Intelligence Empowers Aesthetic Education: A Study of MOOC Video Production Based on LDA Topic Modeling

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Abstract. Videos are the most important and commonly used resource in massive open online courses (MOOCs). This study takes 12 national quality courses of aesthetic education on the platform of 'Chinese University MOOC' as the research samples, aiming to explore the diversified production strategies of MOOC videos under intelligent technology. The study applies python web crawler to obtain the course evaluation data, and uses LDA topic modeling to mine the topics of the course evaluation texts. The experimental results show that learners mainly focus on five aspects: teacher teaching, course content, learning effect, aesthetic immersion, and video form. Based on this, video production strategies such as story-telling knowledge teaching, hierarchical content design, self-driven learning effect, immersive aesthetic immersion, and interactive video form are proposed to provide feasible references for the development and production of MOOC videos.

Keywords: Aesthetic Education, MOOC, Video Production, LDA Model, Course Reviews

1 Introduction

In recent years, aesthetic education has become increasingly important for cultivating students' aesthetic ability and humanistic literacy. On December 20, 2023, the Chinese Ministry of Education issued the 'Notice on the Comprehensive Implementation of School Aesthetic Education Immersion Actions', which deeply implements President Xi Jinping's idea of socialism with Chinese characteristics in the new era, namely, passing down the Chinese civilization, strengthening cultural self-confidence and further improving the work of aesthetic education. The 7th item of the 'Notice' proposes aesthetic wisdom education empowerment action, specifically, by empowering school aesthetic education with digital technology based on the national wisdom education public service platform, the 'Notice' requests for developing high-quality aesthetic education excellent courses and teaching results such as exhibitions , displays, interactive experiences, etc.[1]

MOOC (Massive Open Online Course) provides a free and flexible online learning platform for global learners. Since the establishment of the 'Chinese University MOOC' platform in 2013, Chinese MOOC has moved from initial imitation to

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independent innovation, and has now formed a relatively complete ecosystem. Video is the most important teaching resource of MOOC, and video has a natural advantage of conveying beauty and demonstrating artworks and skills. This study aims to explore how to combine audio-visual language, intelligent technology and other diversified means to produce MOOC videos in order to enhance the learning effect of learners and promote the digital popularization of aesthetic education.

2 Literature Review

McLuhan proposed that “the medium is the message”, and that the appearance of each new medium, no matter what it transmits, brings a certain message to human society in its own form and results in certain change in society. [2]In this sense, new technology is the revolutionary power. With the development of new technologies such as mobile Internet, virtual reality, augmented reality and so on, the quantity and quality of MOOC courses on aesthetic education have been significantly improved. In recent years, a large number of studies have been actively exploring how to improve MOOC videos through technological innovation. The MOOC project ‘Virtual Hong Kong: New World, Old Traditions’, led by AIMtech Center of City University of Hong Kong, recreates Hong Kong's history, modernity and traditional culture through virtual technology, and provides immersive learning content for distance learners to appreciate and experience Hong Kong's traditional culture and folklore. [3] Huiyuan Xie et al. addressed the problem of weak interactivity in MOOC video courses, and designed a nonlinear, decentered, and reproducible video course that supports interactive activities, which improves the interaction level and deepens the degree of interaction.[4]

It is not difficult to find that most of the above studies take teacher-oriented and video content as samples, while there are fewer studies that take student-oriented and evaluation feedback as samples. Under the trend of postmodernism, the learners' multivariate feedback on MOOC courses is especially important. With the help of network big data to obtain massive course review information, it can objectively present the real feedback of learners. LDA (Latent Dirichlet Allocation) topic model as an unsupervised machine learning method is widely used in the field of text mining, especially when dealing with a large-scale document collection, it can effectively discover the hidden topic structure. [5] Xianjing Lai utilizes the LDA topic model to conduct topic mining on course review texts, and proposes that learners' online course review topics mainly focus on five aspects: teaching methods, audience groups, learning platforms, teaching effects, and course quality.[6]However, such studies do not propose specific strategies for video production. Based on above, this study combines the theoretical knowledge of video production, utilizes the LDA model for topic mining of course review texts, and proposes video production strategies one by one for the topics that students are concerned about.

3 Methods

3.1 Research Path

This study takes 12 national quality courses of aesthetic education on the platform of 'Chinese University MOOC' as samples. Python programming technology was used to process the data. The first step is to use web crawler to crawl the user comment data, the second step is to pre-process the data, and the third step is to use LDA topic modeling to generate visualized topic feature maps. Each theme of learners' concern is analyzed, and the corresponding MOOC video production strategy is proposed. The research path is shown in Figure 1.

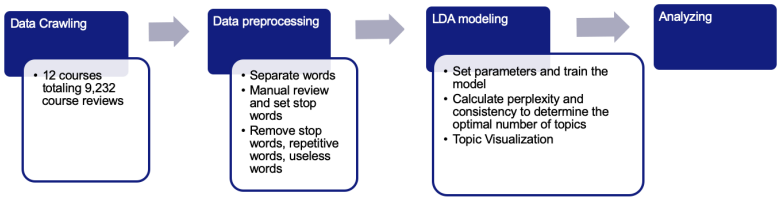

Fig. 1. Technology Pathway(Author drawing)

3.2 Research Steps

Data Crawling

Course comments are the real feedback of learners with high objectivity. Web crawler can comprehensively capture the comments of all pages to ensure the integrity of the data. Taking 'Chinese University MOOC' as the platform, by searching for the keyword 'aesthetic education' and selecting the national excellent courses, there are 12 courses in total, and this study takes them as the research samples (the data is up to January 19, 2024). The 'BeautifulSoup' library for Python was used to request and parse the web content to extract the course evaluation text information, which results in total 9,232 texts. This study ensured that the crawler correctly modeled user behavior and followed the website's robots.txt protocol to fetch data in a legally compliant manner, and that the content of the reviews fetched was consistent with what the user was able to see on the website.

Data Preprocessing

In order to ensure the validity of the data, it is necessary to clean and standardize the crawled comment information through data preprocessing. Firstly, 'jieba' library in Python is invoked to perform Chinese word separation on the original corpus; secondly, in order to improve the accuracy of the results, manual review of the data is used and the stop-list is set manually; thirdly, the stop-words, useless words, repetitive words are removed to obtain valid text data; finally, word frequency statistics are done on the cleaned data.

LDA Topic Modeling

The LDA model contains three levels: document, topic and vocabulary. This model can extract the topic from the document and reflect the potential topic of the document through the probability distribution of the vocabulary. The core idea of the LDA model is to use the topic as a mediator to mine the relationship between the document and the topic, the topic and the vocabulary. It is a three-level Bayesian probabilistic generative model,[7] and the joint distribution of the whole model is shown in Equation (1).

$$p(w, z, \theta_m, \varphi_k \mid \alpha, \beta) = \prod_{n=1}^{N} p(\theta_m \mid \alpha)\, p(z_{mn} \mid \theta_m) \\ p(\varphi_k \mid \beta) p\left(w_{mn} \mid \theta_{z_{mn}}\right) \tag{1}$$

Firstly, the ' LDA Model library' of Gensim is called to set the model parameters. The Gibbs sampling algorithm is used to obtain the global distribution of topic Z and word W. α and β are set to 50/K and 0.01 according to the empirical values.[8] Secondly, the perplexity and coherence indicators are used to determine the optimal number of topics, K. The value of perplexity decreases with the increase of the number of topics. The number of topics shows a decreasing trend, the smaller the value of perplexity is, the stronger the generative ability of the topic model is proved; the consistency index is used to calculate the semantic correlation between the words within each topic, and the higher the consistency index is, the better the model interpretability is. Finally, the topic feature lexicon is generated, and the 'LDAvis' library is used to visualize the topics generated by the model for a more intuitive understanding of the topics.

4 Results

4.1 Determination of K

The perplexity and coherence curves were used to determine the optimal number of topics K. In principle, the best modeling effect is achieved when the perplexity is lower and the coherence is higher. As shown in Figure 2, the perplexity curve showed that the perplexity tended to decrease with the increase of the number of topics, and when the number of topics K was greater than or equal to 5, the perplexity decreased; the coherence curve showed that the number of topics K reached the peak when it was 5, which meant that the coherence index was the highest. Combining the results of the two curves, this study determined that the number of topics K was 5.

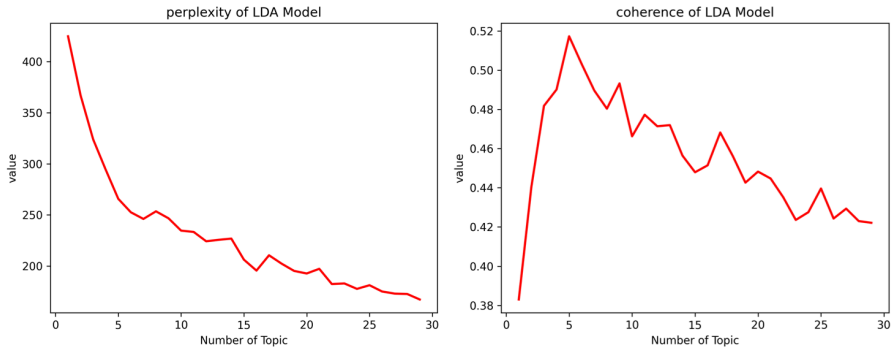

Fig. 2. Perplexity and Coherence

The 'LDAvis' library was called to visualize the topic structure generated by the model. When K was 5, the topic visualization map of Figure 3 can be generated. A circle represented a topic, and when K was 5, the circles were dispersed and did not intersect, which proved that K was 5 could accommodate the evaluation text better, and the topic modeling was effective.

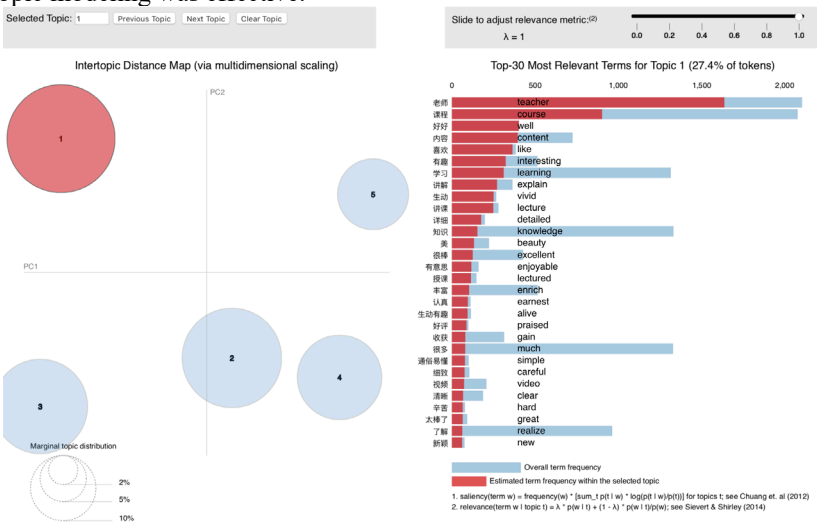

Fig. 3. LDA Topic Visualization

4.2 Distribution of Topic Features

The larger the diameter of the circle, the greater the probability of the occurrence of this topic feature words, i.e., the more attention it received from the learners. The distribution of the feature words of each topic was shown in Table 1.Combined with the word frequency characteristics of each topic, the five topics were named manually. Circle 1 corresponded to Topic 1 'Teacher teaching', Circle 2 corresponded to Topic 2

'Course content', Circle 3 corresponded to Topic 3 'Learning effect', Circle 4 corresponded to Topic 4 'Aesthetic immersion', Circle 5 corresponded to Topic 5 'Video Format'.

Table 1. Thematic features

No	1. Teacher teaching		2. Course content		3.Learning effect		4.Aesthetic immersion		5.Video form	
	Feature	Probability	Feature	Probability	Feature	Probability	Feature	Probability	Feature	Probability
1	Teacher	0.108	Understand	0.039	Much	0.097	Human	0.041	Learning	0.032
2	Course	0.059	Aesthetics	0.031	Knowledge	0.086	Benefit	0.033	Human civilization	0.023
3	Well	0.026	Learning	0.026	Learned	0.06	Human civilization	0.031	Course	0.016
4	Content	0.026	Course	0.025	Course	0.043	Course	0.027	Video	0.011
5	Like	0.024	Pattern	0.022	Nice	0.033	Understand	0.019	Ppt	0.009
6	Interesting	0.021	Culture	0.013	Learning	0.032	Life	0.018	Production	0.008
7	Learning	0.02	Enrichment	0.012	Great	0.025	Civilization	0.016	Exquisite	0.007
8	Explain	0.018	Decorate	0.011	Enrich	0.021	Recognize	0.015	Classroom	0.006
9	Vivid	0.016	Teacher	0.011	Understand	0.018	Interesting	0.013	Way	0.006
10	Lecture	0.016	History	0.01	Teacher	0.016	Help	0.011	Art	0.006

5 Discussion

5.1 Storytelling Knowledge Teaching

Topic 1, 'Teacher's teaching', includes such characteristic words as teacher, explain, vivid, lecture, etc., accounting for 27.4% of all comments, which indicates that the highest concern of learners is the teacher's teaching style. When teachers record teaching videos, they usually adopt the way of oral broadcasting or voice-over explanation. Ordinary people will be nervous and unnatural when facing the camera, and the teacher's expressiveness when appearing on camera may be weaker than that in offline classrooms, which may create a feeling of stiffness and rigidity for students. As a result, negative comments such as "the teacher is reading PPT" and "the teacher is like a robot" have appeared in course evaluations. So how should teachers teach in order to be lively and interesting?

Narrative cognitive theory suggests that the human brain has an innate ability to construct and understand stories, and that elements such as plot, character, and conflict in stories can promote long-term memory and stimulate deeper understanding.

Therefore, teachers can embed story elements in instructional videos to visualize abstract concepts. Storytelling narratives help students construct personal knowledge maps through contexts, instead of passively receiving information, students actively construct knowledge through interaction with contexts. Teachers can design a contextual framework to impart knowledge through storytelling, which can help students connect new knowledge to their prior experience and reduce the difficulty of comprehension. Video producers can make a short video or a small animation to increase the interest of the video so that students can understand the knowledge in a more visual way.

5.2 Hierarchical Content Design

Topic 2 , 'course content', including aesthetics, curriculum, graphics, culture, etc., accounted for 23.2% of all comments. Most of the positive comments considered the course content to be rich, but there were a few negative comments that the course content was not deep enough and stayed at the superficial level of knowledge. Benjamin Bloom, an American educational psychologist, proposed that the cognitive domain goals include six levels: memorization, comprehension, application, analysis, synthesis, and evaluation. Based on this theory, the curriculum should be designed in a hierarchical manner, including not only the explanation of basic knowledge, but also case studies, practical demonstrations, and critical thinking. Hierarchical content design can provide learners with a comprehensive and progressive learning experience, which in turn promotes their deep learning and the development of advanced thinking skills. Video content is recommended to match the content of the course, so as to achieve progressive; at the same time, the video can be broken down into multiple frames, design subheadings, and use flower characters and sound effects to prompt learners.

5.3 Self-driven Learning Effects

Topic 3, 'learning effect', including words like learned, good, great, etc., accounted for 20.9% of all comments. Based on the vast user market of MOOC videos, it is difficult for teachers to realize one-on-one learning guidance, and it is especially important to improve learners' self-learning effect. Self-regulated learning theory emphasizes that learners are not only passive receivers of information, but also active managers of learning. MOOC platforms should build a learning environment that supports learners' self-driven, self-management and self-assessment, so as to enable learners to achieve more efficient learning on the platform. Firstly, before the video starts, learning objectives are listed in prominent flowery characters to guide learners to set personal learning goals and adjust learning strategies accordingly. Secondly, the video content is split into easily digestible subsections, with each subsection corresponding to a specific learning objective, which facilitates step-by-step learning and self-testing by the learners. Thirdly, interactive questions or pause points are inserted in the video to motivate the learners to think, answer, and record, thus activating the meta-cognitive process and allowing them to realize more effective learning. Finally, a self-assessment game is inserted into the video to help learners assess their own learning progress and mastery on a regular basis, and to facilitate their self-adaptation.

5.4 Immersive Aesthetic Immersion

Topic 4, 'Aesthetic Immersion', including words such as human, civilization, life, awareness, etc., accounts for 16.7% of all comments. Aesthetic videos have a certain effect of aesthetic infiltration on learners, and learners can acquire aesthetic literacy and cultivate their sentiment through watching MOOC videos. Aesthetic education videos use multimedia forms such as text, image, sound, etc., which fully mobilize the participation of learners' multiple senses, help form deep-level cognition, and enhance the effect of aesthetic education. Contextual learning theory emphasizes that learning is a socio-cultural process and must take place in a concrete, real environment, rather than isolated, abstract learning. Aesthetic education MOOC videos need to create corresponding scenes, so that the learners can watch and analyze art works as if they were in the corresponding actual scenes, thus understanding and experiencing beauty more deeply. Therefore, VR and AR videos can be produced when funding allows, and virtual scenes can be constructed to provide learners with an immersive art experience, thus deepening their understanding of artwork and art space.

5.5 Interactive Video Format

Topic 5, 'video format', including the words video, ppt, production, exquisite, etc., accounts for 11.8% of all comments. Learners are not only concerned about the content of the video, but also the form in which the video is presented. For the 12 courses involved in the study sample, learners generally agreed that the videos were well-produced and the PPTs were exquisite, but some learners also suggested that the video format lacked innovation. With the improvement of filming and editing techniques, MOOC videos can incorporate new technologies to realize the integration and innovation of video forms. Firstly, upgrade the visual presentation to enhance the viewing experience of learners, such as using animation, 3D models and other diversified means to visually display the art works; secondly, cut the video content scientifically and reasonably, and make short videos to facilitate students' use of fragmented time for learning; finally, produce interactive video content, such as voting, pop-ups, choices and other functions, to encourage students to interact and enhance learning participation.

6 Conclusions

The development of intelligent technology provides more possibilities for the production of MOOC videos, and this study explores how to combine new technologies, audio-visual elements, and other multifaceted means to produce videos on aesthetic education. The Python web data crawler was used to obtain all the comment data of 12 national quality courses in aesthetic education, and with the help of LDA topic model, the hidden topic structure in the comment data was mined. Thus, this study finds the focuses of learners' attention: teacher teaching, course content, learning effect, aesthetic immersion, and video form, and accurately propose video production strategies for each theme: storytelling knowledge teaching, hierarchical content design, self-driven learning effect, immersive aesthetic immersion, and interactive video form.

Based on the fact that the samples were selected as national quality courses with high course ratings and most of the course comments were positive, no textual sentiment analysis was done in this study. Subsequent studies may try to increase the number of study samples by supplementing samples with average or low course ratings and conducting textual sentiment analysis of course evaluation information to improve the comprehensiveness of the findings.

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