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Research on Evaluation of Teaching Media Application Skills of College Physical Education Teachers from the Perspective of TPACK

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Abstract: The excellent teaching media application skills of college PE teachers are one of the foundations to ensure the realization of PE teaching objectives. By using the methods of literature analysis and mathematical statistics, the evaluation indexes of college physical education teachers' teaching media application skills from the perspective of TPACK are identified as four first-level indexes of media design arrangement, use effect evaluation, theme content selection and technical specification requirements, and 20 second-level indexes, such as the degree of curriculum characteristics, the degree of topic selection suitable for specification, the degree of scientific accuracy of content, the degree of meeting teaching requirements and the degree of clarity of teaching objectives, and their weights are calculated respectively, and finally the evaluation indexes of college physical education teachers' teaching media application skills from the perspective of TPACK are constructed. The test shows that the goodness of fit is good, which shows that this evaluation system can be used to evaluate the application skills of teaching media for college physical education teachers.

1. Introduction

With the global advancement of educational informatization, the informatization level of Chinese universities has been significantly improved. With the use of advanced modern information technology, the rapid development of higher education has been realized and the continuous improvement of education and teaching level has been promoted [1-4]. In recent years, China's Ministry of Education officially released the Education Informatization 2.0 Action Plan and the Opinions of the Ministry of Education on Implementing the National Project 2.0 for Improving the Application Ability of Information Technology for Primary and Secondary School Teachers, emphasizing that the application ability of information technology is the core accomplishment of teachers in the new era, and taking the education informatization and strengthening the application ability of information technology for teachers as the main fulcrums for accelerating the education modernization and building a strong education country. Physical education teachers in colleges and universi-

ties are important members of subject education, and of course they should have solid information technology application ability [5-7]. Teaching application skills of media is a process in which teachers apply information technology in teaching, requiring teachers to have comprehensive information technology knowledge, which is consistent with the subject teaching knowledge of integration technology emphasized by TPACK theory [8-10]. Therefore, it has certain theoretical value and practical significance to study the evaluation of teaching media application skills of PE teachers in colleges and universities from the perspective of TPACK.

2. Determination of Evaluation Indicators at All Levels

2.1 Acquisition of Evaluation Indicators

By means of questionnaires and expert interviews, this paper makes an in-depth investigation of relevant experts, scholars, physical education teachers and school administrators. On the basis of obtaining reliable first-hand data, combined with relevant literature results [11-15], through statistics, sorting and analysis, this paper puts forward some words for evaluating the application skills of college physical education teachers' teaching media from the perspective of TPACK. After the items are compiled and investigated, the data obtained are statistically analyzed, including the calculation and sorting of the total score of each item and the elimination of extreme data. Calculate the correlation between each item and the total score, exclude the items with the correlation coefficient lower than 0.40, and carry out independent sample T test of high and low groups with 27% of the total score of the questionnaire as the boundary. After excluding the items with the critical ratio CR not reaching the significant level, we can get "the degree of curriculum characteristics, the degree of standardization of topic selection, the degree of scientific accuracy of content, the degree of meeting the teaching requirements, the degree of clarity of teaching objectives, the degree of highlighting students' subjectivity, the degree of all-round development, the appropriate degree of method application and the flexibility of teaching strategies" (as shown in Table 1)

Table 1: Evaluation index of teaching media application skills of college physical education teachers from the perspective of T pack

Evaluation object	evaluating indicator
Teaching media application skills	Degree of curriculum characteristics
	Degree of suitability for topic selection
	Scientific accuracy of content
	Degree of compliance with teaching requirements
	Clarity of teaching objectives
	Highlight the degree of students' subjectivity
	Pay attention to all-round development.
	Appropriate degree of application of methods
	Flexibility of teaching strategies
	Reasonable degree of technology application
	Degree of structural integrity of data
	Novelty and practicality of conception
	Media selection appropriateness
	Image clarity
	Content stability degree
	Degree of compliance with technical specifications
	Whether students are welcome or not
	Degree of completion of teaching tasks
	Good degree of auxiliary effect
	Degree of achievement of predetermined target

2.2 Test of Evaluation Index

(1) Reliability and validity test

1) Cronbach's alpha coefficient

The Cronbach's alpha coefficient test of "Teaching Media Application Skills" shows that the average alpha value is 0.848, the overall alpha value is 0.851, and both alpha values are greater than 0.8, which shows that this group of data has high reliability. (as shown in Table 2)

Table 2: Cronbach's alpha Test Table

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.851	0.848	20

2) KMO inspection and Bartlett's spherical inspection

The KMO test and Bartlett's spherical test of "Teaching Media Application Skills" showed that KMO value was 0.779 and c2 value was 3,325.876 (DF = 190, Sig=0.000), which reached the significant level, indicating that the validity of this group of data was high. (as shown in Table 3)

Table 3: KMO and Bartlett's Test inspection table

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.779
Bartlett's Test of Sphericity	Approx.Chi-Square	3325.876
	df	190
	Sig.	0.000

(2) Extraction of common factors

Four factors with characteristic values greater than 1 were extracted as common factors, with the cumulative variance contribution rate of 73.062%, characteristic values of 5.769, 3.174, 2.988 and 2.681 respectively, and explanatory variance contribution rate of 28.844%, 15.871%, 14.941% and 13.406% respectively. The contribution rate of the cumulative explanatory variance of public factors is over 70%, which shows that the "application skills of teaching media" is representative. (as shown in Table 4)

Table 4: Population variance explanation table

Component	Initial Eigenvalues			Extraction			Rotation Sums of		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.96	29.805	29.805	5.961	29.805	29.805	5.76	28.844	28.844
2	3.74	18.699	48.504	3.740	18.699	48.504	3.17	15.871	44.715
3	2.77	13.862	62.366	2.772	13.862	62.366	2.98	14.941	59.656
4	2.13	10.696	73.062	2.139	10.696	73.062	2.68	13.406	73.062
5	.991	4.956	78.018						
6	.797	3.985	82.003						
7	.685	3.426	85.429						
8	.653	3.263	88.692						
9	.439	2.193	90.885						
10	.325	1.624	92.509						
11	.289	1.447	93.956						
12	.262	1.309	95.266						
13	.251	1.255	96.521						
14	.167	.834	97.355						
15	.156	.780	98.135						
16	.119	.594	98.729						

17	.079	.393	99.122
18	.067	.335	99.457
19	.064	.320	99.777
20	.045	.223	100.000

From the gravel map of factor analysis, it can be seen that the characteristic value of the fifth factor began to decline smoothly, while the variance contribution rate of this factor was low, so it was reasonable to remove it and finally extract four common factors. (see figure 1)

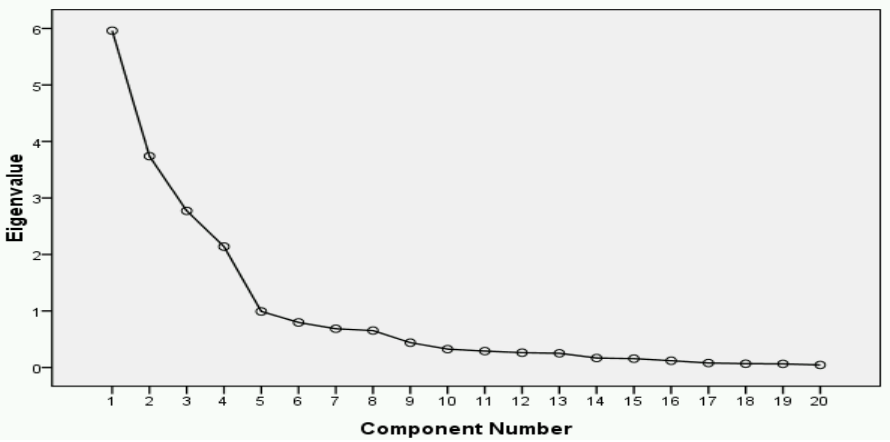

Fig. 1: Factor Analysis Gravel Diagram

(3) Factor load

Select the variance maximization orthogonal method to rotate the factor load matrix, and get the specific situation of factor load of factor analysis of "teaching media application skills" (see Table 5).

Table 5: Factor load matrix table after rotation

	Component			
	1	2	3	4
Clarity of teaching objectives	.854	.005	.110	.070
Highlight the degree of students' subjectivity	.837	.016	.097	.051
Pay attention to all-round development	.809	.020	.096	.046
Appropriate degree of application of methods	.803	-.045	.004	.137
Flexibility of teaching strategies	.790	-.027	.087	.065
Media selection appropriateness	.783	.010	-.035	-.061
Degree of structural integrity of data	.782	-.056	-.110	.111
Reasonable degree of technology application	.758	.045	-.009	-.057
Novelty and practicality of conception	.757	.036	.044	.061
Whether students are welcome or not	-.007	.899	.079	-.017
Degree of completion of teaching tasks	.046	.897	.116	.003
Good degree of auxiliary effect	-.066	.867	.035	.003
Degree of achievement of predetermined target	.034	.840	.145	-.025
Degree of curriculum characteristics	.020	-.019	.875	.106
Scientific accuracy of content	.059	.012	.862	.136
Degree of suitability for topic selection	-.002	.256	.830	.008
Degree of compliance with teaching requirements	.096	.168	.810	-.034
Content stability degree	.089	.008	.146	.954
Degree of compliance with technical specifications	.120	-.016	.121	.934
Image clarity	.045	-.024	-.046	.900

(4) Naming of common factors

According to the data of the rotated factor load matrix, the corresponding relationship between factors and indicators is obtained. (as shown in Table 6)

Table 6: Correspondence table between common factors and original indicators

common factor	F1 (28.844)	F2 (15.871)	F3 (14.941)	F4 (13.406)
Original index	Clarity of teaching objectives	Whether students are welcome or not	Degree of curriculum characteristics	Content stability degree
	Highlight the degree of students' subjectivity	Degree of completion of teaching tasks	Scientific accuracy of content	Degree of compliance with technical specifications
	Pay attention to all-round development.	Good degree of auxiliary effect	Degree of suitability for topic selection	Image clarity
	Appropriate degree of application of methods	Degree of achievement of predetermined target	Degree of compliance with teaching requirements	
	Flexibility of teaching strategies			
	Media selection appropriateness			
	Degree of structural integrity of data			
	Reasonable degree of technology application			
	Novelty and practicality of conception			

According to the corresponding relationship between public factors and indicators, combined with expert interview suggestions, the public factors were named as media design arrangement, use effect evaluation, theme content selection and technical specification requirements. (as shown in Table 7)

Table 7: Common Factor Naming Table

common factor	Original index	factor loading
F1 Media design arrangement	Clarity of teaching objectives	.854
	Highlight the degree of students' subjectivity	.837
	Pay attention to all-round development.	.809
	Appropriate degree of application of methods	.803
	Flexibility of teaching strategies	.790
	Media selection appropriateness	.783
	Degree of structural integrity of data	.782
	Reasonable degree of technology application	.758
	Novelty and practicality of conception	.757
F2 Evaluation of use effect	Whether students are welcome or not	.899
	Degree of completion of teaching tasks	.897
	Good degree of auxiliary effect	.867
	Degree of achievement of predetermined target	.840
F3 Theme content selection	Degree of curriculum characteristics	.875
	Scientific accuracy of content	.862
	Degree of suitability for topic selection	.830
	Degree of compliance with teaching requirements	.810
F4 Technical specification requirements	Content stability degree	.954
	Degree of compliance with technical specifications	.934
	Image clarity	.900

3. Construction of Evaluation Index System

3.1 Calculation of the Weight of the Primary Index

Take the public factor extracted from the factor analysis of "Teaching Media Application Skills" as the first-level index, and normalize the proportion of its explanatory variance, that is, get the weight of the first-level index. (as shown in Table 8)

Table 8: Statistical table of weight of primary indicators

Evaluation object	Primary index	Explanatory variance ratio	weight
Teaching media application	Media design arrangement	28.844	0.395
	Evaluation of use effect	15.871	0.217
	Theme content selection	14.941	0.204
	Technical specification requirements	13.406	0.183

3.2 Calculation of Secondary Index Weight

According to the data of factor load of "Teaching Media Application Skills", the factor load is normalized, and then the product of common factor weight and the corresponding load normalized value is added to determine the weight of the secondary index of "Teaching Media Application Skills". (as shown in Table 9)

Table 9: Statistics of secondary index weight

Secondary index	F1	F2	F3	F4	weight
Clarity of teaching objectives	0.110	0.004	0.021	0.017	0.052
Highlight the degree of students' subjectivity	0.109	0.002	0.019	0.013	0.050
Pay attention to all-round development.	0.104	0.006	0.023	0.013	0.049
Appropriate degree of application of methods	0.103	0.016	0.002	0.038	0.050
Flexibility of teaching strategies	0.102	0.004	0.016	0.015	0.049
Media selection appropriateness	0.102	0.014	0.018	0.029	0.045
Degree of structural integrity of data	0.101	0.002	0.007	0.015	0.053
Reasonable degree of technology application	0.098	0.010	0.011	0.017	0.044
Novelty and practicality of conception	0.098	0.010	0.002	0.014	0.045
Whether students are welcome or not	0.000	0.210	0.015	0.007	0.050
Degree of completion of teaching tasks	0.005	0.209	0.027	0.002	0.053
Good degree of auxiliary effect	0.008	0.201	0.008	0.000	0.049
Degree of achievement of predetermined target	0.004	0.195	0.032	0.006	0.052
Degree of curriculum characteristics	0.003	0.005	0.190	0.027	0.045
Scientific accuracy of content	0.009	0.004	0.187	0.035	0.048
Degree of suitability for topic selection	0.000	0.060	0.181	0.003	0.050
Degree of compliance with teaching requirements	0.012	0.038	0.177	0.010	0.051
Content stability degree	0.012	0.000	0.030	0.252	0.058
Degree of compliance with technical specifications	0.015	0.003	0.025	0.245	0.057
Image clarity	0.006	0.005	0.009	0.240	0.049

4. Conclusion

The teaching skill level of PE teachers in colleges and universities determines the quality of PE teaching, and affects the realization of talent training objectives. Physical education teachers in colleges and universities can only achieve the fundamental task of talent cultivation with solid teaching skills, and can truly cultivate new people of the era with all-round development of morality, intelli-

gence, physique, beauty and labor for social and economic development. Through the research, it is concluded that the evaluation index system of college physical education teachers' teaching media application skills from the perspective of TPACK includes four first-level indicators and 20 second-level indicators. After mathematical statistics and analysis, it is shown that the evaluation index system can reasonably and effectively evaluate college physical education teachers' teaching media application skills. But it should be more clear that evaluation is only a tool to test the effect, and its more important function is to promote the development of related things. Therefore, only by generally improving teachers' information technology application ability and literacy can we truly achieve the long-term goal of national education informatization development, and enable China's higher education to be in an invincible position in the process of rapid development of education informatization and globalization.

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