Analysis of the SERVQUAL Based Mixed Teaching Model in Colleges

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Abstract: Teachers' information technology teaching level and teaching quality can be improved by combining online and offline teaching. This paper constructs the SERVQUAL model to measure the service quality of college professional teaching from the perspective of service quality management. Using factor analysis and entropy weight method, this paper determines the dimension coefficient of the model, analyzes each index, and discusses the priority order of index action. The purpose of this paper is to provide a reference for improving the quality of professional teaching services in colleges and universities.

1 INTRODUCTION

The teaching model is built around student-centered learning and development, designing teaching situations according to real job scenarios, further refining teaching tasks according to the teaching situations, and turning students into workplace people, playing different roles and completing various work tasks. With the TTR mechanism as the guarantee, the mobile classroom and the physical classroom, the pre class and post class double track and three links run alternately, and finally achieve the teaching goal. The student-centered, context-led task-driven hybrid teaching model is shown in Figure 1.
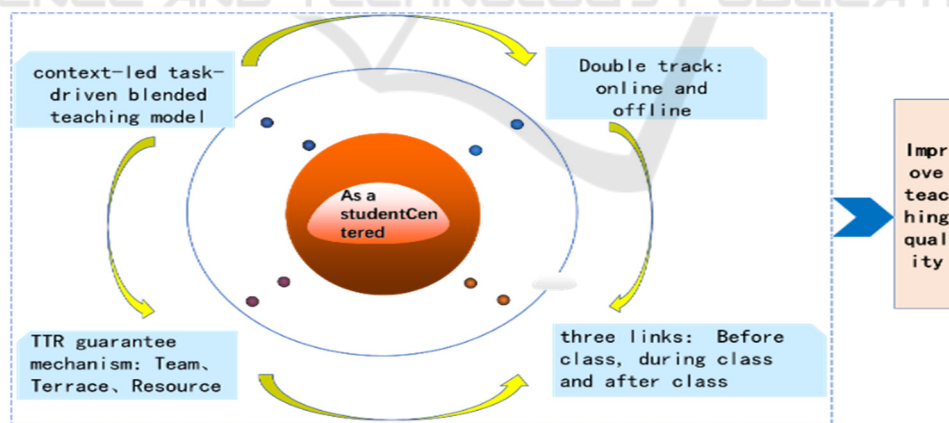

Figure 1 Context-led task-driven hybrid teaching model

The use of data mining technology in educational research is a common method of exploring the relationship between evaluation object and evaluation index. The development trend in teaching evaluation and teaching management is to improve the quality of teaching through effective evaluation standards and methods. The teaching model emphasizes student-centered learning and development. Making the teaching environment and experience as realistic as possible, refine the teaching tasks accordingly, and

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convert students into professionals. Using the TTR mechanism, the mobile classroom and physical classroom, operating before and after class, in a double track, three-way alternating pattern, finally achieve their educational objectives (Luo 2022).

SERVQUAL model is based on the difference theory. It believes that service quality has five dimensions, namely, tangibility, reliability, responsiveness, assurance and empathy. Evaluators' perception of service quality is evaluated from these five dimensions. SERVQUAL model is to set 22 secondary indicators (questions) based on five dimensions. Evaluators score the psychological expectations and actual feelings of secondary indicator questions according to their own experiences and actual needs. The difference between the two scores is the evaluator's evaluation of service quality. The smaller the difference, the higher the evaluation.

2 THE PURPOSE OF THIS STUDY IS TO CONSTRUCT AN EVALUATION AND ANALYSIS MODEL OF MIXED TEACHING QUALITY IN COLLEGES.

Each index score is evaluated based on the difference between psychological expectation and actual experience, As shown in Formula (1), the difference is the students' evaluation of the teaching quality.

$$SQ = \sum_{j=1}^{5} W_j \sum_{i=1}^{R} (P_i - E_i) \qquad (1)$$

Where, R is the number of second-level indicators to which each attribute belongs; P_i is students' psychological expectation score for the i th question; E_i is the score of students' actual feelings about the ith question, and W_j is the weight of each dimension.

Because different attributes have different degrees of influence on the evaluation of teaching quality, using the same weight assignment will result in large deviation. The research uses entropy weight method to determine the weight of each secondary indicator of the model. Because the secondary indicators of each attribute have strong relevance (factor analysis can be used to extract factors for verification), the weight of each attribute is the accumulation of the weight values of the secondary indicators.

As a result of the different properties of the teaching quality evaluation, the weight of the same assignment will produce large deviations. To determine the weights of each secondary index in the model, the research uses the entropy weight method. Because secondary indicators have strong correlations, the weight of each attribute is part of the secondary index weights.

With online teaching quality evaluation to illustrate the basic principle of entropy weight method, there are m students participating in online teaching quality evaluation, n secondary index of evaluation, the statistical value of student evaluation index is marked X_{ij}, indicating the evaluation of the JTH index by the i th student. The extreme value method is used to standardize statistical data to eliminate the influence of different units among indicators. The standardized formula is as follows:

$$y_{ij} = \frac{x_{ij}\mathbf{1}^{-min(x_{ij})}}{max_j(x_{ij}) - min(x_{ij})^1} \qquad (2)$$

After quantifying the same degree of standardized indicators, the proportion of the i th student's evaluation value of the j th indicator is:

$$Pij = \frac{y_{ij}}{\sum_{i=1}^{m} y_2'j} \qquad (3)$$

Weight of each attribute:

$$W_j = \sum_{i=1}^{R} w_j \qquad (4)$$

Score gaps between multiple evaluators on a single index increase with the larger the gap. The smaller the entropy and the larger the entropy weight, the greater the entropy, indicating that the index can provide more information about the research topic and play a greater role in sample comparison.

The perceptual difference (psychological expectation-actual feeling) of 230 samples was calculated to obtain the perceptual matrix of online teaching evaluation, and the entropy weight of 26 second-level indicators was calculated by entropy weight method (as shown in Table 1).

Table 1. Entropy weight, the second-level index of SERVQUAL Scale for teaching Quality in Colleges

Number	A1	A2	A3	A4	A5	A6	A7	A8	A9
Entropy weight	0.0457	0.0547	0.0214	0.0277	0.0369	0.0147	0.0258	0.0369	0.0124
Number	B10	B11	C12	C13	C14	C15	C16	D17	D18
Entropy weight	0.0248	0.0325	0.0244	0.0257	0.0235	0.0741	0.0239	0.0258	0.0147
Number	D19	D20	D21	E22	E23	E24	E25	E26	
Entropy weight	0.0147	0.0741	0.0258	0.0357	0.0159	0.0753	0.0852	0.0458	

3 TEACHERS' DIGITAL TEACHING ABILITY AND INNOVATION AND ENTREPRENEURSHIP ABILITY

Online and offline hybrid teaching puts forward un-precedented high standards and requirements for teachers' digital processing ability, information teaching ability and innovation and entrepreneur-ship ability.

As a result of online and offline hybrid teaching, teachers are expected to demonstrate unprecedented levels of digital processing ability, information teaching ability, and innovation.

3.1 Transforming Teachers' Teaching Philosophy

Traditional teaching has formed a teacher-centered closed classroom model, teachers guide and act by themselves, blindly instill knowledge into students, only to complete teaching tasks, and completely ignore students' independent learning and personalized development. If teachers can't adapt to the development of the times, change the outdated educational ideas, and change their roles in education, they will certainly mislead students. So, teachers must break through the old and create new ones, establish the information mixed teaching concept, and adopt the most advanced teaching technology and means (Liu 2020, Yu 2022).

3.2 Teachers are Encouraged to Participate in Various IT Teaching Ability Trainings

The school has created all conditions, invited IT teaching experts, digital processing experts, innovation and entrepreneurship entrepreneurs to give lectures in the school, encouraged teachers to actively participate in various forms of online and offline modern teaching ability training, digital processing ability training, digital quality training and innovation and entrepreneurship ability training, held symposiums and exchanges, and discussed and consulted with each other.

3.3 Teachers Are Encouraged to Participate in Various Levels of Teacher Teaching Ability Competitions

By learning the content of the competition, forming pairs to participate, preparing for the competition, participating in the competition, exchanging the competition and reflecting on the competition, a set of process, even if they do not win the prize, the teachers' informatization teaching level must have improved.

3.4 Build an Intelligent Teaching Platform Centered on Active Student Learning

Blended online and offline teaching requires teachers to upload digital resources, students to be able to learn locally when and where they want, and to be able to implement interactive online and offline teaching. This requires teachers to build a platform. To successfully build a teaching platform in a short period of time, the following steps are required.

Step 1: Understand the dual interface and dual ports of the platform. Dual interface refers to the teacher interface and student interface, and dual ports refer to the computer side and mobile side.

Step 2: Build the platform. To build a platform, you have to build a course first, and give all your courses a good framework and columns. Then upload digital resources (Liang 2021). Set up before, during and after class activities.

By building a platform course and implementing online and offline hybrid teaching, the teacher uploads digital materials before class, allowing

students to pre-study online and discuss problems with the teacher and classmates at any time, the teacher explains the important and difficult problems offline during class, and through online questions, discussions, salons, quizzes and quizzes, the online and offline interleaved operation improves students' motivation, and the teacher assigns homework and releases extended materials after class to Classroom knowledge is further enhanced.

4 AN EMPIRICAL ANALYSIS OF BLENDED TEACHING IN COLLEGES AND UNIVERSITIES

4.1 Data Sources and Processing

This paper selects the online teaching quality evaluation data of business administration majors in a university in Shandong Province for empirical analysis. Each student (considering that there are few theoretical courses for senior students and the sample size is insufficient, this paper does not do research) scores the expectation and actual perception of 38 indicators, and uses formula (1) to calculate the evaluation of individual students on the current online teaching quality. The online questionnaire (questionnaire star) was used to eliminate invalid samples, and a total of 230 samples were determined, including 85 marketing majors and 145 business administration majors.

4.2 Construction of Comprehensive Indicators of Teaching Evaluation

1. Ensure the reliability of the SERVQUAL scale and each dimension subscale by conducting a reliability analysis, it is necessary to conduct reliability, validity

and paired sample T-test on the collected questionnaires to determine the designed online teaching quality scale for colleges and universities. At the same time, the differences in the scores of students' psychological expectations and actual feelings about the indicators in the questionnaire were compared. The relevant indexes obtained by SPSS software are shown in Table 2.

Service quality and gap The SQ value of the overall service quality of professional education is 0.358, and its percentile score is 92.12; The service quality SQ value of each indicator is 0.07-1.2 (Table 2), in which the mean values of the "curriculum setting", "curriculum teaching" and "teaching resources" dimensions are 0.0658, -0.0998 and 0.195 respectively. The paired t-test results showed that there were statistically significant differences between students' expectations and perceptions of various indicators of professional education services (P<0.05, Table 2).

Digital resources should not only achieve sharing with the paper content of the textbook, but also achieve interaction with the platform. Ping The platform includes resource platform, teaching plat-form, training platform, etc. The digital content of the teaching materials should be shared with the platform content to facilitate teachers and students to access and learn anytime and anywhere using different web tools and mobile tools, and to promote more interactive learning between teachers and students. To facilitate students' reading and use, loose-leaf textbooks can be developed according to the characteristics of the course.

In order to ensure the reliability of SERVQUAL and its sub scales, it is necessary to conduct reliability, validity and paired sample T tests on the collected questionnaires to determine the designed online teaching quality scale for colleges and universities, and compare the differences between the students' psychological expectations and actual feelings of the indicators in the questionnaire. Relevant indexes obtained by SPSS software are shown in Table 2

Table 2. SERVQUAL Scale for Teaching Quality in Colleges and Universities: Reliability and Validity

Scale	α	KMO	Bartlett's test for sphericity	Factor loadings	Factor loadings
SERVQUAL Total	0.897	0.997	0.000	-	-
Tangibility Quality Scale	0.810	0.784	0.000	0.547	0.000
Reliability Quality Scale	0.904	0.946	0.000	0.577	0.000
Responsiveness Quality Scale	0.987	0.863	0.000	0.641	0.000
Assurance Quality scale	0.901	0.897	0.000	0.487	0.000
Empathy Quality Scale	0.963	0.904	0.000	0.701	0.000

Table 3. KMO and Bartlett spherical tests and Cronbach's coefficient of correlation

Dimension	Index number	Cronbach's α		KMO	
		Expectation subscale	Perceptual subscale	Expectation subscale	Perceptual subscale
The curriculum	7	0.721	0.856	0.851	0.829
Course teaching	4	0.851	0.744	0.732	0.873
Teaching resources	8	0.744	0.893	0.799	0.805
Toatal	19	0.825	0.862	0.816	0.844

5 CONCLUSION

Combining factor analysis and entropy weight method, the five-dimension weight coefficients of the SE-VQUAL model can effectively reflect the importance of each dimension, and the SE-VQUAL model based on the weight coefficients can reasonably score online teaching quality. The result shows that the score of online teaching quality is proportional to the grade and major. In view of the curriculum setting in colleges and universities, it shows that colleges and universities should strengthen the improvement of online teaching quality of basic courses; There is a gap in the teaching quality scores of different majors, which indicates that there are differences between the secondary majors of business administration. Colleges and universities should improve or evaluate the secondary majors based on the particularity of the secondary majors.

1. Cronbach's α coefficient was used to test the reliability of SERVQUAL model. The overall Cronbach's α coefficient of the scale was greater than 0.900, and each dimension was between 0.802 and 0.859 (Table 1). Based on KMO and Bartlett spherical tests, all dimensions had KMO values greater than 0.5 (Table 1), and the differences were statistically significant (P < 0.05). The results of factor analysis of SERVQUAL model validity showed that the factor matrix was orthogonal rotated with maximum variance, and the three factors with characteristic root greater than 1 accounted for 94.930% and 64.304% of the perceived and expected variation.

2. Using the SERVQUAL model scale, the empirical study builds an online teaching quality evaluation scale for colleges and universities., and the Reliability and validity are tested. In each dimension index, there is a significant difference between psychological expectation and actual perception. This shows that the SERVQUAL model can be used to evaluate colleges' and universities' teaching quality. Additionally, it combines the generality of service quality management theory with the specificity of university teaching

and learning quality management. Provide new ideas for studying teaching quality management in colleges and universities, and improve the theory of teaching quality management.

By building a platform course and implementing online and offline hybrid teaching, the teacher uploads digital materials before class, allowing students to pre-study online and discuss problems with the teacher and classmates at any time, the teacher explains the important and difficult problems offline during class, and through online questions, discussions, salons, quizzes and quizzes, the online and offline interleaved operation improves students' motivation, and the teacher assigns homework and releases extended materials after class to Classroom knowledge is further enhanced.

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