate the imbalance of education according to their own level, needs and time. American universities have launched three major MOOC platforms: Coursera, edX and Udacity, which have opened the high-quality online educational resources and services to global learners. Coursera latest statistics show that 109 famous universities open 679 courses on the platform, 7 million 696 thousand students have registered on the platform (Wang, 2015; Ding et al., 2017). Many "985" famous universities in China have joined the MOOC platform (Bu, 2015). At present, the practice development of massive open online course is prior to the theory research about MOOC. In this paper, we clarify the operation process and classification of MOOC, and summarize the function characteristics of MOOC, and explain the internal learning mechanism of MOOC, and promote the theory research and practice of localization and innovation development of MOOC.

Contribution of this paper to the literature

- This research uses the method of constructing data model to research the learning mechanism and function characteristics of MOOC in the process of higher education, and the realness is high.
- From practical problems, this paper summarizes the learning mechanism and function characteristics of MOOC from different perspectives, and it has strong recommendation.
- Combined with the environment of contemporary university students, this paper gives a new route of higher education, which provides a theoretical principle for the further research.

LITERATURE REVIEW

Domestic Research Status

For the problem about MOOC in higher education, domestic scholars (Dai and Li, 2015) have proved that the online discussion area plays an important role in promoting the higher-level learning of courses. Compared with face-to-face discussions and consultation, the interaction in online discussion area can promote the research and discussion of course content (McLean et al., 2017; Mayer, 2017). The learners show more active participation, so as to obtain the stronger concept application ability and critical thinking ability. Based on the above conclusions, the scholar (Li, 2017; Taggart, 2017) considers that the course discussion area plays three kinds of roles in the teaching of MOOC: the first is the channel that learners acquire the course information, which includes the conceptual understanding, the examination evaluation and the activity arrangement; the second is the interactive mode substituting for the face-to-face interpersonal communication in physics classroom. It is the virtual space that learners know each other, and exchange information, exchange emotions, and enhance interpersonal attraction, and develop a sense of belongingness; the third is the platform that learners construct knowledge, which explores solutions and proposes new ideas and creates new knowledge (Scott et al., 2017). In MOOC discussion area, the discussion process has five stages of development: motivation incentive, online companionship, information exchange, knowledge construction and community development. In different stages of development, learners have different learning motivation and cooperative behavior. Teachers need to use corresponding negotiation and promotion strategies (Ballou and Springer, 2017; Paredes, 2017).

Foreign Research Status

Abroad, there are a lot of research about MOOC in the process of higher education, where, the scholars (Hood et al., 2015; Kinkead-Clark, 2017) consider that MOOC emergence phenomenon needs four conditions: internal variousness, internal redundancy, neighbor element interaction and decentralized control. The function mechanism of the above four conditions: firstly, the internal variousness is the precondition for the emergence of MOOC, which is reflected in the learner's age, gender, occupation, professional background and global distribution; secondly, internal redundancy is the repetitive or redundant internal attribute of complex system, and it makes the component elements of system have a good interaction, causing emergent phenomena of system (Liyaganawardena et al., 2015; Guterman, 2017; Si and Qiao, 2017). Foreign scholars (Bulger et al., 2015) considers that the interaction of neighbor element is reflected in the partner consultation and discussion mechanism of MOOC discussion. This mechanism helps learners understand the concept and principle in the course through negotiation and supports learners to use course knowledge to solve practical problems, and then makes learners to enhance their professional knowledge and skills; (Watson, Kim, and Watson, 2016) consider that decentralized control is reflected in the openness and freedom of MOOC, which includes the autonomous control of learning process, the free setting of theme of course discussion area, formation of internal group of course with social media tools and the personalized learning based on situation (Lai et al., 2017).

METHODS

MOOC has the emergent phenomenon of complex self-organizing systems. The mutation theory believes that a small disturbance in the system which is amplified by the nonlinear interaction between individuals will cause the mutation of individual attribute and behavior. The multiple individual uncertainty mutation which is amplified by individual interaction will cause the emergence phenomenon (Mackness et al., 2016). When system has the emergent phenomenon, complex systems will be changed from low equilibrium state to high equilibrium state, and the new process and structure will take the place of the old process and structure (Giddens, 2016; Parks-Stamm et al., 2017; Liu, 2017). The comparison of generation mode of traditional on-line course and MOOC course resources is shown as [Figure 1](#).

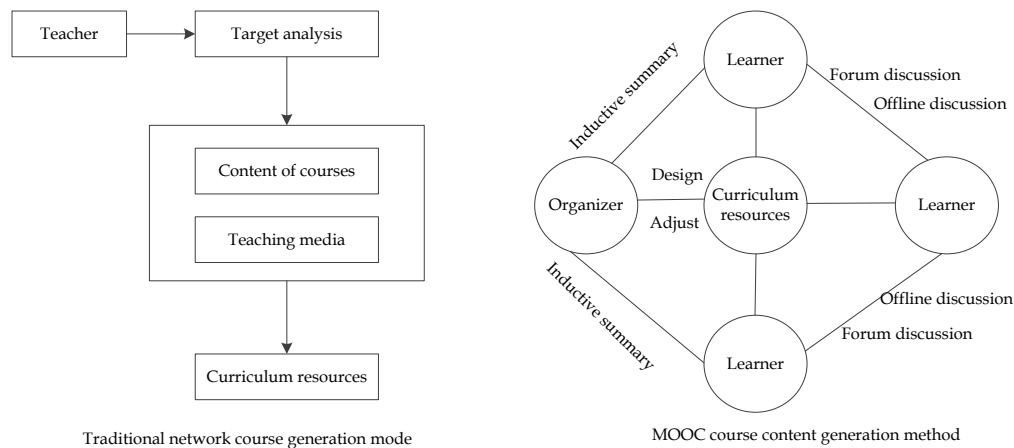


Figure 1. Comparison of generation mode of traditional on-line course and MOOC course resources

For MOOC, the individual mutation causes the learner to generate insight in the cognitive interaction and understand the concept of knowledge or generate innovative ideas instantly. The system emergence makes teachers and students have good cooperation in a short time, and makes the course generate innovative ideas and course knowledge system (Koedinger, et al., 2015; Hardy and Totman, 2017). On the basis of comparing the generation mode of traditional on-line course and MOOC course resources, this paper uses the panel data model to analyze MOOC learning mechanism in higher education. The specific formula is as follows:

$$\hat{y}_{in} = \lambda^*_{in} e + \tilde{x}_{in} \beta^*_{in} + \delta^*_{in} \tag{1}$$

Thus, the analysis formula of function characteristic of MOOC in higher education is as follows:

$$RSS = y_{in} - \hat{y}_{in} \tag{2}$$

If:

$$\begin{aligned} W_{xx,i} &= \sum (x_{it} - \bar{x}_i)(x_{it} - \bar{x}_i)' \\ W_{xy,i} &= \sum (x_{it} - \bar{x}_i)'(y_{it} - \bar{y}_i) \\ W_{yy,i} &= \sum (y_{it} - \bar{y}_i)^2 \end{aligned} \tag{3}$$

The residual sum of squares of model is calculated as follows (Wautelet et al., 2016):

$$S = W_{yy} - W'_{xy} W_{xx}^{-1} W_{xy} \tag{4}$$

Using the above formula can obtain the analysis result of an online course forum. Thus, the learning mechanism and function characteristics of MOOC in the process of higher education are analyzed.

RESULTS

On the basis of data model established by this paper, we can conclude that MOOC has five learning mechanisms and function characteristics in the process of higher education.

Five Learning Mechanisms

- (1) Effector mechanism of teaching method. The teaching method is the main factor that influences the effect of online teaching. According to the differences that learners control the learning mode, the teaching methods of online teaching are divided into three types: lecture style, autonomous style and cooperative style. The related researches prove that online teaching effect of autonomous style and cooperative style is significantly greater than the online teaching effect of independent type and explanation type. Compared with network excellent course and excellent resource sharing course, MOOC has the perfect support mechanism in teacher guidance and learning companions support. Its teaching effect is better than the teaching effects of first two (Hao et al., 2017).
- (2) Effector mechanism of teaching media. The teaching media has no effect on the effect of online teaching, but applying teaching media has a significant influence on the effect of online teaching. Clark considers that the media is only the carrier of learning content, which cannot change the learning itself. Recently, many empirical researches have proved Clark's theory.

- (3) Careful mastery of learning mechanism. The theory of mastery learning believes that if most of students have enough learning time and accept appropriate teaching, they will be able to master any knowledge in the world; the fundamental task of teaching is to find the teaching strategy and the support mechanism which can consider the individual differences and promote the individual development. The related studies have proved that mastery learning can improve participative behavior of learners and reduce students' absenteeism, which greatly improves the learning achievement. According to the analysis of the theory of mastery learning, MOOC provides learners with two kinds of fine theory of mastery learning: one is that the structure design of teaching video supports learners' fine mastery learning, the other one is that the formative test supports learners to extract cognitive behavior repeatedly.
- (4) Interactive cooperation mechanism of academic partners. Social constructivism considers that the knowledge is essentially social. Thomas studies have proved that the knowledge acquired from the interaction of learning partner is equal to those acquired from curriculum materials. Therefore, the complete interactive mechanism of learning companions is the key to ensure the quality of teaching by MOOC. Generally, MOOC has two kinds of interactive collaboration mechanisms: negotiation discussion of learning companions in curriculum discussion area and the peer negotiation discussion and mutual evaluation curriculum assignments of learning companions.
- (5) Dynamic evolution mechanism of MOOC. MOOC is a self-organizing network learning system in the Internet. Its dynamic evolution mechanism has two explanatory methodologies: the conditional methodology of theory of dissipative structure and the dynamic methodology of synergetic theory. Obviously, MOOC dynamic evolution comes from subtle changes in its integrant element. Through the interaction between elements, it is amplified to cause the change of curriculum structure.

Three Function Characteristics

- (1) Large scale. The characteristics of large scale of MOOC are embodied in three aspects: large-scale participation, large-scale interaction and massive learning data. Firstly, large-scale participation refers to the increasing possibility of the number of participants in the course, moreover, the number of university students who participate in curriculum is greatly increased. Secondly, large-scale interaction is that tens of thousands of people participate in the course discussion. When learners ask questions, several hundred people communicate with each other from different angles of problem. Finally, massive learning data are produced through university students' participation and interaction. MOOC platform uses the data mining, the artificial intelligence and the natural language processing technology to analyze massive learning behavior data from many dimensions, so as to find the characteristics and rules of course and adjust the learning guiding strategies and learning support service dynamically.
- (2) Openness. In the process of higher education, the openness is the innate property of Internet. The openness of MOOC expands the openness of Internet, which has four levels of open characteristics. The first is the freedom of time and space in curriculum learning. MOOC learning is not limited by time and space, and it casts off the limitation of time and space in traditional physics classroom. The second is the open information flow of curriculum system. The learners and instructors use the network learning tools to keep the information interaction with the outside world of MOOC learning environment. The third is the disappearance of authority in the curriculum learning. The learners use social media to freely interact and communicate with the companions and teachers. The learners are responsible for the construction of their knowledge in the media context, so as to achieve the real academic freedom and freedom of expression.
- (3) Networking. The networking characteristics of MOOC are embodied in three dimensions: learning environment network, individual learning network and curriculum knowledge network. In the dimension of learning environment network, the learning resources of MOOC are generated and spread through the Internet space. The teaching and learning activities of MOOC are actualized in the Internet space by using various network learning support tools. In the dimension of individual learning network, participating in MOOC learning is the process of constructing the individual internal network and external ecological network. The learners use the assimilation cognition and adaptation cognition mechanism to update the knowledge network in the brain. At the same time, the social media tool is used to build the individual social network and the ecological knowledge network.

In the dimension of curriculum knowledge network, MOOC is a distributed knowledge base system. There is a reciprocal interweaving knowledge network taking learners, teachers, social media, learning resources and artificial products as nodes. The knowledge is scattered in the network with the form of fragments.

DISCUSSION

By researching the learning mechanism and function characteristics of MOOC in the process of higher education, the continuous development of MOOC will bring more and more impact on classroom teaching from following two aspects:

- (1) with the increase of educational data accumulated by MOOC, more and more learning rules and effective learning patterns will be found. These rules of learning can be used for the classroom teaching, so as to improve teaching effect.
- (2) the number of MOOC will increase constantly, and the curricula-variable number of students will be more and more. The combination of classroom teaching and MOOC will be an inevitable trend. In order to adapt to the MOOC era, teachers need to constantly explore how to make MOOC and classroom teaching promote each other, so as to provide better education services and improve teaching effectiveness.
- (3) in the Internet background, teachers should be involved in the MOOC and guide the students to join, then actively promote the online courses except traditional classroom and use excellent teaching resources at home and abroad to supplement the bottleneck of course learning at school. In addition, this exploration proposes that teachers should guide students to participate in the MOOC course in a planned way and take MOOC course learning as the exploration and research work of second classroom, which has no precedent at home and abroad.
- (4) MOOC learning is not limited by time and space. Anyone can study on Internet. Thus, MOOC will promote the generation of more teaching modes and learning methods. There are two ways to improve teaching effect with MOOC: theoretical research and practical application. Theoretical research is to use the learning process data recorded by MOOC to research in the field of education and find the theoretical basis of effective educational methods and learning methods. Practical application is to use MOOC resources to enhance the teaching effect in the teaching process.

CONCLUSION

Making good use of MOOC is a pressing matter of the moment in local universities. In the process of higher education, how to actively and rationally prepare for the opportunities and challenges brought by MOOC is still a long groping process.

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