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Research Paper

Evaluation index system of college students' satisfaction with blended learning based on the physical and mental characteristics and education needs

Hou Yongmei

Department of Psychology, School of Humanity and Administration, Guangdong Medical University, Dongguan 523808, Guangdong Province, China.

*Corresponding author. E-mail: 2184456621@qq.com.

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Abstract. Based on the current situation and requirements of blended learning in China, as well as undergraduates' physical and mental characteristics, Expert Opinion Method(Delphi method) and analytic hierarchy process (AHP) were used to construct an evaluation index system of college students' satisfaction with blended learning. Under the guidance of developmental psychology and need theory, combined with the results of 3 semi-structural interviews with 28 experts and the pre-examination with other 14 experts, the basic content of the evaluation index system was initially drawn up. Then, Delphi method was used to carry out two rounds of consultation for the remaining 70 experts, and AHP was used to build the evaluation index system. Finally, this evaluation index system was used to investigate 396 college students to determine its reliability and validity. The effective recovery rates of two rounds of expert consultation were both 100%, with the authority coefficient of 0.790 and 0.812 ($P< 0.05$), respectively. The coordination coefficient of experts' opinions was 0.814 ($P< 0.05$), and the coefficient of variation of each index was less than 0.15. The final version of evaluation index system of college students' satisfaction with blended learning was formed, which included 4 first-grade indexes, 10 second-grade items and 41 third-grade indicators. In conclusion,the experts' enthusiasm and the concentration degree of their opinions were relatively high. The method of constructing the evaluation index system of college students' satisfaction with blended learning is scientific and reliable, with good psychometric performance.

Keywords: College students, blended learning, satisfaction, evaluation index system, expert opinion method (Delphi method), analytic hierarchy process (AHP).

INTRODUCTION

Blended learning is a combination of the advantages of traditional learning methods and digital learning. Not only does it play the leading role of teachers in guiding, inspiring and monitoring the teaching process, but also fully reflects the initiative, enthusiasm and creativity of students as the main body of learning (Kekang, 2004). With the development of education informatization, blended learning has become the development trend of teaching (Jing, 2018; Porter *et al*., 2014; Jingxin and Xuesong, 2019). A large number of studies have confirmed that learners' satisfaction is an important factor in the sustainable development and learning effect of blended learning (Xijuan *et al.*, 2018; Lim and Morris, 2009; Henrie *et al.*, 2015). However, in the process of practice, there are various problems in blended learning, such as the simplification of teaching resource construction, lack of formality of teaching interaction, separation of classroom teaching and online teaching, neglect of students' individual differences, emphasis on form and technology reform and neglect of the role of emotion and psychology,

etc. (Yonghui *et al.*, 2018; Yun and Ning, 2019; Chuanjun, 2017). In view of foregoing problems, college students' recognition and satisfaction of blended learning are insufficient (more than 33.3% of college students are not satisfied with the current effect of blended learning) (Liwei *et al.*, 2018; Xiangzhi and Xiaolin, 2018), which not only hinders the adoption of blended learning, but also decreases students' participation enthusiasm and learning effectiveness (Bo and Qiaozhen, 2019; Junwei *et al.*, 2018).

There are few researches on the evaluation of college students' satisfaction with blended learning. Most domestic researches focuses on the role of learners' personality characteristics, learning environment, interaction degree and learning achievement (Weitong and Xiaoxiao, 2019). The methods and content of foreign researches are relatively broad. For example, So and Brush, (2008) proposed the influencing factors of satisfaction of blended learning through qualitative research, and found that curriculum structure, emotional support and communication media are important factors affecting learning satisfaction. Based on the "social cognitive theory", Wu *et al*. (2010) and Diep *et al.* (2017) constructed a satisfaction model of three-dimensional elements of "individual-environment-behavior" in the blended learning environment, emphasized that learners' self-awareness has an important impact on satisfaction, and verified that learners with high self-efficacy have higher satisfaction.

In conclusion, previous studies mostly focus on the external factors of blended learning such as curriculum structure and the role of learners' personality, but they does not involve the connotation and task of blended learning. External factors may change by people and place, and personality factors compose a very complex system, which makes the research focus easy to change with the interest of researchers. Therefore, these two kinds of factors are lack of stability, resulting in different research conclusions, which affects the universality and popularization of the research results. According to the connotation of blended learning (Kekang, 2004), we can see that one of the key tasks of blended learning is to do a good job in teaching design, make classroom learning and autonomous learning seamless, and let students, the main body of blended learning, participate in deep and meaningful interaction and learning. Therefore, the value orientation of blended learning should be changed from "subject knowledge centered" to "student learning centered", which should be guided by college students' physical and mental characteristics and the basic needs of education, so as to improve their satisfaction. On the other hand, due to the stability across regions of college students' physical and mental characteristics and the basic needs of teaching, "student learning centered" can improve the promotion of research results.

Needs are the psychological experience produced when an individual is in a state of lack of an object, or is experiencing some imbalance. It is necessary for individuals to take certain actions to solve this imbalance or tension, that is, to carry out or inhibit certain actions (Shaffer, 2002). It can be seen that needs are the fundamental factor of individual behavior, and satisfaction will be produced when needs are satisfied.

People have various needs, such as educational needs. Educational needs can be divided into personal needs and social needs. Personal needs refer to the psychological tendency to meet the individual's own survival and development, that is, the gap between the current level of learners and the level they expect to achieve, including the general characteristics of learners, such as the current knowledge level, skill level, personal learning expectations, emotion, attitude, etc. Social needs refer to the social requirements for individual's development, that is, whether the cultivation and output of talents can promote social development (Shaffer, 2002).

College students are in the stage of pre-service specialized learning, and their most urgent social need is to find a job (Chongde, 2015). According to the Research Report "Unemployment and Employment: Labor Transformation in the Era of Automation" released by McKinsey Global Institute at the end of 2017, by 2030, 375 million workers in the world will have to change their careers and learn new skills due to automation, of whom there will be 102 million workers in China. Future workers need to spend more time on activities with lower machine ability, such as management, application of professional technology and social communication. They need more social skills, emotional skills, higher logical reasoning ability and creativity (McKinsey Global Research Institute, 2017).

At the same time, college students are in a period of rapid physical and mental development, with the qualities not mature and not balanced. They have a more keen sensitivity, certain logical thinking ability, preliminary analysis, understanding and problem solving ability, but the learning goal is not clear and needs to be pointed out; their willingness of autonomous and active learning is not strong; Their comprehensive ability is not strong and the ability of knowledge systematization is weak; they lack profound thinking, coupled with lack of practical experience, theoretical analysis ability and the ability to integrate theory with practice; they have plenty of time, so it is easy to arrange the content of the course paragraph by paragraph. However, due to their impetuous mentality and unstable attention, they are not good at long-time patient thinking and deduction, and like intuitive and visual image data. As their critical thinking is not high, they tend to accept ready-made conclusions. Although they hope to innovate and start a business, there are few related attempts and achievements (Chongde, 2015).

Based on the above analysis, this study intends to build an evaluation index system of college students' satisfaction with blended learning based on educational needs and college students' physical and mental charac-

teristics with Delphi method and Analytic Hierarchy process.

MATERIALS AND METHODS

Materials

Consulting experts

One hundred and twelve consulting experts were selected by stratified random sampling, including 28 experts in the field of higher education, 28 college teachers and 56 college students. Inclusion criteria: ① Expert representatives in the field of higher education: Associate senior or above title and bachelor degree or above, engaged in higher education research or management for 15 years or more. ② College teacher representatives: Deputy senior or above title, Master degree or above, engaged in higher front-line teaching for more than 15 years. ③ College student representatives: Master's students or undergraduates (28 each), who have participated in blended learning of one or more courses.

From the above representatives, 7 experts in the field of higher education, 7 college teachers, 14 students (7 master's students and 7 undergraduates) were randomly selected as interviewing experts, and 14 experts (3 experts of higher education, 4 college teachers, 3 master's students and 4 undergraduates) as pre-survey experts. The remaining 70 experts served as correspondence experts.

Respondents

448 college students were selected by stratified random sampling from Shenzhen University, Guangdong Medical University, South China University of Technology, Guangdong Ocean University, Guangzhou Institute of Physical Education, Guangzhou Academy of Fine Arts and Guangdong University of Finance and Economics.

Methods

Preliminary construction of the evaluation index system

First, the researchers studied deeply relevant literatures to understand the research status and development trends. On this basis, the researchers conducted three semi-structured interviews with 28 experts to understand their evaluation and expectation of colleges' blended learning. Combined with the results of literature analysis and interviews, the researchers initially proposed the item pool of "evaluation index system of college students' satisfaction with blended learning". Taking that item pool as the core content, combined with the results of special group discussion, the "draft questionnaire of college students' satisfaction with blended learning" was formed. Then, 14 pre-survey experts (except those who participated in semi-structured interviews) were investigated with that draft questionnaire. According to the results of the pre-survey, the draft questionnaire was modified to ensure that it met the requirements of psychometrics, and then the "inquiry questionnaire for experts on college students' satisfaction with blended learning" was determined, which was the core content of preliminary version of "evaluation index system on college students' satisfaction with blended learning", including 4 first-grade indicators, 12 second-level indicators and 59 third-level indicators.

Indicator selection

Delphi method was used to screen the preliminary evaluation indexes. First, two rounds of inquiry were conducted to 70 inquiry experts (except those who participated in semi-structured interviews and pre-survey) with letter or e-mail. The inquiry questionnaire was attached with 4 items such as inquiry instructions, personal information of experts, experts' familiarity with the subject, as well as judgment basis. The familiarity was divided into five levels such as very unfamiliar, unfamiliar, moderate familiarity, familiar, and high familiarity, with the familiarity coefficient of 0.2, 0.4, 0.6, 0.8 and 1.0, respectively. The judgment basis, according to convention, can be divided into four categories: practical experience, theoretical analysis, reference to domestic or foreign data and intuition, which influence can be divided into three levels: large, medium and small, with different quantitative values given respectively. The experts evaluated the indicators according to their importance: 5 points for the most important, 4 points for very important, 3 points for moderately important, 2 points for unimportant and 1 point for the most unimportant. The criteria for index selection were importance assignment mean > 3.5 and coefficient of variation < 0.2 (Yansong, 2015). In the first round, the experts put forward their opinions on 59 indicators, and in the second round, they put forward their opinions on 51 indicators. Combined with the experts' opinions and the discussion of the research group, four first-grade indicators were selected, including the evaluation of teachers, the evaluation of students, teaching support system and teaching effect, and then ten second-level indicators, as well as 41 third- level indicators.

Questionnaire survey

From November 2020 to February 2021, the preliminary evaluation index system was used to conduct a questionnaire survey. First, the investigators were trained uniformly, the survey process and evaluation standard were unified, and the consistency test (kappa = 0.81~0.90) was conducted to meet the test requirements.

Table 1. Expert authority coefficient and coordination coefficient.

Round	Experts' enthusiasm (%)	Experts' coordination coefficient(*W*)	*P*
1	100	0.766	0.037
2	100	0.814	0.041

Table 2. Experts' authority coefficients of 4 first-grade indicators in two rounds of consultation.

Indicators in grade 1	The first round of consultation			The second round of consultation		
	Ca	Cs	Cr	Ca	Cs	Cr
Teacher evaluation	0.748	0.933	0.841	0.761	0.945	0.853
Student evaluation	0.736	0.902	0.819	0.749	0.928	0.839
Teaching support system	0.727	0.844	0.786	0.752	0.875	0.814
Teaching effectiveness	0.722	0.704	0.713	0.730	0.755	0.743
Average value	0.733	0.846	0.790	0.748	0.876	0.812

The questionnaire survey was sent by e-mail or letters, and the purpose, significance and notes of the research were introduced with unified guidelines.

The questionnaires with missing answers of more than 50% were eliminated, and the missing values of valid questionnaires were estimated and filled with average. Epidata3.0 software was used for data entry. Two researchers entered the same data independently and carried out a unified logic check to ensure its accuracy. A total of 448 questionnaires were distributed by stratified random sampling and 396 valid questionnaires were collected, with an effective recovery rate of 88.4%. Among them, there were 211 males and 185 females, aged 17～26 (22.36 ± 1.71) years old, 142 master's students and 254 undergraduates. Fifty-one students from Guangdong Medical University, 16 from Guangzhou Academy of Fine Arts, 19 from Guangzhou Institute of Physical Education, 82 from Guangdong University of Finance and Economics, 76 from Guangdong Ocean University, 65 from South China University of Technology and 87 from Shenzhen University.

In order to estimate the test-retest reliability of the questionnaire, 60 students (18 master's students and 42 undergraduates) were randomly selected from the sample.

Statistics and analysis

The data were exported from epidata3.0 to SPSS 20.0 for statistical analysis. Pearson correlation analysis, exploratory factor analysis, internal consistency coefficient, test-retest reliability, content validity and other statistical methods were used to evaluate the measurement performance of the evaluation index system.

RESULTS

Enthusiasm, authority coefficient and coordination coefficient of participating experts

In the first and second round, 70 questionnaires were sent out and 70 returned respectively, so the enthusiasm of experts in the first and second round were both 100%. The coordination coefficient of experts is shown in Table 1.

Authority coefficient of experts

Ca (Coefficient of judging influence degree) was taken as the coefficient of influence degree, which was quantified as practical experience (0.8), theoretical basis (0.6), reference to domestic and foreign literature (0.4), as well as intuition (0.2). The coefficient of experts' familiarity degree to a problem was expressed by Cs, which was quantified as very familiar (1.0), familiar (0.8), general (0.6), unfamiliar (0.4), and very unfamiliar (0.2). Cr was used to represent the degree of authority of experts, which was the arithmetic average of coefficient of influence degree and familiarity coefficient, namely Cr = (Ca + CS) /2. The authority coefficients of four first-grade indicators in two rounds of expert consultation were all higher than 0.7. The results are shown in Table 2.

Concentration degree and coefficient of variation of experts' opinions

The concentration degree of experts' opinions was expressed by the mean of importance coefficient, coefficient of variation and full score ratio, as shown in Tables 3 and 4. The experts' scores of the first and second–grade indicators were all higher than 4.00, which was a group of high scores. The coefficients of variation were all less than 0.15, which was a group of normal scores. The full score ratios were more than 0.30, which was a group of relatively concentrated scores.

Reliability of evaluation system

Internal consistency coefficient

Cronbach α coefficient of the total evaluation index system

Table 3. Concentration degree and variation coefficient of experts' opinions on grade-I indicators.

Indicator	Score	Variation coefficient	Full score ratio
Teacher evaluation	4.33±0.59	0.136	0.37
Student evaluation	4.54±0.53	0.117	0.44
Teaching support system	4.57±0.66	0.144	0.34
Teaching effectiveness	4.18±0.56	0.134	0.31

is 0.874, Cronbach α coefficients of the four first-grade indexes are 0.822, 0.805, 0.773 and 0.785, respectively. andCronbach α coefficients of the ten second-grade indexes are 0.764, 0.780, 0.753, 0.819, 0.836, 0.827, 0.831, 0.822, 0.813 and 0.774, respectively.

Test-retest reliability

The test-retest reliability coefficient of the total evaluation index system is 0.847. The test-retest reliability coefficients of the four first-grade indexes are 0.825, 0.821, 0.813 and 0.804, respectively, and the test-retest reliability coefficients of the ten second-level indexes are 0.785, 0.802, 0.760, 0.754, 0.761, 0.739, 0.759, 0.742, 0.758 and 0.746, respectively.

Validity of evaluation index system

Content validity (CVI)

CVI is calculated according to the relevant formula (Hong *et al*., 2004). The CVI of each index is 0.826 to 1.000, and the average CVI of all indexes is 0.915.

There are many calculation methods for CVI, such as expert judgment method, duplicate method, retest method, empirical method, regression equation method, etc. In this study, the regression equation method is used, that is, the score of each evaluation index is used as the prediction variable (independent variable, expressed in X_1, X_2, X_3..... X_{41}, respectively), and the total evaluation score of the whole index system is used as the calibration variable (dependent variable, expressed in Y). The multiple regression equation is established, and the regression coefficient of each prediction variable (index) is the content coefficient of this index.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k + \varepsilon.$$

B_1, β_2,.....and β_k in the formula are the content validity coefficients of X_1, X_2, ... and X_k.

Construct validity

Convergent validity and discriminant validity

There is a significantly positive pairwise correlation coefficient between the scores of the four first-grade indicators (r = 0.319 to 0.591, all P < 0.01); There is a significantly positive correlation coefficient between each first-grade index and the total score of the scale (r = 0.683 to 0.817, all P< 0.01). The correlation coefficients between the 10 second-grade indexes were all greater than 0.30 (all P< 0.01), and the correlation coefficients between second-grade indexes and their primary indexes, as well as third-grade indexes and their second-grade indexes were all greater than 0.40 (all P< 0.01). The correlation coefficient between each second-grade index and their primary index, third-grade index and its second-grade index is greater than those between the same index and other primary or second-grade indexes.

Exploratory factor analysis

The exploratory factor analysis is used for the 41 three-grade indicators. As KMO= 0.968, Bartlett's spherical test value χ^2 =13422.886 (P <0.01), the three-grade indicators are suitable for exploratory factor analysis. Then, principal component analysis is used to extract common factors, and eigenvalue > 1 is used as the screen standard. A total of 10 common factors are extracted, which can explain 68.193% of the total variance. Furthermore, exploratory factor analysis is carried out on 10 second-grade indexes, As KMO = 0.949, Bartlett's spherical test value χ^2 = 6277.355 (P< 0.01), the second-grade indexes are suitable for exploratory factor analysis. The principal component analysis is used to extract common factors, and eigenvalue > 1 is used as the screen standard. Four common factors are extracted, which can explain 84.390% of the total variance. The structure of principal component extraction of exploratory factor analysis is basically consistent with the theoretical conception of the index system. The results are shown in Table 5. The factor load of 41 items are shown in Tables 6 and 7.

Determination of indicators

Finally, the evaluation index system of college students' satisfaction with blended learning is formed, including 4 first-grade indexes, 10 second-grade indexes and 41 third-grade indexes. The results are shown in Table 8.

DISCUSSION

The reliability and scientificity of the construction of the evaluation index system

In this study, 70 experts with good representativeness

Table 4. Concentration degree and variation coefficient of experts' opinions on grade-2 indicators.

Indicator	Score	Variation coefficient	Full score ratio
Teaching ability	4.83±0.51	0.106	0.52
Teaching attitude	4.71±0.41	0.087	0.49
Teaching method	4.97±0.36	0.072	0.58
Adaptability of e-learning	4.77±0.45	0.094	0.51
Learning attitude	4.93±0.49	0.099	0.61
Face to face teaching	5.00±0.00	0.000	1.00
Course features	4.52±0.47	0.104	0.39
Network teaching	4.64±0.53	0.114	0.42
Effects on students' qualities	4.35±0.54	0.124	0.34
Teaching evaluation	5.00±0.00	0.000	1.00

Table 5. Factor analysis results of 10 second level indexes of evaluation system.

Indications of grade 1	Indications of grade2	Eigenvalue	Contribution rate (%)	Cumulative contribution rate (%)
Teacher evaluation	Teaching ability	7.346	17.117	17.117
	Teaching attitude	5.904	8.322	25.439
	Teaching method	6.438	14.413	39.852
Student evaluation	Adaptability of e-learning	4.861	10.754	50.606
	Learning attitude	4.467	8.997	59.603
Teaching support system	Face to face teaching	5.403	3.663	62.266
	Course features	3.375	4.249	67.515
	Network teaching	6.123	6.626	74.141
Teaching effectiveness	Effects on students' qualities	5.012	7.641	81.782
	Teaching evaluation	2.286	2.608	84.390

DISCUSSION

The reliability and scientificity of the construction of the evaluation index system

In this study, 70 experts with good representativeness are selected. Their enthusiasm for this study is 100%, and 68% of the experts put forward constructive opinions, which fully reflect their attention and support. The authority coefficient of experts is 0.812, which is higher than the acceptable lower limit of 0.70, and also higher than 0.80, which is the lower limit that experts have a greater grasp of the content (Yansong, 2015), indicating that the experts in this study have a higher degree of authority and ensures the reliability of this study. The overall coordination coefficients, which are 0.766 and 0.814 respectively in the two rounds of consultation are significantly higher than the acceptable lower limit of 0.70. Meanwhile, the experts' scores of the first and second-grade indicators are higher than 4.00, which belong to the high score. The coefficients of variation are less than 0.15, which belong to the normal scores, and the full score ratios are all more than 0.30, which belong to the relatively concentrated scores, indicating that the experts' opinions tend to be consistent and good coordination, and the evaluation system is reasonable (Yansong, 2015).

On the other hand, the results of the questionnaire survey show that the evaluation index system has good psychometric performance.

First, the internal consistency reliability coefficients of the total scale and each first- and second-index are all above 0.70, and the test-retest reliability coefficients are above 0.80, which indicates that the evaluation index system has good internal consistency reliability and good cross-time stability.

Secondly, the correlation coefficients between each index and its upper-grade index are all > 0.4, and the correlation coefficients between each index with other upper-grade indexes are less than the correlation coefficient between the same index and its upper-grade index. There is a significant positive pairwise correlation between the four first-grade indicators, a significant positive correlation between each first-grade index and the total score of the scale. It is suggested that the evaluation

Table 6. Principal component analysis and factor load of 41 items (factor load > 0.5).

Teaching ability (A)		Teaching attitude (B)		Teaching methods (C)		Learning adaptability (D)		Learning attitude (E)	
Item	**Factor load**	**Item**	**Factor load**	**Item**	**Factor load**	**Item**	**Factor load**	**Item**	**Factor load**
A1	.704	B1	.549	C1	.673	D1	.736	E1	.689
A2	.589	B2	.530	C2	.544	D2	.661	E2	.638
A3	.513	B3	.661	C3	.576	D3	.612		
		B4	.621	C4	.605				

Table 7. Principal component analysis and factor load of 41 items (factor load > 0.5).

Face to face teaching (F)		Course features (G)		Network teaching (C)		Effects on students' qualities (D)		Teaching evaluation (E)	
Item	**Factor load**	**Item**	**Factor load**	**Item**	**Factor load**	**Item**	**Factor load**	**Item**	**Factor load**
F1	.649	G1	.581	H1	.717	I1	.657	J1	.705
F2	.622	G2	.599	H2	.686	I2	.723	J2	.624
		G3	.611	H3	.594	I3	.578	J3	.523
				H4	.635	I4	.699	J4	.616
						I5	.716	J5	.557
						I6	.567	J6	.505
						I7	.542		
						I8	.529		
						I9	.514		
						I10	533		

Table 8. Evaluation index system of college students' satisfaction with blended learning.

Indications in grade 1 (weigh)	Indications in grade 2 (weigh)	Indications in grade 3 (weigh)
Teacher evaluation (0.2448)	Teaching ability (0.1244)	Good understanding and sequence of basic knowledge, and strong systematization (0.0559) Appropriate teaching methods and means (0.0397) Strong ability of information technology required by blended learning(0.0288)
	Teaching attitude (0.0446)	Well on-line and off-line prepared before class(0.0138) Resources timely, complete, standardized, visual and exploratory (0.0102) Willing to interact with students, and interact naturally and deeply(0.0166) Make clear the advantages and difficulties of blended learning, and strive to master and use this technology (0.0040)
	Teaching methods (0.0758)	Proper methods, effectively connect classroom with network teaching(0.0263) The teaching rhythm is reasonable (0.0114) To cultivate thinking ability through good guidance(0.0177) Effectively encourage and guide students to participate in multiple activities (0.0204)
Student evaluation (0.3678)	Learning adaptability (0.2561)	The ability to use the Internet technology for blended learning (0.0945) Communication, interaction and collaborative learning ability(0.1220) Reasonable arrangement of self-study time(0.0396)
	Learning attitude (0.1117)	Self efficacy (0.0483) (On-line and off-line) willing to autonomous learning(0.0634)
Teaching support system (0.1764)	Face to face teaching (0.08349)	Effective content (closely linked with actual needs, timely reflecting new progress, strong practicality)(0.0537)

Table 8. Contd

Teaching effectiveness (0.2110)		Diversified and appropriate methods(0.0298)
	Course features (0.03154)	Flexibility of curriculum (0.0080) Adaptability of curriculum (0.0134) The richness of content(0.0101)
	Network teaching (0.06137)	Effective content(0.0146) Right way(0.0153) The function of network teaching platform(0.0232) Difficulty of platform operation(0.0083)
	Effects on students'qualities (0.1375)	Master the main contents, stimulate learning interest and reduce learning pressure (0.0221) Help to obtain high quality information and expand the scope of knowledge(0.0141) Improve self-control(0.0097) Improve the ability of self-expression(0.0169) Promoting autonomous learning(0.0134) Improve collaborative learning(0.0088) Improve the ability of comprehensive analysis and critical thinking(0.0144) Improve problem solving ability(0.0072) Promoting the development of meta-cognition(0.0063) Promote interaction between teachers and students, meet the needs of emotional exchange and improve communication ability(0.0245)
	Teaching evaluation (0.0735)	Pay attention to formative evaluation such as homework (0.0104) Various learning forms and contents(0.0087) Give consideration to learning behavior and psychology(0.0165) Timely and effective feedback on the learning effectiveness(0.0262) The evaluation standard is objective and operational (0.0151) Promote application ability(0.0116)

index system has good convergent validity and discriminant validity.

Factor analysis is made on the 41 third-grade indexes. A total of 10 common factors are extracted, which can explain 68.193% of the total variance. Furthermore, exploratory factor analysis is conducted on 10 indexes in the secondgrade and 4 common factors are extracted, which can explain 84.390% of the total variance. The structure of principal component extraction of exploratory factor analysis is basically consistent with the theoretical conception of this index system. It is confirmed that the evaluation index system has good structural validity.

CONCLUSION

One hundred and twelve consulting experts were selected by stratified random sampling, including 28 experts in the field of higher education, 28 college teachers and 56 college students. Through three rounds of semi-structured collective discussion and two rounds of Delphi expert consultation, the "evaluation index system of college students' satisfaction with blended learning" is constructed. Through the investigation of 396 college students selected by stratified random method, it is proved that the evaluation index system has good reliability and validity. The two content modules of the evaluation index system ("student e" and "teaching effectiveness" can fully reflect the physical and mental development characteristics and related educational needs of Chinese college students).

SUGGESTION

The results of this study suggest that college students' satisfaction with blended learning depends not only on the advanced level of teaching facilities and teachers' professional knowledge and teaching skills but also on Teachers' personality charm, whether teaching contents and teaching methods meet the physical and mental development characteristics of college students and whether they can meet the educational needs of college students. Therefore, college teachers must strengthen their personality construction and improve their personality charm; At the same time, only by deeply understanding the

law of College Students' physical and mental development and clarifying their learning and educational needs can we enhance the affinity and satisfaction of blended learning.

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