A Study on the Quality Evaluation of Online Teaching and Willingness to Use in Higher Education Physical Education

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Abstract. The popularity of information technology promotes the generation of various teaching methods and the innovation of approaches. In modern university physical education teaching, the effective combination of physical education teaching and information technology can achieve diversified teaching forms, intuitive teaching methods, and highlight the "student-centered" approach, comprehensively improving classroom teaching effectiveness. In this regard, this paper constructs an online teaching quality evaluation index system for university physical education majors based on hierarchical analysis, establishes the weights of the evaluation index system, tests the consistency of teaching quality evaluation indexes, and also analyzes the willingness of university physical education majors' teachers and students to use online teaching, in order to provide thoughts for the in-depth integration of modern education technology into the teaching reform of professional courses.

Keywords: Physical education; Online teaching; Quality evaluation; Willingness to use

1 Introduction

Online teaching quality evaluation of physical education in higher education is a complex systematic project, as it has to face both the specificity of physical education practice teaching and the complexity of modern information technology teaching. At present, there are real problems such as incomplete standards, backward ways and imperfect mechanisms in online teaching quality evaluation of college sports. Based on this, this paper studies the teachers and students have different experiences and evaluation standards for teaching online teaching quality evaluation scale compiled by the college sports professional theory courses and technical courses, on this basis to explore the teachers and students online teaching willingness to use, can be a more comprehensive understanding of the teacher's teaching concept of the change and the students' learning needs for the information technology to further integrate into the college sports professional classroom teaching, and to promote promote college sports

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professional education and teaching reform provides a reference.[1] It can provide reference for the further integration of information technology into the classroom teaching of physical education in colleges and universities, and promote the reform of physical education in colleges and universities.

2 Model construction of online teaching quality evaluation index system for university sports majors

Considering the factors affecting the quality of distance teaching, the hierarchical analysis method is used to determine the subjective weights of the factors, and then the weighted sum is carried out, so as to construct the model of the distance teaching quality evaluation system based on the hierarchical analysis method.[2] The model is divided into three layers as follows, the top layer based on the hierarchical analysis method of distance learning quality evaluation for the objective layer, the middle layer corresponds to the first level of indicators layer, namely, facilities and services, teaching management, faculty teaching, student learning, social reputation. The bottom layer is the guideline layer corresponding to the second-level indicator layer, i.e., facility services including teaching basic facilities, multimedia resources, network security, teaching funds; teaching management: including teaching resources, professional settings, teaching systems and methods, course management, curriculum system settings, graduation design management; teacher teaching: including the number and structure of faculty, teaching methodology model, the style of the main teacher, and teaching services; student learning: Including student learning process, student learning management, student satisfaction; social reputation: including the philosophy of school running, training objectives and specifications, school spirit and learning style, and employment rate of further studies, as shown in Figure 1.[3]

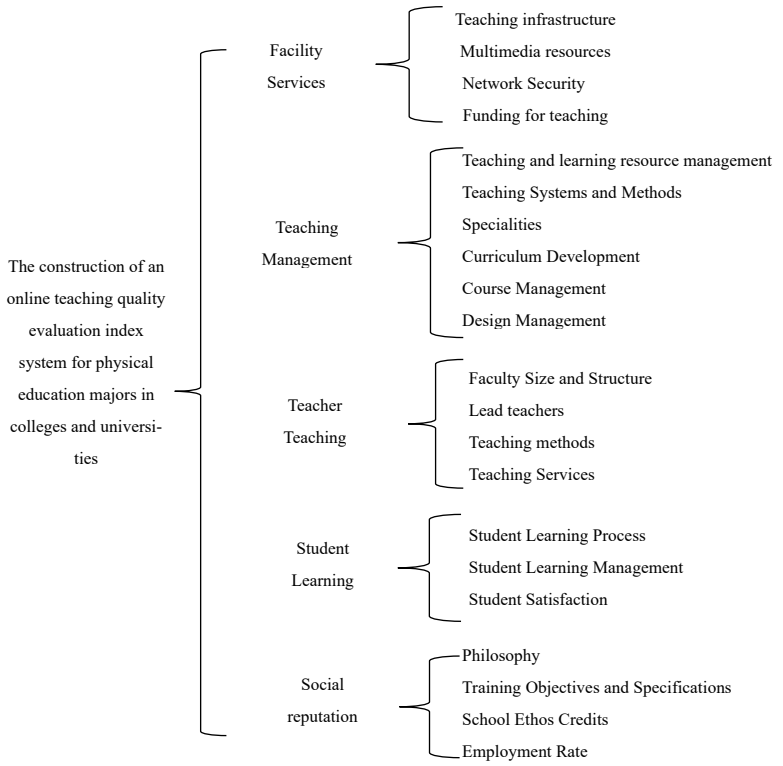

Fig. 1. Model of online teaching quality evaluation index system for physical education majors in colleges and universities

3 The establishment of weights and consistency test of online teaching quality evaluation index system for college sports majors

3.1 Construction of Online Teaching Quality Evaluation Indicator System for College Physical Education Majors Based on Hierarchical Analysis Method

3.1.1 Judgement matrix construction and value assignment

According to the judgement matrix guidelines, through the next layer of the previous layer of a criterion (or goal) of the degree of influence comparison, to determine the weight of a certain layer of factors for a certain criterion, the requirements of the elements before the two-two comparison of the importance of the degree of importance according to the 1-9 assigned value.[2]

Table 1. Scale of significance

Level of Importance	Meaning
1	Comparing two elements, equally important
3	Comparing two elements, the former is slightly more important than the latter
5	Comparing two elements, the former is clearly more important than the latter
7	Comparing two elements, the former is strongly more important than the latter
9	Comparing two elements, the former extreme is more important than the latter
2,4,6,8 Countdown	The intermediate value of the above judgement If the importance of element i compared to element j is a_{ij} , then the ratio of the importance of element j compared to element i is $a_{ij} = 1/a_{ij}$

3.1.2 Hierarchical single ordering

Hierarchical single ordering refers to the relative weights of the factors of all judgement matrices with respect to their criteria, essentially calculating the weight vector.Apply the sum principle to calculate each column of the consistency judgement matrix normalized to obtain the corresponding weights.[4] Normalize each column of the non-consistency judgement matrix to obtain an approximation of its corresponding weights, and take the arithmetic mean of these n column vectors as the final weights. The formula for calculation is:

$$\omega_i = \frac{1}{n}\sum_{j=1}^{n}\frac{a_{ij}}{\sum_{k=1}^{n} a_{kj}} \tag{1}$$

3.1.3 Consistency of the judgement matrix

In practice, the consistency test is required to determine whether the matrix meets the general consistency, only the general consistency is satisfied to confirm the logical soundness of the judgement matrix, and then need to continue to analyse the results. The steps for testing consistency test are as follows:

(1) Calculate the consistency index CI.

$$CI. = \frac{\lambda \max - n}{n-1} \tag{2}$$

(2) Obtain the corresponding average random consistency index RI by checking the table.

The average stochastic consistency indicator RI is calculated by checking the following table to determine the different orders of the matrix.[5]

Table 2. Average random consistency index RI. Table

Matrix order	1	2	3	4	5	6	7	8
RI.	0	0	0.52	0.89	1.12	1.26	1.36	1.41
Matrix order	9	10	11	12	13	14	15	
RI.	1.46	1.49	1.52	1.54	1.56	1.58	1.59	

(3) Calculate the consistency ratio CR. and make a judgement

$$CR. = \frac{CI.}{RI.} \tag{3}$$

The consistency of the judgement matrix is accepted when CR. < 0.1.

3.1.4 Hierarchical total ordering and testing.

The total ranking is the relative weight of all the factors of the judgement matrix in relation to the target layer. This weight is calculated using a top-down approach, synthesised layer by layer. If the relative weight $\omega^{(k-1)} = \left(\omega_1^{(k-1)}, \omega_2^{(k-1)}, \cdots, \omega_n^{(k-1)}\right)^T$ of the m elements of layer k-1 to the total target has been found, the single ranking weight of the n elements of layer k for the jth element of the previous layer (layer k-1) is $\rho_j^{(k)} = \left(\rho_{1j}^{(k)}, \rho_{2j}^{(k)}, \cdots, \rho_{nj}^{(k)}\right)^T$, where the weight of the element not dominated by j is zero. Let $\rho^{(k)} = \left(\rho_1^{(k)}, \rho_2^{(k)}, \cdots, \rho_n^{(k)}\right)$, denoting the elements of layer k sorting the elements of layer k-1, then the total sorting for the elements of layer k of the total objective is

$$\omega^{(k)} = \left(\omega_1^{(k)}, \omega_2^{(k)}, \cdots, \omega_n^{(k)}\right)^T = \rho^{(k)}\omega^{(k-1)}$$

Or

$$\omega_i^{(k)} = \sum_{j=1}^{m} \rho_{ij}^{(k)} \omega_j^{(k-1)} \qquad i = 1,2,\cdots,n \tag{4}$$

In general, if the weight of n factors in level A is, and if the consistency of some factors in level B for some indicator ranked in upper level A is, corresponding to an average random consistency indicator of RI., then the total ranking consistency ratio in level B is:

$$CR. = \frac{\sum_{j=1}^{n} \omega_j CI._j}{\sum_{j=1}^{n} \omega_j RI._j} \tag{5}$$

3.1.5 Indicator weights of the hierarchical single ordering of online teaching quality evaluation for higher education physical education majors

In summary, the weights of the indicators of the hierarchical analysis method based on the hierarchical analysis of distance teaching quality evaluation hierarchical single sorting are determined as shown in Table 3.[6]

Table 3. Indicator weights for the hierarchical list ordering of online teaching quality evaluation of physical education in higher education

Tier 1 indicators	Weighting	Secondary indicators	Weighting	Secondary indicator consistency test	Primary indicator consistency test
Facility Services	0.0759	Teaching infrastructure	0.1854	0.0016	0.0012
		Multimedia resources	0.5320		
		Network Security	0.1854		
		Funding for Teaching and Learning	0.0971		
Teaching Management	0.2196	Teaching Resource Management	0.1222	0.0009	
		Teaching System and Methodology	0.2370		
		Professional Settings	0.2370		
		Course System Setting	0.2370		
		Course Management	0.1222		
		Graduation Design Management	0.0447		
Teacher Teaching	0.4089	Number and structure of teaching staff	0.2346	0.0016	
		Lead Teachers	0.2346		
		Teaching methods	0.4488		
		Teaching Services	0.0819		

Student Learning	0.2196	Student Learning Process	0.2000	0	
		Student Learning Management	0.6000		
		Student Satisfaction	0.2000		
Social reputation	0.0759	Philosophy	0.0819	0.0016	
		Training Objectives and Specifications	0.4488		
		School Culture and Learning Style	0.2346		
		Employment Rate	0.2346		

3.2 Determination of weight coefficients of indicators at each level and consistency test

The hierarchical analysis of this problem framework is divided into a total of 3 layers, from the formula (4) to calculate the total ordering weights of each indicator level is:

$$\omega = \begin{pmatrix} 0.0141,0.0404,0.0141,0.0074,0.0268,0.0520,0.0520,0.0520,0.0268,0.0098,0.0959, \\ 0.0959,0.1835,0.0335,0.0439,0.1318,0.0439,0.0062,0.0341,0.0178,0.0178 \end{pmatrix}$$

Meanwhile, the consistency test of the total hierarchical ordering is calculated by formula (5) as CR.=00012 < 0.1.

So the overall consistency of the judgement matrix is acceptable, and the weights and consistency test table of each index of distance teaching quality evaluation are shown in Table 4.

Table 4. Weighting and consistency test of each indicator for online teaching quality evaluation of physical education in higher education

Indicators	Weighting	Consistency check
Teaching infrastructure	0.0141	0.0012
Multimedia resources	0.0404	
Network Security	0.0141	
Funding for Teaching and Learning	0.0074	
Teaching Resource Management	0.0268	
Teaching System and Methodology	0.0520	
Professional Settings	0.0520	
Course System Setting	0.0520	
Course Management	0.0268	
Graduation Design Management	0.0098	
Number and structure of teaching staff	0.0959	

Lead Teachers	0.0959	
Teaching methods	0.1835	
Teaching Services	0.0335	
Student Learning Process	0.0439	
Student Learning Management	0.1318	
Student Satisfaction	0.0439	
Philosophy	0.0062	
Training Objectives and Specifications	0.0341	
School Culture and Learning Style	0.0178	
Employment Rate	0.0178	

Using hierarchical analysis to construct the online teaching quality evaluation system of higher education sports majors,the data source through the questionnaire to quantify the indicators, the use of hierarchical analysis to get the corresponding weights of the indicators of the online teaching quality evaluation system of higher education sports majors, and the weights of the indicators of the online teaching quality evaluation of higher education sports majors for the consistency test, the consistency test results of $0.0012<0.1$.[6]Through the hierarchical analysis method applied in the online teaching quality evaluation of college sports majors, it greatly improves the efficiency and accuracy of the online teaching quality evaluation.[7]analysis method is applied in the online teaching quality evaluation of college sports majors, it greatly improves the efficiency and accuracy of online teaching quality evaluation of college sports majors.[8]

4 Analysis of Willingness to Use Online Teaching in Physical Education in Higher Education

To investigate the causal relationship between online teaching quality evaluation and the willingness to use online teaching, binomial logistic regression analysis was conducted with teachers' and students' willingness to use online teaching as the dependent variable, and teachers' and students' basic personal characteristics and online teaching quality evaluation as the independent variables.[9]

4.1 Influence of online teaching quality evaluation on teachers' willingness to conduct online teaching

4.1.1 Theoretical courses

Table 5 shows that the overall p-value of the model is less than 0.01, indicating that there is a significant relationship between the independent variables and the dependent variable, which passes the significance test and is statistically significant. The p-value of the model Hosmer-Lemeshow is greater than 0.05, which indicates that the model fit of the effect of online teaching quality evaluation on teachers' willingness to carry out online teaching in theory courses is high, and the interpretation of the origi-

nal data is more satisfactory.[10]

Table 5. Results of the overall test of the impact model of teachers' willingness to use online teaching in theoretical courses

x^2	Sig	-2 log-likelihood values	Cox&Snell R^2	Nagelkerke R^2	Hos-mer-Lemeshow（sig）
112.120	0.000	125.625[a]	0.444	0.624	0.074

4.1.2 Technical programme

Table 6 shows that the overall p-value of the model is less than 0.01, indicating that there is a significant relationship between the independent variables and the dependent variable, which passes the significance test and is statistically significant. The p-value of the model Hosmer-Lemeshow is >0.05, indicating that the model fit of the effect of online teaching quality evaluation on the willingness of teachers of technical courses to carry out online teaching is high, and the interpretation of the original data is more satisfactory.[11]

Table 6. Overall test results of the influence model of teachers' willingness to use online teaching in technology courses

x^2	Sig	-2 log-likelihood values	Cox&Snell R^2	Nagelkerke R^2	Hos-mer-Lemeshow（sig）
117.943	0.000	305.187[a]	0.315	0.424	0.840

4.2 Influence of online teaching quality evaluation on students' willingness to use online teaching

4.2.1 Theoretical courses

Table 7 shows that the overall p-value of the model is less than 0.01, indicating that there is a significant relationship between the independent variables and the dependent variable, which passes the significance test and is statistically significant.[12] The p-value of the model Hosmer-Lemeshow is greater than 0.05, which indicates that the model fit of the effect of students' evaluation of the quality of online teaching of theoretical courses on their willingness to use online teaching is high, and the interpretation of the original data is more satisfactory.[13]

Table 7. Overall test results of the influence model of students' willingness to use online teaching in theory courses

x^2	Sig	-2 log-likelihood values	Cox&Snell R^2	Nagelkerke R^2	Hos-mer-Lemeshow（sig）

400.699	0.000	1981.509[a]	0.188	0.265	0.060

4.2.2 Technical programme

Table 8 shows that the overall p-value of the model is less than 0.01, indicating that there is a significant relationship between the independent variables and the dependent variable, which passes the significance test and is statistically significant. The p-value of the model Hosmer-Lemeshow is >0.05, which indicates that the model fit of the effect of students' evaluation of the quality of online teaching in technical courses on their willingness to use online teaching is high and the interpretation of the original data is more satisfactory.[14]

Table 8. Overall test results of the model of the influence of students' willingness to use online teaching in technical courses

x^2	Sig	-2 log-likelihood values	Cox&Snell R^2	Nagelkerke R^2	Hosmer-Lemeshow（sig）
507.158	0.000	2341.578[a]	0.105	0.141	0.087

The study found that through large-scale online teaching practices, higher education physical education faculty and students showed more acceptance of online teaching and higher willingness to use it.

5 Conclusion

Establishing a set of objective and scientific distance learning quality evaluation index system is an extremely complex and difficult matter. It needs to be constantly modified and improved according to the actual operation situation. This paper only considers the 21 basic indicators affecting distance teaching, and the indicators for the evaluation of distance teaching quality may not be comprehensive enough to be considered in a more comprehensive and detailed way.[15]In order to effectively improve the quality of online teaching of sports majors in colleges and universities to integrate the advantages of online teaching into traditional teaching, so that the teachers' willingness to use online teaching is transformed into actual classroom teaching reforms, which can provide support for teachers and students.

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