Research Article

Research on Collaborative Innovation of Supply-Side Reform of University Ideological and Political Education Based on Intelligent Big Data Information Fusion

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The times are changing with each passing day, and the traditional ideological and political education cannot adapt to the information age. Schools overemphasize theory, weaken the implementation of practice, ignore the needs of students, and lack electronic equipment to assist learning. All these factors make ideological and political education in colleges and universities stay in a superficial form and do not really lead students to study deeply. Innovation introduces supply-side vision, reforms educational theory structurally, and accelerates the transformation of classroom style. Let teachers and students leave the shackles of the classroom, learn from various sources of knowledge, and carry out personalized learning from their own areas of interest. The results show that (1) after data fusion, the credibility of ideological and political knowledge is 91%, which is better than other methods. (2) The knowledge base constructed by the laboratory meets the standards of colleges and universities, and its quality passes the standard, but its timeliness is slightly poor, and the test result is about 85%. (3) Learning interest model can push personalized knowledge according to students’ characteristics. (4) In the actual scene, students’ ideological and political education shows a benign development trend. The results of this study are quite satisfactory, which verifies the practicability and effectiveness of the proposed method and obtains feasible results.

1. Introduction

In recent years, global informationization has been basically realized, and earth-shaking changes have taken place in human work, study, and life. The efficient and convenient scientific and technological strength brought by this change has liberated some simple mechanical work for mankind, but it has not perfectly integrated all walks of life with the existing technology, which is undoubtedly a waste of resources. Taking ideological and political education in the education sector as an example, colleges and universities still adopt backward pure theoretical methods to instill students in this related classroom, which is divorced from the realistic basis, and at the same time, there are problems of incoordination and imbalance with students’ ideological needs, which cannot achieve the effect of educating people in all directions. Colleges and universities need to combine innovative ideas, make effective use of intelligent equipment, integrate various sources of information, build an educational reform model relying on students as the main body, and greatly expand the direction and space of practice.

Questionnaire survey and field interview classroom teaching, from the perspective of “supply side,” find out the strategic policy to solve the phenomenon of “low-headed people” [1]. Discuss the imbalance between content, mode, carrier, and actual demand under supply-side thinking [2]. Judge and evaluate the results of collected knowledge, organize and fuse fragmented information, and build an applicable network knowledge framework [3]. From the perspective of complex systems and cross-domains, the processing architecture of granular computing and R&D management control is proposed, which can be used for intelligent modeling of data fusion problems [4]. In order to discover valuable cross-media intelligence, data synthesis,
induction, and filtering are carried out through the framework of deep cognitive neural network [5]. Referring to the process of building an intelligent university information management service system, ETL, data warehouse modeling, and other technologies are used [6]. Examine a variety of network information challenges from a three-dimensional perspective, and realize the high integration and two-way interaction between big data and ideological and political education [7]. According to the ideological needs of college students, this paper comprehensively analyzes the contradiction between supply and demand and innovative development of ideological and political education in colleges and universities [8]. In view of the isolated island phenomenon of multsource learning information, NoSQL technology is used to build a data sharing system to solve the problem of heterogeneous fusion [9]. Because RBM under mega data has the problem of slow model training, the design of MapReduce framework based on Hadoop can effectively accelerate large-scale training [10]. Based on data collection and processing, the metadata relational mapping table is constructed, and different educational information is intelligently fused with Protege software and semantic ontology [11]. Combining concept drift detection algorithm with unsupervised reverse verification algorithm, knowledge from various sources is efficiently fused [12]. Least squares algorithm and D-S evidence theory method are introduced in sink node and monitoring terminal, respectively [13]. Analyze the significance of knowledge service to meet deep information needs and realize multimodal innovation [14]. Information complementary mechanism improves the accuracy of data analysis, accurately depicts learning subjects and situations, and intelligently restores the whole picture of teaching [15].

The above-mentioned literature provides a reference method and ideas for the experiment of this paper and provides a strong theoretical and data support. Comply with the trend of the times, innovate and develop the "online + offline" learning mode from the new perspective of supply-side reform theory, and realize self-reflection and reform. Knowledge integration is carried out for information from various sources on the network, which enhances the credibility, availability, and sharing of knowledge and provides a solid foundation for the subsequent development of intelligent classroom. In addition, by constructing the online learning model of learners, teachers can find out the key points and learning situations that students are interested in, and feedback the results to the classroom teaching content, so as to carry out ideological and political education activities smoothly.

2. Theoretical Basis

2.1. Ideological and Political Education and Supply-Side Reform in Colleges and Universities. Ideological and political education in colleges and universities is a subsystem of the whole university. It can exist independently and is closely related to every student, teacher, parent, and society. We should not only achieve the purpose of educating people but also guide students’ ideological education contents such as world outlook, outlook on life, and values. In addition to the classroom in school, ideological education should be infiltrated into all aspects of life. Because of its complexity and openness, the single and fault education mode is doomed to be wrong. Only by forming an orderly organizational structure, orderly and coordinated, can we achieve the most efficient overall educational purpose. Supply-side structural reform was first proposed in 2015 [16]. It was originally applied to the economic field, aiming at reducing the financing cost of enterprises and improving the level of social productivity. In order to obtain stable economic quality and quantity, this reform method starts from the supply point of view, adjusts the economic structure, corrects the unreasonable parts, makes the production factors reach the optimal allocation, and improves the flexibility, adaptability, and effectiveness of the supply structure, so as to meet the needs of people’s daily life and improve people’s quality of life from the source. The reason why this method is introduced as a new perspective to examine the ideological and political education in colleges and universities is that there is some objectivity and inevitability between this reform and ideological and political education in colleges and universities. They can further deepen the theoretical application in the process of collaborative innovation. Their contents are complementary [17], their operation mechanism is consistent [18], their basic logic is consistent, and their development dynamics [19] are similar, which can always adapt to the fluctuation of society and people’s needs. Using the thinking of side supply to optimize the classroom structure should be guided by students’ actual situation and actual needs and promote colleges and universities to reduce ineffective or inefficient knowledge output. Attach importance to the innovation of content and method, refuse the traditional “rote learning” form of learning, and flexibly adapt to the new development of new science and technology. In addition, educators’ own knowledge reserve and ability to adapt to science and technology should be required, and they should be good at showing rich knowledge on the Internet to students and leading them to the correct ideological path. Strengthen the benign interaction between educators and students, and promote the growth of students’ thoughts in the process of effective dialogue.

2.2. Knowledge Evaluation Method for Big Data. Because of the different data sources, there will be conflicts and inconsistencies in the knowledge obtained from the network. Before merging, it is necessary to find the real facts in the real world, that is, the truth value, through knowledge evaluation. Only correct knowledge can ensure that the knowledge base is not disturbed by wrong knowledge, some low-value data, and outdated or invalid information. Ensure the credibility and practicality of knowledge sources. The idea of using Bayesian model [20] to estimate is more traditional and mature. From a mathematical point of view, the Bayesian core algorithm can be defined as

$$P(B|A) = \frac{P(A|B)P(B)}{P(A)}.$$  (1)
First, formula (2) sets a set of knowledge to be evaluated. Formula (3) represents the observations obtained by the data source. Let the joint probability distribution of observed values be shown in formula (4). According to Bayesian theory, the posterior probability shown in formula (5) can be obtained. If we assume that the observed values are independent of each other, we can get formula (6). Finally, by bringing formula (6) into formula (5), we can get the posterior probability formula (7) when \( k_i \) is true, that is, the correct knowledge we are looking for.

\[
k = \{ k_i | 1 \leq i \leq n \}, \quad (2)
\]

\[
S = \{ S_j | 1 \leq j \leq m \}, \quad (3)
\]

\[
P(S) = P(S_1, S_2, \cdots, S_m), \quad (4)
\]

\[
P(k_i | S) = \frac{P(S | k_i) \cdot P(k_i)}{P(S)}, \quad (5)
\]

\[
P(S | k_i) = \prod_{j=1,m} P(S_j | k_i), \quad (6)
\]

\[
P(k_i | S) = \frac{\prod_{j=1,m} P(S_j | k_i) \cdot P(k_i)}{\sum_{j=1,m} \prod_{j=1,m} P(S_j | k_i) \cdot P(k_i)}. \quad (7)
\]

Because of the limitations of the Bayesian method, we need to satisfy the independence and predictable probability of knowledge, so we add two methods that can be used for knowledge evaluation. The local theory of classification is adopted and fuzzy integral is used to relax the limitations of the original Bayesian method. The graph model method is based on neural network, which transforms the original link prediction problem into matrix filling problem. The knowledge evaluation method based on fuzzy set theory [21] needs to meet the following basic conditions:

\[
\begin{align*}
g(\emptyset) &= 0, \\
g(X) &= 1, \\
g(A) &\leq g(B), \\
A &\subseteq B \text{ and } A, B \subseteq X, \\
\lim g(A_i) &= g(\lim A_i), \\
A_i &\subseteq X,
\end{align*} \quad (8)
\]

where \( X \) represents the set. Where the Borel field is an empty set, \( g \) represents the measurement function, and \( \{A_i\} \) represents the single-tone set sequence. An additional rule is added to solve the measurement problem by fuzzy measurement. On the basis of the above measurement, let \( \lambda > -1 \) get the value of formula (12) by solving. Set the blur density to \( X = \{x_1, x_2, \cdots, x_N\} \), \( g_i(i = 1, 2, \cdots, N) \).

\[
\begin{align*}
g(A \cup B) &= g(A) + g(B) + \lambda g(A)g(B), \\
A \cap B &= \emptyset, A, B \subseteq X,
\end{align*} \quad (11)
\]

\[
\lambda + 1 = \prod_{j=1,N} (1 + \lambda g_j). \quad (12)
\]

Fuzzy integral [22] is defined as follows.

\[
\int_{A} h(x) \ast g(\cdot) = \sup \min \{ a, g(A \cap a) \}, \quad (13)
\]

\[
a_a = \{ x : h(x) \geq a \}. \quad (14)
\]

Graph model is also a popular method. Let the original knowledge base be a three-dimensional matrix [23], and calculate the low-rank decomposition. Then, use the standard MLP [24] to capture the interaction items.

\[
\Pr(G(s, p, o) = 1) = \sigma \left( \sum_{k=1}^{K} u_{sk}a_{pk}v_{ok} \right), \quad (15)
\]

\[
\Pr(G(s, p, o) = 1) = \sigma \left( \hat{p}^T f [A[u_s, w_p, v_o]] \right). \quad (16)
\]

2.3. Theory Related to Ideological and Political Interest Model. According to the principle of supply side of ideological and political education, we cannot homogenize every student. As an independent individual, every student has his own preferences and excellence. Because of individual differences, everyone’s interest in learning is different. Traditional classroom teaching is a one-to-many teaching mode. Because of the limited class hours and teaching tasks, teachers can only take care of most students' learning wishes and learning effects and cannot push forward effective learning methods for everyone. Therefore, constructing students' ideological and political interest model and pushing relevant courses and knowledge content according to interest can effectively make up for the shortcoming that offline classroom teachers cannot give detailed guidance. Teachers can also adjust the classroom structure more reasonably according to students’ online learning and the reform principle of supply-side structure, subtract ineffective or unnecessary explanations, and spend this part of time on other more meaningful teaching activities to promote teacher-student interaction. Firstly, we construct a long-term learning interest model based on vector space model and express the interest vector and interest degree. The time decay factor [25] is introduced, and the time window is set to one week. More attention should be paid to learners’ recent behavior, and short-term interest model should be established for learners.

\[
\vec{I}_n = \left\{ w^{i_1}_{u_1}, w^{i_2}_{u_2}, \cdots, w^{i_n}_{u_n} \right\}, \quad (17)
\]

\[
\hat{w}^{i}_{u_i} = \frac{n_i^{i_1}}{\sum_{j=1}^{i} n_i^{j}}, \quad (18)
\]

\[
\hat{I}_n = (1 - \alpha) \hat{I}_{n-1} + \alpha \Delta \hat{I}. \quad (19)
\]

TF-IDF is used to count the importance of words, which is convenient to judge the field of knowledge subject words.
The formulas for TF, IDF, and TF-IDF are as follows:

\[
\text{tf}_{ij} = \frac{n_{ij}}{\sum_{k=0}^N n_{kj}}, \\
\text{idf}_{j} = \log \frac{N}{1 + n_j}, \\
\text{score} = \text{tf}_{ij} \times \text{idf}_{j}.
\]

3. Side Supply Intelligent Model and Application of Ideological and Political Information Fusion

3.1. Data Fusion Model. In addition to changing the source of classroom knowledge, in order to better promote the supply-side structural reform. We should grasp the educational theme of students, change the perspective of demand and supply, go deep into the perspective of students, and follow the general and special laws of educational development to make changes. The purpose of this section is not to obtain more and more contents related to political education, but to collect various data from different sources, mine knowledge that can be effectively related from massive fragmented data, and fuse the knowledge into a database, which is convenient for application in actual educational classroom scenes. According to the side supply theory, we need to exclude the content unrelated to ideological and political education and solve the information deviation brought by this part from the source. Therefore, data preprocessing before fusion is very important. For heterogeneous data, their formats are also different, so they should be treated by unified operations and represented in a standardized way. Through this framework, we can clearly see the whole process of how to integrate big data information: First, accurately identify the knowledge related to political and ideological education from the massive and complicated information on the network, and efficiently collect a large number of data from different sources or forms. After preprocessing the data into standard form, natural language processing technology is used to extract various elements of knowledge. After verifying the quality and credibility of these knowledge by using the knowledge evaluation module, the knowledge expansion module updates the knowledge and organizes and generates the knowledge base according to the type and order of knowledge after merging calculation, as shown in Figure 1:

3.2. Student Personalized Modeling. This section mainly uses the learning interest model to make personalized learning
recommendation. TF-IDF method can count the key vocabulary of students, so that the topic summary of the knowledge base system can be extracted to the knowledge field related to this ideological content. According to students’ personal information, interest, and knowledge reserve, we should build a network of learning trust relationship and improve personalized curriculum formulation. Deeply understand the definition of cosine similarity and calculate
Calculate the interesting knowledge topics, courses, and knowledge fields, respectively.

\[
t_{\text{sim}}(u_i, u_j) = \frac{t_{u_i} \cdot t_{u_j}}{|t_{u_i}| \cdot |t_{u_j}|},
\]

\[
c_{\text{sim}}(u_i, u_j) = \frac{c_{u_i} \cdot c_{u_j}}{|c_{u_i}| \cdot |c_{u_j}|},
\]

\[
d_{\text{sim}}(u_i, u_j) = \frac{d_{u_i} \cdot d_{u_j}}{|d_{u_i}| \cdot |d_{u_j}|}.
\]

3.3. Application Model of Side Supply Reform. According to the perspective of supply-side structural reform, we transform the ideological and political knowledge that colleges and universities should teach students into the question of what students need. College classrooms combine online and offline methods. From the perspective of students, they can use electronic devices to watch pictures, texts, audio, and videos related to ideological and political education anytime and anywhere from the screened knowledge base. There is no need to be forced to recite large sections of books and read obscure words because of the constraints of teaching tasks. They can plan or supervise their own learning in their own way from the perspectives of their own knowledge structure, learning style, interest direction, and mental state. In particular, the world has long been inseparable from the participation of the Internet, and there are huge amounts of information on electronic devices, including positive energy information that can be used for knowledge fusion, and there are also wrong ideas that students are difficult to distinguish, which requires correct guidance from university teachers. From the perspective of colleges and universities, it can greatly reduce the pressure of teaching progress and have tools that are more helpful to understand students' thoughts, abilities, and attitudes, so as to facilitate the adjustment of teaching policies. As far as the national society is concerned, the network platform spreads widely and is extremely fast. Students who have no precautions can easily walk into various "traps" and then change their values under the influence of negative information. Therefore, constructing students' personalized learning model, actively grasping students' psychological state, understanding students' ideological trends, and integrating ideological and political education into life with new media can effectively enhance the influence of mainstream ideology, as shown in Figure 2.

4. Experimental Analysis

4.1. Knowledge Fusion Model Testing

4.1.1. Comparison of Fusion Information Reliability. After obtaining the data, due to the unique nature of ideological and political itself, it has political and abstract uncertainty and practical testing, and its literal nature is very strong. If you want to get valuable or meaningful knowledge, you need to go through a series of pretreatment processes such as cleaning and screening. You need to use knowledge evaluation methods to verify the true value of knowledge and test the credibility of the obtained knowledge data. Only by continuously reducing the uncertainty of knowledge and screening out the wrong knowledge can the reliability and reliability of knowledge be improved. The real data we took in the experiment came from large open-source knowledge
bases Freebase and WordNet. In addition, the data used in the experiment do not involve user privacy. Contrast Bayesian method, D-S evidence theory, fuzzy set theory, graph model, and the method obtained in this paper were used. According to the curve trend, we can clearly find that the error rate of the knowledge obtained by this method is as low as 9%, which is three times lower than that of Bayesian estimation method. In terms of accuracy performance, this method also shows its advantage as high as 91%. However, the computational efficiency is only 89%, and there is no outstanding performance. This is because the method we use adopts hybrid model, which is complicated and takes more time. Fuzzy set theory is improved on the basis of Bayesian and D-S evidence theory, so the accuracy is slightly higher than the other two, which can reach 84%. Graph model method can guarantee 88% accuracy in this test with the help of external auxiliary information, but it is always not as good as this method, as shown in Figure 3.

4.1.2. General Situation of Ideological and Political Knowledge Evaluation. Because the classroom mode after the reform of side supply has changed into “online + offline” mode, students will directly obtain teaching knowledge from the integrated knowledge base to a certain extent. Therefore, it is necessary to ensure that the education received by students has profound knowledge, which is in line with the nature of social ideology, and to ensure that the knowledge pushed for students online keeps pace with the times and has strong universality. In order to determine the effect of this method in different knowledge fields of ideological and political teaching, we select three groups of knowledge theories with different contents and emphases to carry out
experiments and test seven different indicators. In the statistics of experimental results, we can find that the three groups of data in the timeliness have a big difference, only 86.1%, 85.6%, and 83%. However, the three groups of data of relevance, objectivity, accuracy, authority, verifiability, and universality have little difference and have good performance, as shown in Figure 4.

4.2. Learning Interest Model Test. The biggest advantage of this method is that the model can recommend students’ interests according to the differences of different individuals and feedback the results to teachers. The main purpose of this test is to verify that the model can successfully describe and distinguish students individually. If the model cannot correctly distinguish the needs and differences between people, then this model still has great defects. We use the most basic collaborative filtering algorithm in the recommendation system, compare three vectors based on knowledge topic, course, and knowledge field, and add a random recommendation control group. Due to the limitation of various experimental conditions, we only selected 2000 students from the data set for the experiment. Compare the probability that students are interested in the pushed teaching content and set it as $P$ value. The probability that the knowledge of interest appears in the learning list is set as $R$ value. Because $P$ value and $R$ value are contradictory indexes, we should add a $F$ value that can balance these two indexes, as shown in Figure 5.

From the data comparison of the three index values in Figure 5, we can find that the $P$ value of the interest vector based on knowledge domain increases from 0.05 to 0.347 with the increasing $N$ value, which is the best index in collaborative filtering recommendation. This is because when setting the vector, students’ topics and course interests are considered comprehensively, so the division of knowledge fields is highly predictable, and the results are more in line with the experimental expectations. Compared with the corresponding $R$ value, the probability of random recommendation decreases the fastest, and the $R$ value is only 0.0154 when the $N$ value reaches 100. The descent curves of the other three recommended methods gradually approach when the $N$ value is 20, and the final probability is stable at about 0.03. From the equilibrium point of view, the $F$ value of random recommendation is the lowest, while the other three methods perform better than it. Therefore, from a single level, recommending based on knowledge field is more in line with students’ interests than simply recommending courses and topics. Therefore, the method in this paper is the most effective based on the fusion of three methods. This also reflects the positive significance of our side supply reform for ideological and political education in colleges and universities and stimulates colleges and universities to respond to students’ demands for innovation and synergy.

4.3. Application Effect of Ideological and Political Teaching

4.3.1. Analysis of Students’ Knowledge Level. For college students, the model proposed in this paper is put into use in a college teaching situation, and the actual effect of the model is verified to determine whether it is available. In this section, we mainly aim at the comprehensive evaluation of students’ knowledge level. The results are counted from five aspects: grades, prolongation of study time, improvement of study initiative, rise of knowledge level, and change of thirst for knowledge. The experiment invited three classes A, B, and C of the same major as test points. Set the control group class F, that is, the class without this reform model. After a semester’s study, the students’ understanding of ideological and political education is tested. Compared with the pure theory teaching
class, we can find that the classroom structure reform class performance has obviously improved to varying degrees. The comprehensive score of class F is only 76.4, while the scores of the other three classes are all above 85, among which class B is as high as 90.6. Students in classes A, B, and C are no longer limited to the limited knowledge taught by teachers in class but use electronic equipment to learn in rich forms. Supply-side reform fully mobilizes the initiative of learning, improves their own knowledge level, and makes students more willing to seek knowledge and explore, and student is willing to spend more time deeply understanding the ideological and political content and spiritual connotation and development, as shown in Figure 6.

4.3.2. Analysis of Classroom Education in Side Supply Mode. In addition to assessing the changes of students’ subjects, we should also analyze the quality of ideological and political teaching in the whole classroom. Therefore, we will make statistics on the data results according to the coverage rate of ideological and political knowledge points in colleges and universities, the progress of teaching tasks, the fun of teachers and students in class, the novelty of knowledge transfer, the satisfaction of colleges and universities, the difficulty of learning, and the interaction between teachers and students. The experiment is still carried out for the four classes in the previous section. After the reform of the side supply model, the knowledge points of the three classes are
covered, and the progress of teaching tasks is close to 100%, while the coverage rate of class F is only 96%, and the teaching completion is only 94%. From a novel point of view, the three classes A, B, and C have increased by nearly 40% compared with class F, and students' classroom interaction has increased significantly, and their learning fun is higher. The satisfaction of colleges and universities with ideological and political education is also in line with expectations. The difficulty of students studying courses can be reduced by about 20% to 30%, as shown in Figure 7.

5. Conclusion

As an important link of cultivating and exporting talents to the society, colleges and universities should cultivate students' various qualities in all directions. It is worth noting that the reform from the perspective of supply side must focus on the needs of students. The goal, content, method, and other elements in the process of education all serve around the subject and strive to achieve a coordinated balance point. For the external environment, it can provide good collaborative conditions, meet the individual actual needs of students, and ensure and expand the learning scope outside the classroom. Based on the background that intelligent education promotes the development of modern educational Informationization and the support of computer technology, this paper uses Bayesian estimation, graph model, and fuzzy set theory to evaluate knowledge and combines domain knowledge model and learner knowledge model to extract knowledge that conforms to ideological and political education in colleges and universities from massive data for fusion. Effectively build a knowledge base that can be used to solve problems, broaden students' life depth, and enrich their horizons. With the help of network platform as the carrier, through statistics and evaluation of each student's learning behavior and learning preference, teachers can better control the classroom. It is necessary to further promote the supply-side reform path of ideological and political education in colleges and universities.

Although this experiment has achieved some research results, but limited by technology, funds, equipment, and other factors, this topic cannot be fully realized and meet the practical application of college classroom. This means that there are still a lot of problems to be solved in the follow-up work. Among them, using mega data can improve the practical effect of knowledge base, but the current fusion technology still has a lot of challenges. Because information from different sources has different timeliness and update frequency, the existing methods mainly aim at static knowledge, but it is difficult to correctly evaluate this dynamic time series knowledge. In addition, there are too few data sets and experimental samples for training, which cannot verify the universality and effectiveness of the experiment. In addition to the personalized function of helping learning, we should also consider appropriately enhancing the interaction between teachers and students and offline activities, so that teachers can play the role of ideological leaders and fully fulfill their educational mission.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declared that they have no conflicts of interest regarding this work.

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