# Study on MOOC Knowledge Map

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**Abstract:** Currently, MOOCs face the problem of high dropout rates. Many learners find it inconvenient to use MOOC resources. Fragmented learning time leads to a loss of systemic knowledge. The MOOC Knowledge Map is an effective way to solve these problems. This paper describes the needs for knowledge maps for MOOCs. It analyses the challenges faced by the MOOC Knowledge Map, proposes the basic flow of knowledge map construction. Finally, it also objectively analyses some difficulties in building knowledge maps. Knowledge map is the direction of MOOC development and the basis for achieving systematic knowledge. By using MOOC knowledge map, the efficiency of student can be improved and their learning habits can be optimized. Ultimately, it will achieve the goal of increasing the social value of MOOCs and promoting the development of MOOCs.

## 1. Introduction

MOOC is the large open online courses. Courses are provided by internationally renowned university and shared through the network [1]. It enables global sharing of quality course. Coursera, Udacity, edX are currently the three largest providers in the world.

Its philosophy is to enable global learners to share quality resources through information technology and web technologies. [2] MOOC have a complete set of teaching modes. Including registration, watching video lectures, quizzes, assignments, discussions, exams, graduation, certificates and other processes. These teaching models to learners brought a new experience and give chance to get involved in high education. At the same time, through sharing the resources, the college courses can also be improved.

The number of schools participating in MOOCs and the number of courses is rapidly increasing. However, in the process of MOOC practice, many problems have also been discovered.
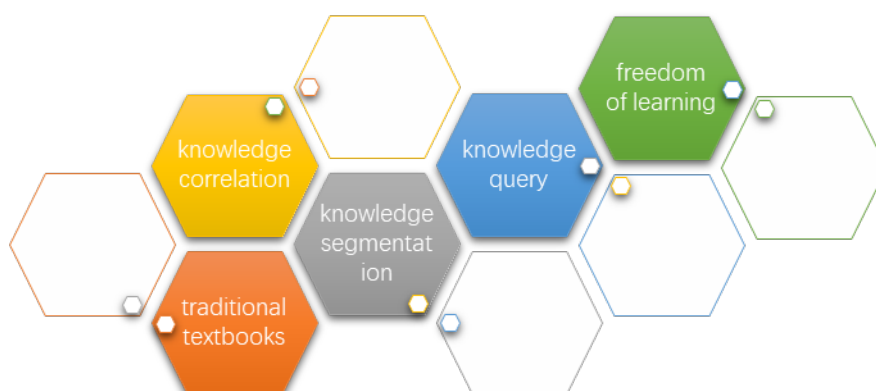


Fig. 1 The problems of the MOOCs' knowledge structure.

## 1.1 Existing MOOC knowledge is based on traditional textbooks

The reason why MOOC can develop rapidly is the rapid generation of curriculum resources. In order to speed up the generation of curriculum resources, teachers often follow the classroom teaching model. For classroom teaching and MOOC teaching, the way and content of teacher teaching are almost the same. Even many learners did not understand the difference between video teaching and MOOC. They simply think that MOOC is recording video of teachers' lectures and learning through the Internet. On the other hand, online learning has caused students to lose the opportunity to communicate face-to-face with their teachers. They often lack the tension and motivation to learn. Therefore, MOOC teaching is still at a relatively low level. It needs to further improve teaching methods.

At present, the study of MOOC learning mode is at a preliminary stage. It is also understandable to extend and use the model of classroom teaching in practice. The formation of a suitable teaching model takes a long time of practice to form. Therefore, we need to continue to explore and find MOOC scientific teaching mode.

Although the taught knowledge is the same, the organization of content can be more flexible. Digital technology can make the relationship between knowledge points more systematic. Classroom content is copied onto the Internet and ignores the features of online learning. Obviously, students' learning effects will be affected.

## 1.2 The knowledge segmentation is not precise enough

In the traditional classroom, a course is designed according to the teaching of class hours. A lesson usually contains multiple associated knowledge modules. In the MOOC class, the knowledge module can be further subdivided due to the loss of class hours. A video generally contains single or multiple knowledge points. Video length is generally less than ten minutes. Some scholars have found that the optimal duration is 6 minutes. Knowledge decomposition allows learners to use fragmentation time.

Currently, video on the MOOC platform often mixes multiple knowledge points together. It often directly divides the lecture recordings by time. It is difficult to set a knowledge tag for such a course video. And, it has brought difficulties to the inquiry of knowledge resources. This knowledge segmentation model has created obstacles for students to learn effectively.

## 1.3 Insufficient knowledge correlation

Fragmented learning requires further improvement in the organization of knowledge. And we need to visualize the knowledge system to learners. However, the current MOOC platform is still far from enough. Because learners are not guided by teachers, they cannot connect knowledge points. On the other hand, fragmentation means discontinuity of learning time. Learner's knowledge is fragmented. It will enable learners to abandon course learning. Therefore, while we are subdividing knowledge, we also need to present the relationship of knowledge points to learners.

## 1.4 Difficulties with knowledge query

For many students, they need to learn a specific knowledge point during the learning process. Students need to query related resources to learn. How to let students quickly search for the desired teaching resources is an important issue. The query function of the current MOOC platform is only for the fuzzy matching of the input keywords and course introduction and directory. However, the vast majority of learners want to find knowledge resources. They do not need to learn the entire course. They will spend a lot of time looking for the desired resources in the search results. This is also caused by the irrational structure of the platform's knowledge organization.

## 1.5 The knowledge system of the course limits the freedom of learning

The MOOC platform's knowledge framework is built of independent courses. The student's learning style is curriculum learning. This model is equivalent to the platform designed learning plan, students step by step learning. The scope of learning is limited to the knowledge system of the

course, which reduces the freedom of learning. In the era of MOOC, students hope to expand the learning space for the knowledge they are interested in. It is very important that the organization of knowledge is no longer limited to curriculum restrictions.

At present, the study of MOOC knowledge maps is still not a lot. Some recent studies include the following. Formanek (2018) [1] analyzed and studied motivations of college students studying MOOC courses. Lloyd et al. (2017) [2] calculated and analyzed MOOC course learning behaviors and learning performance data. Andrew (2017) [3] based on the characteristics of chemistry courses, studies how to enable more effective communication among learners and improve their learning in MOOC. Alario-Hoyos (2016) [4] analyzed MOOC learning behaviors and its effectiveness as a means of assessing MOOC. Hone et al. (2016) [5] analysed the factors affecting the retention of MOOC learning through the questionnaire. Mackness et al. (2015) [6] analyzed the prospects and challenges of MOOC development. Margaryan et al. (2015) [7] analyzed MOOC teaching quality and its influencing factors. Phan (2016) [8] analyzed students' performance in participating in the MOOC course. And do a comparative study of classroom learning and online learning. Bart Pursel et al. (2016) [9] studied MOOC learners' demographic data, learning behaviors and course interaction data. Stich (2017) [10] analyzed the MOOC in the United States and found that the platform blindly pursued the number of courses but neglected the service to learners.

Although the learners' basics and needs are different, the knowledge structure of the MOOC platform determines that learners can only study according to the curriculum knowledge system. This is obviously unfavourable for the vast majority of learners. Because MOOC learners pay more attention to effective learning, acquiring knowledge is the fundamental purpose of learning. It is necessary to change the existing MOOC platform knowledge organization model.

## 2. The role of knowledge maps for MOOC

Knowledge map is an important means of knowledge management. Some experts define knowledge maps as a management tool that helps users understand the relationship between knowledge and the positioning of knowledge. It is a configuration diagram of where knowledge exists, and it can also be an information query system. It describes the knowledge structure, function, existence position, hierarchical relationship, and query path within a knowledge system. Knowledge maps widely adopt modern information management technologies as support tools.

In MOOC, what role does the knowledge map play? Think of the following effects:

### 2.1 Help to expand knowledge and grasp research directions

Through knowledge maps, knowledge can be fully presented. Establishing the connection of knowledge points and expanding new knowledge is the direction in which scientific research needs to develop. It can improve the efficiency and level of scientific research. On the other hand, the construction and sharing of knowledge maps is also the way to spread knowledge. Knowledge maps can tap into the potential of knowledge. It serves as a lever of knowledge.

### 2.2 Knowledge map helps knowledge search

Knowledge maps can help learners increase learning efficiency. Only accurate and systematic knowledge maps can accurately locate knowledge. The accuracy of positioning can reduce the time for learners to browse search results. Accurate positioning will not mislead learners to learn irrelevant knowledge and waste time.

### 2.3 Knowledge maps establish systematic knowledge

Technology has influenced education and many new learning modes have emerged. MOOCs enlarge the learning time and space span. MOOC advocates learning at any time and learning is not systematic. Knowledge maps can link isolated knowledge points systems together. The systematic reconstruction of knowledge can improve learners' learning effect of MOOC.

## 2.4 Knowledge Map provides the basic framework for the integration of learning resources

Knowledge resources are rapidly growing, but similar courses are also emerging. Learners spend a great deal of time on repetitive learning. It greatly reduces the efficiency of online learning. Knowledge maps can integrate the resources of the same knowledge point and present it to learners. It is with knowledge maps that also provides an organizational structure and a basic framework for the integration of resources.

## 3. Knowledge map production steps

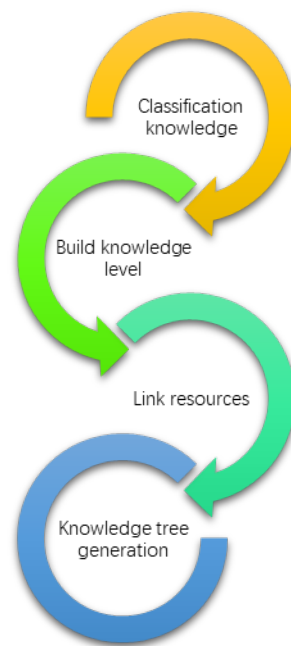The steps of the knowledge map can be divided into the following four steps, as shown in the following figure:



Fig. 2 Steps to create a knowledge map

### 3.1 Knowledge classification

For each course, the knowledge it contains can be structured. For the convenience of the learner to learn and inquire, the knowledge is divided into definitions, theorems and applications by practice. Divide all the knowledge of the course carefully.

### 3.2  Knowledge building

The second step is to establish the hierarchical relationship of knowledge. The relationship between knowledge can be represented by edges in the knowledge network. Taking into account the hierarchical relationship of knowledge, these sides are all oriented.

### 3.3 Links and Networking of Resources

In this step, it is necessary to link resources and knowledge points to establish resource links and eventually form a knowledge network. This step is one of the core tasks of knowledge map construction. Completing the networking means that the organizational structure and form of the knowledge map have been completed.

### 3.4 Knowledge tree generation

We need to improve the efficiency of the query and clearly present the results to learners. Therefore, it is necessary to design knowledge maps of knowledge maps and modules for knowledge tree generation. This is the most important functional module of the MOOC Knowledge Map and one of the core technologies of the MOOC application.

## 4. Challenges in building a knowledge map for MOOC

### 4.1 Knowledge segmentation and networking need a lot of research

The workload of knowledge segmentation is huge. Also, the division and association of knowledge points need to be accurate and reflect the latest research results as much as possible. Requires builders to invest a lot of research, repeated analysis and argumentation. On the other hand, cross-discipline knowledge linkage and segmentation require the exchange and cooperation of researchers.

### 4.2 The decomposition of learning resources requires manpower

Existing MOOC resources are often video and resources for classroom teaching. According to classroom teaching mode, knowledge is mixed together. We need to further decompose the video and design a more detailed knowledge tag. This kind of work is very complicated and will reduce the construction rate of MOOC resources. But despite this, this is a step that must be completed to build the MOOC knowledge map.

### 4.3 Knowledge map builders need to understand professional knowledge

The existing MOOC platform organization structure and framework are not suitable for building knowledge maps. System developers need to understand the basic operating principles of knowledge maps. At the same time to ensure the accuracy of knowledge points. This also increases the quality requirements of system developers.

### 4.4 Learners need to adapt to a new learning model

From a learner's point of view, the new learning model also needs to adapt. Learners rely on traditional teaching models, and their learning habits and thinking patterns need to be changed to adapt to the MOOC. In particular, knowledge-based learning patterns may not have the concept of a knowledge section. The process of change in learners' habits will also have a certain influence on the efficiency of learning.

## 5. Conclusions

The original origin of MOOC resources was to satisfy learners' needs for knowledge. We need to change the structure of MOOC resources to better adapt to online learning. To achieve the goal of reducing the dropout rate of MOOCs. And it can increase the incidence of effective learning. Although the construction of knowledge maps faces many challenges, we must work hard in this direction. Ultimately, the goal of increasing the application of MOOCs is achieved.

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