

Research on Barrage Text Mining and Emotional Orientation in Online Interactive Learning Videos: Based on the Case Study of "Luo Xiang's Criminal Law"

Yidi Luo

Central South University, Changsha, Hunan Province, China

1103303790@qq.com

Abstract. This study uses text mining and sentiment analysis methods to analyze the barrage text information of "Luo Xiang's Criminal Law" online teaching videos and sort out the main emotional tendencies of users. The research found that user emotions change with the dispersion of hot topics, showing a decentralized characteristic, and at the same time, users still have a certain lack of capture for the content of online teaching videos in the interactive learning process. It is urgent to clarify the specific impact of technology on users. This study is helpful for deepening research on online interactive learning, clarifying user emotional tendencies, and providing a decision-making basis for accurately improving interactive learning effects.

Keywords: Teaching Videos; Interactive Learning; Sentiment Analysis Research; Barrage Text Mining.

1. Introduction

On December 27, 2021, the Central Cybersecurity and Informatization Commission issued the "14th Five Year" National Informatization Plan, emphasizing the importance of the construction of the "Internet plus Education" platform. Affected by public health crises in the past few years, China's online education has developed rapidly. Combining cases to extract Chinese experience in digital transformation of education can effectively promote the improvement of educational informatization level (Yang et al., 2023). Research has analyzed the case of Xi'an Jiaotong University's development of online education, formed personality portraits based on learners' individual characteristics, developed personalized online learning strategies and methods, and worked closely with the National Smart Education Public Service Cloud Platform (Zheng, 2023).

The application of online teaching videos in social life cannot be separated from the participation of users. The use of bullet-screen by users represents the content of interactive learning in videos. The original meaning of "bullet-screen" is to represent dense bullets or intensive shelling tactics with bullets (Yao, 2022). Its application in the field of computers first emerged in the field of games. In 2006, comments made by users on the Japanese niconko animation website could appear instantly on the corresponding video content, which is considered to be the origin of the bullet-screen that we talk about most now (Lv & Xu, 2016). When the annotations and comments (Wang, 2015) composed of characters that are reproduced with the playback of the video stream accumulate to a certain amount, the dense form resembles countless bullets flying past, hence the name "bullet-screen".

Based on this, the entry point of this study is the analysis of user bullet-screen text in online teaching. Through quantitative methods of text mining, the emotional tendency of users in online teaching video interactive learning is analyzed. In current video products, bullet-screen is mostly concentrated in the entertainment field, rarely appearing in the education industry. Most of China's online course public platforms (such as MOOC) have not opened bullet-screen function. As the birthplace of Chinese bullet-screen culture, Bilibili not only has many popular culture and subculture video products, but also contains rich educational resources. Users' use of bullet-screen in interactive learning on the platform tends to be rich, which can reflect the emotional tendency of users in online teaching video interactive learning.

2. Literature Review

At present, digital transformation is not a new phenomenon, and it has been accompanied by higher education institutions for many years. The era of online and offline teaching coexistence has arrived (Kopp et al., 2019; Leszczyński et al., 2018). Due to the prevalence of the COVID-19, the popularization of artificial intelligence and 5G technology has accelerated, and online education has gained opportunities for vigorous development. Olasile and others believed that after the outbreak of the COVID-19, the development of online education in universities lacked proper planning and design, and effective online education theories and models were not applied, so online migration of teaching scenes caused by the pandemic should not be equated with effective online education or digital transformation of education (Olasile&Emrah, 2023).

Effective online education requires at least two elements: first, teachers make full use of the construction of online learning environment to improve students' skills; second, the network teaching model has received recognition from teachers and students, which promotes the improvement of teaching quality. Han and Ellis (2019) suggested that teachers need to help students realize the value of learning through mixed discussions, and clarified the integration of online discussions and traditional face-to-face learning. Some studies have explored the relationship between student traits, self-regulated learning, technology self-efficacy, and curriculum outcomes in online learning environments (Wang et al, 2013), in order to provide suggestions for optimizing online education models. Compared with students in traditional classrooms, students in online classrooms have disadvantages in cooperative learning, teacher-student interaction, teaching practice, etc. (Amber & Angie, 2018). The existing research results show that students are generally dissatisfied with online learning, especially with the communication and question-and-answer modes. Online teaching does not completely surpass traditional teaching, especially in courses with difficult theories and abstract formulas, where traditional teaching shows its advantages (Tao et al, 2020). A study based on the Big Five personality traits shows that agreeableness, conscientiousness, neuroticism, and openness positively affect students' satisfaction with online teaching models, while extraversion negatively affects students' satisfaction with online teaching models (Sohaib et al, 2022).

Existing research has provided some insights for optimizing the development path of online education: online education has a dual effect on society, with both positive and negative effects. For example, the most typical MOOC has not only promoted the external brand effect of universities, but also improved the teaching quality within the university; Redefine the role of teachers and innovate teaching models; Giving students a complete and in-depth learning experience improves the completion rate of the course (Kang, 2014). Some studies have also pointed out that online distance education may widen social disparities (Sébastien et al., 2021). For example, under the trend of online learning driven by the COVID-19, for individual students, the lack of computer skills and the perception of higher load tasks make them unable to feel their performance has improved in the new teaching environment (Aleksander et al, 2020). For teachers, the transition from traditional classroom to online education has caused serious disruptions to their teaching roles and personal lives, representing a fragmented and destructive reconstruction of traditional teaching activities (Richard et al., 2020). According to the researchers' summary, there are still four major challenges in MOOC teaching: difficulty in evaluating students' homework; a feeling of empty talk due to the lack of immediate feedback from students; heavy burden of time and money; and lack of participation in online discussions by students (Khe et al., 2014).

In the post-pandemic era, improving emotional experience may be a good solution to deal with these problems. Emotional experience can initiate positive psychology, trigger moral judgment, and address educational challenges (Li & Zhu, 2020). We should establish the teaching concept of "Internet plus+education", use the online "asynchronous+synchronous" flipped teaching mode, innovate the design of online learning activities, build an intelligent learning environment, and jointly promote the occurrence of online in-depth learning (Du&Huang, 2020). As a unique interactive tool, bullet screen has reshaped the dissemination mode of bullet screen video. The characteristics of instant feedback, targeted and fragmented viewpoints, and diverse expressions are all distinctive

features (Jiang, 2014). In the context of bullet screen, the evaluation content and video content interact and integrate, and the dynamic nature of the commenting process can reflect people's emotions and evaluations in real time. Therefore, the emotional orientation of bullet screen information is more prominent than ordinary commenting texts (Wei & Wang, 2022). Bullet screen provides users with a new way for cultural practice and emotional expression.

3. Methodology

This study employs machine learning for sentiment analysis, initially discerning the sentiment orientation of each text as either positive or negative. In the realm of binary text classification algorithms, previous research predominantly favors the utilization of the naive Bayes method based on the binomial distribution. This method exhibits notable accuracy by utilizing pre-coded samples, representing the two classes, as a training set. The Bayesian formula is then applied to compute the attribution and probability of unclassified texts.

In the process of text acquisition, a random sampling method is employed to manually code around 800 sample texts, attributing each text with positive or negative sentiment. This subset of texts is intended as the training dataset for machine learning, facilitating the construction of a sentiment analysis classifier. Subsequently, the entire corpus is processed, and the program leverages the classifier's predetermined criteria to assign each text a sentiment index between 0 and 1. A value closer to 1 indicates a higher likelihood of positive sentiment, while a lower value implies a negative sentiment.

During the case selection process, the study's preference for the Bilibili platform is primarily rooted in the platform's considerations regarding the incorporation of online learning video content. Simultaneously, the interactive dynamics of the "Luoxiang Shuo Xingfa" online learning course are deemed representative (Bu & Zhu, 2023). Bilibili is chosen to gather primary online teaching video texts and associated comment information. As one of the most widely used online teaching platforms, Bilibili aggregates a comprehensive collection of Chinese online teaching videos spanning disciplines such as humanities, philosophy, law, sociology, and communication studies. These videos exhibit good representativeness and authority. Among the selected videos on the Bilibili website's "Luoxiang" channel, lecture series posted by UP hosts, including Luoxiang himself, demonstrate strong interactivity with multiple UP hosts engaging in actions such as attention, comments, likes, coin donations, collections, shares, or collaborations, underscoring their typical characteristics.

In the data retrieval process on the Bilibili platform, the study focuses on the following criteria: firstly, based on common text requirements for online teaching videos, the study obtains samples by searching keywords such as "class" or "study." Secondly, during the sample search process, the study emphasizes the retrieval of research materials related to typical cases such as "Luoxiang" and "Fakao." Following these settings, the study employs Python to crawl 96 bullet screen text pieces related to "Luoxiang Shuo Xingfa" online teaching videos. For research purposes, this paper collects bullet screen text information from the Bilibili website's "Luoxiang" channel online teaching videos and subsequently conducts data cleaning on the collected bullet screen text information.

4. Results

4.1. Multifaceted Projection of Video Hot Topics

The online educational videos related to "Luoxiang Shuo Xingfa" on the Bilibili website are disseminated by the user "@陌水云殇" and consist of 96 episodes. The duration of each episode varies, ranging from approximately 5 minutes to over 60 minutes. Similarly, the quantity of bullet screen text messages per episode exhibits noticeable differences, with some exceeding 6000 messages and others numbering around 150.

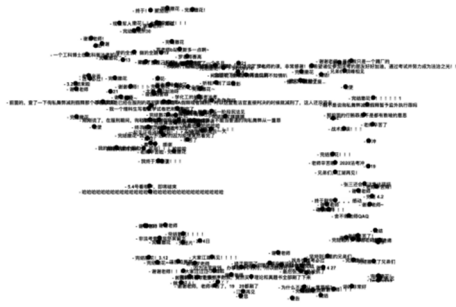


Figure 3. Evolutionary Trend Graph of Hot Topics in "Luoxiang Shuo Xingfa" Bullet Screen Text (Episode 96)

The analysis of the dissemination of social forgetting messages, as produced by Gephi, provides insights into various path propagation structures. Specifically, when examining the propagation paths based on official retweet messages, several distinctive structures emerge, encompassing two-tier tree-like retweet structures, self-retweet structures, multi-tier tree-like retweet structures, trunk retweet structures, and circular retweet structures.

Of particular significance is the two-tier trunk retweet structure, which sheds light on the paths through which messages propagate back to the source, represented by the soswga user. This user boasts a substantial follower base, and these followers maintain concrete relational connections with the original user who posted the online educational videos. For instance, in the analysis of the bullet screen text for "Luoxiang Shuo Xingfa" Episode 1, this study identifies an interconnected network of relationships in the hot topics discussed in the bullet screen. The structural representation mirrors the characteristics of a social network.

Furthermore, this study conducts an in-depth analysis and design of an open architecture, opting for the Web Service structure as the chosen technological framework for development. This choice effectively supports the analysis of semantic relationship networks.

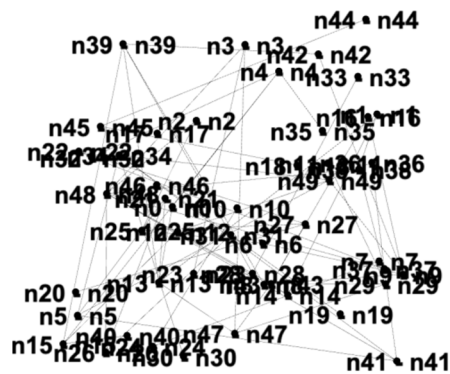


Figure 4. Relationship Graph of Hot Topics in "Luoxiang Shuo Xingfa" Bullet Screen Text (Episode 1)

5. Findings

5.1. Strong Discreteness of Hot Topics: Varied Emotional Focus of Students

This study, utilizing Gephi to analyze the basic information in the bullet screen text of "Luoxiang Shuo Xingfa," constructed simulations in Atlas Focus. The findings indicate a trend of hot topics dispersing from the center outward, revealing a gradual dissemination process during the propagation of "Luoxiang Shuo Xingfa" bullet screen text. This further verifies the dynamism and interactivity of bullet screen text during dissemination. Further research could delve into factors affecting the spread

of hot topics, such as the influence of propagators and the sensitivity of topics. This would enhance our understanding of the mechanisms behind online public opinion formation, providing valuable insights for future studies.

The strong discreteness of hot topics implies significant differences in students' attention to the same topic. Students exhibit diverse interests and preferences, influenced by social environments and media. The formation of their emotional focus points is affected by personal interests, preferences, social environments, and emotional states. This underscores the need for personalized care and understanding in guiding students to develop healthy and comprehensive emotional focus points in the process of education.

In the "Luoxiang Shuo Xingfa" course, students' emotional focus points vary due to factors such as personal interests, knowledge background, and learning motivation. Teachers should consider this diversity and employ varied teaching methods to meet different students' needs, stimulating their interest and motivation. Interactive discussions and online teaching videos can effectively foster students' emotional and intellectual development, enhancing learning outcomes and self-management skills. Future education practices should explore the application and optimization of online teaching videos to meet students' learning needs and promote the development of education.

Firstly, personal interests are a crucial factor influencing students' emotional focus points. Students may have different points of interest in the field of criminal law; some may be more interested in the fundamental theories, while others focus on specific cases and practical applications. Hence, students' emotional focus on different topics in the course varies. Secondly, students' knowledge backgrounds impact their emotional focus points. Students with different knowledge backgrounds may understand and accept course content differently. For instance, students with relevant background knowledge may find it easier to grasp legal terminology and basic principles, while others may require more time to adapt. This knowledge gap contributes to the non-uniformity of students' emotional focus points. Additionally, learning motivation is another factor affecting students' emotional focus points. Students' motivation can be influenced by various factors such as career plans, hobbies, and exam pressures. Students with different motivations may focus on different aspects of the course content. For instance, students aspiring to pursue legal professions may be more concerned with content related to their careers, while others may prioritize the course's entertainment value and practicality.

5.2. Complex Semantic Network: Fusion of Students' Diverse Emotional Orientations

In the "Luoxiang Shuo Xingfa" course, students' emotional orientations are diverse and complex, revealed through the analysis of the semantic relationship network. This complexity is further illuminated by examining the relationships between different words and phrases in the course's relevant bullet screen text. Different vocabulary and phrases may exhibit various semantic relationships, such as synonymous, antonymous, or contextual relationships. For instance, certain words may frequently describe a particular topic or character, reflecting students' emotional inclinations. Further research could analyze this complexity through the topological structure of the semantic network, revealing community structures that represent shared emotional inclinations towards specific topics.

As the online teaching course progresses, students' emotional orientations towards different topics may change. Analyzing these trends can provide insights into the development of students' attitudes and emotional states towards course content. In summary, by complexifying the semantic relationship network, this study delves deeper into the amalgamation of students' diverse emotional orientations in the "Luoxiang Shuo Xingfa" course. This not only analyzes students' learning states and emotional needs but also offers valuable insights for optimizing and improving the course.

This study, aided by participatory observation, discovered that in the "Luoxiang Shuo Xingfa" online teaching video course, students' diverse emotional orientations manifest on multiple levels. Firstly, Reverence and Respect: Students exhibit an attitude of reverence and respect towards criminal law and the legal system, acknowledging their authority and significance in maintaining social order and

fairness. Secondly, Understanding and Agreement: Students comprehend and agree with the cases and legal provisions discussed in the course. Through analysis and contemplation, they gradually understand the conditions of the application of criminal law and judicial logic, developing a sense of agreement with the regulations and principles of criminal law. Thirdly, Emotional Resonance: Students experience anger towards criminal acts and sympathy for victims during the course. Through case analysis, they gain awareness of the societal harm and moral implications of criminal behavior, resonating emotionally. Fourthly, Reflection and Exploration: Students contemplate and explore controversial issues and complex cases in criminal law. Guided by the course, they develop independent thinking and problem-solving skills, engaging in in-depth discussions on the challenges and controversies within criminal law.

Moreover, in terms of the expression of students' diverse emotions, bullet screen text directly reflects their multifaceted emotional expressions. Previous studies have discussed the issue of the sense of acquisition in courses. Students' bullet screen text in the "Luoxiang Shuo Xingfa" online teaching video course expresses their demands for learning criminal law subjects. Specifically, students provide life-based evaluations of online teaching videos, integrating profound understanding with conscious identification of the ideological values implied in theoretical knowledge. Methods to enhance the sense of acquisition in the dissemination of "Luoxiang Shuo Xingfa" online teaching videos are relatively limited. The theory of obtaining a sense emphasizes the internal fulfillment and psychological satisfaction derived from objective learning content and results, reflecting explicit gains.

5.3. Strong Interactivity of Hot Topics: High Student Participation in Learning

The "Luoxiang Shuo Xingfa" course features strong interactivity of hot topics, coupled with high student participation in learning. This results from the combined effects of Professor Luoxiang's course design, teaching style, and the qualities of the students themselves. This highly interactive learning method not only improves students' learning outcomes but also nurtures legal awareness and literacy, laying a solid foundation for future legal practice and social life. Emotion is the main target of a teacher's enthusiasm to stimulate students' learning desires. Teachers urgently need to use abundant enthusiasm to stimulate students' desire to learn, using "justice" to stimulate students to obtain the correct worldview, outlook on life, and values, which are the core qualities cultivated in the course. This study analyzed the bullet screen text messages of the "Luoxiang Shuo Xingfa" online teaching video through Gephi, finding that the hot topics of students' discussion activities exhibit strong discreteness and interactive discussions demonstrate students' strong "anticipated gains."

This study, through participatory observation, discovered that the "Luoxiang Shuo Xingfa" course features strong interactivity of hot topics, with high student participation in learning. Firstly, topics are closely related to reality. Professor Luoxiang selects hot topics in the course that are closely related to societal realities and public concerns, such as widely-discussed cases and controversial legal issues in recent years. These topics easily capture students' interest, sparking their enthusiasm for participation in discussions. Secondly, case analysis prompts reflection. Professor Luoxiang, through in-depth analysis of hot cases, guides students to contemplate the legal principles, moral concepts, and societal impacts behind each case. This analytical approach stimulates students' curiosity and exploration spirit, encouraging them to actively participate in course discussions. Thirdly, well-designed interactive segments. The course includes interactive elements such as questioning, discussion, and role-playing, facilitating better understanding of course content and boosting students' enthusiasm for participation. In interactions with students, Professor Luoxiang encourages them to express their opinions and views, respecting diverse perspectives, creating an open and inclusive learning atmosphere. Additionally, a humorous teaching style. Professor Luoxiang's humorous and engaging teaching style presents complex legal knowledge in a lively manner, reducing the difficulty of learning for students. This teaching style stimulates students' interest in learning, enhancing their learning initiative. Moreover, strong student participation awareness. In the "Luoxiang Shuo Xingfa" course, students demonstrate a strong awareness of

participation, willingly engaging in course discussions and actively expressing their opinions. This participatory consciousness is influenced by Professor Luoxiang's course design and teaching style, as well as the qualities of the students themselves.

This study found strong student initiative in participation in the "Luoxiang Shuo Xingfa" course. Firstly, concerning Professor Luoxiang's teaching style. Professor Luoxiang employs a lively, interesting, and easily understandable teaching method, delivering complex legal knowledge in an approachable manner. He adeptly uses vivid cases and humorous language to explain legal concepts, making learning enjoyable. In this relaxed atmosphere, students become more actively involved in the course. Secondly, concerning the design of course content. The course content is designed to be closely related to reality, covering societal hot topics and legal controversies. This makes it easier for students to resonate with the content, igniting a strong interest. Additionally, Professor Luoxiang invites students to participate in case discussions and role-playing activities, enhancing course interactivity and inspiring students' enthusiasm for learning. Thirdly, concerning the practicality of legal knowledge. Criminal law, as a highly practical discipline, offers knowledge that not only helps students solve real-life problems but also cultivates legal awareness and literacy. Students recognize the importance of learning criminal law knowledge, actively participating in the course to master relevant knowledge. Fourthly, concerning Professor Luoxiang's charismatic personality. Professor Luoxiang's personal charm is also a reason for students' active participation in learning. Leading by example, he conveys correct values and morals to students through his actions and words. This method of leading by example allows students to feel the dignity and power of the law, motivating them to actively learn and explore legal knowledge. Fifthly, concerning students' intrinsic learning motivation. Students' active participation in learning is also related to their intrinsic learning motivation. Many students realize the importance of learning criminal law knowledge for their future career development and social responsibility. Therefore, they are willing to invest time and effort to learn and master relevant knowledge. This intrinsic learning motivation is one of the reasons for students' active participation in learning in the "Luoxiang Shuo Xingfa" course.

6. Conclusion

This study is based on the barrage text information of the online educational video series "Luoxiang Explains Criminal Law." Using text mining tools, we collected barrage text data from user comments on the videos. After data cleaning and analysis, we summarized the behavioral characteristics and emotional tendencies of users in online teaching videos. The research reveals that user behavioral features exhibit a dispersed pattern that follows the migration of hot topics. Therefore, how to stimulate positive guidance from online teaching videos to video users and employ reasonable strategies to promote interactive learning has become a shared issue for current network platforms, educators, and users.

Firstly, enhancing the interactivity of online teaching videos and promoting the concentration of hot topics away from a dispersed state is crucial. Online education platforms or networks providing online teaching videos should offer sufficient support, actively mobilize societal forces, encourage user participation in curriculum development, and collaboratively create distinctive online teaching videos. Furthermore, promoting the application of emerging intelligent technologies to serve as robust support for the utilization of online teaching videos is essential. As users in online teaching video activities are learners, their learning attitudes are susceptible to the negative impact of platform-induced entertainment. Therefore, users need to cultivate learning habits during course practices, promoting independent thinking, and enhancing learning abilities. Additionally, with the deepening mediatization of society, providing users with robust learning technologies and platform support to assist in technical training can reduce or eliminate students' negative emotions during the use of online platforms. When various facilitating conditions enhance students' learning satisfaction, users are more inclined to use online teaching videos. Lastly, as the primary users of online teaching videos, users should possess certain key abilities. These include self-management, self-feedback, and self-regulation. The effectiveness of online learning is closely related to users' emotional expressions, and

a positive emotional attitude contributes to the enhancement of the learning subject's initiative. This can achieve comprehensive improvements and efficiencies, collectively promoting the optimization of online teaching video effectiveness.

References

- [1] Xiaohong Yang, Xin Zheng & Jing Zhang. (2023). Research of Chinese Experience on Fighting against COVID-19 in Education Field: from the Perspective of Online Education. *Chinese Journal of Distance Education*. (01), 1-11+20.
- [2] Qinghua Zheng. (2023). Exploration and Practice of Artificial Intelligence Enabling Online Education Innovation and Development. *China Higher Education*. (Z1), 8-11.
- [3] Jie Yao. (2016). Study on bullet screen video of subculture from the perspective of communication. Master's degree thesis, NanJing University.
- [4] Peng Lv, Fanjia Xu. (2016). Over-laid Comments Pool as a Drugstore: A Study on Over-laid Comment (Danmu). *Chinese Journal of Journalism & Communication*. (10), 28-41.
- [5] Jiaqi Wang. (2015). Research on barrage culture based on barrage video website. Master's degree thesis, Shandong Normal University.
- [6] Kopp, M., Gröblinger, O., & Adams, S. (2019). Five common assumptions that prevent digital transformation at higher education institutions. In *Inted2019 Proceedings* (pp. 1448-1457). IATED.
- [7] Leszczyński, P., Charuta, A., Łaziuk, B., Gałzowski, R., Wejnarski, A., Roszak, M., & Kołodziejczak, B. (2018). Multimedia and interactivity in distance learning of resuscitation guidelines: a randomised controlled trial. *Interactive Learning Environments*, 26(2), 151-162.
- [8] Adedoyin, O. B., & Soykan, E. (2023). Covid-19 pandemic and online learning: the challenges and opportunities. *Interactive learning environments*, 31(2), 863-875.
- [9] Han, F., & Ellis, R. A. (2019). Identifying consistent patterns of quality learning discussions in blended learning. *The internet and higher education*, 40, 12-19.
- [10] Wang, C. H., Shannon, D. M., & Ross, M. E. (2013). Students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, 34(3), 302-323.
- [11] Dumford, A. D., & Miller, A. L. (2018). Online learning in higher education: exploring advantages and disadvantages for engagement. *Journal of computing in higher education*, 30, 452-465.
- [12] Tang, T., Abuhmaid, A. M., Olaimat, M., Oudat, D. M., Aldhaeebi, M., & Bamanger, E. (2023). Efficiency of flipped classroom with online-based teaching under COVID-19. *Interactive Learning Environments*, 31(2), 1077-1088.
- [13] Mustafa, S., Qiao, Y., Yan, X., Anwar, A., Hao, T., & Rana, S. (2022). Digital students' satisfaction with and intention to use online teaching modes, role of big five personality traits. *Frontiers in psychology*, 13, 956281.
- [14] Yeqin Kang. (2014). An Analysis on SPOC: Post-MOOC Era of Online Education. *Tsinghua Journal of Education*, (01), 85-93.
- [15] Goudeau, S., Sanrey, C., Stanczak, A., Manstead, A., & Darnon, C. (2021). Why lockdown and distance learning during the COVID-19 pandemic are likely to increase the social class achievement gap. *Nature human behaviour*, 5(10), 1273-1281.
- [16] Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N., & Umek, L. (2020). Impacts of the COVID-19 pandemic on life of higher education students: A global perspective. *Sustainability*, 12(20), 8438.
- [17] Watermeyer, R., Crick, T., Knight, C., & Goodall, J. (2021). COVID-19 and digital disruption in UK universities: Afflictions and affordances of emergency online migration. *Higher education*, 81, 623-641.
- [18] Hew, K. F., & Cheung, W. S. (2014). Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges. *Educational research review*, 12, 45-58.
- [19] Wenhao Li & Zhiting zhu. (2020). Improving Affectional Experience to Alleviate Emotional Problems with Online Learning During a Large-scale Epidemic. *China Educational Technology*(05), 22-26+79.
- [20] Yanyan Du & Qingshuang Huang. (2020). The Occurrence Mechanism and Promoting Strategies of Online Deep Learning. *China Higher Education Research*(06), 58-63.
- [21] Hanxue Jiang. (2014). The Research of Barrage Video from Communication Version. Master's degree thesis, Central China Normal University.
- [22] Lai Wei & Weijie Wang. (2022). Sentiment Analysis of Video Website Bullet Screen Information Based on Interactive Ritual Chain Theory: Take Bilibili Health Science Videos as an Example. *Information Studies: Theory & Application* (09), 119-126.
- [23] Yanfang Bu & Yuning Zhu. (2023). From the Perspective of the Communication Network of 'Luo Xiang Talks about Criminal Law': Exploring Bilibili's Creative Ecological Advantage. *Journalism Lover*(02), 48-52.