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Research on service quality of professional education based on the PZB service quality model

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With the arrival of Internet technology and the information era, China's higher education has entered a new stage of development. In this context, new learning methods represented by "Internet+" have gradually emerged and rapidly spread, and traditional classroom teaching is facing a huge impact. At the same time, more and more students choose to learn independently through online courses due to resource constraints, time and space. This new learning method has posed a great challenge to the traditional education concept. Therefore, how to improve the quality of college education services has become one of the urgent problems to be solved at present. In this paper, from the perspective of service quality of college education, it is of practical significance to apply the theory of hybrid service quality to college hybrid education to explore its service quality improvement strategy. In this paper, the application of the PZB service quality model in professional education teaching is studied and discussed by using the methods of literature, mathematical statistics, and logical analysis. In this paper, the structure of the service quality evaluation system, influencing factors and results analysis, and the summary of improvement suggestions are deeply analyzed.

KEYWORDS

quality of teaching services, higher school education, PZB service quality, Delphi method, hierarchical analysis method

1 Introduction

At present, the concept of service quality has been more in-depth and comprehensive understanding. From the initial focus on customer satisfaction and service remediation, a more complete and mature theoretical system has been gradually formed. Among them, service quality in the field of education is mainly reflected in the construction of relevant indicators to measure whether the educational services provided by schools to students meet the standards and how well they meet the needs, and on this basis, analyze the factors that affect the work, and then propose corresponding strategies and methods. However, there are still some shortcomings in the research on service quality, especially in the special form of hybrid education. Therefore, in this paper, we will take a university's hybrid education service quality as an example and conduct further exploratory and confirmatory analysis research.

2 Literature review

2.1 PZB service

In this study, PZB service quality refers to comprehensive, effective, and accurate guidance by the teachers of professional education in the learning process of students, so as to achieve the purpose of guiding and improving the physical and mental quality of athletes and cultivating good habits. In the process of sports, the teaching contents and methods, means and forms of activities as well as relevant policies and regulations are organically combined (Simic Brønn, 2012). PZB enables teachers and students to realize their self-worth and personal needs better and faster. It mainly includes the following aspects: (1) Provide high-quality curriculum resources with teaching objectives, so that students can get better development in professional education courses; (2) Establishing a sound and rational curriculum and teaching materials with strong regularity and relevance; (3) Regularly hold various activities to attract students to participate in physical exercise; (4) Regularly hold various activities so that students can get physical and mental health in sports and improve their interest in physical exercise (Streetman and Goodman, 2022).

2.2 Characteristics of service quality in professional education

The study of service quality is the focus of foreign scholars in recent years on the quality of education, students' physical and mental health, social and economic development, etc. This paper analyzes the problems in university professional education and proposes corresponding countermeasures. In this regard, the following characteristics of service quality are proposed:

- 1 From the student's point of view, we understand the current situation of the service quality of professional education teaching in schools. At the same time, teachers' use of new technologies to teach is also a professional teaching method to improve student performance (Liu et al., 2023). Through the survey and research, the relevant factors affecting the quality of work of professional education teachers and students' satisfaction with them are analyzed, and suggestions are made to effectively improve the physical fitness level of our college students, improve the curriculum and enhance the logistic support.
- 2 Students' perceptions of excellent and poor service quality, the composition and influencing factors of professional education service quality in colleges and universities were analyzed. To improve the service quality, it is necessary to strengthen the main position of students, improve the logistics guarantee system. We found that a large proportion of students do not engage in physical activity regularly, and the proportion of physical exercisers who exercise less than 4 h a day account for less than 50% (Gil-Madrona et al., 2019a). Therefore, we must focus on cultivating students' interest in physical exercise and pay attention to the cultivation of students' interest in sports and exercise, and improve the level of teachers' professional skills, etc. These measures are used to improve the current development of professional education (Shang et al., 2014).

- 3 Quality is assessed not only in terms of the outcome of the service, but also in terms of the process of the service. In the teaching process, it has been proved that the teaching dimension and the respect dimension are the two most important dimensions of teaching authority (Gil-Madrona et al., 2020). and the level of teaching quality is improved through the analysis of students, teachers and sports facilities. Meanwhile, Parsuraman, Zeithaml, and Berry proposed the service quality gap model (Figure 1). This model is a customer-oriented, service quality-as-a-whole model that evaluates and judges' students' teaching activities, thus achieving the goal of improving communication between teachers and students and the sports department as well as improving the management of professional education in universities. This model is a way to evaluate the teaching process using effective tools based on factors such as students, teachers and sports facilities, thereby improving the level of quality of professional education services in colleges and universities.

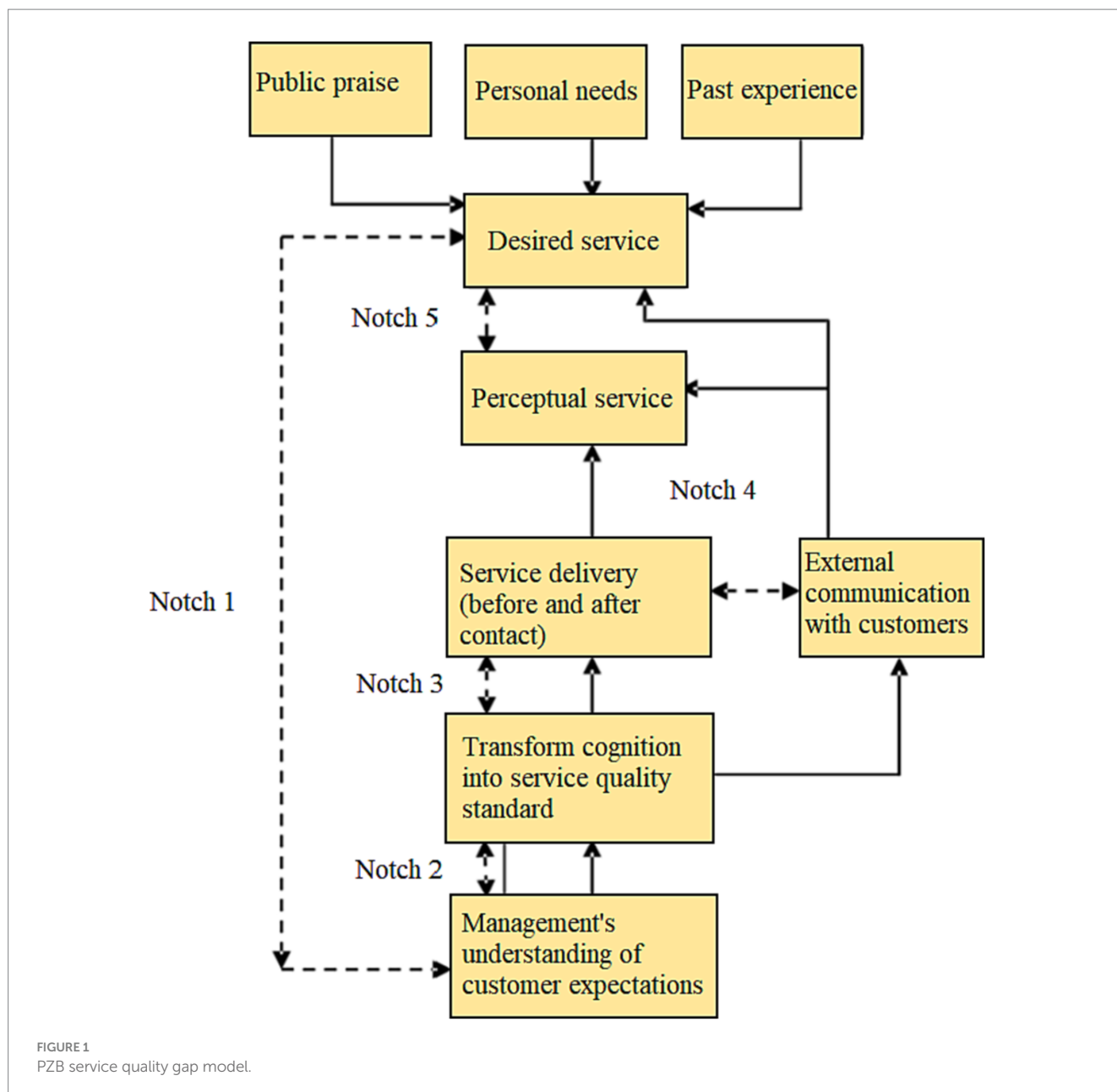
3 Methods of evaluating the quality of professional education teaching services in colleges and universities

The research on the evaluation method of professional education teaching service quality mainly refers to the use of scientific rationality principle and mathematical statistics and other theories combined with practice to build the satisfaction measurement system of college students, teachers and parents. Through the satisfaction survey of college students, teachers and parents, the factors that affect the quality of teaching and learning can be identified, and based on this, corresponding countermeasures can be proposed. In order to evaluate the teaching accurately and effectively, an evaluation model is established as shown in Figure 2. The main function of the model is: based on the satisfaction of teachers and students, through the analysis of its evaluation model, the problems in the teaching process can be found, and there is a need to strengthen the management and improve the quality of service in the practice of sports programs (Ritzer et al., 2021).

3.1 Delphi method

3.1.1 Concept of Delphi method

In the actual teaching process, the use of the Delphi method can effectively improve the level of communication and interaction between teachers and students and the level of service quality. It uses a certain number of investigators to explore and communicate the research questions to be studied, and then feedback to the relevant experts, who will then revise, amend their opinions and finally get the conclusions, in the use of this technique will generally have a process steps: firstly, determine the number of options proposed by the researcher, and then evaluate the options, and according to the feedback to amend the finalized questionnaire. Secondly, the results of the effectiveness evaluation should be accepted to a different degree for each feasible person selected, and then the results are given back to the students, so that teachers can improve the quality of their



services by conducting teaching activities according to different evaluation criteria (Zubkova and Tagirova, 2020). Finally, it is suggested that each scholar should adjust and improve the content of each factor in a targeted way.

3.1.2 Delphi method for expert research

The Delphi method is a qualitative analysis method, the basic principle of which is to organize and summarize the information in the minds of experts, statistics and calculations, and transform it into simple and easy-to-understand regular characteristics, and then into a simple and easy to understand mathematical model, so that students have a general understanding of things, so that they can grasp the regular knowledge more easily to understand and remember. In practical applications, anonymous surveys are used. This random sampling of questions allows more teachers to

participate in the survey to understand the teaching situation and related work dynamics, and also to get their ideas and needs, so that they can take the initiative to improve the teaching work, thus increasing students' interest in learning, so that their motivation can be better mobilized (Miśniakiewicz and Krnáčová, 2021). The process of expert survey using the Delphi methods shown in Figure 3.

The comprehensive analysis of student satisfaction in the process of evaluating the quality of sports services is a very important and practical and meaningful area of research. By building on the PZB-type structural model, the required information on the relationship between college teachers and students, teaching contents and methods, and mutual communication between teachers and students was constructed, and the judgment matrix of its literature information resource evaluation is shown in Table 1.

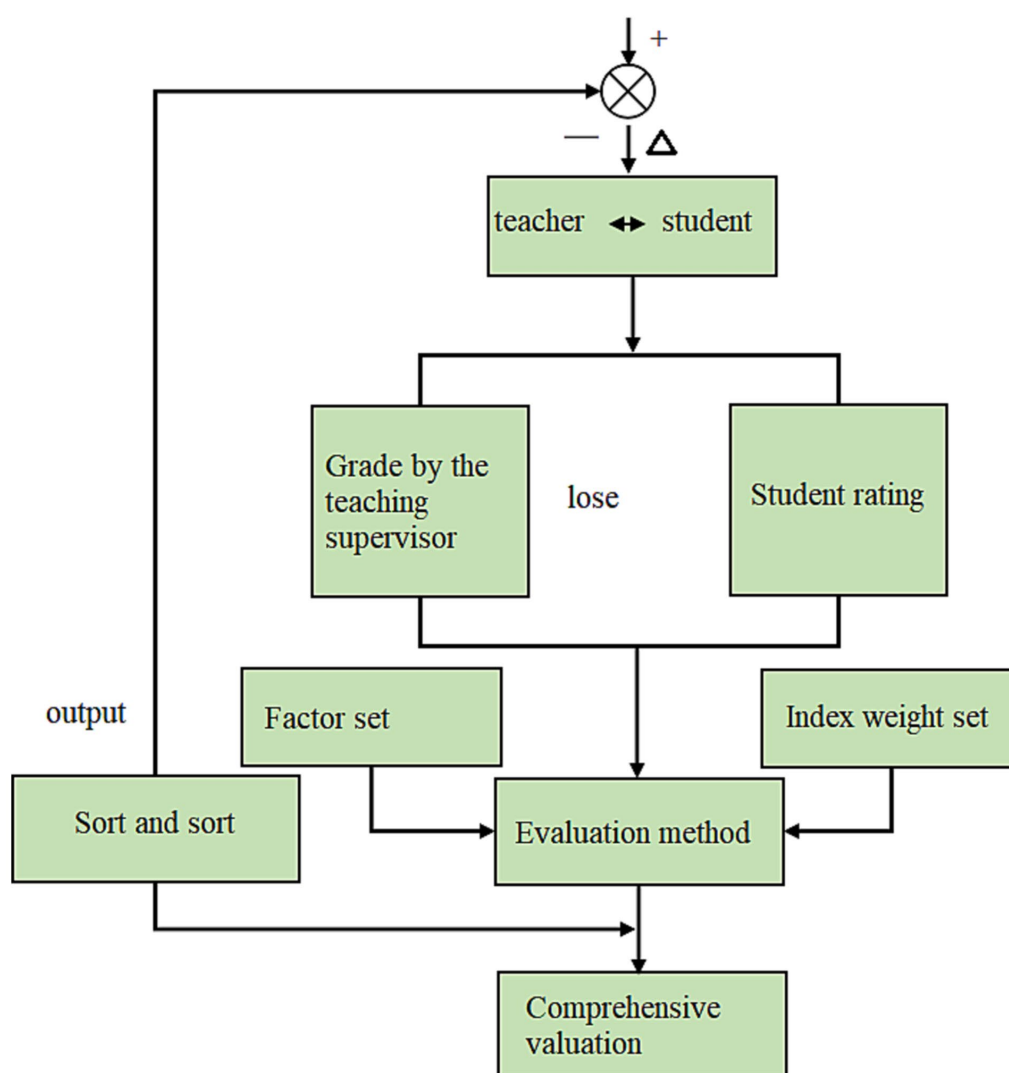


FIGURE 2
Teaching evaluation model.

3.2 Hierarchical analysis method

3.2.1 Hierarchical analysis

The hierarchical analysis is a systematic research method that combines qualitative and quantitative aspects, translates the problem into a specific value, and gives reasonable suggestions based on the actual situation. When used in the application process, it is necessary to first determine what kind of relationship exists between the factors, and secondly to consider several aspects affecting students' learning effectiveness, teaching quality and improving the performance of professional education teachers, so as to achieve a comprehensive and systematic analysis of students and to come up with reasonable suggestions. This can provide a theoretical basis for professional education teaching reform, which is also an important way to solve the current problems in the quality of professional education services (Parida and Baksi, 2011). By using this method, it can accurately reflect the current situation and development trend of school professional education service quality:

first, ensure that the course content provided by the school conforms to the regulations of the Ministry of Education of China; second, strengthen the interaction between teachers and students and improve students' participation; third, enhance the teaching enthusiasm of professional education teachers by establishing a perfect evaluation mechanism; fourth, strengthen the construction and management of the course assessment system (Long et al., 2020). Based on this, the specific steps of the derived hierarchical analysis method are shown in Figure 4.

3.2.2 Calculation of index weights by using hierarchical analysis method

In the evaluation index of teaching service quality, the analysis of students' satisfaction is mainly done by establishing a hierarchical structure model to determine the influence degree weights of each factor and determining the influence degree of each factor on students' satisfaction by fuzzy comprehensive evaluation method, so as to come up with the strategy to improve

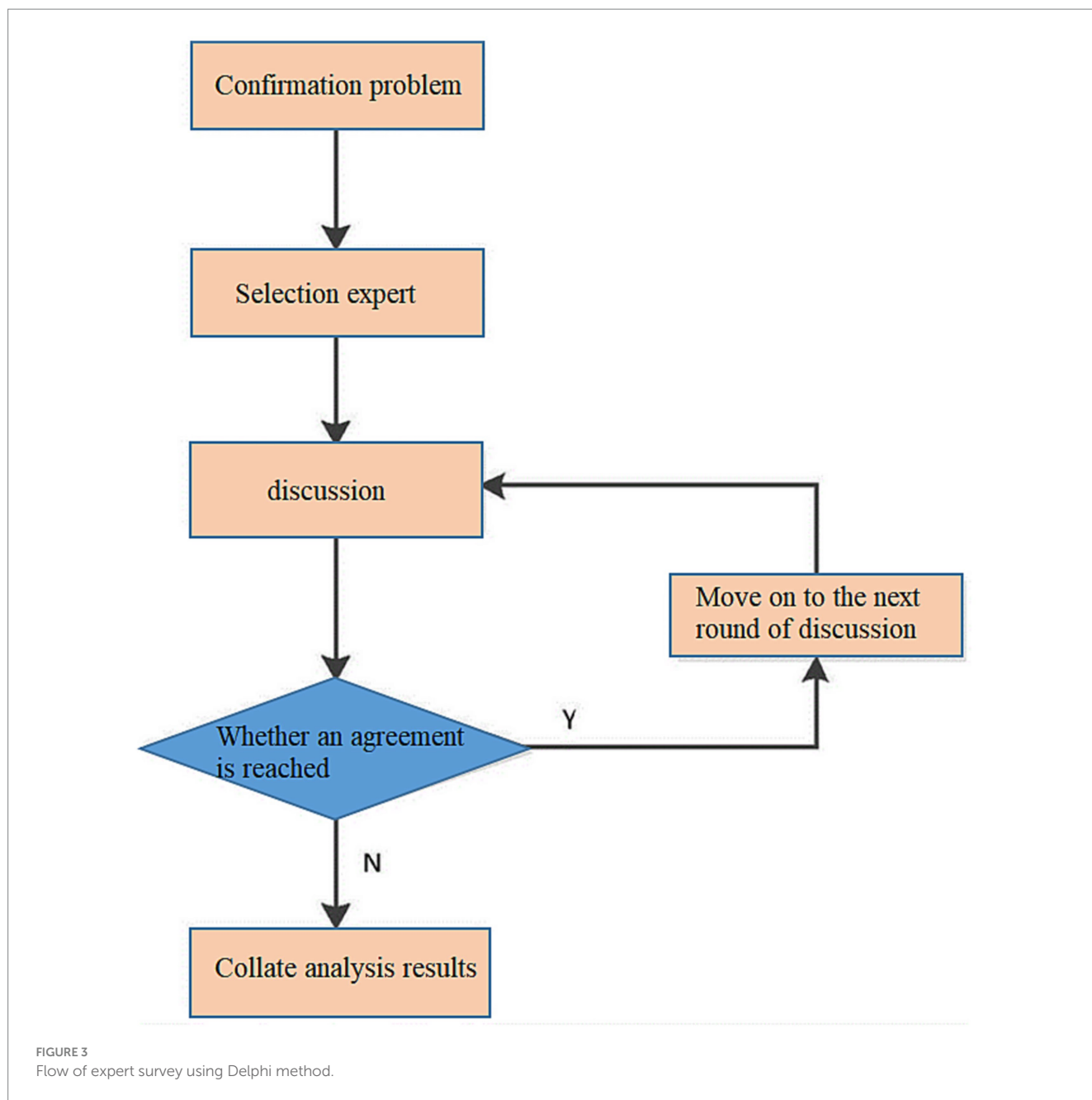


TABLE 1 Judgment matrix of literature information resources evaluation.

A	A1	A2	A3	A4
A1	1	1/4	1/4	2
A2	4	1	1	3
A3	4	1	1	3
A4	1/2	1/3	1/3	1

the management level of professional education teaching service quality. In order to determine the weights, this paper uses hierarchical analysis to identify the main factors affecting the quality of professional education teaching services in colleges and universities and quantifies each dimension to derive the final

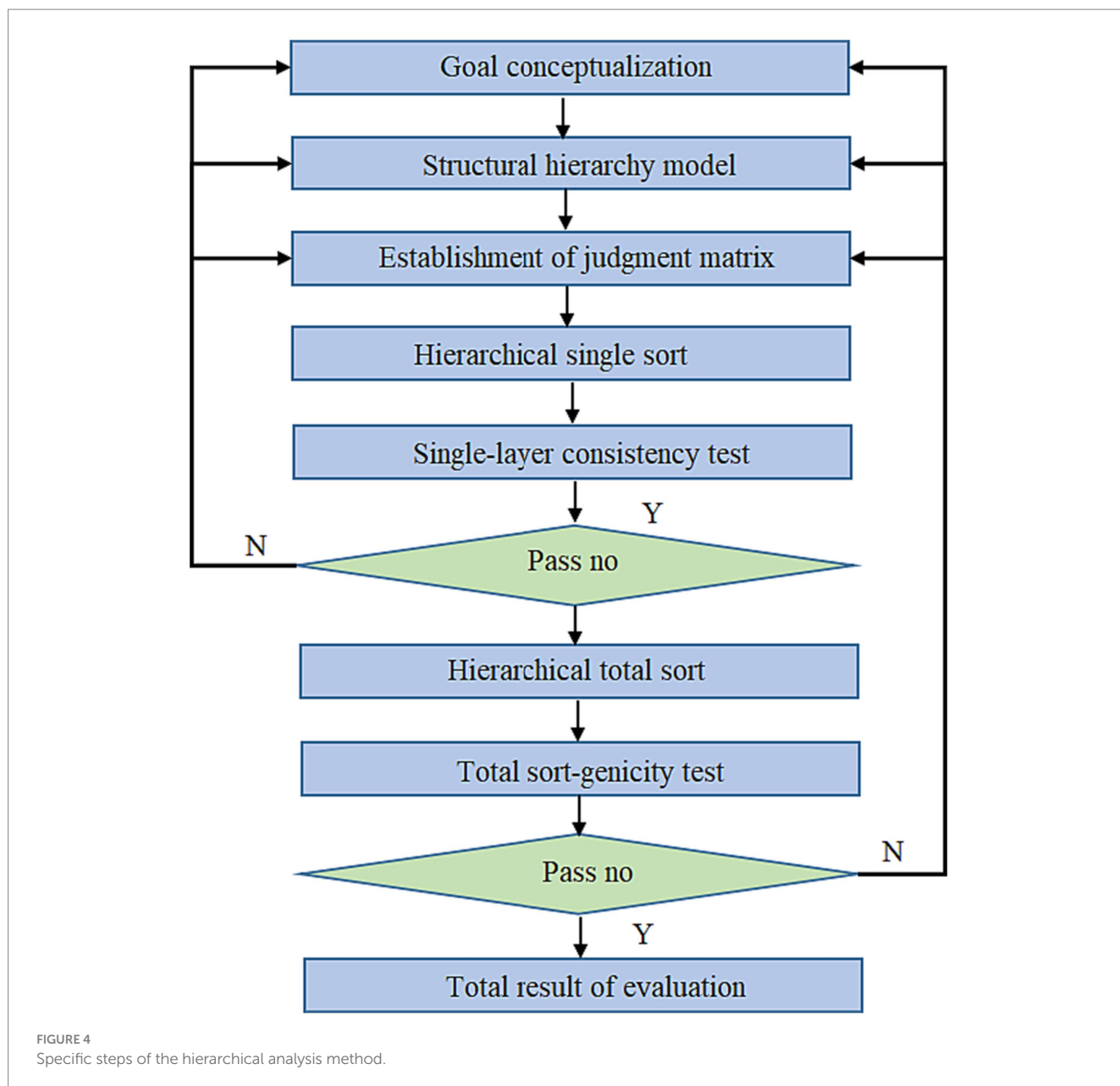
results. By using the fuzzy comprehensive evaluation model to study the current management status and development trend of colleges and universities in most regions of China, the steps of its teaching evaluation are:

- ① Set up a set of factors, which is a collection of indicators composed of evaluation indicators, as shown in formula (1).

$$U = [u_1, u_2, \dots, u_n] \tag{1}$$

- ② Set up an evaluation set, which is a set that indicates the degree of merit of the evaluation objectives, as shown in formula (2).

$$C = [c_1, c_2, \dots, c_m] \tag{2}$$



③ The weight matrix of indicators is obtained from the hierarchical analysis (AHP), as shown in formula (3).

$$W = [w_1, w_2, \dots, w_m] \tag{3}$$

where, we are the weight value of each index. Through the investigation and analysis of the current situation of teaching service quality of professional education teachers, it is found that the current professional education teaching service in China has problems such as weak awareness of student participation, poor interaction between teachers and students, and lack of scientific and reasonable evaluation mechanism (Fallah Jelodar, 2016). In response to these problems, this paper puts forward relevant suggestions: improve the importance of school leaders, improve the management system and assessment standards; strengthen the construction of logistic support, and

establish effective incentive and restraint mechanisms and rewards and punishments, so as to promote teachers and students to actively learn new knowledge and skills, which can lay a solid foundation for better development in the future.

④ Construct a single-factor evaluation matrix R, where $R_i = (r_{i1}, r_{i2}, \dots, r_{in})$ is the result of the evaluation of the factor as shown in formula (4), which has an impact on the satisfaction of students. The questionnaire and interview results found that professional education teachers have problems such as irregularity and unreasonableness in the teaching process, and the corresponding countermeasures are proposed for these phenomena: optimize the curriculum structure, strengthen the communication mechanism with parents to establish a good teacher-student relationship, improve the logistics guarantee system to improve the level of logistics services, so as to ensure the quality of

professional education work in colleges and universities, improve student satisfaction, and actively improve the quality of logistics services.

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix} \quad (4)$$

- ⑤ The weighted average type of comprehensive judgment model [as shown in formula (5)] was used to evaluate and analyze the quality of professional education teaching services in colleges and universities, and it was found that the management mechanism of teaching service quality has not yet been formed, and the enthusiasm of students' participation needs to be improved. In the survey, it was learned that the factors affecting the efficiency and effectiveness of professional education teachers in colleges and universities are multifaceted and multidimensional, mainly including incomplete teaching resources and equipment, poor professional quality of professional education teachers, and inadequate management of students by school leaders. In response to the above problems, corresponding countermeasures were proposed, such as strengthening the construction of hardware facilities and improving the equipment of professional education, improving the efficiency and quality level of logistics support, establishing an effective feedback mechanism and reforming the assessment system (Biese et al., 2021).

$$M = (, \oplus) = \sum_{i=1}^n (W_i r_{mn}) \quad (5)$$

Calculating the comprehensive judgment matrix [as shown in formula (6)] is most used in fuzzy mathematics in three models: hierarchical analysis, fuzzy comprehensive judgment model, and gray system method. At present, the evaluation of professional education teaching service quality is mainly based on qualitative indicators. The hierarchical analysis method is the most widely used in education evaluation, which can make full use of the information provided by the factor fuzzy matrix to quantify the evaluation indicators of professional education teaching service quality, so that students can have an intuitive and comprehensive understanding of their learning effect and teachers' working efficiency, thus improving the teaching service level (Nowoświat and Leszczyńska, 2016; Goodson et al., 2021).

$$A = W \quad R = [w_1, w_2, \dots, w_m] \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix} \quad (6)$$

- ⑥ The gray correlation degree was calculated to determine the correlation order, analyze the influencing factors, and propose countermeasures to improve the quality of professional education teaching services in colleges and universities in order to improve students' participation in professional education

classes. The correlation degree is calculated as shown in formulas (7)–(9).

$$\eta_{ij}(k) = \frac{\min_i \min_k \Delta_i(k) + \ell \max_i \max_k \Delta_i(k)}{\Delta_i(k) + \ell \max_i \max_k \Delta_i(k)}, \ell \in (0,1) \quad (7)$$

$$\Delta_{ij}(k) = |A'_j(k) - A'_i(k)| \quad (8)$$

$$\eta_{ij} = \frac{1}{k} \sum_1^k \eta_{ij}(k), k = 1, 2, \dots, n \quad (9)$$

3.3 Computational analysis of teaching quality

The calculation and analysis of teaching quality refer to the dynamic adjustment of the relationship between teachers and students and between teachers and students through actual perception, feedback and monitoring in the process of students' learning of professional education courses. Before the teaching practice is carried out, it is necessary to understand whether the content taught meets the requirements of this stage, and if not, it is necessary to correct and reformulate the relevant system in time to ensure the effective operation of the classroom; on the contrary, when problems arise, the teaching should be stopped immediately or measures should be taken to solve them, so as to ensure that the teaching quality is continuously improved and improved, and finally improve the comprehensive quality and ability of students. The above-mentioned method and model are used to evaluate the quality of classroom teaching in a certain teaching evaluation in our college, for example.

- ① Set up the factor set: U = [us/teaching content, us/teaching method, us/teaching attitude, us/teaching basic skills, us/teaching effect].
- ② Set up the evaluation set and assign the value: C = [very good, good, better, fair, poor].
- ③ By the AHP method, on the basis of consulting experts, the corresponding judgment matrix is established by the 1–9 scale method to determine the weights of factors at the same level, and then the judgment matrix is shown in the formula (10).

$$A = \begin{bmatrix} 1 & 2 & 3 & 2 & 2 \\ 1/2 & 1 & 2 & 2 & 2 \\ 1/3 & 1/2 & 1 & 1/2 & 1/2 \\ 1/2 & 1/2 & 2 & 1 & 1/2 \\ 1/2 & 1/2 & 2 & 2 & 1 \end{bmatrix} \quad (10)$$

- ④ The one-factor evaluation matrix R obtained by the expert panel for the three teachers' ratings is shown in formulas (11)–(13).

$$R_1 = \begin{bmatrix} 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.2 & 0.3 & 0.2 & 0.3 & 0 \\ 0.2 & 0.5 & 0.2 & 0.1 & 0 \\ 0 & 0.2 & 0.4 & 0.3 & 0.1 \\ 0 & 0.3 & 0.5 & 0.1 & 0.1 \end{bmatrix} \quad (11)$$

$$R_2 = \begin{bmatrix} 0.2 & 0.4 & 0.3 & 0.1 & 0 \\ 0.2 & 0.3 & 0.4 & 0.1 & 0 \\ 0.5 & 0.3 & 0.1 & 0.1 & 0 \\ 0.1 & 0.4 & 0.2 & 0.1 & 0.1 \\ 0.1 & 0.5 & 0.2 & 0.2 & 0 \end{bmatrix} \quad (12)$$

$$R_3 = \begin{bmatrix} 0.1 & 0.3 & 0.3 & 0.2 & 0.1 \\ 0.3 & 0.3 & 0.2 & 0.2 & 0 \\ 0.4 & 0.3 & 0.2 & 0.1 & 0 \\ 0.1 & 0.3 & 0.2 & 0.3 & 0.1 \\ 0.3 & 0.2 & 0.4 & 0.1 & 0 \end{bmatrix} \quad (13)$$

A weighted average type of comprehensive evaluation model was used to analyze the current situation of the quality of professional education teaching services in Hunan universities using the questionnaire survey method. Problems affecting students' low participation and lack of teachers' active communication ability were found, and the evaluation results were obtained by using the synthetic operation of the fuzzy matrix, as shown in the formula (14).

$$A_1 = W$$

$$R_1 = [0.34361, 0.24012, 0.09638, 0.13791, 0.18198] \quad (14)$$

$$\begin{bmatrix} 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.2 & 0.3 & 0.2 & 0.3 & 0 \\ 0.5 & 0.5 & 0.1 & 0.1 & 0 \\ 0 & 0.2 & 0.4 & 0.3 & 0.1 \\ 0 & 0.3 & 0.5 & 0.1 & 0.1 \end{bmatrix} = \begin{bmatrix} 0.101661 \\ 0.271124 \\ 0.350898 \\ 0.209967 \\ 0.06635 \end{bmatrix}$$

4 Design of hybrid education quality evaluation system based on the PZB service quality model

4.1 System architecture design

The hybrid education model is a new teaching method based on computer technology and communication network. It is based on computer information technology and uses various advanced means to build a systematic and standardized service quality evaluation system for colleges and universities. By monitoring and managing all aspects of the service process, the modelist improves students' learning efficiency and satisfaction, enhances students' learning motivation and realizes the sharing of higher-quality educational resources. From the

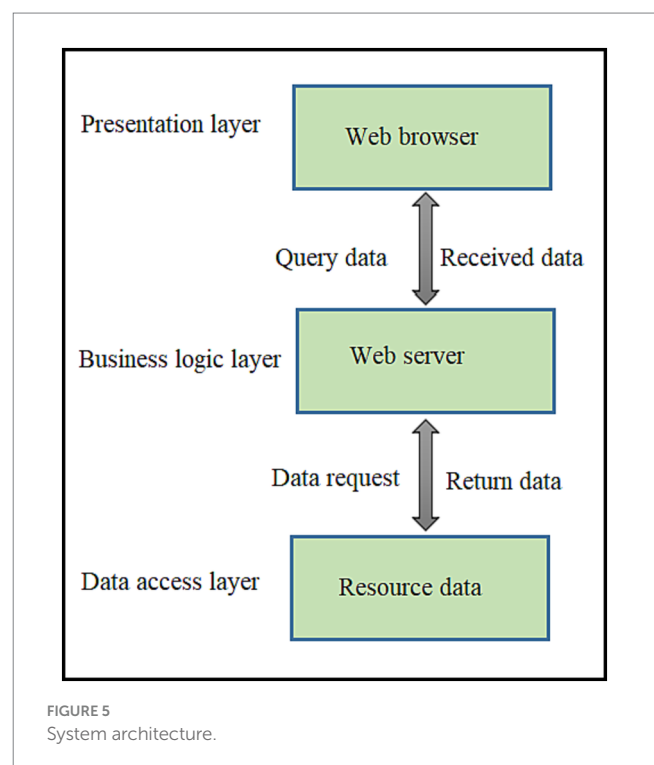
theoretical point of view: it is important to establish a perfect scientific and reasonable evaluation index system to improve students' comprehensive quality, and from the practical point of view: a scientific and reasonable evaluation model is established by taking multiple dimensions such as teachers' teaching effect and school running efficiency as evaluation criteria. The system architecture is shown in Figure 5.

4.2 Teaching quality evaluation system function module

Based on the PZB service quality evaluation system, the quality of hybrid education is scientifically and reasonably evaluated, mainly based on the number of problems encountered by students in the learning process, the length of time and the learning effect and other indicators to determine the teaching content. The evaluation criteria and methods are used to determine whether the teachers and students have achieved the expected goals in the implementation of the course. Based on this paper, the teaching quality evaluation system is studied, and its functional modules are shown in Figure 6.

4.3 Sampling strategies

This study adopts the "purposive sampling" of non-probability sampling in quantitative study research sampling methods, that is, according to the research purpose, the research objects that can provide the maximum amount of information for the research question are selected (Borrego et al., 2009).



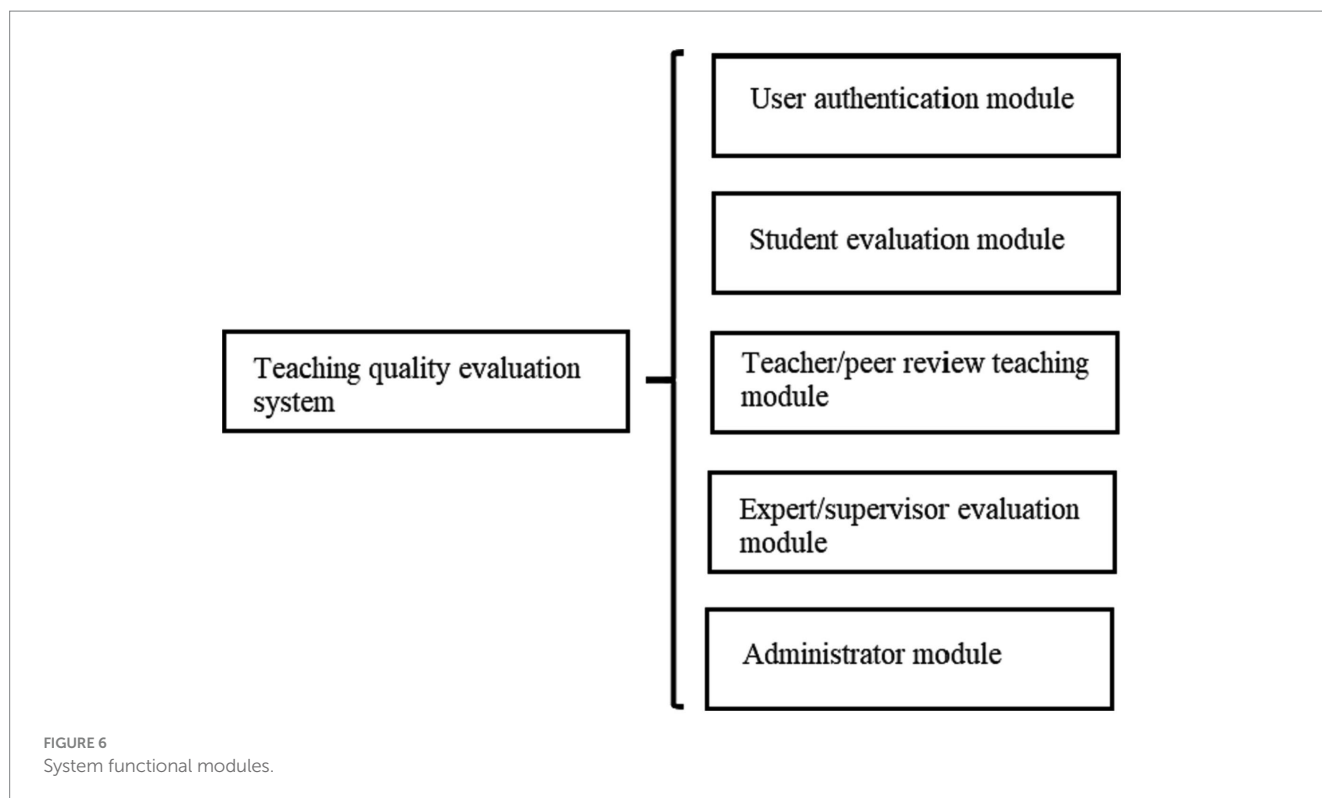


TABLE 2 Analysis table of college students' overall expectation of professional education teaching service quality (N = 770).

Layer	Average	Standard deviation	Sort
Visible view	4.15	0.54	1
Reaction view	4.10	0.65	2
Assurance view	4.02	0.47	3
View of human nature	3.84	0.56	4
Whole	4.02	0.55	

4.4 Data collection

For this study, we collected data at Shenzhen Institute of Technology. We used purposeful sampling to select 800 students for a questionnaire survey. After extracting the data and excluding questionnaires with consistent answers and incomplete answers, there were 770 valid data.

5 Research results and discussion

5.1 Analysis of college students' expectations of PE teaching service quality

5.1.1 Overall expectation analysis

Table 2 shows that the overall expectation of college students for the service quality of professional education is 4.02, which

indicates that students have high expectations for the teaching quality of professional education courses. Through the survey of professional education teaching quality, we found that most students are generally satisfied with the service quality of the existing courses in colleges and universities, which shows that at present our professional education is constantly developing and improving. On the other hand, this also reflects the current public participation in sports and fitness awareness is not strong enough, the school management is not in place and other problems. Therefore, it is of great significance to improve the physical condition of college students and promote the healthy growth of the whole people.

5.1.2 Analysis of expectations of students from different backgrounds on professional education teaching service quality

Through the analysis of teachers' and students' expectations in the questionnaire, there are differences in the perceived degree of professional education teaching service quality among students from different backgrounds. Under the traditional exam-oriented education, most schools focus on theoretical knowledge learning and neglect practical ability cultivation, therefore, many colleges and universities limit the teaching content to books for explanation and demonstration and other ways to improve classroom efficiency. Or, in order to cope with the examination only to arrange some courses with a large amount of class time, high difficulty, and difficulty to grasp and complete the task, they ignore the impact of factors such as practical hands-on operation and development of creative thinking ability of students on the quality of teaching, which makes students in professional education teaching cannot really master the knowledge learned, thus affecting the quality of school education.

Under the PZB service quality model, universities investigate and study their own conditions and actual situation and propose corresponding countermeasures.

5.1.3 Analysis of college students' expectations in different levels of professional education teaching service quality

By analyzing the different expectations of college students regarding the quality of professional education teaching services, we found that most students are satisfied with the teachers and school logistics, but some are dissatisfied. Firstly, there is a lack of communication between teachers and students, as teachers and students lack mutual understanding and timely and effective resolution of conflicts; secondly, the school has not established a perfect evaluation system to motivate and supervise the staff to improve their own business level, and again it is the teachers' low expectation of professional education service quality, low quality and even vicious circle, which leads to students in a passive position in college education. The last thing is that because of the low quality of professional education teaching, leads to the failure of the logistics work in colleges and universities, thus making the quality of school education low.

5.2 Analysis of students' actual feelings toward professional education teaching service quality

5.2.1 Analysis of overall feeling

As can be seen from [Table 3](#), the overall average feeling of college students about the quality of professional education teaching service is 3.11, which shows a rising trend year by year, which indicates that there are big problems in the quality of professional education teaching service in colleges and universities. This paper mainly adopts the questionnaire survey method to study the factors influencing college students' participation in professional education teaching quality.

5.2.2 Analysis of the actual feelings of students from different backgrounds about the quality of professional education teaching services

In the teaching process, professional education teachers should make reasonable plans for the course contents according to the actual situation of students. For example, students with a good foundation, strong self-control and high motivation can choose some easy-to-learn sports. For different groups of students, different forms and levels of classroom activities should be adopted to stimulate their interests and enthusiasm, while modern science and technology can be used to assist the teaching process, the use of multimedia technology to assist the professional education teacher to explain and demonstrate, so that students can intuitively perceive the relevant content.

5.2.3 Analysis of students' actual feelings at different levels

From the students' point of view, they have a high perception of the quality of teaching services and are able to grasp the problems they have in their daily activities. At the same time, the survey found that most

TABLE 3 Analysis of students' overall feelings about the quality of professional education services in college (N = 770).

Layer	Average	Standard deviation	Sort
Visible view	3.16	0.75	3
Reaction view	2.91	0.72	4
Assurance view	3.17	0.69	2
View of human nature	3.20	0.80	1
Whole	3.08	0.63	

TABLE 4 Analysis of the overall discrepancy in the quality of professional education services (N = 770).

Layer	Average	Standard deviation	Sort
Visible view	-0.94	0.93	2
Reaction view	-1.26	0.94	1
Assurance view	-0.85	0.80	3
View of human nature	-0.64	0.98	4
Whole	-0.93	0.78	

students hope that teachers can provide more targeted, practical and up-to-date courses, which requires teachers to continuously improve their own service consciousness and professional skills in the teaching process, which can enable students to contribute more actively and enthusiastically to the professional education course learning.

5.3 Analysis of the gap between the actual feelings and expectations of college students on the quality of professional education teaching services

5.3.1 Analysis of the overall discrepancy

As can be seen from [Table 4](#), the overall actual feeling of students on the quality of professional education teaching services is less than the expected value, and the satisfaction of students with the quality of teaching services is lower than the expected value. Through the survey, it is found that the main factor affecting the work enthusiasm and effect of professional education teachers in colleges and universities is their own quality. Therefore, in order to improve the image of professional education in society and enhance the overall level of the school, it is necessary to strengthen the construction and improvement of the teaching management system, so that teachers and students can really enjoy the services of modern higher education with high quality and efficiency, thus improving the quality of teaching ([Bezruk and Skorik, 2015](#)).

5.3.2 Analysis of the overall disparity of students with different variable backgrounds

The variability in the quality of professional education services is mainly for different groups of students, and there are

large differences between individual students. For those students who have good grades in school and have a good learning base, they receive more higher-quality and higher-level quality fitness sports programs, while for those who are not willing to participate in sports activities, there are negative effects and reduced positive emotions generated. Those who participate in sports or participate in other programs may also reduce the efficiency of sports due to lack of exercise physical fitness and other reasons. The most popular leisure activities among young people during the week are the use of technology and the neglect of physical exercise (Gil-Madrona et al., 2019b), which requires teachers to improve the quality of teaching services according to different groups of students, through the effective quality of teaching services to improve the communication skills between professional education teachers and students and the enthusiasm for sports participation.

6 Conclusion

The PZB service quality model is a service quality concept that aims to achieve service quality by satisfying customer needs and through information exchange and feedback. Its core is customer satisfaction, i.e., “making customers satisfied.” Adopting the PZB service model in the field of professional education teaching service can effectively improve teaching quality and also promote professional education teaching reform, which is conducive to the school and teachers to jointly improve the management ability and teaching level in all aspects of professional education classroom. Based on the service quality theory, this study constructs a mixed education service quality model for colleges and universities in China based on relevant literature and practical experience at home and abroad. On this basis, the model is verified through questionnaires, and the current situation and problems of mixed education service quality in colleges and universities are analyzed from three aspects of “expectation,” “feeling,” and “difference between feeling and expectation.” We also analyzed the current situation and problems of hybrid education service quality in three aspects: “expectation,” “feeling” and “gap between feeling and expectation.” The innovations of this paper are as follows: firstly, there is no research on service quality in the field of mixed education in academia, and most of the existing studies are focused on higher education; secondly, although foreign countries have started to pay attention to the research on service quality, due to the different cultural background, the foreign service quality models cannot be directly applied to the actual situation in China, so we need to establish a service quality evaluation system that meets Chinese characteristics.

7 Limitations

Vocational education is a huge education system, and the cultural backgrounds and teaching strategies of each country and region are different. In addition, the data collected in this study come from the same Chinese school. The conclusions drawn may

not be generalizable to countries outside Asia. education system, and I hope that future foreign researchers can also do the same research to explore whether the education system in other different cultural backgrounds can get consistent conclusions and promote it.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Shenzhen Institute of Technology, Shenzhen, Guangdong Province, 518116, China. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

XD: Conceptualization, Data curation, Funding acquisition, Resources, Writing – original draft. LL: Supervision, Writing – review & editing, Methodology, Visualization, Validation. XL: Conceptualization, Data curation, Writing – original draft, Formal Analysis, Investigation.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

- Bezruk, V., and Skorik, Y. (2015). Multicriterial choice of telecommunications means using hierarchical analysis method. *Informat Telecommun Sci* 2, 18–24. doi: 10.20535/2411-2976.22015.18-24
- Biese, K. M., Winans, M., Fenton, A. N., Hernandez, M., Schaefer, D. A., and Bell, D. R. (2021). High school sport specialization and injury in collegiate Club-sport athletes. *J. Athl. Train.* 56, 1271–1277. doi: 10.4085/1062-6050-0021.21
- Borrego, M., Douglas, E. P., and Amelink, C. T. (2009). Quantitative, qualitative, and mixed research methods in engineering education. *J. Eng. Educ.* 98, 53–66. doi: 10.1002/j.2168-9830.2009.tb01005.x
- Fallah Jelodar, M. (2016). Prioritization of the factors affecting bank efficiency using combined data envelopment analysis and analytical hierarchy process methods. *Aust. J. Optim.* 2016:817. doi: 10.1155/2016/5259817
- Gil-Madrona, P., Aguilar-Jurado, M. Á., Honrubia-Montesinos, C., and López-Sánchez, G. F. (2019b). Physical activity and health habits of 17-to 25-year-old young people during their free time. *Sustainability* 11:6577. doi: 10.3390/su11236577
- Gil-Madrona, P., Hinojosa, L. M. M., Pérez-Segura, J. J., Sáez-Sánchez, M. B., and Poblete, G. Z. (2020). Scale of pedagogical authority meanings in the classroom (ESAPA) for Ibero-America built on the opinions of teaching students. *Teach. Teach. Educ.* 93:103079. doi: 10.1016/j.tate.2020.103079
- Gil-Madrona, P., Prieto-Ayuso, A., Silva, S. A. D. S., Serra-Olivares, J., Aguilar Jurado, M. Á., and Díaz-Suárez, A. (2019a). Hábitos y comportamientos relacionados con la salud en adolescentes durante su tiempo libre. *Anales de Psicología* 35, 140–147. doi: 10.6018/analesps.35.1.301611
- Goodson, A., Franklin, C. A., and Bouffard, L. A. (2021). Male peer support and sexual assault: the relation between high-profile, high school sports participation and sexually predatory behaviour. *J. Sex. Aggress.* 27, 64–80. doi: 10.1080/13552600.2020.1733111
- Liu, L., Liu, Y., Lai, I. K. W., and Liu, X., (2023) Research on the practice of VR entering the classroom—taking City University students of Macau as an example. In *International conference on blended learning* (pp. 191–201). Cham: Springer Nature Switzerland.
- Long, N., Linh, D., Anh, T., Lan, N., Thang, N., Trang, V., et al. (2020). Prioritizing the level of negative emotional coping strategies of cancer patients' family members by using extended hierarchical analysis method. *Decis Sci Lett* 9, 456–476. doi: 10.5267/j.dsl.2020.2.003
- Mišniakiewicz, M., and Krnáčová, P. (2021). Academic tutoring as a form of modern cooperation with the student and an element of improving the quality of teaching services. *Market Sci Res Organ* 39, 47–66. doi: 10.2478/minib-2021-0003
- Nowoświat, A., and Leszczyńska, M. (2016). Application of hierarchical analysis method to design the structural partitions with different material and structural solutions for window glazing. *Architect Civil Engineer Environ* 9, 95–104. doi: 10.21307/acee-2016-038
- Parida, B. B., and Baksi, A. K., (2011). Application of PZB service quality model in identifying service quality gap—a study on State Bank of India. *Siddhant-A Journal of Decision Making* 11, 1–10.
- Ritzer, E. E., Yang, J., Kistamgari, S., Collins, C. L., and Smith, G. A. (2021). An epidemiologic comparison of acute and overuse injuries in high school sports. *Inj. Epidemiol.* 8:51. doi: 10.1186/s40621-021-00344-8
- Shang, X., Xing, X., and Gao, P. (2014). Hierarchical analysis method and model based data of controlling parts of the body for clothing. *J. Fiber Bioengineer Informat* 7, 479–494. doi: 10.3993/jfbi12201402
- Simcic Brønn, P. (2012). Adapting the PZB service quality model to reputation risk analysis and the implications for CSR communication. *J. Commun. Manag.* 16, 77–94. doi: 10.1108/13632541211197978
- Streetman, A. E., and Goodman, B. D. (2022). Does high school sports participation predict physical activity in college-age women? *Int. J. Exerc. Sci.* 11:2. doi: 10.1249/01.mss.0000876628.87592.2a
- Zubkova, T., and Tagirova, L. (2020). Using the hierarchical analysis method for decision making in a business activity. *J. Phys* 1553:012008. doi: 10.1088/1742-6596/1553/1/012008