International Journal for Housing Science and Its Applications
Publish August 10, 2025. Volume 46, Issue 4 Pages 1663-1674

https://doi.org/10.70517/ijhsa464146

A Collaborative Mechanism for the Construction of Ideological and Political Education in Vocational College Courses and the Improvement of Comprehensive Abilities Driven by Intelligent Optimization Algorithms

Linlin Ren[1,*] and Yang Jiang[2]
[1] Publicity Department, Shanghai Xingjian College, Shanghai, 200072, China
[2] Software Development Department, Zhangzhou Huizhi Information Technology Co., Ltd., Zhangzhou, Fujian, 363000, China
Corresponding authors: (e-mail: rrrddd0127@126.com).

Abstract Strengthening the construction of ideological and political education in professional courses in vocational colleges is an important way to promote the overall development of students. In order to improve the quality of student training in vocational colleges, this paper constructs a personalized recommendation model applied to ideological and political education in courses by mining student behavior data and professional course resource data. The evaluation indexes of students' comprehensive ability are selected, and the factor analysis are combined to assess students' comprehensive ability and explore the influence of the construction of curriculum ideological and political education in professional courses on the improvement of students' comprehensive ability. The analysis shows that the accuracy of the personalized recommendation method of teaching resources for ideological and political education in professional courses in this paper is significantly better than the traditional method, with HR, MRR, and NDCG reaching 18.49-21.63, 1.81-2.12, and 4.31-4.87, which is feasible in course teaching. In addition, the optimization of ideological and political education in professional courses teaching based on personalized resource recommendation has a certain promotion effect on the improvement of students' comprehensive ability, and the comprehensive ability score of students implementing ideological and political education in professional courses teaching is 1.672, compared with students who implement traditional teaching, it is more expressive. Vocational colleges and universities should establish a long-term mechanism of collaborative linkage, strengthen practice and application, and provide strong support for cultivating excellent talents with comprehensive ability.

Index Terms personalized recommendation method, factor analysis, students' comprehensive ability

I. Introduction

Vocational education is an important part of China's higher education, and it is traditionally believed that vocational colleges and universities cultivate skilled applied talents with certain theoretical knowledge and strong practical ability [1], [2]. In the context of the new era, this kind of skillful and applied talents is given a new connotation, and in addition to certain knowledge and skills, they also need to have a correct worldview, outlook on life, values and vocational outlook [3]-[5]. Ideological and political education in professional courses has gradually developed in this context. Ideological and political education in professional courses is a new mode of ideological and political education in colleges and universities in the new era, as well as a new educational concept, which is not to open an additional course, but to fully explore the ideological and political education elements of each course [6]-[9]. While imparting professional knowledge to students, ideological and political education is carried out at the right time, combining value leadership with knowledge transfer and ability cultivation, which is the extension and development of ideological and political education in vocational education [10]-[12].

And the development of artificial intelligence technology provides new development opportunities for the teaching of ideology and politics in vocational education courses [13], [14]. Vocational education ideological and political education in professional courses plays an important role in talent cultivation, but it still exposes various problems such as resource allocation in the teaching process [15]. Intelligent optimization algorithms and a series of technologies that are very characteristic of the times have changed the way of information dissemination and the pattern of communication while constructing a picture of future development, providing a new teaching scenario and discourse space for the ideology and politics of vocational education courses [16]-[19]. Intelligent algorithms have reconfigured the teaching of the ideology and politics of vocational education courses, the work and study of teachers and students, the field of life, as well as the cognition of thought and self-construction in many areas,

opening up technological changes to the ideology and politics of vocational education courses [20]-[22]. It brings the application of personalized teaching, teaching optimization, dynamic assessment and feedback for students, which helps to improve students' comprehensive abilities such as ideological and political literacy, innovation, and assistance [23]-[25].

The research constructs the recommendation model of ideological and political education in professional courses teaching resources, focus on the analysis of ideological and political education in professional courses teaching resources. Then extract the features ideological and political teaching resources based on data mining, and finally realize the personalizoed intelligent recommendation of ideological and political education in professional courses teaching resources. The dataset and comparison method are selected to explore the effect of ideological and political education in professional courses resources recommendation of the personalized resources recommendation method in this paper through the comparative analysis of hit rate, average inverse rank and normalized discount cumulative gain. In this context, the evaluation index system of students' comprehensive ability is constructed, the data are collected by questionnaire survey, and the evaluation results of students' comprehensive ability. Finally, it discusses the path of the construction of ideological and political education in professional courses in vocational colleges, and puts forward the suggestions of building a long-term mechanism of synergy and linkage, and strengthening the practice and application of ideological and political education in professional courses.

II. Individualized recommendation methods for teaching resources on Construction of ideological and political education in professional courses

Ideological and political education in professional courses teaching resources are an important part of supporting and enhancing the construction of ideological and political education in professional courses, and they provide teachers with the necessary materials and tools to better integrate ideological and political education in professional courses into the teaching of professional courses in vocational colleges and universities. In order to optimize the construction of ideological and political education in professional courses in vocational colleges and universities, this chapter constructs a personalized recommendation model of ideological and political education in professional courses teaching resources based on data mining.

II. A.Personalized Recommendation Method Design

II. A. 1) Constructing recommendation models

The integration of ideological and political elements into the professional courses of vocational colleges can promote the cross-integration of vocational college education and humanities and social sciences, and provide strong support for the improvement of students' ideological and political education and comprehensive quality and ability. Therefore, the vocational college curriculum is personalized to recommend the Ideological and Political teaching resources. First of all, in order to ensure that the recommendation effect of the Ideological and Political resources is targeted, we now construct the ideological and political education in professional courses teaching resources recommendation model to analyze the learning behavior and the corresponding ideological and political education in professional courses teaching resources.

This article takes the "Love Course" online learning platform of a certain vocational college as the data source, after obtaining the historical learning data of vocational college course learners in the background, the ideological and political elements represent the recommended model of ideological and political teaching resources of vocational college courses with prime tuples, the formula is as follows:

$$k = \left(h_{ij}^{n}, l_{as}^{m} \right) \tag{1}$$

where, h_{ij} is the usage trajectory of the ideological and political education in professional courses teaching resources, l_{as}^{m} is the threshold value of the course learning behaviors, ij is the position of each teaching resource in the model, n is the number of ideological and political teaching resources usage trajectories, m is the number of learning behaviors in the model, and as is the percentage of a certain learning behavior in the model. Percentage, at this point, the formula of the directed graph of the trajectory h_{ij}^{n} of the ideological and political education in professional courses resources use is as follows:

$$h_{ij}^{n} = (q, w) \tag{2}$$

where, q is the ideological and political teaching resource node in the course in the model, and w is the edge between the teaching resource nodes. Considering that learners' course learning is a dynamic process, after completing the behavioral classification, the weights of various learning behaviors are decomposed and calculated to provide a basis for future teaching resource allocation and recommendation.

II. A. 2) Extraction of resource characteristics

Under the premise of ensuring that the mining effect is not affected, the key to improve the mining efficiency does not lie in selecting more and more text feature items, on the contrary, it is crucial to select fewer and more representative words. Therefore, reducing the number of textual feature terms and selecting the most representative ones is a very important task called keyword extraction of ideological and political education in professional courses Teaching Resources in Vocational College Curriculum.

Set the keywords in the trajectory of the use of the Ideological and Political Teaching Resources in the n courses as v, construct a keyword set based on the learners' historical search keywords in the model, and use data mining to update the learners' search keyword weights, which are given by the following formula:

$$\partial = B^{\frac{In(T-t)}{r}} + Y_v \times \alpha \times \beta \tag{3}$$

where, ∂ is the weight of the keywords of the learning interest node of the Ideological and Political teaching resource, $B^{\frac{h(T-t)}{r}}$ represents the evaluation function, r is the network evaluation factor of the teaching resource, T is the current date of the model of the recommended resource, t is the most recent modification of the recommended model in the date of the keyword, Y_v is the set of historically learned keywords, β is the learning rate, and α is the corresponding score of the evaluation of the teaching resource.

The similarity between learners in the recommendation model is computed to avoid recommendation result anomalies triggered by similarity of learners in the future recommendation process of teaching resources. Therefore, the similarity formula between learners M and N is given:

$$Z\left(f_M, f_N\right) = \frac{\sum_{i=1}^{5} Y_v^M * Y_v^N * g_i^2}{\sqrt{\sum_{i=1}^{5}\left(Y_v^M * g_i\right)^2}\sqrt{\sum_{i=1}^{5}\left(Y_v^N * g_i\right)^2}} \tag{4}$$

where, Y_v^M is the collection of historical keywords of learner M, Y_v^N is the collection of historical keywords of learner N, and g_i is the weights of learners' feature information.

Due to the need to use multiple teaching resources to compose the teaching content in the daily teaching process, and the existence of a before-and-after relationship between teaching resources, there are differences in the learning resources required by different learners. Therefore, in order to ensure the accuracy and effectiveness of the subsequent teaching resources recommendation, the learning resources must be carefully divided based on the semantic information in the teaching resources. Such processing can provide more accurate resource classification for the model, thus meeting the personalized needs of learners.

II. A. 3) Intelligent recommendation of resources

Define a collection of instructional resources that are designed to meet the needs of learners, denoted as $c = \{c_i, i \in 1,2,\ldots,n\}$, where n denotes the total number of candidate instructional resources available. For each candidate teaching resource c_i, two key metrics need to be evaluated: first, the frequency of the resource being used by learners u, and second, the average recommendation result of the resource from the recommender system η. Combining the above information, the recommendation index μ of each teaching resource is calculated, and the candidate teaching resources are ranked according to the recommendation index to recommend the best teaching resources to learners with the following formula:

$$p\left(c_i\right) = \varpi u\left(c_i\right) + (1-\varpi)\mu\left(c_i\right) \tag{5}$$

where, ϖ is a variable parameter in the calculation process.

In practical application, the situation that the recommended indexes of the two alternative teaching resources are exactly the same will be encountered, therefore, the two alternative teaching resources must be judged twice, and the formula is as follows:

$$X = \sum_{i=1}^{n} \eta\left(s_i, p\left(c_i\right)\right) \tag{6}$$

where, s_i is the teaching resources recommendation vector.

The above formula is used to make a secondary determination of teaching resources in order to achieve the accurate recommendation of ideological and political education in professional courses teaching resources, so as to provide learners with personalized learning resources. For example, computer majors: the text, books, video, etc., which are recommended for some computer specialized courses, such as how to guide students to focus on the connection between computer science and technology and human life, to guide students to think about how to

better serve and human, and reflect the video of humanistic care. The integration of ideological and political education in professional courses teaching resources in the curriculum of vocational colleges and universities is of vital significance in enhancing the comprehensive quality of students, promoting the innovative development of education and cultivating talents with a sense of social responsibility and mission.

II. B.Testing and Analysis

II. B. 1) Data preparation

To analyze the practical application effect of the personalized recommendation method for ideological and political resources in higher vocational college courses based on data mining, a comparative experiment was conducted. The dataset involved in the experimental dataset test was a self-built dataset, and the data source was a dataset of ideological and political elements mined from professional courses on the Professional online learning platform of a certain higher vocational college.

In the specific testing process, in order to evaluate the performance of the design recommendation method in a more comprehensive and holistic way, the ideological and political education in professional courses teaching object of an institution is used as the specific recommendation object, which includes a total of seven classes, the disciplines covered include economics, education, engineering, management, art and literature.

II. B. 2) Evaluation indicators

Collaborative filtering-based teaching resource recommendation method (Method 1) and similarity algorithm-based teaching resource recommendation method (Method 2) were used as control groups, respectively. For the evaluation of specific recommendation effect, three evaluation indexes were designed, which were hit rate (HR), mean reversed rank (MRR), and normalized discounted cumulative gain (NDCG).The larger HR and MRR were, the better the corresponding recommendation effect was. NDCG is similar to MRR in that it also emphasizes the “sequentiality” of the recommendation results, and standardizes different recommended objects by means of logarithmic operations, so as to establish a comparable relationship between NDCG values of different recommended objects.

II. B. 3) Test results

On the basis of the test environment, the test results of different recommendation methods were compared, the number of recommended resources was set to 10, and the corresponding hit rate, average inverse rank, and normalized discounted cumulative gain calculation results of the different methods are shown in Figs. 1 to 3. The test results of the three different recommendations presented different characteristics. In the test results of collaborative filtering recommendation methods, HR, MRR, and NDCG show relatively stable characteristics, in which HR is stable at 16.32-18.28, MRR is stable at 1.11-1.23, and NDCG is stable at 4.13-4.32, and there is room for further improvement of the overall recommendation effect. In the test results of the similarity algorithm recommendation method, the degree of fluctuation of HR, MRR, and NDCG increased significantly, in which the maximum value of HR was 19.28, but the downward fluctuation amplitude reached 4.03. The maximum value of M is 1.28 and the downward fluctuation amplitude reaches 0.17. The maximum value of D is 5.21 and the downward fluctuation amplitude reaches 1.77. In contrast, in the test results of the design method, HR, MRR, and NDCG not only showed high stability, but also were always at a high level, with the corresponding interval ranges of HR, MRR, and NDCG being 18.49-21.63, 1.81-2.12, and 4.31-4.87, respectively.

The comprehensive test results can be concluded that the personalized recommendation method of teaching resources for Ideological and Politics in vocational college courses based on data mining can realize the effective recommendation of resources.

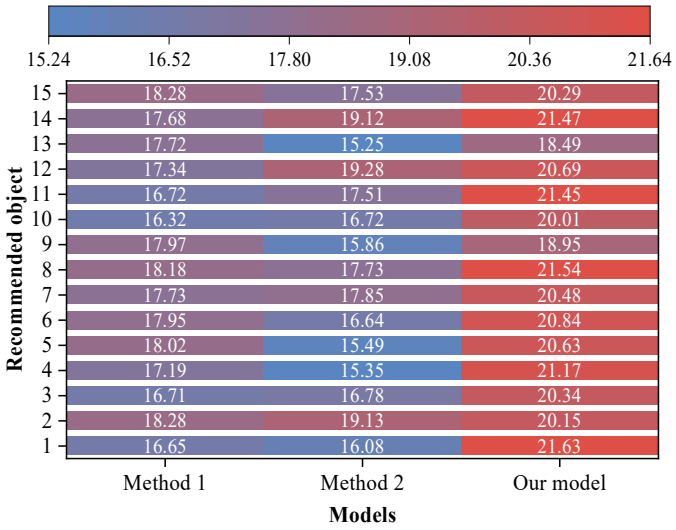

Figure 1: The calculation results of the HR of different methods

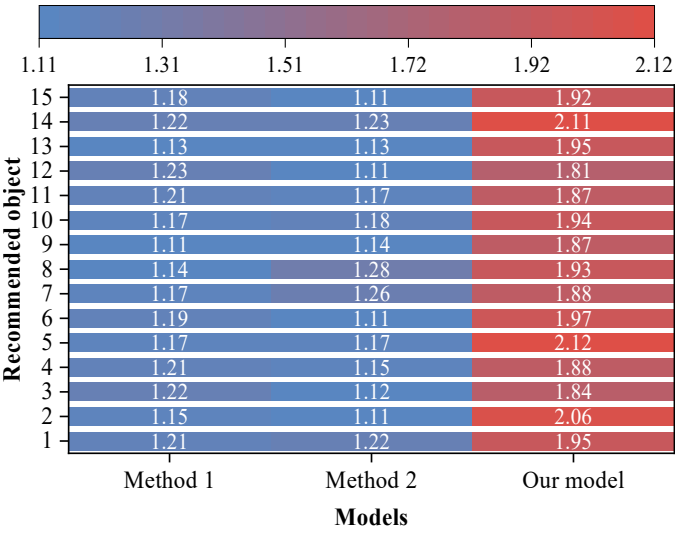

Figure 2: The calculation results of the MRR of different methods

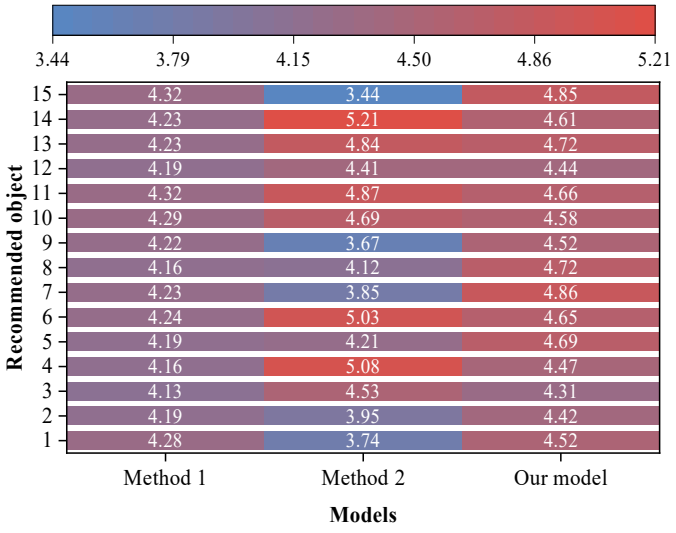

Figure 3: The calculation results of the NDCG of different methods

III. Impact of the construction of the ideological and political education in professional courses on the enhancement of students' comprehensive abilities

In this chapter, based on the construction of course ideology of personalized resource recommendation optimization, the impact of course ideology construction on the improvement of students' comprehensive ability is explored by establishing the index system of comprehensive quality ability of students in vocational colleges and universities.

III. A. Research Methodology and Technical Approach

According to the research content and structural arrangement of this paper, the proposed technical route is shown in Figure 4. The specific methods are: collect data through questionnaires, use the Bayesian network algorithm based on maximum expectation (EM-NB), fill in the missing data in the questionnaire survey process, and improve the effectiveness of the network survey questionnaire. Based on the multivariate perspective, we construct an index system for assessing the comprehensive ability of students in vocational colleges and universities, and use the Weighted Factor Assessment (WFA) model to carry out empirical research, to realize the combination of qualitative and quantitative assessment methods, and to clarify the influence of the construction of course ideology and politics on the improvement of students' comprehensive ability.

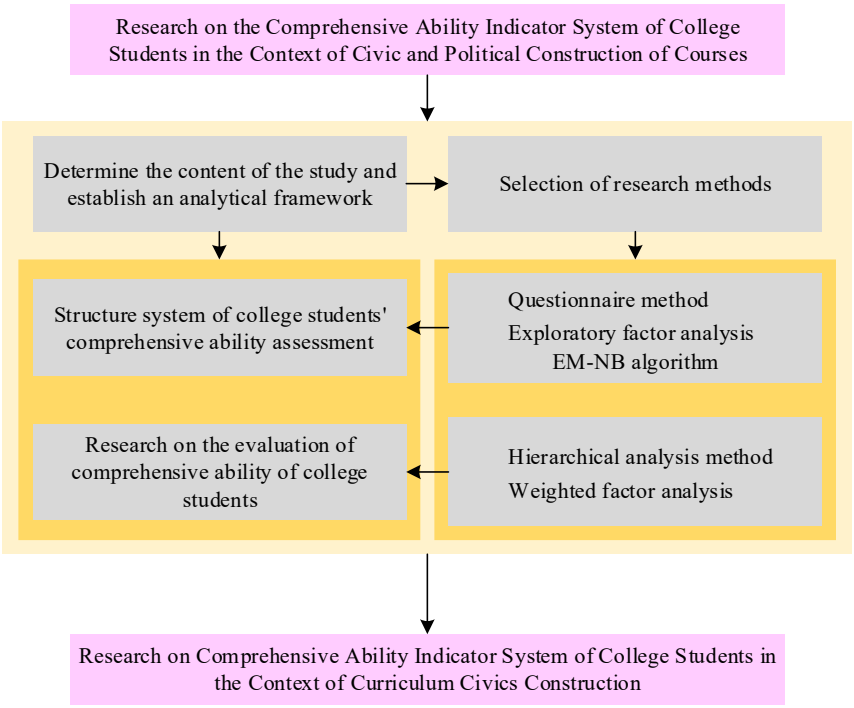

Figure 4: The technical route of the study

The weighted factor assessment model includes a weighted factor analysis which are described below.

Principal Component Analysis (PCA) is a statistical analysis method that reduces multiple variables into a few principal components (composite variables) through dimensionality reduction techniques. These principal components can reflect most of the information of the original variables, and they are usually expressed as some kind of linear combination of the original variables. The main idea of PCA principal component analysis is to map the original n-dimensional features onto k-dimensional features, i.e., transforming the data to a selected substrate, which k-dimensional is a brand new orthogonal feature, also known as the principal component, which is reconstructed on the basis of original n-dimensional features. It is the k-dimensional feature reconstructed on the basis of the original n-dimensional feature.

Let there be p indicators for the study of a certain thing, which are denoted by $X_1,\cdots,X_p$, and these p indicators constitute a p-dimensional random variable $X=\left(X_1,\cdots,X_p\right)'$. A linear transformation of X yields Y, i.e., the following equation:

$$\begin{cases} Y_1 = u_{11}X_1 + u_{21}X_2 + \cdots + u_{p1}X_p \\ Y_2 = u_{12}X_1 + u_{22}X_2 + \cdots + u_{p2}X_p \\ \cdots \\ Y_p = u_{1p}X_1 + u_{2p}X_2 + \cdots + u_{pp}X_p \end{cases} \tag{7}$$

Since the above linear transformations of the original variables are arbitrary, the composite variables Y obtained from different transformations are not the same, and it is known from the theory of PCA that it is desirable that $Y_i = u_i'X$ has as large a variance as possible and the individual Y_i are independent of each other, but the variance of Y_i can be made infinitely large if no constraints are imposed on u_i, so the following constraints are imposed: (1) $u_i'u_i = 1(i = 1, \cdots, p)$. (2) Y_i and Y_j are unrelated $(i \neq j; i, j = 1, \cdots, p)$. (3) Y_1 is the largest variance of all linear combinations of $X_1, \cdots, X_p$ that satisfy principle (1), and so on. The composite variables $Y_1, \cdots, Y_p$ determined based on the above three principles are referred to as the first, second, and all the way up to the pth principal component of the original variable, respectively.

Generally when solving principal components, it always starts from the covariance matrix or correlation matrix of the original variables, and the number of selected principal components is determined by solving the principal components and combining them with the fragmentation diagram. In most cases, the selection of three principal components can ensure that the selected principal components maintain a weighting of 80% or more of the total information.

Factor loading is an important basis in the interpretation of principal components, and the absolute size of the factor loading portrays the main significance of the principal component and its causes. It is also necessary to pay attention to how well the principal components explain the total variance of the original variables in principal component analysis, i.e., the variance contribution ratio. The accumulation of the variance contribution rate allows the number of principal components to be determined for further analysis.

The factor analysis model is a generalization of principal component analysis, and its basic idea is to group the original variables according to their correlations, so that correlations within groups are higher and correlations across groups are lower. Each group of variables is represented by an unobservable latent variable, the common factor. There are n samples, each with p observations, and the sample observations are standardized, while eliminating differences in the observed scales, by expressing the sample vector as X and the common factor as $F_1, \cdots, F_m (m < p)$ to represent the model representation as follows:

$$\begin{cases} X_1 = a_{11}F_1 + a_{12}F_2 + \cdots + a_{1m}F_m + \varepsilon_1 \\ X_2 = a_{21}F_1 + a_{22}F_2 + \cdots + a_{2m}F_m + \varepsilon_2 \\ \cdots \\ X_p = a_{p1}F_1 + a_{p2}F_2 + \cdots + a_{pm}F_m + \varepsilon_p \end{cases} \tag{8}$$

The matrix form of the model is $X = AF + \varepsilon$. The common factors $F_1, \cdots, F_m$ are independent of each other and unobservable, $\varepsilon_1, \ldots, \varepsilon_p$ is called the special factor, each special factor as well as the special factor and all the common factors are independent of each other, and the element a_{ij} in matrix A is called the factor loadings, whose absolute value is larger indicating that the degree of dependence between X_i and F_j is larger. Matrix A is called the factor loading matrix.

For the initial common factors obtained, a linear combination, i.e., factor rotation, can be performed with a view to finding common factors with clearer meaning and more obvious practical significance. After rotation, due to the change of the loading matrix, the public factors may change greatly and no longer be the same as the original, and the public factors satisfactory to both people can be obtained. Finally, the factor scores need to be calculated.

III. B. Selection of indicator elements

Considering the comprehensive ability that students of vocational colleges and universities should have from the viewpoints of teachers, students and employers, three modules of the elements of the competency system are established, and the indicators of the comprehensive competency assessment system for students are shown in Table 1, with 21 secondary indicators.

Table 1: Indicators of the student comprehensive ability assessment system

Primary indicator	Secondary indicator
Basic quality and basic ability	Mathematical ability
	Computer capability
	Humanistic science literacy
	Physical quality
	Ideological and political quality and legal literacy
	Interpersonal skills
	Innovation and lifelong learning
	Team cooperation ability
	Organizational management ability
	Critical thinking ability
Professional knowledge and skills	Economic and legal thinking ability
	The ability of professional tools to use
	Specialized research ability
	Professional exploration ability
	Professional innovation ability
	Professional orientation ability
	Practical application ability
	Decision-making ability
Practical operation ability	Language synthesis ability
	Mental regulation ability
	Knowledge system master ability

III. C. Comprehensive student competency assessment

Weighted factor analysis (WFA) are used to establish an assessment system for the comprehensive ability of students in vocational colleges and universities, and a weighted factor model is proposed to assess the comprehensive ability of students in vocational colleges and universities in the context of the construction of curriculum ideology.

III. C. 1) Data sources

The survey was conducted by both paper questionnaire and network survey, which involved students from several majors in a vocational college. The students, including 2021~ 2024 students, and 2024 students use the personalized learning resource recommendation method designed in this article to develop the learning platform based on the independent development of the school, and the rest of the grades continued to follow traditional teaching methods. The online survey was conducted to 574 students, and 493 valid data questionnaires were obtained, with a recovery rate of 85.89%. Paper survey was sent to 635 questionnaires, 559 valid questionnaires were recovered, and the recovery rate of valid questionnaires was 88.03%.

III. C. 2) Weighted factor analysis

This paper is based on the idea of fuzzy comprehensive assessment to average the scores of students in each major on each ability. First, the raw data of the indicators are standardized, and the weights of each indicator obtained by hierarchical analysis are multiplied with the corresponding standardized indicators to obtain the weighted standardized indicators. Then, the public factors were selected through factor analysis by using the variance-maximizing orthogonal rotation transformation, with the cumulative variance contribution rate of 80% or more as the screening criterion, and after four iterations, three public factors were obtained, and the eigenvalues of the rotated factor loading matrix and the cumulative contribution rate were shown in Table 2. The three rotated public factors explained 36.291%, 29.876% and 15.643% of variance contribution, respectively, and were able to explain most of the differences in the variables.

Table 2: The eigenvalue and cumulative contribution rate of the factor load matrix after rotation

Factor	Eigenvalue	Variance contribution/%	Cumulative contribution/%
1	6.274	36.291	36.291
2	3.285	29.876	66.167

3	2.269	15.643	81.810

Finally, the loading matrix of each factor is obtained, and the orthogonal rotation of the factor loading matrix is shown in Table 3. According to the division of each index, F1, F2 and F3 are named as “management and communication power”, “literacy and practice ability” and “workplace competitiveness” respectively. Based on the idea of regression equation, the factor scores were estimated and weighted by the proportion of the variance contribution rate of the factors to the total variance contribution rate of the three factors to get the composite score F of the comprehensive ability of each professional student, i.e., F=(0.363×F1+0.299×F2+0.156×F3)/0.813.

Table 3: The factor load matrix after orthogonal rotation

Index		Factor load		
		F1	F2	F3
Management and communication ability	Interpersonal skills	0.686		
	Innovation and lifelong learning	0.656		
	Organizational management ability	0.792		
	Critical thinking ability	0.711		
	Professional orientation ability	0.721		
	Practical application ability	0.776		
	Decision-making ability	0.777		
	Language synthesis ability	0.775		
	Knowledge system master ability	0.674		
Literacy and working ability	Mathematical ability		0.668	
	Computer capability		0.743	
	Humanistic science literacy		0.670	
	Physical quality		0.657	
	Ideological and political quality and legal literacy		0.789	
	Team cooperation ability		0.68	
	Professional innovation ability		0.767	
Workplace competitiveness ability	Economic and legal thinking ability			0.657
	The ability of professional tools to use			0.664
	Specialized research ability			0.729
	Professional exploration ability			0.654
	Mental regulation ability			0.734

III. C. 3) Impact of ideological and political education in professional courses

The students in grade 2024 of the sample vocational colleges were taught curriculum-based ideological and political education in professional courses based on personalized resource recommendation, and students in grade 2023 and above were still taught in the traditional way, and the weighted factor assessment analysis was conducted, and the results of the model assessment of the comprehensive competence level of the students in each grade are shown in Table 4.The comprehensive competence of the students in two grades, grade 2021 and grade 2024, was above average, with the scores of 3.785 and 1.672, and students in the remaining grades had below-average general competence.

Compare students who have received and those who have not received personalized recommendation model education, it is found that students who have experienced the ideological and political education in professional courses teaching have a more balanced development of all aspects of the ability, and their comprehensive ability has a greater improvement compared with those who have not experienced it, indicating that the ideological and political education in professional courses teaching based on personalized resource recommendation can enhance the development of students' comprehensive ability.

Table 4: Evaluation results of the comprehensive ability level model of students in each grade

Grade	Comprehensive score	Comprehensive score ranking	Cluster analysis rankings	Whether to implement personalized recommendations
2021	3.785	1	1	No
2024	1.672	2	2	Yes

2022	-0.048	3	2	No
2023	-3.925	4	3	No

IV. Paths to building a curriculum of ideological and political in vocational colleges and universities

Through the analysis of the previous section, this paper verifies the influence of the construction of curriculum ideology and politics on the improvement of students' comprehensive ability. In order to accelerate the cultivation of high-quality talent team, vocational colleges and universities need to guide students to actively participate in the practice courses and combine the courses with ideological and political education. In this regard, the path of curriculum ideological and political construction in vocational colleges is discussed.

IV. A. Building long-term mechanisms for synergies and linkages

To improve the personalized recommendation accuracy, more advanced data analysis and machine learning techniques are required. This includes continuous collection and analysis of students' learning behaviors, preferences and feedback, and more accurately simulation and prediction of student needs. The recommended system should be designed to be able to study, adapt, and to recommend strategy adjustments based on the behavior of the students. In addition, the comprehensive students and teachers directly feedback the recommendation results can further enhance the recommendation correlation and effectiveness. Through these measures, we can ensure that each student receives the most appropriate thoughts on education, which in turn improves the learning heat and results.

First of all, vocational colleges and universities should plan and deploy “ideological and political education in professional courses” from a core perspective, which includes formulating clear educational objectives and teaching plans, clarifying the concept and content of the ideological and political education in professional courses, and designing personalized teaching programs to meet the needs of different student groups by combining modern information technology and big data analysis.

]Secondly, vocational colleges and universities should implement the ideological and political education in professional courses from a professional point of view. Teachers should focus on combining the ideological and political theory with subject knowledge during classroom teaching, and guide students to apply the specialized knowledge they have learned to practical problems and deepen their understanding and grasping of the socialist core values by means of teaching methods such as case analysis and project practice.

At the same time, it should also be coordinated with student associations, and through cooperation and communication with student associations, it promotes students' participation in Ideological and Political education activities, cultivates their organizational ability, leadership ability and innovative spirit, and creates a pattern of all-member participation and all-member education.

Finally, it is necessary to strengthen the overall planning and assessment in the implementation process, comprehensively grasp the effect of the implementation of the ideological and political education in professional courses, and constantly optimize and improve the teaching content and methods. In addition, in order to promote the ideology and politics of the curriculum, colleges and universities should create a good learning environment.

IV. B. Strengthening practice and application

To improve the acceptance degree of the intelligent algorithm, we must strengthen the understanding and trust of the above technology through education and training. These include regular training courses and workshops, which introduce the basic principle of intelligent algorithm, application case and the potential value of the education. At the same time, it should also encourage teachers and students to participate in the development and evaluation process of intelligent algorithms, so that students can more direct geographic and feel these technologies. In addition, the students can further improve the success of teaching and learning efficiency by demonstrating the intelligent algorithm, and further improve the confidence of teachers and students on these technologies. Through these work, teachers and students are able to accept and use intelligent algorithms to make the intelligent algorithm wave the most important role in the work of the education.

First of all, by simulating real situations through experiments, students can carry out practical operations and observations so as to understand the theoretical knowledge in the course more deeply. Experiments can help students consolidate and apply what they have learned, and develop their problem-solving and innovative thinking abilities through problems encountered in actual operations.

Secondly, through contact and participation with real-life situations, students will understand and master what they have learned more deeply and apply it to practical problem solving. The authenticity and practicality of practical activities can stimulate students' interest and motivation in learning and improve the learning effect.

Finally, the curriculum content and practical activities should be set up in close connection with the needs of the industry and society, focusing on cultivating students' vocational literacy, and enabling students to use the knowledge and skills they have learned and their innovative thinking in the process of solving practical problems to provide practical solutions and strategies for solving problems.

V. Conclusion

Strengthening the construction of ideological and political education in professional courses in vocational colleges and universities is both an effective way to solve the problem of ideological and political education and an important way to promote the overall development of students. The study is based on data mining technology to construct a personalized recommendation method for ideological and political education in professional courses teaching resources to promote the enhancement of ideological and political education in professional courses teaching. In the context of the construction of ideological and political education in professional courses based on the optimization of the recommendation model, factor analysis are used to assess the comprehensive ability of students and explore the impact of the construction of ideological and political education in professional courses on the improvement of students' comprehensive ability.

In the model comparison of ideological and political education in professional courses resource recommendation, the results of each index of collaborative filtering recommendation method are more stable, the results of the index of similarity algorithm recommendation method have obvious fluctuation, and the HR, MRR, and NDCG levels of personalized recommendation method of this paper are higher than those of the former two methods, which amount to 18.49-21.63, 1.81-2.12, and 4.31-4.87, respectively, and have better stability, reflecting the good recommendation effect of this method on the teaching resources of ideological and political education in professional courses.

Based on the comparative perspective, the comprehensive competence score of students in grade 2024 who carried out ideological and political education in professional courses teaching was 1.672, confirming that ideological and political education in professional courses teaching based on personalized resource recommendation had an effect on improving students' comprehensive competence.

Vocational institutions need to build a synergistic long-term mechanism to create conditions for students to receive ideological and political education in professional courses education. This can be realized through the close cooperation between departments and the joint creation of a good atmosphere for Ideological and Political education. In addition, practice and application need to be strengthened to provide strong support for students' personal and professional development. By continuously enriching and improving the construction of curriculum ideology and politics, a group of high-quality talents with both professionalism and good ideological and moral quality can be better cultivated.

References

[1] Yang, X. (2022). Evaluation on the Training Effect of Applied Talents in Higher Vocational Colleges under the Background of Regional Economy. Mathematical Problems in Engineering, 2022(1), 8631696.

[2] Hu, K., & Li, X. (2024). Research on Industry-education Integration and Talents Cultivation of Vocational Education Empowering New Quality Productive Forces. Journal of Higher Vocational Education (ISSN: 3005-5784), 1(2), 211.

[3] Yu, Y. (2024). Research on Training Mode of Applied Talents Based on OBE Concept. Advances in Education, Humanities and Social Science Research, 11(1), 1-1.

[4] Wanjing, L. (2023). Research on the Current Situation and Improvement Path of the Industrial Awareness of Applied Talents. future, 6(9), 77-85.

[5] Li, S., Cao, Z., & Han, T. (2023). Research and practice of training of innovative talents in vocational undergraduate education. Frontiers in Educational Research, 6(27).

[6] Shan, Y. (2023). Thoughts on promoting the construction of “curriculum ideology and politics” in professional courses of vocational and technical education. Journal of Education and Educational Research, 3, 162-164.

[7] Qu, X., & Bo, X. (2023). To Assess the Methods of Integrating Ideological Education into The Second Classroom for Physical Education of Higher Vocational Colleges. Eurasian Journal of Educational Research (EJER), (107).

[8] Yang, L. I. (2021). Explore the Path to Improve the Teaching Quality of Ideological and Political Course in Higher Vocational Colleges. The Theory and Practice of Innovation and Enntrepreneurship, 4(13), 112.

[9] Wang, H. (2023). Construction of ideological and political cognition teaching mode in English courses in higher vocational colleges. Methods, 6(18), 1-6.

[10] Li, L., Sun, W., Zhou, B., Cao, Y., Guo, F., Zhang, S., & Liu, M. (2022, July). Research and Discussion on the Implementation Path of Curriculum Ideological and Political Education under the Background of Vocation. In 2022 3rd International Conference on Mental Health, Education and Human Development (MHEHD 2022) (pp. 666-670). Atlantis Press.

[11] Huang, L., & Yao, R. (2020). Construction and innovation of the “ideological and political theories teaching in all courses” in vocational colleges. Open Journal of Social Sciences, 8(8), 128-138.

[12] Liu, W., & He, C. (2022). Curriculum-Based Ideological and Political Education: Research Focuses and Evolution. International Education Studies, 15(5), 28-35.
[13] Dong, F., & Dong, S. (2023). Research on the optimization of ideological and political education in universities integrating artificial intelligence technology under the guidance of curriculum ideological and political thinking. ACM Transactions on Asian and Low-Resource Language Information Processing.
[14] Du, J. (2022). Research on the Realization Path of Curriculum Ideological and Political Education System from the Perspective of Community—From the Perspective of Open University Curriculum Teaching. Advances in Applied Sociology, 12(11), 704-716.
[15] Li, L., & Cu, Z. (2019). Research on the Innovation of ideological and political courses in higher vocational colleges under the background of vocational education reform. DEStech Transactions on social science, education and human science.
[16] Li, W., Wang, G. G., & Gandomi, A. H. (2021). A survey of learning-based intelligent optimization algorithms. Archives of Computational Methods in Engineering, 28(5), 3781-3799.
[17] Song, Q., Li, S., Yang, J., Bai, Q., Hu, J., Zhang, X., & Zhang, A. (2021). Intelligent Optimization Algorithm‐Based Path Planning for a Mobile Robot. Computational intelligence and neuroscience, 2021(1), 8025730.
[18] Altay, E. V., & Alatas, B. (2020). Intelligent optimization algorithms for the problem of mining numerical association rules. Physica A: Statistical Mechanics and its Applications, 540, 123142.
[19] Dyulicheva, Y. Y. (2019). The swarm intelligence algorithms and their application for the educational data analysis. Open Education, 23(5), 33-43.
[20] Sun, J. (2017). Usability evaluation approach of educational resources software using mixed intelligent optimization. Mathematical Problems in Engineering, 2017(1), 2926904.
[21] Protopopova, J., & Kulik, S. (2020). Educational intelligent system using genetic algorithm. Procedia Computer Science, 169, 168-172.
[22] Qian, L., Cao, W., & Chen, L. (2025). Influence of artificial intelligence on higher education reform and talent cultivation in the digital intelligence era. Scientific Reports, 15(1), 6047.
[23] Weimin, O. (2021). Classroom education effect evaluation model based on MFO intelligent optimization algorithm. Journal of Intelligent & Fuzzy Systems, 40(4), 6791-6802.
[24] Zhu, J., Liao, Y., & Lu, D. (2024). Design and Optimization of Personalized Education System Based on Intelligent Algorithms. Procedia Computer Science, 243, 514-522.
[25] Zeng, Y., & Xu, X. (2022). The construction and optimization of an AI education evaluation indicator based on intelligent algorithms. International Journal of Cognitive Informatics and Natural Intelligence (IJCINI), 16(1), 1-22.