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Application of Multimedia Courseware in Ideological and Political Education Management

Hui Wang, ChongQing Institute of Foreign Studies, China*
Yuting Liu, ChongQing Institute of Foreign Studies, China
Jin-Tae Kim, Hanseo University, South Korea

ABSTRACT

The intervention of modern teaching media in classroom teaching activities has greatly extended the time and space of teaching practice, and new teaching methods, teaching models, and teaching designs have emerged one after another. Improving pertinence and effectiveness and cultivating high-quality talents with solid theoretical foundations provide something that many schools and related teachers have been exploring and researching. Multimedia teaching courseware has its excellent advantages and effects. However, when we enjoy the convenience brought by multimedia to basis of the existing teaching behavior analysis technology, it combines research methods such as residual calculation (residual calculation) and support vector machine (SVM), aiming at both teachers and students. It becomes intuitive, visualized, concrete, and contagious, which keeps students' attention, emotion, interest, and other psychological factors in the learning process in a good state.

KEYWORDS

Application, Ideological and Political Education, Multimedia Courseware

Multimedia technology has gradually been introduced into education and teaching, providing us with an extremely important teaching method for modern ideological and political theory courses (Gebre Yohannes et al., 2016). Those who design ideological and political courses in universities now face the questions of how to effectively and rationally utilize multimedia technology as an auxiliary means, continually develop the reform of teaching methods, and improve the effectiveness of classroom (Bin Jahlan & Soliman, 2021).

In recent years, the Ministry of Education and various provincial and municipal education work committees have introduced various incentive mechanisms through policy support and conducted exchanges and demonstrations through ideological and political multimedia courseware competitions; these initiatives have greatly increased the enthusiasm of teachers in using multimedia teaching and promoted the development of teaching standards (Teichgräber et al., 2021). Not only is multimedia teaching easily accepted and loved by students, but it also conforms to the discipline characteristics of ideological and political courses. In the content of ideological and political textbooks, there is

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advanced political content, and some of this content is highly theoretical (Rakhimova & Islomova, 2021). At present, the practical life experience of college students is generally lacking. The combination of multimedia graphics and text, which can integrate multiple resources, such as images, audio, and so on, helps to narrow the distance between students and textbooks, making up for the monotony of traditional teaching models (Akbarova, 2022).

Multimedia teaching can be presented to students in various forms through media such as sound, video, and animation, making dull concepts and theoretical viewpoints intuitive, vivid, specific, and infectious, and keeping students' attention and emotions engaged in the learning process (Adanech, 2021). For example, when teaching patriotism, teachers emphasize how college students should love their country in today's peaceful times and guide students in how to combine patriotism with love for school and family (Zeng et al., 2020). Teachers seek to show students that patriotism begins with love of their school. Teachers can also display patriotic pictures and videos to students through multimedia to enhance the teaching effect (Tian & Sun, 2021). Multimedia teaching presents a large amount of content to students in a very short time. In addition, multimedia teaching can also break through the content of books and enrich classroom teaching with various relevant materials, which can greatly enhance the expressive power of information (Laosethakul & Leingpibul, 2021).

Examining the use of multimedia in teaching ideological and political theory courses in universities, this paper explores the starting and ending time data of classroom teaching and constructs a behavior evaluation system based on multimedia teaching. To examine students' learning habits, this research takes the campus network students' online data records as a starting point and uses K-means algorithm to statistically analyze different types of students' online behavior. Through classification of SVM behavior data, this article analyzes the interrelationship between students' online learning behavior and online time, frequency, and client type, and clarifies the relationship between students' online behavior and their interest and success in learning.

MATERIALS AND METHODS

Related Concepts of Multimedia Teaching

Multimedia

On the one hand, *multimedia* refers to physical carriers used to store and transmit information, such as books, CDs, magnetic tapes, impressions, and other entities (Qiao, 2021). Another meaning of *multimedia* describes media existing in a single form. It is a collection of media including text, pictures, animation, audio, video, and other forms of expression. However, it is worth noting that multimedia is not only a simple combination of multiple presentation media, but also an organic and efficient combination of the information carried by multiple media through comprehensive planning and processing based on the widespread application of the aforementioned media (Wu, 2022).

Multimedia Technology

Multimedia technology involves multiple disciplines. It is an organic combination of various information processing technologies. It uses computers to establish logical connections between various types of information such as text, images, and videos, thereby forming a technology for real-time interactive systems (Chen, 2020). Multimedia technology represents a great revolution in the history of computers. The development of multimedia technology has accelerated the entrance of computers into various fields of social life and has been widely used in school education, family life, enterprise production, etc., bringing more convenience to people's lives, learning, work, etc. (Abdurasulovich et al., 2020).

Multimedia Teaching

With the transformation of educational concepts, examination-oriented education has been gradually replaced by quality education. Multimedia technology is welcomed by the field of education; with its rich forms of expression and powerful ability to disseminate information, it is also constantly improving (Benson et al., 2022). While providing technical support in the field of education, it also introduces new teaching modes, such as multimedia demonstration teaching, simulation teaching, distance teaching, interactive teaching, etc.

Multimedia teaching is a means and method of teaching that consists of the selection of suitable multimedia technology through systematic teaching design; this development has injected new vigor and vitality into the field of education. Multimedia teaching combines teaching with a variety of media methods, fully absorbs the strengths and advantages of different methods and has unique characteristics that are different from traditional teaching methods and from any single media method (Ekwonwune & Oparah, 2020). It provides a variety of channels and means for students to learn independently, explore knowledge, and cultivate innovative ability, and has a profound impact on all aspects of teaching.

First, multimedia teaching has broken through the limitations of blackboard and books. It delivers a large amount of information to students through various media channels within a limited 45-minute period. In addition, the style of multimedia teaching is rich. Third, with the progress of the times, the delivery of information becomes more real-time, keeping up with the latest developments in content and perspectives (Sulaiman & Kamaruddin, 2020).

Second, traditional curriculum teaching uses a single piece of reading material, supplemented by blackboard writing. This teaching method has its significance and value, but in the face of some relatively abstract or indirect theoretical knowledge, it cannot directly present complex content on the screen for playback and demonstration (Abdulrahaman et al., 2020). In contrast, multimedia teaching uses animation, pictures, frames, and other more intuitive presentation methods to present abstract and difficult content and knowledge relationships in books to students, allowing them to develop a sense of ownership of knowledge and deepen their mastery and understanding of course content. Then, in real social life, in the face of real situations, they can better apply what they have learned.

However, it is undeniable that the widespread use of modern teaching media in college ideological and political classrooms has also brought some negative effects. The abstract and speculative nature of theory itself conflicts with the intuitive nature of multimedia technology. If excessive emphasis is placed on the use of elaborate images, sound and light, students' attention will be diverted, and they will be distracted from the systematic nature and inherent logic of the theory itself, and thus diminishing the achievement of teaching objectives (Tursunova, 2020). After long-term sensory stimulation, students are also prone to feeling burned out, which affects their interest in learning (Yang, 2020). Finding a way to reduce these negative effects and maximize the positive role of modern teaching media will also be our goal in the future.

The Necessity and Feasibility of Multimedia Teaching in Ideological and Political Education

The Necessity of Applying Multimedia Teaching in Ideological and Political Education Courses

Today's society is an information-heavy, intelligent, and networked society, with new knowledge, tools, and technologies rapidly changing. To adapt to the development of the new era, we must focus on cultivating innovative talents, and the cultivation of talents cannot be separated from education (Siswandi, 2021). For a teacher, it is necessary to change traditional educational concepts and ideas and constantly reform teaching methods and means. Multimedia technology education is an important means of comprehensively implementing quality education. As the main setting for quality education, classroom teaching is awaiting the deepening and integration of multimedia (Liu, 2021).

From a practical perspective, multimedia teaching has changed the traditional teaching mode of "a blackboard, a textbook, and a piece of chalk" for ideological and political theory courses in the past. Moreover, due to the effective integration of various teaching resources with multimedia, classroom teaching presents a new model of three-dimensional information, effectively stimulating the enthusiasm of college students to participate in learning. Participatory teaching and inquiry teaching are also more feasible in the multimedia teaching environment (Darwin et al., 2021). Multimedia teaching opens up many avenues for research on the teaching of ideological and political theory courses; for instance, scholars can explore the relationship between teachers and students in the multimedia teaching environment, the impact of multimedia methods on teaching effectiveness, the interrelationship between teachers' commonalities and their individual personalities, and the effect of multimedia methods on the standardization of teaching (Yu, 2021).

The Feasibility of Applying Multimedia Teaching in Ideological and Political Education Courses

Because of the limitations of their own physiological development, psychological development, and cognitive development, students cannot effectively accept a cold, static presentation of ideological and political knowledge. They need vivid and diverse multimedia teaching methods as aids, which will change abstract knowledge into intuitive experience and integrate complex theoretical knowledge (Belyakova & Pyrkina, 2021). A simple presentation makes students feel like they are on the scene and helps students take in the content of ideological and political courses. In addition, the knowledge acquired by students through their own active exploration will make a deep impression on them. The reasonable application of these new teaching modes can transform the learning experience and change passive learning into active inquiry. Furthermore, regarding students' developmental needs, multimedia teaching effectively promotes the growth of students' knowledge, but also makes it easier to cultivate students' emotions, attitudes, and values through vivid presentation, a cultivation that has great importance for students. Multimedia methods provide a variety of channels and means for students to learn independently, explore knowledge, and cultivate innovative ability, and have a profound impact on all aspects of teaching (Maričić et al., 2020).

RESULTS AND DISCUSSION

Analysis of Teaching Behavior Based on RC Method

Analysis of teaching behavior is an important basis for determining the quality of teaching and has been widely used by researchers in the educational field at home and abroad. However, in the traditional teaching behavior analysis model, the involvement of personal emotions inevitably affects the accuracy and effectiveness of the analysis results. Therefore, on the basis of traditional analysis methods, introducing factors such as objective behavioral data and combining modern teaching models to establish a new feasible behavioral analysis scheme can effectively prevent the interference of subjective emotional factors in the evaluation process. After examining many statistics and comparisons, it is found that most teaching time data are distributed in the standard time threshold range in the form of random residuals. According to this feature, this paper uses the RC method to calculate and analyze the test data and adopts the strategy of "retaining and eliminating," that is, retaining the valid time data in the sample, offsetting the invalid time data and comparing the standard time data to calculate the absolute valid time data. In order to further perform the time vector fitting operation, this paper defines an objectively meaningful calculation formula of the RC method according to the teaching time requirements. In order to eliminate the abstraction of the residual factor, the following definitions are given.

(1) Define α as the behavior start time difference:

$$\alpha = bt - m \tag{1}$$

(2) Define β as the end time difference of the behavior, indicating the difference between the actual end time and the standard end time; the formula is as follows:

$$\beta = ot - n \tag{2}$$

(3) Define:

$$\lambda = \mid \alpha \mid + \mid \beta \mid \tag{3}$$

(4) Define the positive time period, and the negative value part is 0 (not whithin the valid range, it is regarded as invalid and the value is 0); β- means that β only takes the value of the negative time period, and the positive value part takes 0. It is expressed as follows:

$$\gamma = k - \left|\alpha_{+}\right| - \left|\beta_{-}\right| \tag{4}$$

(5) Define fα, fβ, fλ indicating the difference of influence factor between the invalid use time period and period; the formula is as follows:

$$f_{\alpha} = \frac{\mid \alpha \mid}{k}, f_{\beta} = \frac{\mid \beta \mid}{k}, f_{\gamma} = \frac{\mid \gamma \mid}{k} \tag{5}$$

The set of relevant influencing factors u= {fα, fβ, fγ} is obtained by definition (5), wherein fγ is the effective factor, fα and fβ are the invalid factors. In order to clearly indicate the gap between the actual teaching situation and the standard requirements, this article treats the effective factor and the ineffective factor as offset and expresses as the absolute effective factor:

|u|= (fγ- fα- fβ)

An absolute effective factor |u| can be obtained for each use of the users. When the user uses q times within a fixed time, and the average use factor of the user $U = \frac{1}{q}\sum_{i=1}^{q}\left|u\right|_{i}$ is calculated, it represents the overall usage of the user over a certain period of time. The calculated results are as follows, using the definitions (1) to (5):

$$U = \frac{1}{q}\sum_{i=1}^{q}\left[1 - \frac{(bt-m)_{+} + (ot-n)_{-}}{k} - \frac{\mid bt-m \mid + \mid ot-n \mid}{k}\right]_{i} \tag{6}$$

In order to determine whether a teacher's teaching behavior conforms to the teaching time regulations, we need to clearly calculate the gap between the teaching time and the prescribed

standards. This paper constructs a behavioral analysis model based on time parameters to provide a comprehensive data analysis and evaluation of the timeliness, standardization, and offense of multimedia devices used by teachers and other users.

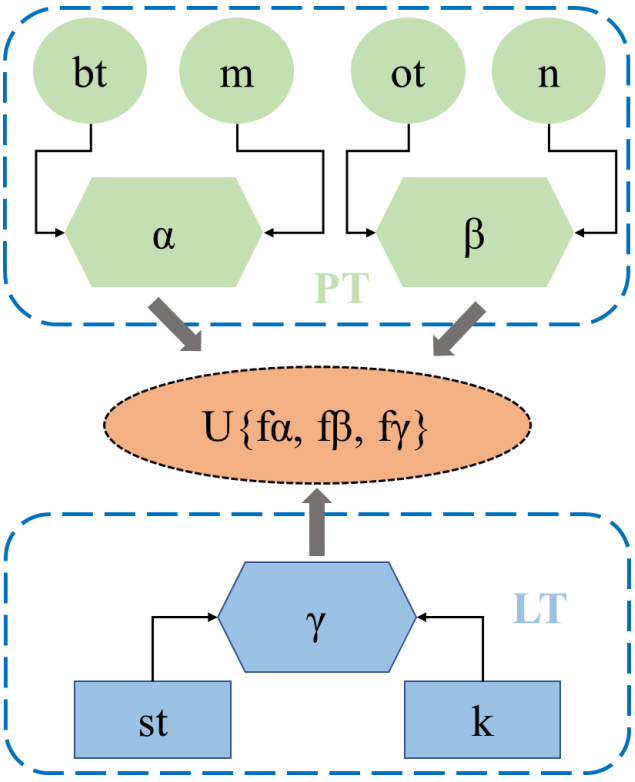
In Figure 1, *bt* represents the starting point of actual use. *ot* represents the end point of actual use. *st* represents the actual use duration. Set the corresponding standard thresholds *m*, *n*, and *k* according to the school curriculum's class hours, representing the standard starting point, standard end point and standard time period, respectively. In the model, the weight factor α, β, γ of the fitting difference between the actual teaching time and the standard teaching time is obtained by comparing the residuals of *b*t, *ot*, *st* and *m*, *n*, *k*. Combining the evaluation calculation formula, further obtain the weight coefficients f_α,f_β,$f\gamma$ for the difference between the actual use data and the standard cardinality. Use the set U{ f_α, f_β, $f\gamma$} to represent the evaluation results of users using multimedia, and establish a PT-LT data model.

Generally, the size of data residuals is the criterion for judging the quality of results. The smaller the data distance within the sample, the closer the values between the samples are, i.e., the more standardized the teacher's behavior. Therefore, judging the quality of residual values under different parameter conditions can be an important basis for judging the quality of the test data.

Analysis of Learning Behavior Based on Network Flow

Learning behavior analysis based on network flow is an analysis of various data of learners with learning intentions from tens of thousands of online behavior data records, for the purpose of identifing valuable learning or life patterns, helping schools, training institutions, and other

Figure 1. PT-LT Model Diagram



educational systems establish reasonable online teaching models, and promoting the spread of a good online learning atmosphere.

For managing a very large quantity of data, choosing the K-means clustering method can yield a good classification effect. In this paper, the data in the collection are first divided into multiple clusters according to certain characteristics; then the elements with greater similarity are classified into the same cluster, and different clusters have obvious feature differences, so that analysis can be done according to different types of clusters. Further research can be done to analyze the correlations. K-means clustering, also known as fast clustering, is an unsupervised learning method whose basic principles are as follows:

(1) In the dataset $\{X_1, X_2, X_3, \ldots X_n\}$ composed of n objects, select K feature objects C1, C2, C3, ..., Ck as the center point of the clustering set.
(2) Divide each item in the test data into the most similar set of classes. If there is:

$$\left\|X_i - C_z\right\| < \left\|X_i - C_w\right\| \tag{7}$$

i=1, 2, 3, …, n; w=1, 2, 3, … k; z ∈ K and z ≠ w, then divide Xi into set Cz.

(3) According to:

$$\overline{X_i} = \frac{1}{n_i}\sum_{x \in c_i}^{n} X \text{ , i=1, 2, 3, …, k} \tag{8}$$

calculate the average value of each collection object after dividing the class, where in n_i is the number of objects in the collection c_i.

(4) Using the criterion function:

$$E = \sum_{i=1}^{k}\sum_{x \in c_i} X - \overline{X_i}^2 \tag{9}$$

the clustering operation is performed until the result E no longer changes significantly.

TF-DF is a commonly used statistical method in information retrieval and data mining. TF-IDF can be used to evaluate the importance of an entry to a text set. The higher the number and frequency of occurrences of a word in the text, the greater its importance in the text. The main idea is that if a word or phrase appears in a text with a high frequency of TF and rarely appears in other text or documents, it is determined that the term has a good ability to distinguish between categories and is more suitable for classification. In this paper, we convert the word bag vector into a TF-IDF weight vector, which is more conducive to judging the similarity between texts. The specific operation is as follows:

(5) Word frequency:

$$TF_{i,j} = \frac{n_{i,j}}{\sum_{k} n_{k,j}} \tag{10}$$

Equation (10) indicates the importance of words in a specific text and normalizes the number of words to prevent it from biasing toward long texts.

(6) Use reverse file frequency:

$$IDF_{i} = \lg \frac{|D|}{\left|\left\{j : t_{i} \in d_{j}\right\}\right|} \tag{11}$$

Equation (11) measures the general importance of words where D represents the total number of documents in the corpus used.

(7) Calculate the product of TF and IDF:

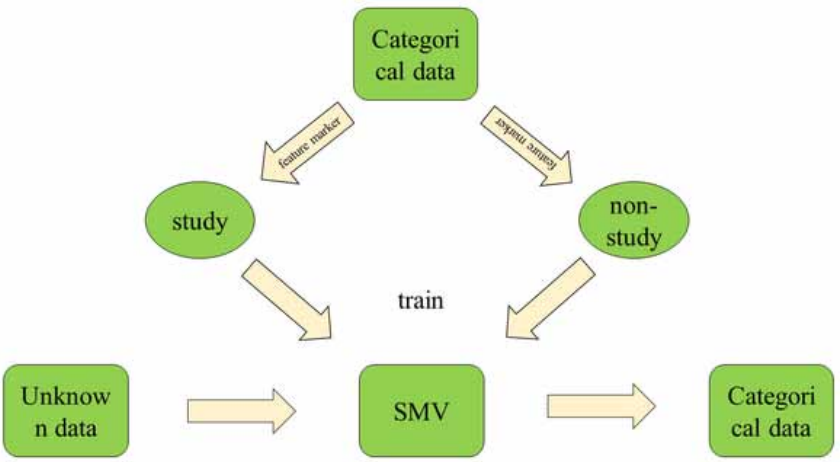
$$A = \frac{T_1 + T_2 + T_3 + \ldots + T_n}{T_1 + T_2 + T_3 + \ldots + T_n + F_1 + F_2 + F_3 + \ldots + F_n} \tag{12}$$

The word importance weight is obtained.

In this paper, the SVM algorithm is used to classify and count the online learning behavior of students, and the advantages of small sample data are reasonably used to analyze the online learning behavior of individual students in detail. Thus, the SVM training model is established on the basis of the classified sample data, as shown in Figure 2.

First, the classified data of students' online behavior are marked with features. Mark samples with learning behavior characteristics such as "education," "literature," "school," and "technology" as "positive" samples [0, +1]. Mark samples with non-learning behavior characteristics such as "games," "movies," and "entertainment" as "negative" samples [0, -1]. Next, SVM is used to find the optimal

Figure 2. SVM Training Model



classification hyperplane for "study" and "non-study" feature samples in the feature sample space, obtain the SVM set representing the sample features and the corresponding VC credibility, and train to form a SVM classifier. After that, the unknown data samples to be detected are input into the trained SVM classifier to obtain the classification results. The unknown data trained at the same time will continuously expand the SVM classifier dataset, thereby improving the stability of the classifier.

This article uses the overall classification accuracy A and the single classification accuracy C to describe the performance of SVM classifiers, as defined below:

(8) When the sample distribution of the dataset is relatively balanced, the overall classification accuracy evaluation index is adopted:

$$A = \frac{T_1 + T_2 + T_3 + \ldots + T_n}{T_1 + T_2 + T_3 + \ldots + T_n + F_1 + F_2 + F_3 + \ldots + F_n} \tag{13}$$

(9) For the unbalanced distribution of data samples, the single classification accuracy evaluation index is adopted:

$$C = T_i / \left(T_i + F_i\right) \tag{14}$$

In the equation (14), Ti represents the number of correct classifications in the i-type data sample. Fi represents the number of error categories. When describing classifier performance, the overall classification accuracy can objectively reflect the generalization performance of SVM classifiers. Single classification accuracy can accurately reflect the advantages and disadvantages of SVM classifiers. This study uses Pearson correlation coefficients to express the correlation between students' online learning behavior and factors such as online time and frequency. The calculation formula is as follows:

$$\rho_{XY} = \frac{N\sum X_i Y_i - \sum X_i \sum Y_i}{\sqrt{N\sum X_i^2 - \left(\sum X_i\right)^2}\sqrt{N\sum Y_i^2 - \left(\sum Y_i\right)^2}} \tag{15}$$

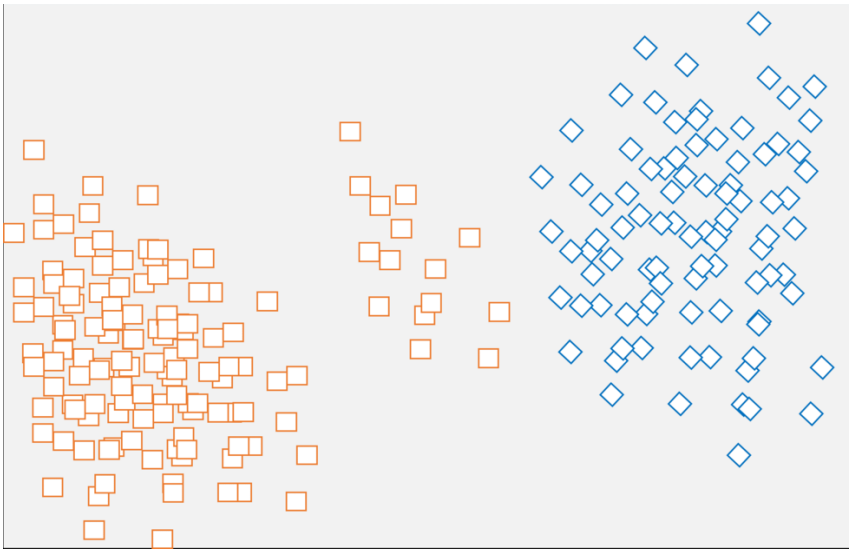
EXPERIMENTAL RESULTS AND ANALYSIS

Data Classification

The data sources for our experiments include the online records of students, the teaching behavior time data of the evaluators, and the standards set by the school. Because of the great size of the data sample set, this paper selects some sample data for clustering test. K initial points are randomly determined as cluster centroids. Each point in the test dataset is classified into the closest centroid point and assigned to the cluster corresponding to the centroid point. The centroid point of each cluster is updated to the mean value of all points in the cluster. The operation is repeated until the allocation result for each cluster no longer changes. The partial test results are shown in Figure 3.

Figure 3 shows the clustering effect based on the SSE (sum of squared error) method. In order to evaluate the quality of the clustering results, this paper uses the SSE method as a measure to detect the clustering effect. Through several rounds of comparative testing, this paper has obtained about 32 categories of online browsing behavior in students' online records, as shown in Figure 4. Among them, behavior records such as IT, education, download, news, audio and video, and search engine

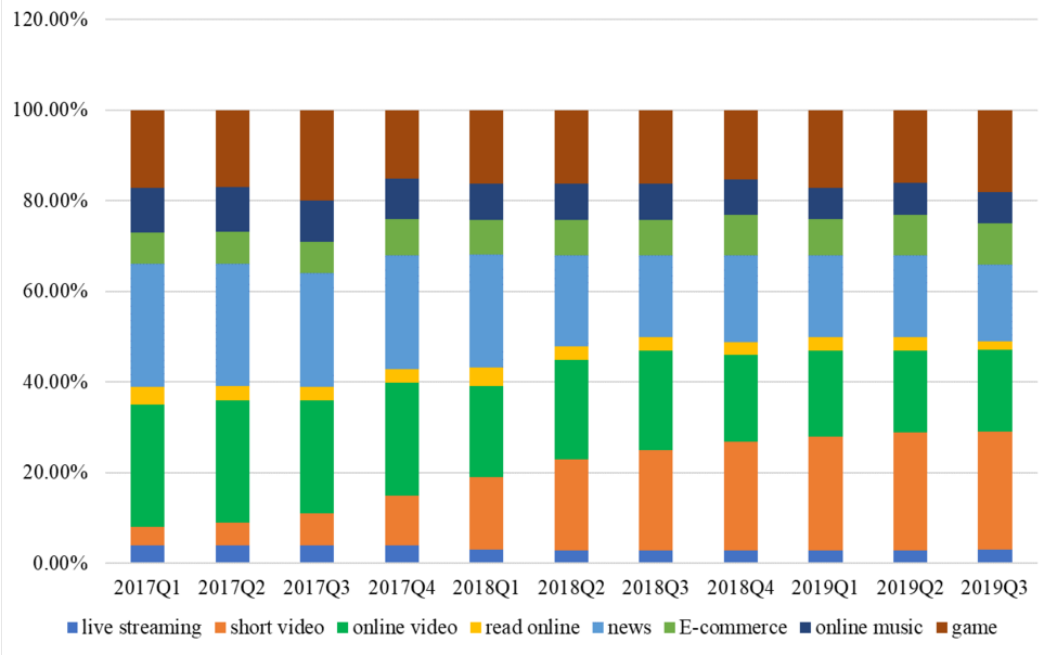
Figure 3. Clustering Effect



records have a particularly prominent proportion. From this operation, we can conduct further analysis and research from categories related to learning behavior such as education, IT, and literature.

Figure 4 shows the distribution of internet behavior classifications in the online records of students. The data classification results can help us analyze the behavior trends of small samples, such as the online interest orientation of individual students or small groups. This paper uses the classification results to classify and integrate the online behavior data of fixed ID users within a

Figure 4. Network Behavior Classification



certain period of time and analyzes the trend of online interest of a single individual over a period of time, as shown in Figure 5. Research shows that different individual students have their own network interest trends. For example, some students focus on games when surfing the internet, while others focus on news or online education. Among them, education, news, and film and television are the main interests of the majority of students. This data provides a reference for the subsequent analysis of online learning behavior.

Figure 5 presents individual students' online interest trends over a specific time period. This behavior is a relatively large aspect of the current problem. In the selection of "micro-course" teaching topics, it should be said that science courses are relatively simple and easier, because the knowledge points of science courses are easy to divide, and the knowledge points are both independent and related. However, it is relatively difficult to select topics for liberal arts courses, because the content of liberal arts courses often cannot be arbitrarily cut and fragmented, and the divided knowledge points often take a long time to explain clearly.

Analysis Results of Teaching Behavior Rules

In this paper, the behavioral time data of the evaluators can be counted. The sample example is shown in Figure 6. In the figure, u1 represents a single user, and the legend represents different test time periods. The user's start-to-use time data bt and end-to-use time data ot within a certain period of time are respectively counted, and the line chart shows different trends and ranges of changes. There is a positive correlation between the level and the regularity of teaching behavior. According to definitions (3), (4), (5), the effective use evaluation factor γf is obtained, as shown in Figure 6, where the ordinate represents the behavior evaluation score, which can be used to feedback teaching behavior rules analysis results.

Figure 6 displays the behavior time-point graph. In general, regarding distance between the data within the sample, the closer the values between the samples, the more standard. From definitions

Figure 5. Trend of Internet Behavior in Small Samples

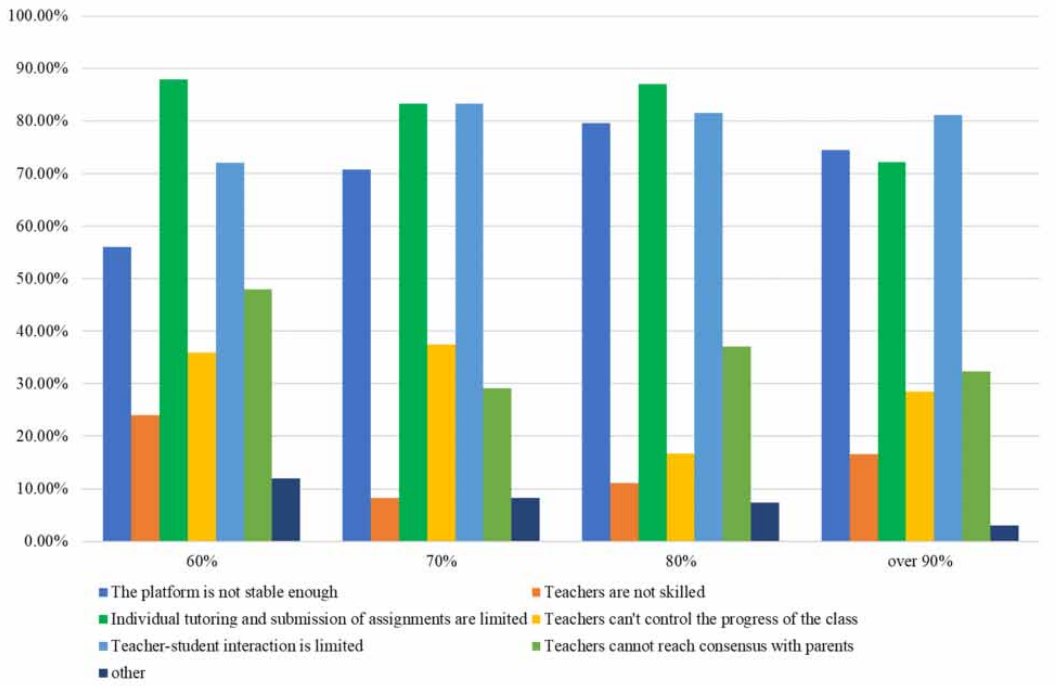
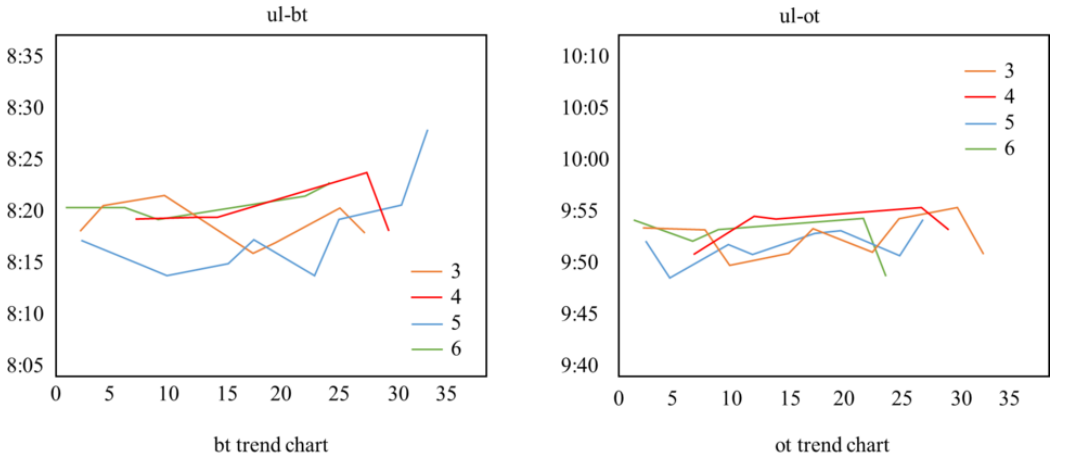


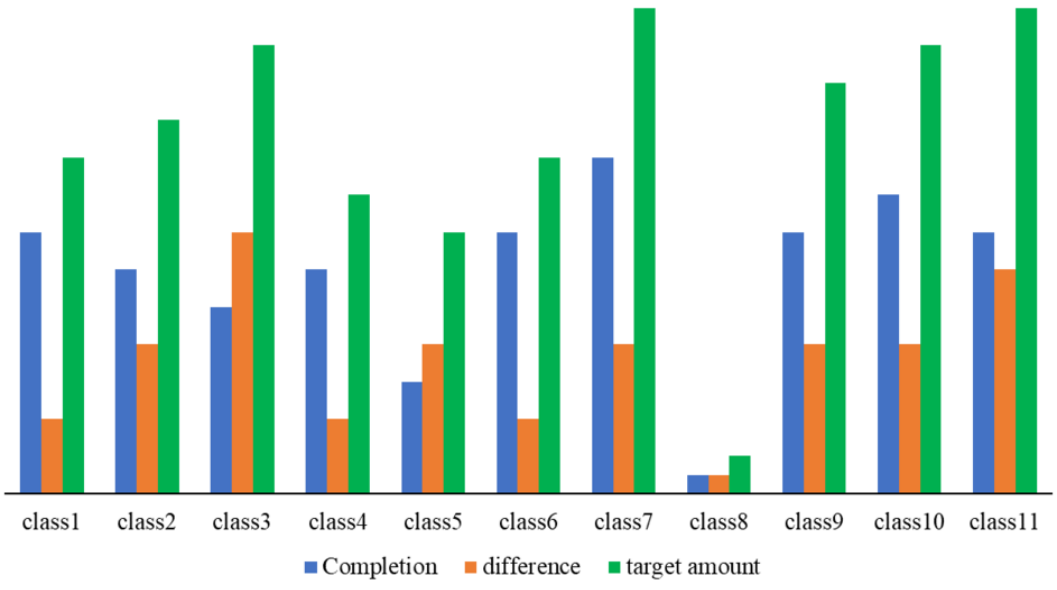
Figure 6. Behavior Time Point Plot



(3) and (4), the absolute effective use time of the user t=γ-λ is obtained, which means that the actual teaching use time is within the specified time limit. The occupancy is the standard time, that is, the absolute effective value.

Figure 7 shows the histogram of average absolute effective usage time. The experimental comparison shows the behavior evaluation value U of each teacher using multimedia in class. The closer the U value is to 1, the closer the teacher's class time law is to the school's prescribed standards. The results in Figure 7 show that most of the teachers' teaching time in this college can reach more than 80% of the norm, and only a few teachers have relatively low scores. The research method in this article fully reflects the standard degree of teachers' class time at the level of teaching behavior and

Figure 7. Histogram of Average Absolute Effective Time



is also an examination and positioning of the multimedia teaching function. After a large number of data experiments, the research results show that there are irregular differences in teaching behavior among teachers; this teaching behavior also has a certain correlation with factors such as personal behavior habits and teaching attitudes.

CONCLUSION

This research proposed practical technical measures to reduce the negative effects of modern teaching media in college ideological and political classrooms while maximizing its positive impact on teaching. A teaching behavior analysis model based on the RC method was constructed, which identified irregular differences in teaching behaviors among teachers. Teaching behavior was found to be related to factors such as personal behavior habits and teaching attitudes. Additionally, a student online learning behavior training model was constructed using the K-means data classification algorithm and SVM classification algorithm. The correlation analysis showed that students' online learning behavior had multiple correlations with factors such as online time and frequency. This study provides insights into analyzing teaching behavior and online learning behavior that can aid in improving the quality of education.

DATA AVAILABILITY

The figures and tables used to support the findings of this study are included in the article.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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