Semantic Mining and Application of Comments in Mooc Course Based on Emotional and Co-Word Analysis

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Abstract: MOOC has developed rapidly in Higher Education in the past few years. Teachers are easier to observe the learning process and the learners' performance from their comments in MOOC. Taking the learners' comments in MOOC of Chinese Universities as the research object, this paper calculates the emotional value based on the comments through using the emotional and co-word analysis. Based on the semantic mining of learners' course comments, it provides suggestions in curriculum designing, teaching style choosing, difficulty of homework arrangement, and in order to strengthen teacher-student interaction and improve video production and management.

1. Introduction

MOOC has developed quickly in recent years since the Ministry of Education issued the "Opinions of the Ministry of Education on Strengthening the Application and Management of Online Open Courses in Colleges and Universities" in 2015. MOOC platforms such as XuetangX, MOOC of Chinese Universities, CNMOOC, icourse and so on have been emerging. There are 4079 MOOC courses from 289 colleges and universities in China which covers six fields, including literature and art, philosophy and history, economics, basic science, engineering technology, agriculture, forestry and medicine on the MOOC of Chinese Universities. Based on the other experts research on the field, this paper uses emotional and co-word analysis to analyze learners' comments on the Chinese Universities MOOC platform, so as to deeply understand the their attitudes of learning MOOC courses, MOOC platform functions. Therefore it provides ideas to optimize MOOC platform and rationalize the curriculum.

2. Literature Review

Most of the early studies on MOOC stayed at the discussions on the concept, characteristics and teaching mode of MOOC. Yang Chengli and Li Qiang analyzed several key factors affecting the development of MOOC in the future, and pointed out that network education resources are the basis of MOOC application and development, and the participation of enterprises is the driving force of online education innovation [1].Wu Jinhui made a comparative study on the basic situation of the three MOOC platforms in China from four aspects: teaching resource design, classroom organization and interaction, as well as achievement evaluation and graduation certification, and put forward the corresponding thoughts and suggestions [2]. Li Xiuli analyzed the construction of MOOC and the utilization [3] of courses in colleges and universities through a questionnaire survey of several MOOC platforms.

The MOOC system attracts more and more researchers' attention because it can maintain the learning records of each learner, which can be used as an important data for the analysis of learners' behavior. Taking the students' curriculum learning data as samples, Liu Sanya found effective methods to guide the teachers' practical teaching, and improved the learners' learning experience through analyzing the differences of learners' participation and learning effectiveness from different dimensions [4]. Based on the statistics of the main MOOC courses of information literacy in China, Zhou Qi puts forward some corresponding suggestions for MOOC improvement through

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comparative analysis from the aspects of curriculum content, resources, model and feedback [5]. From the perspective of big data, Wu Linjing divided MOOC reviews into three main categories: content-related categories, emotional-related categories and other categories by using semantic data mining [6].Xu Xiaozhou et al., taking the MOOC course of entrepreneurship education offered by Zhejiang University as an example, analyzed the effectiveness of MOOC course of entrepreneurship education from the two aspects: the process evaluation and impact evaluation [7].

From the literature research there are certain limitations in representativeness, because most of the existing researches aimed at one course or one type courses, and the mining of comments needs to be further deepened. This study clarifies the existing problems and tries to find good solutions in the construction of MOOC courses through discussing learners' comments on MOOC of different disciplines; different type courses and different emotions by using hot word relation network.

3. Research Design

3.1 Research Object

This paper chose curriculum learning online reviews of the MOOC of Chinese Universities mainly because it has a large-scale population which covers the different levels' participants, not only students from colleges and universities, but also some working persons. This paper chose three general courses and six core major courses (complex variable function and integral transformation, numerical analysis, English-Chinese translation, English phonetics, organization and human resource management, financial risk management) as the research courses, collected all the online reviews of them from February 2018 to March 2018.

3.2 Research Method

The two analytical methods: emotional analysis and word frequency statistical analysis have been used in this study. The comments reflect the learners' emotional tendencies towards the MOOC courses, therefore, based on the emotional words [8], it can calculate the emotional tendencies by weighting positive emotional words and negative emotional words in each comment [9]. At first, the lexical items are analyzed to count the number of positive emotional words and negative emotional words in each comment. If the comment does not contain emotional words, is classified to neutral comments and makes no further discussion.

The emotional value of the course is calculated by the following formula:

$$E = \frac{\sum_{i=1}^{n} P1 - \sum_{i=1}^{n} P2}{\sum_{i=1}^{n} P1 + \sum_{i=1}^{n} P2} \quad (1)$$

E: emotional tendency value of a course (-1<E<1)

n: total number of comments

P1: represents the number of positive emotional words in the review of Article i

P2: the number of negative emotional words in the review of Article I

When the E is closer to 1, the higher the satisfaction of the learners participating in the course is. Whereas the emotional level value E is lower or even negative, the lower the satisfaction of the learners participating in the course is.

3.3 Data Acquisition and Preprocessing

Firstly 1214 comments have been extracted from February 2018 to January 2019 from 9 courses, excluding some meaningless comments such as "video cannot be viewed", "add WeChat…" And then the 1183 comments obtained as analytical samples and identified the positive and negative emotional words for each comment. We took the words, like "easy to understand", "clear" as the positive emotional words, "unable to keep up" and "disappointed" as negative emotional words, and

calculated the emotional level E value.

Secondly, all the comments are classified into two categories: positive comments and negative comments according to the E value. With the help of NLPIR software, the keywords and their frequency are counted, the number of these words appeared in the comment is counted, and the word frequency matrix is made by NCINET software. The more the number of co-occurrence means the closer the relationship between these words. Finally, introducing the positive and negative words into the UCINET software it generated the relational graph.

4. Research Results and Discussion

4.1 Curriculum Emotional Evaluation

Emotional evaluation is used to reflect learners' satisfaction with the curriculum. Some comments are more euphemistic, others are tough, such as “better, but lack of answer analysis” indicates that the learner is satisfied with the course itself, it reduces the degree of satisfaction because lack answer description. Another comment such as “it is not vivid” indicates that the learner's lower satisfaction. According to the affective analysis described above, the results of this study are shown in Table 2.

Table 1 Curriculum Emotional Evaluation

Courses	Positive word frequency	Negative word frequency	Emotional value
Advanced mathematics	174	33	0.68
College English	160	21	0.78
Finance	294	39	0.76
Complex function and integral transformation	63	9	0.75
Translation	74	5	0.87
Human resource management	101	16	0.68
Numerical analysis	142	18	0.76
English phonetics	136	2	0.97
Financial risks management	181	12	0.88

According to the table2, the highest emotional value of the nine courses is 0.97 and the lowest is 0.68, which indicates that the learners' emotion tendency to the nine courses of MOOC in Chinese universities is positive, and the average value of 0.79 is higher than that of the same kind of evaluation results, which indicates that the satisfaction of the above courses is higher.

English phonetics is a core major course of foreign language majors, and learners pay most attention to teachers' pronunciation, lecture mode and then course content. From all the emotional evaluation of this course, more than 50% of the comments are the affirmation of the teacher's pronunciation, followed by the affirmation of the teacher's personal characteristics and teaching style. Although the emotional evaluation of higher mathematics and organization and human resource management is positive, the score is relatively low in the nine courses. The main reasons are as follows: firstly, the content of the course is obsolete, as well as few corresponding exercises or errors in the after-class exercises. Secondly, most comments mentioned that teachers have the problems of giving lecture, such as “accent” and “speed of speech”, which showed that the personal teaching style also affected learning effect. Through the effective emotional evaluation, we can identify the causes of these emotions, therefore the teachers and MOOC platform can take good adjustments.

4.2 Statistical Analysis of Word Frequency

On the basis of emotional evaluation, this study made the relationship map of each kind of comments through UCINET software (Figure 1, 2) by using word frequency analysis [10]. In order to improve MOOC platform and teachers’ performance, it carried out in-depth analysis of positive comments and negative comments. From the positive relationship map, we can know the concerns and achievement of learners through MOOC platform. From the negative relationship map, we can

find out the specific reasons of lower satisfaction and the problems in online courses.

4.2.1 Frequency Analysis of Positive Comments

From Figure 1, the word “teacher” is a central word, as well as a high frequency word that appeared more often in the positive evaluation, followed by another word “good”. Regarding the closely connected words to the “teacher” from the above fig , it is concluded that teacher is the core of the positive evaluation, which affects the students' learning effect and students' criticism of the course. The teacher's characteristics, such as the pronunciation, the speed of speech, are connected with the students' comments; the teacher's teaching methods, such as the courseware style, understandability, affected the learner's learning effect. Once the above factors meet the learners' learning expectations, most learners will mention “good” in their comments.

The curriculum content is another main dimension of the comments, which mainly includes the richness of the curriculum content, the cases application and answer of after-class. In addition, a small number of students also concerned about knowledge expansion of the course and its applicability.

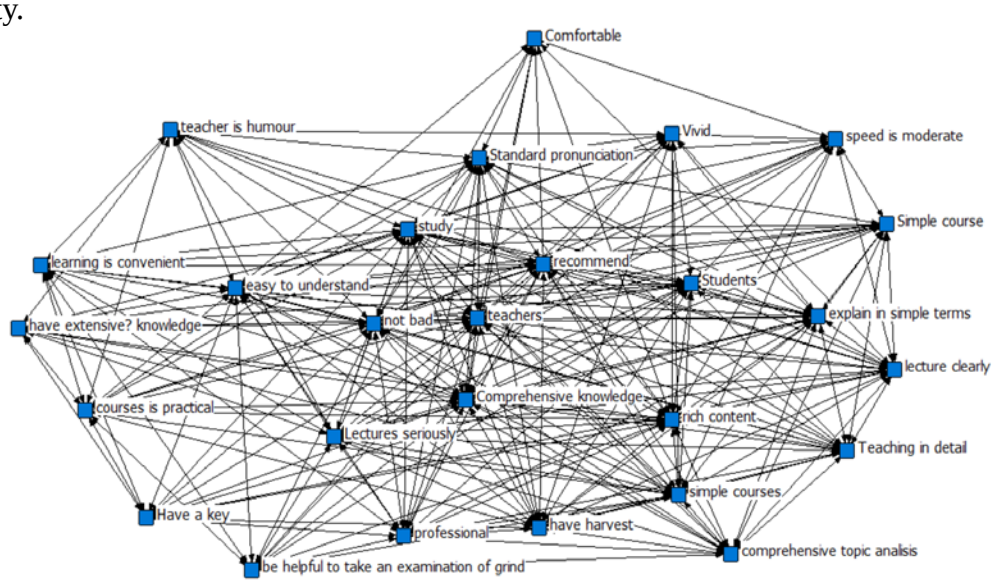

Fig.1 Keywords Map of Positive Comments

4.2.2 Frequency Analysis of Negative Comments

From Figure 2, the negative analysis is still centered with teachers, curriculum content and platform. First is about teachers' teaching style, and connected words are “book copier”, “boring”, “fast rhythm” in the negative comments, which affect learners' interest in learning and the behavior of learning input. And teacher’s characteristics, such as “accent” and “low voice” became the second concern of the students. Thirdly, less communication and interaction is often mentioned in the negative comments. For most learners, they hope to have the opportunity to communicate with teachers and answer questions and solve problems in study.

From the point of view of curriculum content, words such as “only concept”, “incomplete courseware” and “poor application” appear many times in the comment which affected the learners' learning experiences. From the platform perspective, the words “cannot keep up” and “no subtitles” showed some students didn’t adapt to online learning environment. Although most learners say that there is a great difference between the online course teaching of MOOC and the traditional teaching, there are still some learners can’t adapt to it, including online check-in, online homework and exams, and so on.

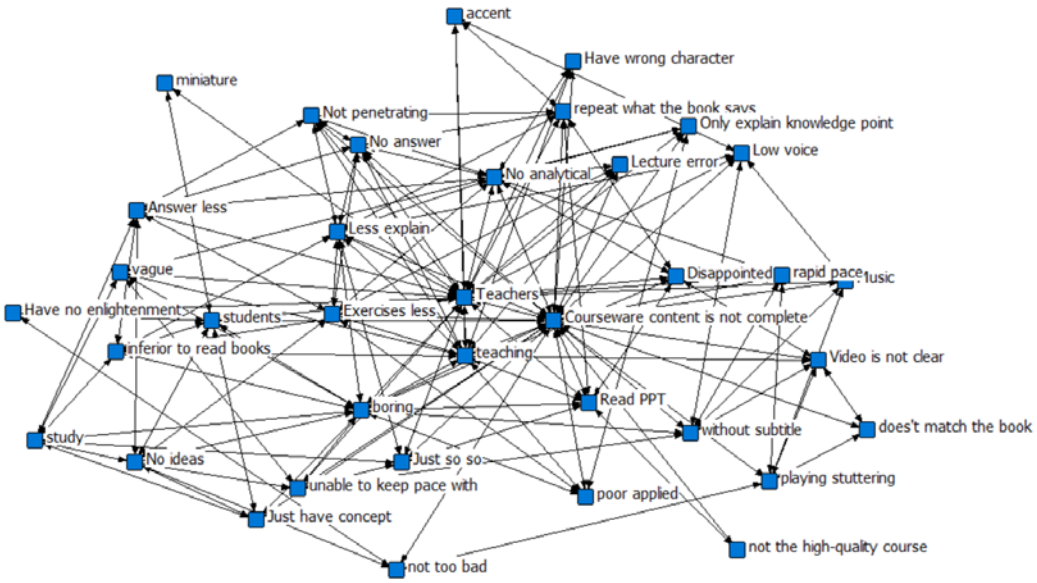

Fig.2 Keywords Map of Negative Comments

5. Suggestions on Improving the Quality of Mooc Courses

5.1 Diversify the Course Contents, Enhances the Course Quality

The course content includes two aspects: the diversification and distribution of the course and the duration of one time teaching [11]. In order to improve the learners' interests, teachers should enrich the course content as far as possible, properly interslotting some video materials related to the content, character interviews, apply vivid cases into theory explanation, and. Another point it should tell the learners the course structure, each time's main theory, so that learners can make a good preparation. Certainly, it is best to limit the time of video to about 15 minutes, avoid learners feeling tired.

5.2 Attach Importance to Teachers' Teaching Style and Improve the Attractiveness of Courses

Teachers' teaching style are not only the main factors that affect learners' learning effect, but also affect learners' evaluation of curriculum. The teaching style includes two aspects: understandability and vitality. If the teacher can make learners easy to understand the obscure theory in a flexible and vivid way, learners will be strongly attracted with high satisfaction. But it is found that many learners complained about the speed of lecture, the dialect in teaching, and so on, those reduce learners' attention and lead to the omission of important knowledge points. Teachers should improve their teaching skills and make more elaborate preparations.

5.3 Meet Different Level learners' Requirements

Different learners have different knowledge base and abilities, so the after-class homework should be designed in terms of different levels. It suggested that teachers can divide exercises into three levels, for students with good foundation and higher understandability can give more difficult questions. In the meanwhile, in order to encourage students finish the homework on time, the MOOC platform should establish check-in system, and reward system.

5.4 Strengthen the Interaction between Teachers and Learners

Because of the large number of students taking a certain course on the MOOC platform, it is a little bit difficult for the teacher to provide one-to-one guidance. On the other hand, the MOOC platform course video is recorded by the teacher in advance, and the teacher cannot interact with the learners in time, which greatly weakens the relationship between students and teachers. It suggests that the group chat mode can be built in MOOC platform; teachers and learners can enter into same discussion online group, so as to increase the interaction and improve the learning efficiency.

5.5 Optimizing Production and Management of Video

At present, the teaching video of MOOC platform is recorded by teachers in advance. MOOC platform can organize professional experts to examine the quality of the video according to the strict standard, if the video cannot follow the rules of platform, it should be re-corrected. Sometimes the video of a course spans a long time, a lot of contents are out of date, so the platform should contact the teachers to update the course in order to guarantee learners' good experiences.

6. Conclusions

This paper takes learners' comments on the MOOC of Chinese Universities client as the research object, based on the analysis of emotion and common words, then translate comment keywords into positive and negative visualization network. Through the semantic mining of learners' course comments, we put forward suggestions on how to improve the course quality of MOOC including curriculum design diversification, teacher-teaching style, difficulty level placement exercises, teacher-student interaction and video follow-up management are proposed.

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