MOOC Instruction Optimization in “Emergency and First Aid”—From the Perspective of the Knowledge Graph

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Abstract. In this study, basing on the MOOC "First Aid" course, we use word frequency analysis method and co-word analysis method to establish a knowledge graph. This study is a visible way to explore MOOC instruction optimization. The knowledge graph of the instruction content can help teachers to carry out efficient and clear teaching process review, analysis and improvement. The comparison of the teaching knowledge graph with the student forum knowledge graph can help teachers to reflect on the problems arising from the teaching designs and students’ cognitive processes, so as to promote the improvement of teaching contents, strategies and activities.

Introduction

Since 2012, MOOC has been rapidly emerging around the world with its high quality teaching resources and free and open features, attracting tens of thousands of learners to participate in the experience of one-on-one “large-scale” online learning. Many countries have established their own MOOC platform, such as the French FUN MOOC, Germany's Iversity, Japan's JMOOC, Australia's Open2Study, China's 12 colleges and universities in Shanghai led the establishment of the “online course sharing alliance”, love curriculum network was established Chinese University MOOC, fruit shell network set up MOOC College. MOOC has become a wave sweeping the world.

In the use of MOOC, teachers should give guidance to the students promptly; the student’s forum must be concerned about to understand the knowledge of the students grasp the situation, and then adjust the teaching content and progress. A large number of forum data will cost teachers a lot of time, the forum data visualization would facilitate teachers to their own teaching and understanding of students understand the process of interpretation. Mapping Knowledge Domain is a series of different graphs showing knowledge development processes and structural relationships. It can visually show the core structure, development history, frontier field and overall knowledge structure of the subject. We make a comparative analysis between instruction knowledge graph and the students’ forum data knowledge graph [1]. It can help teachers reflect on the teaching design and students cognitive process problems, so as to promote the teaching content, strategies and activities.

Research Methods and Data Collection

Knowledge graph based on the development of knowledge visualization technology, in particular, it is based on co-analysis, co-analysis, social network analysis and other basic theory, to build a relationship between the knowledge of the network diagram, to explain the structure of the field and so on[2].

The research tools used in this study are Bicomb co-word analysis software and Cite space cluster analysis software. The course content analysis methods are divided into word frequency analysis method and co-word analysis method. Using the word frequency analysis method can determine the core concepts and key content of the course by analyzing the frequency of the keywords in a section of a course. The co-word analysis method combines the quantitative analysis with the qualitative
analysis to reveal the core concepts and key contents and their relationships by counting the number of professional terms that are common to the curriculum. In order to prevent the division of professional vocabulary, we have all the chapters of the course subtitles in the psychological terms of artificial sorting to form a custom vocabulary [3]. In order to facilitate the keyword co-word analysis, we merge some of the same meaning of the key words and standardize the contents of the text according to the standard. The basic flow of knowledge graph acquisition and analysis in this study is shown in Figure 1.

![Diagram](image)

Figure 1. The basic flow of knowledge graph acquisition and analysis in this study.

The clustering analysis tool used in this study is Cite space software. The software is developed by Dr. Chen Chao-mei, Institute of Information Science and Technology, Drexel University, Philadelphia, USA. It is a knowledge visualization tool developed based on the Java platform. Cite space use steps: to determine a research area; to collect the corresponding format of the document metadata; set the threshold and determine the algorithm to get the visual graph; analysis conclusion. We intend to use Cite space V to draw the knowledge graphs of the content of the course and the student forum data to analyze the matching of the teacher's teaching and student learning progress.

The data in this article comes from the first section of the “First Aid” lesson in the MOOC network—”Emergency and first aid”. The data is divided into two parts; the first part is the teacher's instruction content—courseware, which we download directly from MOOC online. The second part is the student forum data; we use the crawler software to get data at the MOOC network student forum interface [4].

The Results and Analysis

Instruction Content Knowledge Graph

In the “Emergency and first aid” section, high frequency words include “first responder”, “Life-saving 'golden time'”, “call the ambulance in time”, “modern first aid view”, ”site ambulance goals”, ”site ambulance principles”, ”site ambulance processes”. According to the word frequency to form a knowledge graph, visualize the relationship between the high-frequency course content knowledge points. In the knowledge graph, the circle indicates the key node, the larger the circle, the higher the frequency of the corresponding topic appears. In addition to “first responder” outside the
center of the larger nodes were “site ambulance goals”, “site ambulance principles”, “site ambulance processes” and other terms. The above words as the center formed several small groups. And, “site ambulance goals” and “site ambulance processes” form a thicker side. Each word is linked to form a knowledge network.

In the graph, the centrality of the center can measure the size of the power of the point, which can reflect the importance of the point in the network. The higher the centrality, the more important the node, in this study, it means the contents of this chapter are around this keyword. We can find out the important knowledge point of the course, by the key words co-occurrence frequency, key words centrality. The knowledge points associated with the keywords cause the teacher's attention and help the teacher to teach properly.

The associated knowledge points form a direct or indirect connection through the edge, showing a state of aggregation centered on a particular knowledge. The weight of the side reflects the teacher's understanding of the relationship between the knowledge points [5]. We have selected a few knowledge nodes with a large degree of centering. We have listed a small group of knowledge points which are directly related to them. We then select a larger node to list and associate knowledge points to form another group to help teachers form the content of teaching knowledge content. So that we can more clearly and quickly sort out the main content of the curriculum content. In the graph, the association between knowledge groups and knowledge points has a clearer presentation, to a certain extent, reflects the characteristics of the curriculum structure. It helps teachers understand the actual teaching process in the knowledge of the occurrence of relevance; adjust the teaching strategies and teaching activities of the arrangements.

**Student Forum Data Knowledge Graph**

This section of the student forum posts less data, only 2012 posts, and node distribution than the course content is looser. Forum knowledge graph and curriculum content knowledge graph is also the “first responder” as the centre divergence. The knowledge directly linked “first aid” of the forum is significantly less than the instruction content of the knowledge graph, including the causes of unexpected events “disease emergency, health knowledge, site environment”. Centre of the other vocabulary are “site ambulance goals”, “site ambulance processes” and so on, they form a few small groups together with their own vocabularies and associated vocabularies. This reflects the interest of students in learning to discuss the site ambulance goals, site ambulance processes, students want to grasp the content in the discussion. From the side of the weight of view, “first responder and site ambulance processes”, “Life-saving ‘golden time’ and site ambulance principles” is a group of words that are more relevant. This shows that students in the after-school discussion, more concerned about “how to implement emergency in the emergency scene”, and “how to do first responder” this group of knowledge points. In addition, “modern one aid view” where the structure is as a separate word scattered in the graph, is more fragmented knowledge points.

**Instruction Content, Student Forum Knowledge Structure Comparison**

From the level point of view, the same level of knowledge points overlap: they are the “first responder” as the centre of divergence, the second level both has “Life-saving ‘golden time’, “site ambulance goals”, “site ambulance principles”, “site ambulance processes”. The same level of knowledge is not coincident with the part is that the student forum has the cause of an unexpected event. This shows that the students can according to the different causes of in-depth analysis of how to carry out first aid in the analysis of how the first aid, teachers should be issued extracurricular materials and cases to help students understand.

From the knowledge of important knowledge points to analyze the degree of overlap, the association of these associated knowledge, such as the instruction content of the knowledge structure of the “site ambulance principles” of the associated knowledge “calm, fast, scientific, safe, caring”, and students discuss the knowledge structure of the “site ambulance principles” associated knowledge “analysis of reasons, fast, scientific, call the ambulance”.

The comparative analysis of teaching content knowledge graph and student forum knowledge graph can intuitively help teachers to carry out teaching reflection. In order to illustrate the reasons of
deviation between the students’ discussion and teaching focus, teachers can analyze from following circumstances. First, teachers should review the teaching content and focus. To examine whether the focus on certain key knowledge, ignoring the knowledge of other points to explain; examining the lack of clarification of the teaching process because of some abstract concepts, or because the examples are not detailed enough, leading students to understand the knowledge points and cases is not thorough enough to lead to discussion through the forum for help. Teachers need to adjust the instruction content, add relevant knowledge, and answer questions in time. Second, the student's cognitive process deviates. Students understand the misunderstanding of knowledge, confuse the concept. At this point the teacher needs to correct the students' misunderstanding in time to make the correct guidance for the next step. Third, students’ knowledge transfer occurs in the teaching process. This shows that students have new learning content and the original knowledge and experience and cognitive structure of integration, teachers can be on this basis for more in-depth teaching activities. Fourth, students focus on a portion of their interest and communicate with “like-minded” learning partners. In this case, the teacher can provide relevant reading resources; encourage extracurricular inquiry, but also to avoid students from the learning trajectory. Fifth, students discuss the content and homework closely related, this means that students are experiencing difficulties in completing the homework or finding that the teaching content is wrong. Teachers can start an online Q & A and correct the error in time.

Teaching Reflection Based on Knowledge Graph

The discussion of knowledge points in student forums can reflect, to a certain extent, the situation of student learning. MOOC platform to bring one of the conveniences of teaching is how to effectively analyze the forum data to understand the students learning situation, and the organic analysis of the results into the teaching process.

We can determine the range of the knowledge points according to the number of nodes in the knowledge graph. We can determine the relationship between the knowledge points according to the center of the node, the edge between nodes. The visualization of knowledge graphs can clearly show the breadth and relevance of knowledge coverage. This provides a favorable way for further study of teaching content and teaching problems such as knowledge of students.

This paper puts forward the use of MOOC platform curriculum information to establish the knowledge graph based on the curriculum knowledge points, which can promote the optimization of curriculum teaching. However, this study only realizes the knowledge graph analysis for specific courses, and the universality is slightly insufficient, and the visual analysis of any course needs to be further explored and perfected.

References