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Teaching Evaluation Mechanism of Ideological and Political Courses Based on Mobile Information System

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SUMMARY: *Ideological and political courses are an important part of moral cultivation and the main way of ideological and political work in colleges and universities. The evaluation of ideological and political education (IPE) is one of the important contents of IPE. Its purpose is to improve the teaching quality of IPE and promote the comprehensive and healthy development of students. This paper studied the evaluation system of IPE based on mobile information system. It proposed a teaching evaluation method based on mobile informatization in colleges and universities and a fuzzy comprehensive appraisal (FCA) method. Based on this research, it analyzed the teaching quality of IPE and conducted a questionnaire survey and experimental analysis. The experimental results of this paper showed that in terms of IPE teaching quality evaluation, 28.3% of students were satisfied with the teaching method of IPE, and 42.4% of students were generally satisfied; 19.5% of the students thought it was average; 9.8% of the students were not satisfied with it. In the evaluation of the quality of IPE teachers, students thought that the ideological cultivation of IPE teachers was particularly important, accounting for 67.2%; the sense of responsibility accounted for 42.7%; the teaching ability accounted for 41.6%; personality charm accounted for 35.1%; academic attainments accounted for 31.3%. In terms of teaching suggestions for IPE, 32.7% of the students felt that "it is the teacher's self-cultivation, and the theoretical level and personal charm play a key role in improving the effect of the classroom"; 43.6% of the students felt that "the teaching content and method are the key"; 23.7% of the students felt that "the key is to depend on whether students want to take this type of course". The analysis of these conclusions based on the mobile information system showed that IPE courses need to be improved in all aspects. At the same time, the feedback between teachers and students on teaching quality information should be handled well.*

KEYWORDS: *Ideological and Political Courses; Fuzzy Evaluation; Mobile Information System; Questionnaire Survey; Analytic Hierarchy Process*

1 Introduction

All social strata educate the members in a purposeful and organized manner through reasonable political views and moral norms to improve the ideological awareness, and thus serving the society. On this basis, students can master the basic principles of socialism with Chinese characteristics to a certain extent, and establish a correct world outlook and values. First, this paper analyzed the teaching quality of IPE courses in colleges and universities through the questionnaire survey. Secondly, it is of great significance to improve the teaching level of IPE courses in colleges and universities. On the basis of analyzing the current situation and existing problems, this paper proposed a more scientific and reasonable evaluation system to improve

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the teaching quality of IPE courses. The construction of the ideological and political teaching quality evaluation system is conducive to the formulation of a scientific quality evaluation system in other fields of society.

According to the researches from China and other countries, some scholars have also conducted research on IPE courses. Cheng P discussed the teaching practice of college IPE textbooks to improve the satisfaction with social life [1]. Wu R believed that in the process of implementing "situational inquiry", the appropriate use of other teaching methods for optimization can better promote teachers' classroom learning effects [2]. Zhang M analyzed and researched the current ideological resources of English education in colleges and universities from four aspects: cognitive ability, environment, characteristics, and measures. Some useful measures were proposed from five aspects: ideological understanding, language ontology, political education, network innovation, and language and social attributes [3]. There is a lack of relevant research on the construction of scientific Taiji ideological and political class and the interactive classroom of martial arts education. Therefore, Li CY has built a Taiji ideological and political interactive classroom system based on big data technology and graphical neural network [4]. Li X, starting from the importance of the ideological and political theory course, analyzed the learning status of the ideological and political theory course, and put forward corresponding solutions [5]. However, these scholars' exploration of IPE courses lacks a certain technical demonstration. After the study, it is found that there are better researches on the teaching of IPE courses based on the fuzzy evaluation method.

At present, scholars have carried out research on fuzzy evaluation. Based on the algorithm of artificial intelligence and the reality of IPE, Wang Y constructed a process model of fuzzy analytic hierarchy process [6]. Jing W discussed the online teaching platform. Through teaching sequence method, FCA, and other methods, the online teaching platform has been studied [7]. Qiao S used the FCA method to conduct a theoretical analysis of college sports associations and analyzed the relationship between college students' IPE literacy and sports association activities [8]. However, at present, scholars have not carried out in-depth research on the evaluation mechanism of IPE courses based on fuzzy judgment and only discussed its importance one-sidedly.

This paper analyzed the experimental results of the IPE teaching quality evaluation questionnaire and the following conclusions were drawn: the evaluation from students can inevitably form a quality evaluation feedback mechanism, and it is an important manifestation of ensuring the teaching quality of IPE. At the same time, combined with the characteristics of higher vocational colleges, a unique and targeted teaching quality evaluation system for IPE courses should be established.

The innovation of this paper is reflected in: 1) The realization of mobile informatization in colleges and universities is explained, and a fuzzy comprehensive evaluation method is proposed; 2) A questionnaire survey is carried out on the teaching quality evaluation of ideological and political courses, and the experimental results are analyzed and discussed.

2 Teaching Evaluation Mechanism Method Based on Mobile Information System

2.1 Realization of Mobile Informatization in Colleges and Universities

University informatization involves the application of modern information technology to enhance institutional management and teaching quality. A high-performance campus network integrates academic, administrative, research, educational resources, logistics, and service

management, enabling comprehensive informatization and value-added services, reflecting a key trend in higher education development within the information and knowledge economy.

At present, on the basis of campus network construction, colleges and universities have established management systems for various majors, including undergraduate management system, postgraduate management system, office automation system, financial management system, personnel system, equipment and laboratory management, scientific research system, school information service and other systems.

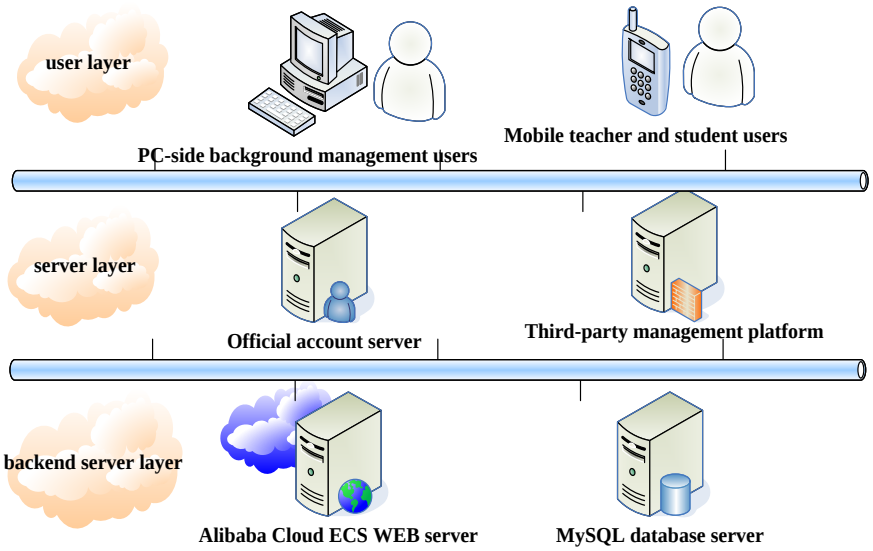

Figure 1: Three-tier architecture diagram

In order to realize the unified management of university information resources and the interconnection and sharing of data information, an information management support platform is established. The structure of the system is shown in Figure 1. The background management users of the user-level PC side are responsible for importing, managing basic information, managing system users, and publishing information; mobile phone users are mainly teachers and students of various types, who log in to various functional modules of the system through WeChat. At present, the application of the informatization construction in the departments of colleges and universities is relatively scattered, and the sporadic system of its construction can only meet some application needs of the campus [9]. It is not conducive to the integration and extraction of information and may also cause information conflict if it is serious. To build a complete digital campus network, it is far from enough to rely on the basic network platform and optimized database resources. To truly realize the digital campus, it is necessary to have a comprehensive service system for students, teachers, and leaders [10]. Finally, the existing application systems of various departments should be integrated to form a complete digital campus solution.

The construction of an integrated school-level information system is an inevitable trend of university informatization, while the decentralized and independent construction methods are no longer valued. The informatization construction of colleges and universities pays increasingly attention to the direct support for teaching and scientific research activities. Collaborative learning, collaborative research, and collaborative work are gradually being integrated [11]. The optimization of the traditional campus operation mode can improve the traditional campus operation efficiency and expand the school's operating functions, which

makes the entire teaching process fully informatized, thereby improving the school's management and work efficiency.

2.2 Teaching Evaluation Based on FCA Method

The FCA method of Analytic Hierarchy Process (AHP) is used to combine qualitative and quantitative to enhance the credibility of evaluation [12].

(1) AHP

AHP is to decompose the influencing factors into elements at various levels to form a hierarchy and then compare the elements of each level according to the standard to construct a judgment matrix; it obtains the largest eigenvalue and corresponding orthogonal eigenvectors and weights at each level through mathematical operations, and then performs consistency verification [13]. After the consistency test, the comprehensive weights of each level are evaluated, ranked, integrated, etc.

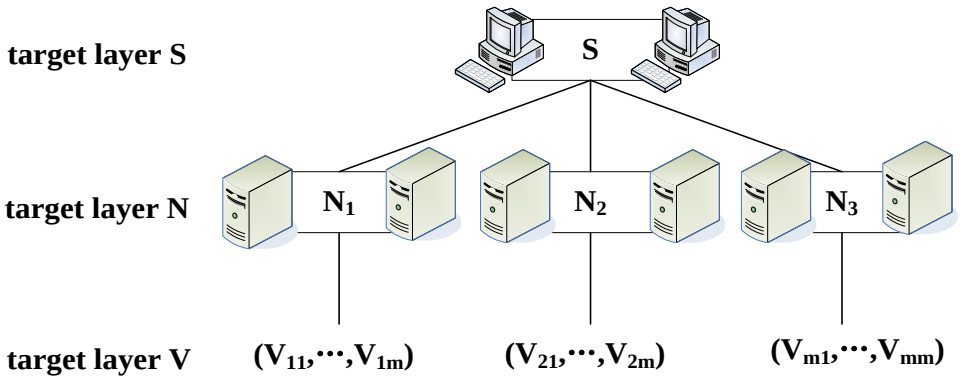

Figure 2: Hierarchical structure of evaluation indicators

Before using the AHP method for analysis, first of all, the target should be analyzed hierarchically, and an indicator system should be constructed, such as the target layer S, the standard layer N, and the specific indicator V. The factor set and subfactor set of the target should be given, as shown in Figure 2.

The factor set is:

$$S = \{N, N_2, \cdots N_m\} \tag{1}$$

The subfactor set is:

$$N_o = \{V_{o1}, V_{o2}, \cdots V_{om}\} \tag{2}$$

The solution of judgment matrix

First, the geometric mean is performed on each column vector in S, followed by normalization.

Find the product of the elements of each column in the discriminant matrix:

$$Z_o = AO_{k=1}^{m} s_{ok}, o = 1,2,3,\cdots,m \tag{3}$$

Calculate the mth root of Z_o:

$$\overline{Z_a} = \sqrt[m]{Z_o}, o = 1,2,3,\cdots,m \tag{4}$$

Normalize to Z_o:

$$Z_o = \frac{(AO_{k=1}^{m} s_{ok})^{\frac{1}{m}}}{\sum_{l=1}^{m}(AO_{k=1}^{m} s_{ok})^{\frac{1}{m}}}, o = 1,2,3,\cdots,m \tag{5}$$

The largest eigenvalue φ_{max} of the judgment matrix is calculated. The maximum eigenvalue φ_{max} is obtained by the following formula.

$$\varphi_{max} = \sum_{o=1}^{M} \frac{(Se_o)o}{me_o}, o = 1,2,3,\cdots,M \tag{6}$$

Among them, S is the S-N judgment matrix, and e is the weight vector obtained by the root method.

The e-vector is normalized to obtain the ordering weight vector of each unit under a single criterion [14].

Consistency test

First, the maximum eigenvalue of the decision matrix is obtained and substituted into the corresponding formula to get the consistency index (CI) and consistency ratio (CR) of the decision matrix, and the consistency check is performed:

$$CI = \frac{\varphi_{max} - m}{m-1} \tag{7}$$

Among them, m is the order of the judgment matrix, and φ_{max} is the maximum value of the judgment matrix.

As the degree of compatibility of the decision matrix increases, the size of the CI decreases accordingly. In order to solve the compatibility problem of judgment matrices of different orders, an average random consistency index is proposed [15], in order to overcome the problem of inconsistent discriminant matrix caused by different matrix orders.

(2) FCA

Determine the evaluation factor set

Factor set I is all factors that affect the purpose of the evaluation, including the following factors:

$$I = \{i_1, i_2, i_3, \cdots i_m\} \tag{8}$$

Among them, M is the number of evaluation factors, and i_m is the evaluation factor of the same level [16].

Build weight set

Different weight values s_m are given to each factor i_m of the factor set I according to the degree of its influence on the evaluation object. The weight set S formed by each weight value s_m is a fuzzy subset of the factor set I, which is expressed as:

$$S = \{s_1, s_2, s_3, \cdots s_m\} \tag{9}$$

Among them, element s_m is the weight value of factor i_m to I, which reflects the importance of each factor in the comprehensive evaluation. Element s_m has the characteristics of normalization and non-negative [17].

Determine the set of evaluation grade criteria

Comment set B is a set of comments for the evaluation target, including all possible

comments, which can be expressed by Formula (10):

$$B = \{b_1, b_2, b_3, \cdots b_z\} \tag{10}$$

Fuzzy one-factor evaluation

Single-factor FCA starts from a single factor and is based on the degree of membership of each factor in the evaluation index [18].

Through a single factor evaluation of o elements i_o, the fuzzy vector T_o relative to b_o can be obtained, which can be expressed as:

$$T_o = (t_{o1}, t_{o2}, \cdots t_{ok}), o = 1,2, \cdots, M; k = 1,2, \cdots, m \tag{11}$$

t_{ok} means that factor i_o has a degree of b_k.

FCA

The FCA result is obtained from the factor set, the comment set, and the single factor rating. n_o is the FCA index, and the calculation result is shown in Formula(12).

$$N = S * T = (s_1, s_2, \cdots s_m) * \begin{bmatrix} t_{11} & t_{12} & \cdots & t_{1m} \\ t_{21} & t_{22} & \cdots & t_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ t_{m1} & t_{m2} & \cdots & t_{mm} \end{bmatrix} = (b_1, b_2, \cdots, b_m) \tag{12}$$

Multi-level FCA

First, a comprehensive evaluation is performed on all factors in a category. Assuming that the kth element in the oth category is comprehensively evaluated, and the membership degree of the evaluation object belonging to the lth element of the evaluation set is t_{okl}, so the single-factor membership degree matrix of the comprehensive evaluation is:

$$T = \begin{pmatrix} t_{o11} & \cdots & t_{o1z} \\ \vdots & \ddots & \vdots \\ t_{om1} & \cdots & t_{omz} \end{pmatrix} \tag{13}$$

Therefore, the FCA set N_o of the oth factor is:

$$N_o = E_o * T_o = (e_{o1}, e_{o2}, \cdots, e_{om}) \cdot \begin{pmatrix} t_{o11} & \cdots & t_{o1z} \\ \vdots & \ddots & \vdots \\ t_{om1} & \cdots & t_{omz} \end{pmatrix} = (b_{o1}, b_{o2}, \cdots, b_{om}) \tag{14}$$

In the formula,

$$o = 1,2, \cdots, M \tag{15}$$

N_o is the relative comprehensive fuzzy operation result of the subordinate factors contained in the oth index of the N layer. E_o is the relative weight of the subordinate factors of the oth index of the N layer, and T_o is the fuzzy evaluation matrix [19, 20].

The lowest-level FCA is a comprehensive evaluation of a class of different factors by considering the overall influence of various factors. It has the characteristics of clear results and strong systematicness, and can relatively well solve vague, difficult-to-quantify, and various non-deterministic problems. The same type of assessment uses a single factor assessment. A single factor evaluation matrix is used as the lowest FCA matrix:

$$N = E * (N_1, N_2, \cdots, N_M)^Y = (e_1, e_2, \cdots, e_M)(N_1, N_2, \cdots, N_M)^Y \quad (16)$$

In conclusion, the FCA method is a better method for evaluating IPE.

3 Experimental Results of the Questionnaire Survey on the Teaching Quality Evaluation of IPE Courses

3.1 Questionnaire Design

A questionnaire survey was conducted among students in College A to evaluate teaching effectiveness, teacher quality, classroom instruction, practical teaching, and suggestions for improving teaching quality in IPE courses. The survey assessed students' overall satisfaction with teaching content, methods, and outcomes; evaluated teachers' professionalism, teaching attitudes, and ethics; examined classroom teaching approaches and learning environment; investigated student engagement in practical teaching; and collected recommendations for enhancing instructional quality.

3.2 Selection and Basic Situation of Survey Objects

The questionnaire is randomly selected. Taking the majors, grades, and genders of students in Class A college as samples, the method of random sampling is used for statistical analysis.

The respondents' basic information includes gender, major, and grade. A total of 500 questionnaires were collected, with 490 valid responses. The sample comprised 309 males and 181 females. Participants were drawn from three grades: 138 (28.2%) from 2018, 225 (45.9%) from 2019, and 127 (25.9%) from 2020. Second-year students were the largest group, as first-year students had recently enrolled and third-year students were partially absent due to off-campus internships. The high response rate and typical sample composition ensure good representativeness of the findings, as shown in Table 1.

Table 1: Basic information of the surveyed students

Project	Gender		Grade		
Content	Male	Female	2018	2019	2020
Number of people	309	181	138	225	127
Percentage	63.1%	36.9%	28.2%	45.9%	25.9%

3.3 Survey Results

(1) Students' general feelings

Figure 3 showed students' satisfaction with course content and teaching methods. Figure 3(a) shows the degree of satisfaction with the course content. Figure 3(b) shows the degree of satisfaction with teachers' teaching methods. The results showed that 18.7% of the students were satisfied with the teaching quality of the IPE courses; 45.5% of the students were basically satisfied; 28.6% thought it was average; 7.2% of the students were dissatisfied. The questionnaire survey showed that 28.3% of the college students were satisfied with the teaching methods of IPE; 42.4% of the students were basically satisfied; 19.5% thought it was average, and 9.8% were dissatisfied.

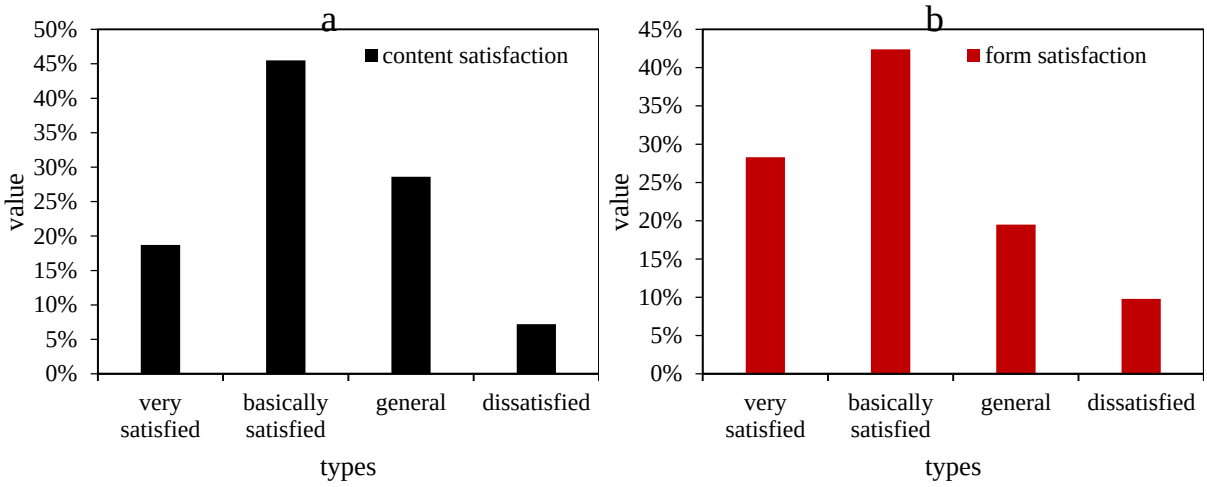

Figure 3: Satisfaction with content and teaching forms

Figure 4 shows the main gains of students learning IPE courses and the role of IPE teaching. Among them, Figure 4(a) is the main gain, and Figure 4(b) is the role of IPE teaching. In the question about "the main gains of studying IPE courses", the questionnaire survey showed that the proportion of learning some knowledge and understanding some principles of life was relatively high, accounting for 38.5% and 41.7% respectively. It can be seen from the above survey that the students of College A were generally satisfied with the teaching quality of IPE courses. The teaching content and teaching form of IPE courses have been recognized by most students, which help students learn knowledge and understand the principles of life, improving their abilities and playing a role in their growth. At the same time, the teaching of IPE courses can improve one's awareness to care about the country and society, learn how to behave in the world, increase knowledge, and broaden horizons. It can also cultivate people's problem awareness, problem-solving ability, and meet people's growth needs.

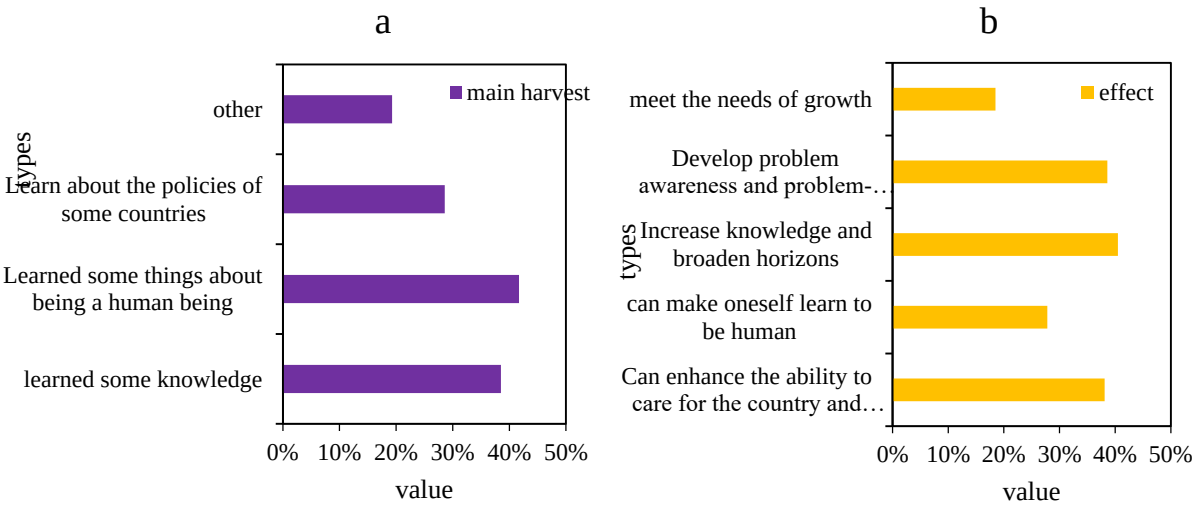

Figure 4: The main gains of students in learning IPE courses and the role they think of IPE teaching

(2) Quality of IPE teachers

Figure 5 shows the teaching attitude and required qualities of IPE teachers considered by

students. Figure 5(a) is the teaching attitude. Figure 5(b) is the required quality. In the question of "Whether the teachers are full of energy, dignified appearance, and loud voice in teaching ?", the questionnaire survey showed that 26.7% of the students thought it was very good; 41.3% of the students thought it was good; 25.6% thought it was average; 6.4% of students thought it was worse. In the survey of "What quality do you think teachers of IPE courses need to have?", the questionnaire survey showed that 67.2% of students believed that teachers of IPE courses should have high ideological accomplishment first; followed by the sense of responsibility accounted for 42.7%; teaching ability accounted for 41.6%; personality charm accounted for 35.1%; academic attainments accounted for 31.3%.

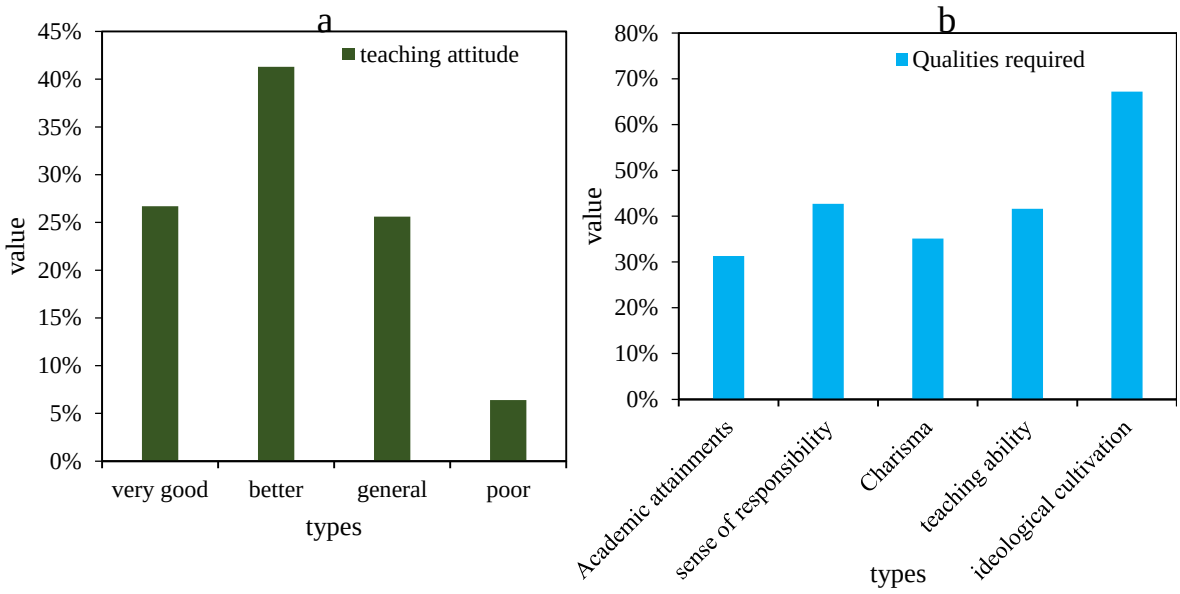

Figure 5: The teaching attitude and required qualities of IPE teachers considered by students

(3) Class implementation

Figure 6 shows the teaching content of IPE teachers considered by students. In the question "How well do the teachers update the teaching content in a timely manner, introduce new trends and developments of the subject, and link theory with practice?", as shown in Figure 6(a), the questionnaire survey showed that 31.6% of the students thought it was very good; 37.3% of the students thought it was better. In the question of "Whether the teacher can highlight the key points, resolve difficulties, and teach proficiently and clearly in classroom teaching?", as shown in Figure 6(b), the questionnaire survey showed that 23.9% of the students thought it was very good; 39.3% of students thought it was better; 28.6% of students thought it's average, and 8.2% of students thought it's poor.

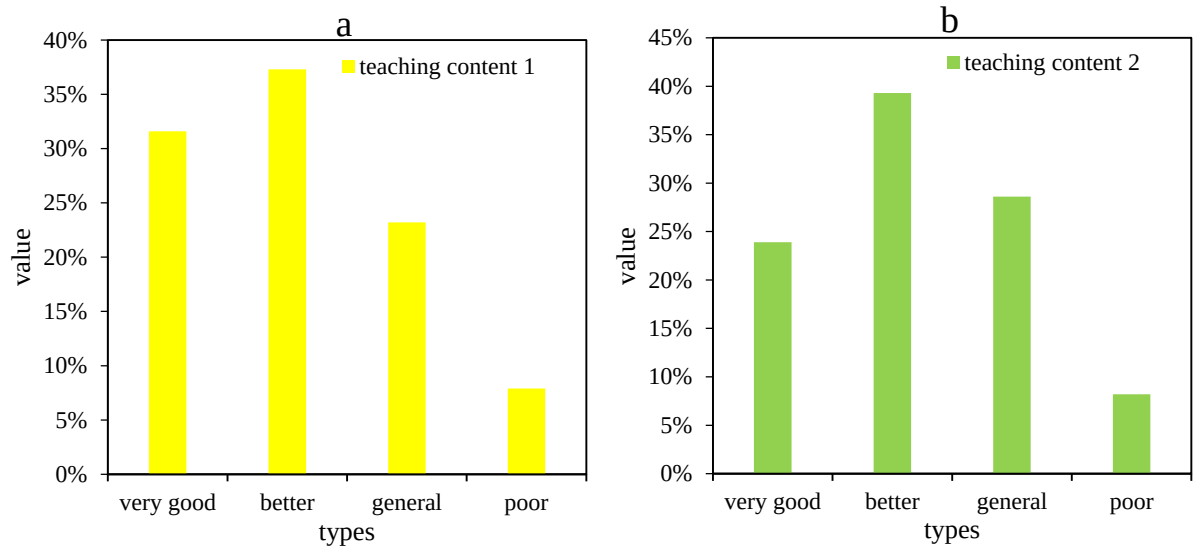

Figure 6: Teaching content of IPE teachers considered by students

Figure 7 shows the teaching methods and classroom interactions that students think about IPE courses. Figure 7(a) is the teaching method, and Figure 7(b) is the classroom interaction. In the survey of "Do you think teachers are good at inspiring students' thinking in teaching?", 26.8% thought it was often; more accounted for 35.6%; general accounted for 28.1%; less accounted for 9.5%. In the survey of "What do you think of the interaction between the teacher and classmates in the classroom", 34.5% thought it was often; more accounted for 38.3%; general accounted for 23.1%; less accounted for 4.1%.

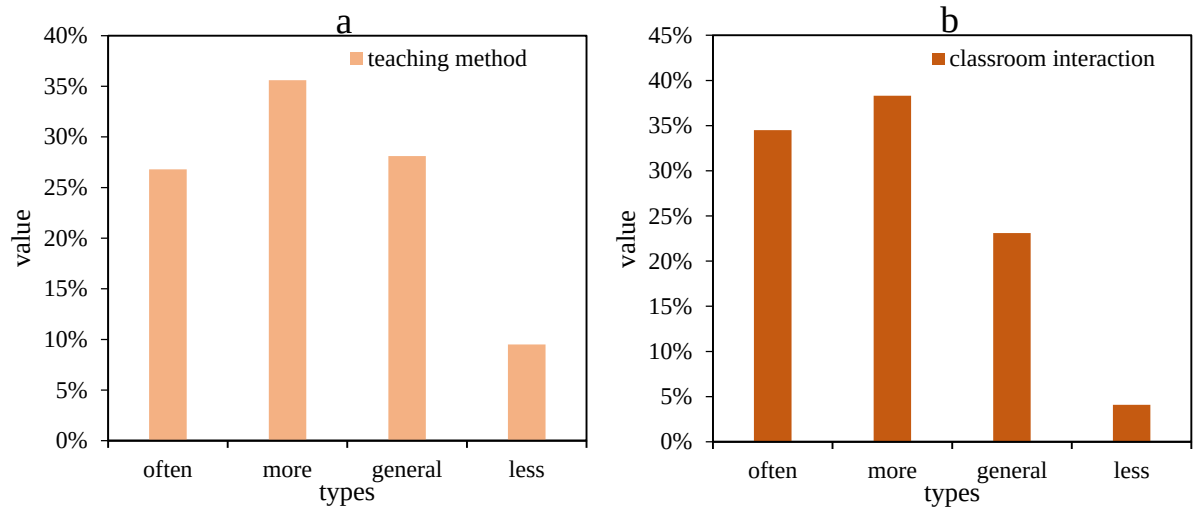

Figure 7: The teaching methods and classroom interaction of IPE courses considered by students

(4) Practical teaching situation

In the survey of "What do you think of the role of college students in participating in practical teaching activities of IPE courses", as shown in Figure 8, 42.6% believed that "you can exercise yourself very well, apply what you have learned, and have a deep understanding of the society". "I am willing to participate, but I don't learn much due to the conditions, and I cannot exercise myself well" accounted for 21.9%. "It doesn't matter whether it is carried out or not" accounted for 15%. "It's useless, like a burden" accounted for 10.3%.

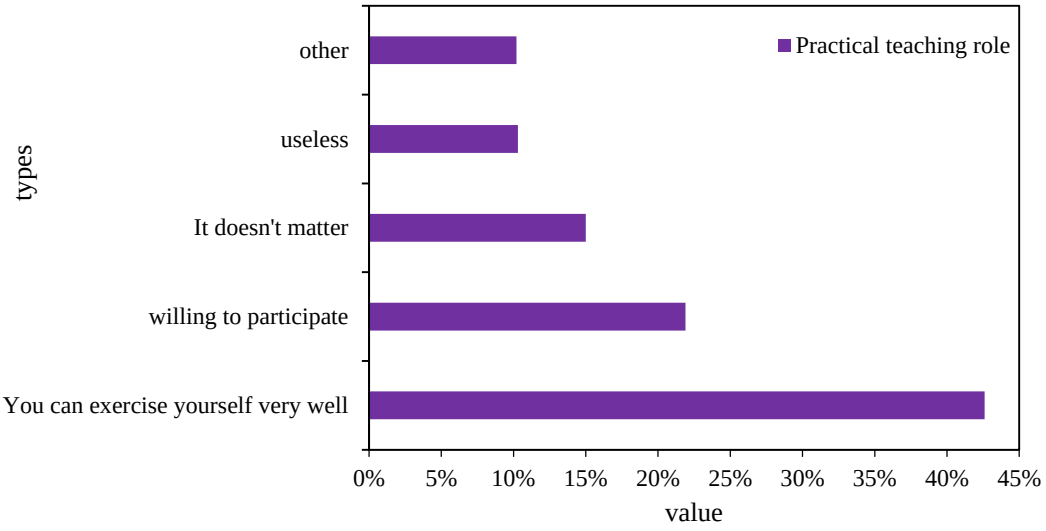

Figure 8: The role of practical teaching

(5) Students' suggestions for teaching quality

In the survey of "What do you think are the urgent measures to be taken to improve the effectiveness of IPE teaching?", as shown in Table 2, most of the students made choices from the aspects of teaching means, practical teaching, assessment methods, and teaching effects.

Table 2: Students' suggestions for improving teaching effectiveness

The measures	Proportion
Combine theory with practice, answer the key, difficult and hot issues that everyone cares about	51.2%
Reduce class size	63.1%
Adopt advanced teaching methods	65.2%
Strengthen practical teaching	53.6%
Reform the way examinations and grades are judged	61.7%
Enhance the overall quality and ability	68.5%

In the survey of "Do you think it is correct to say that the key to improving the teaching effect of IPE courses lies in teachers?", as shown in Table 3, 32.7% of the students believed that "YES, since teachers' self-cultivation, theoretical level, and personal charm play a key role in improving classroom effectiveness"; 43.6% of students believed that "NO, since teaching content, teaching means and teaching method are the key"; 23.7% of students thought "NO, since the key is whether students want to study this type of courses".

Table 3: Key to improving the teaching effect of IPE courses considered by students

Question	Proportion
Yes Teachers' self-cultivation, theoretical level and personal charm play a key role in improving classroom results	32.7%
No The key lines in teaching content and teaching methods are the key	43.6%
No The key is to see if the student wants to take this type of course	23.7

(6) Students' evaluation of teaching quality

Figure 9 shows the teaching quality evaluation method of students' IPE courses. In the question "Do you agree that the evaluation of IPE teachers at the end of the semester adopts the

method of students' online scoring?", as shown in Figure 9(a), the questionnaire survey showed that 28.6% of the students agree; 45.3% of the students relatively agree; 18.3% of the students are in general, and 7.8% of the students disagree. In the survey of "In the online scoring of students at the end of the semester, the score you gave the IPE teachers among all the teachers?", as shown in Figure 9(b), 26.8% of students rated it as the highest, and 35.6% rated it as medium; 9.5% of the students rated it as the lowest, and 28.1% of the students rated it randomly.

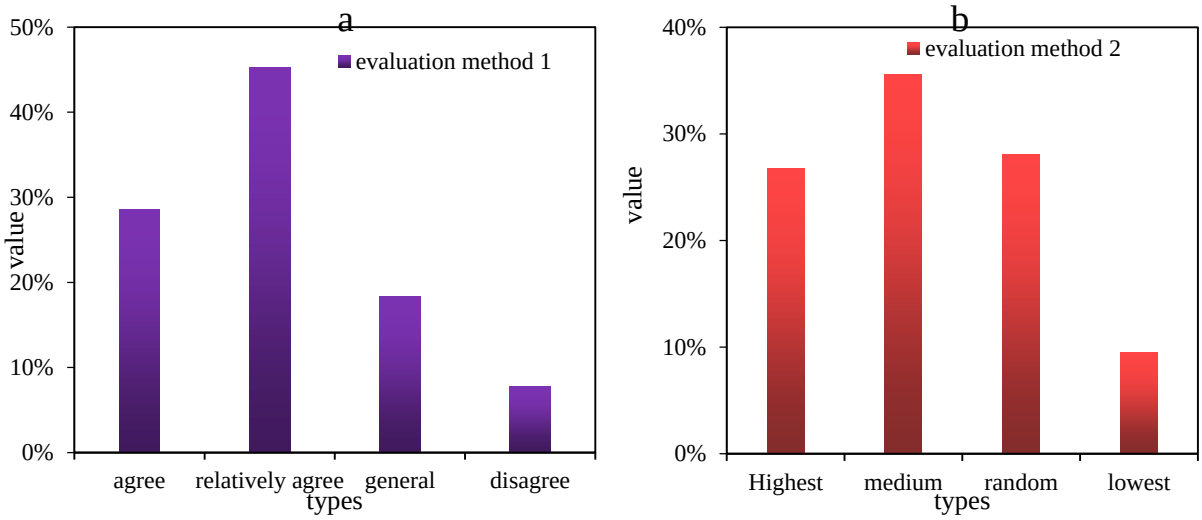

Figure 9: Teaching quality evaluation method

There is feedback when there is an evaluation, which is an important symbol to ensure the quality of IPE.

Feedback on the quality of education for teachers and students needs to be properly handled. Vocational students are the objects to be trained. Therefore, when evaluating the teaching quality of IPE courses, related work must be paid attention to. Correct feedback should be accepted, and unreasonable feedback should be reserved. According to the actual situation and personality characteristics of higher vocational students, the professional talent training program that suits them should be formulated from the psychological level.

As the people who have the closest relationship with students, teachers have a better understanding of students' learning conditions. In addition, relevant information can also be obtained from schools, societies, and enterprises. Through the contact with the evaluation object, it is possible to better grasp the students' learning status and practice performance, providing a reference for better evaluation of teaching quality.

4 Conclusions

Mobile informatization leverages mobile communication and internet technologies across handheld devices, servers, and computers to enable mobile, digital, and networked management, business, and services, delivering efficient, transparent, and interactive societal services. A mobile information-based evaluation mechanism for ideological and political teaching enhances teaching quality assessment and promotes pedagogical improvement. Such evaluation should align with the educational goal of moral development and, under the guidance of institutional leadership and party committees, establish a scientific and rational evaluation system. The school leaders have to give full attention to it for forming a comprehensive quality assurance system together with the majority of teachers, staff, and students and establishing a

scientific and reasonable teaching evaluation system for IPE courses. In the aspects of planning and design, the characteristics of the college should not only be taken into account, but the new teaching methods should also be updated to make it consistent with the requirements of the times. In the implementation process, it is necessary to enforce leadership orientation, correct deviations, and strengthen the effectiveness of relevant guarantee systems. In terms of construction methods, it is necessary to pay attention to the application of information technology. Colleges and universities should establish a targeted and distinctive teaching quality evaluation system for ideological and political courses according to their own characteristics. However, due to the limitations of time and technology, this paper does not conduct in-depth discussions on mobile information systems. In this regard, further analysis and research are going to be carried out in the future.

Conflict of Interest statement

There is no potential conflict of interest in our paper and all authors have seen the manuscript and approved to submit to your journal. We confirm that the content of the manuscript has not been published or submitted for publication elsewhere.

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Data Availability statement.

The data that support the findings of this study are available from the corresponding author upon reasonable request.

About the Author

Yuxin Zuo, born in October 1982 in Dancheng, Henan Province. She is a lecturer at Luoyang Open University and holds a Master's degree obtained from Henan University of Science and Technology. Her main research field is ideological and political education.
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