Student Satisfaction Evaluation of Featured Online and Offline Mixed Teaching Mode Based on Chaoxing Online Education Network Platform

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Abstract. Introducing information technology, visualization technology, and artificial intelligence technology, based on the Chaoxing online education network platform and the OBE concept, the "12467" online and offline hybrid teaching mode has been constructed, empowered by "OBE+creativity". Based on 846 valid questionnaires, factor analysis and multiple linear regression analysis were used to study student satisfaction with this teaching model. The research results show that student satisfaction is very high, with a very satisfied proportion of 90%. Among the 9 research variables, 8 of them passed the significance test, and the optimization of online teaching content and the condition of online teaching facilities are key influencing factors. When improving students' satisfaction with teaching models, it is necessary to focus on two aspects: improving the design of teaching content and increasing investment in teaching software and hardware facilities, such as increasing the construction of campus information networks, smart classrooms, and smart screens, and from the online education platform, we should actively optimize big data technology, actively use artificial intelligence technology, and effectively achieve human-computer interaction.

Keywords: online education, information technology,blended learning, regression analysis

1 Introduction

The rapid development of technologies such as artificial intelligence, big data, and blockchain will profoundly change the demand for talent and the form of education[1]. The intelligent environment has not only changed the way teaching and learning are conducted, but has also begun to deeply influence the concept, culture, and ecology of education. In this context, the course team has been continuously exploring, summarizing, and optimizing for 5 years, introducing information technology, visualization technology, and artificial intelligence technology[2]. Based on the superstar online education network platform, the team has introduced the OBE concept and constructed the "12467" characteristic online and offline hybrid teaching mode empowered by "OBE+creativity". The core key point of "12467" refers to: "1" refers to a concept: based on the OBE concept; "2" refers to two guiding policies: the construction of the "Four New" and the ideological and political construction of courses; "4" refers to the four dimensional goals and four subjects: setting the four dimensional goals of "knowledge, ability, quality, and ideological and political education", and introducing four evaluation subjects of

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"teacher, student, group, and class"; "6" refers to six modules and six evaluations: design a characteristic teaching module of the "knowledge + learning + evaluation + exploration + conclusion + practice", integrating evaluation methods, evaluation processes, evaluation subjects, evaluation forms, evaluation standards, and evaluation results; "7" refers to seven methods: integrating the seven teaching methods of "student-centered" and forming an evaluation system for online and offline mixed teaching mode (as shown in Figure 1). Based on this evaluation system, this article will evaluate the application effect of the "12467" color online and offline mixed teaching mode empowered by "OBE+creativity" from the perspective of students.

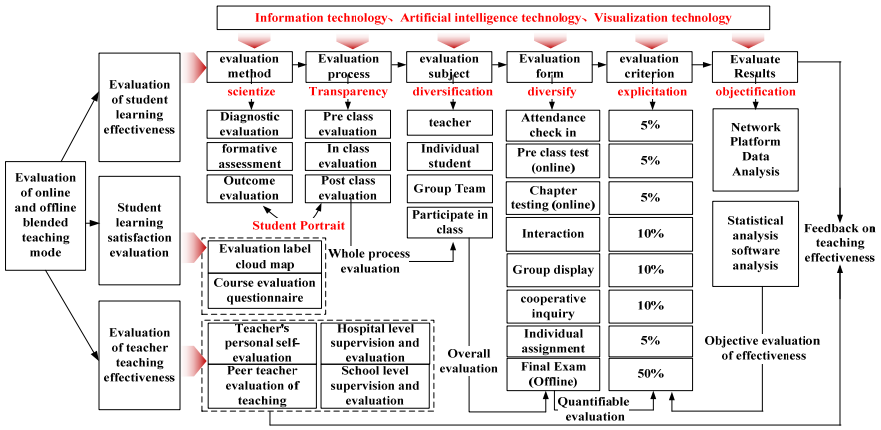

Fig. 1. Evaluation System for Online and Offline Mixed Teaching Mode

2 Data Source and Model Selection

2.1 Data source

The research group mainly surveyed students majoring in economics and management who were taught in Harbin Huade University's "12467" characteristic blended teaching mode based on the "OBE+creativity" empowerment. Relevant data was collected through a survey questionnaire distributed on Chaoxing Learning. The survey questionnaire was jointly researched and determined by the research group members and relevant experts[3], and improved through small-scale experiments to form the final questionnaire, The number of measurement items in the final questionnaire is 33, and each measurement item uses the five level Likert scale method, including very satisfied, relatively satisfied, general satisfied, relatively dissatisfied, very dissatisfied. A total of 1000 questionnaires were distributed, and 952 were actually collected, with a recovery rate of 95.2%. The number of valid questionnaires was 846, with an effective recovery rate of 84.6%. The ineffective questionnaires were mainly caused by multiple choices, few choices, and random selection[4].

2.2 Model selection

This study mainly focuses on the satisfaction evaluation of the characteristic blended teaching mode based on Superstar Learning, mainly from the perspective of students[5]. The dependent

variable is the students' satisfaction with this teaching model. Whether the students are satisfied with this model and how satisfied they are caused by a variety of influencing factors. It can be seen that the study focuses on the relationship between multiple independent and dependent variables, so we plan to choose a multiple linear regression model for quantitative analysis of the survey data. The basic form of the model is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon \quad (1)$$

Among them, X_k is an independent variable; β_0 is a constant, β_k is a coefficient; ε is a random Error term.

The research group uses SPSS21.0 statistical analysis software to analyze the basic data. When conducting multiple linear regression analysis, it needs to confirm whether the regression equation is effective. Generally, it needs to pass five statistical tests: first, Goodness of fit test; The second is DW inspection; The third is the significance test of the regression equation; Fourth, collinearity test; The fifth is the significance test of the regression coefficient[6].

3 Empirical analysis

3.1 Reliability and Validity Testing

The reliability and validity test of the questionnaire is a prerequisite for in-depth analysis of the sample data[7]. From the inspection results (as shown in Tables 1 and 2), α Value is 0.925, based on standardized terms α A value of 0.923 indicates that the reliability of the scale is very high and the consistency within the scale is high. At the same time, the KMO value is 0.821, which is greater than the minimum judgment value of 0.50, and is located in the high judgment value range, making it very suitable to adopt factor analysis method.

At the same time, the chi square value of the sphericity test is 6282.911, and the significance probability value P is 0.000, so the original hypothesis can be rejected, that is, the rejection of the original hypothesis that the correlation coefficient matrix is the identity matrix, indicating that the original matrix is not the identity matrix, and there is a certain correlation between the original variables.

The questionnaire total table is suitable for factor analysis and aggregation into nine common factors, according to the content of the measurement items of each common factor, named as 9 common factors, including teaching faculty capacity, number of teaching objects, optimization of teaching content, selection of teaching methods, design of teaching process, reform of teaching evaluation, condition of teaching facilities, formulation of teaching syllabus, and refinement of teaching objectives.

Table 1. Reliability Test of the Total Questionnaire Scale

Cronbach's Alpha	Cronbach's Alpha based on standardized terms	Number of items
.925	.923	33

Table 2. KMO Inspection and Bartlett Sphericity Inspection

scale	KMO value	Bartlett's Sphericity Test		
		Approximate chi square distribution	df	Sig.
Questionnaire Total Table	.821	6282.911	496	.000

3.2 Goodness of fit test

The Goodness of fit test refers to the goodness of fit of the regression equation to the sample observation value[8]. For multiple linear regression analysis, the R^2 value is usually required to be greater than 0.80. Through SPSS21.0 statistical software, the regression equation results show that the Goodness of fit R^2 values of the model are 0.926, and the adjusted R^2 values are 0.924, both greater than 0.80, indicating that the model has a high degree of fitting and the regression effect of sample data is very good (see Table 3).According to the DW test results in Table 3 above, it can be seen that the Durbin Watson value is 2.009, which is close to the DW judgment value of 2, indicating that the possibility of autocorrelation can be ruled out.

Table 3. Goodness of fit of the model

model	R	R square	Adjusting the R square	Error in standard estimation	Durbin-Watson
1	.962	.926	.924	.221	2.009

3.3 Finspection

The F-test is a significance test of the regression equation to test the combined effect of all explanatory variables on the explained variables[9]. The F-test result of regression equation shows that the F value is 379.902, and the significance level is 0.000, which is less than the decision value of 0.05, indicating that there is a linear regression relationship between independent variable and dependent variable Y (as shown in Table 4).

Table 4. Analysis of variance

Model	Sum of squares	df	mean square	F	Sig
regression	167.274	9	18.586		
residual	13.307	272	.049	379.902	.000[a]
total	180.582	281			

3.4 Collinearity test

Collinearity is an important problem in regression equation testing (as shown in Table 5). If there is a multicollinearity problem, it can cause inaccurate regression parameter values, which may result in some regression coefficients being significant but not passing the test, or the regression coefficients not being reasonable[10].

Table 5. Regression Coefficient Table

model	Non standardized coefficient		Standard coefficient	t	Sig.	Collinearity statistics	
	B	error	Beta			tolerance	VIF
Constant	3.929	.013		298.303	.000		
X1	.194	.026	.242	7.573	.000	.265	3.779
X2	-.044	.021	-.054	-2.109	.036	.408	2.449
X3	.222	.024	.276	9.097	.000	.294	3.406
X4	.163	.032	.203	5.173	.000	.175	5.707
X5	.091	.018	.114	4.939	.000	.510	1.959
X6	.095	.017	.119	5.626	.000	.605	1.653
X7	.195	.019	.244	10.073	.000	.464	2.157
X8	.011	.015	.014	.789	.431	.823	1.215
X9	.053	.014	.067	3.811	.000	.889	1.125

Usually, the variance expansion factor (VIF) is used to judge whether there is multicollinearity, whose value is between 1~∞. The larger the VIF value, the greater the possibility of collinearity between independent variables. If the VIF value exceeds 10, it is considered that this variable has collinearity with other explanatory variables. According to the VIF values, the independent variable VIF values are 3.779, 2.449, 3.406, 5.707, 1.959, 1.653, 2.157, 1.215 and 1.125, all less than 10, indicating that there is no multicollinearity problem between variables (as shown in Table 5).

3.5 Regression equation fitting

According to the test results, it can be seen that the significance level of the t-test for eight independent variables, namely teaching faculty ability X1, number of teaching objects X2, optimization of teaching content X3, selection of teaching methods X4, design of teaching processes X5, reform of teaching evaluation X6, situation of teaching facilities X7, and condensed teaching objectives X9, is lower than the judgment value of 0.05, with values of 0.000, 0.036, 0.000, 0.000, 0.000, 0.000, 0.000, respectively. This indicates that the t-test has been passed, there is a significant impact between the independent variable and the dependent variable, and the regression coefficients are 0.194, -0.044, 0.222, 0.163, 0.091, 0.095, 0.195, and 0.053, respectively (as shown in Table 5). Therefore, the fitted multiple linear regression equation is:

$$Y = 3.929 + 0.194X_1 - 0.044X_2 + 0.222X_3 + 0.163X_4 + 0.091X_5 + 0.095X_6 + 0.195X_7 + 0.053X_9 + \varepsilon \quad (2)$$

Among them, $X_1, X_2, \ldots, X_k$ is the independent variable, representing various factors that affect satisfaction; ε is a random Error term.

4 Research Conclusion

4.1 Based on information technology, visualization technology, and artificial intelligence technology, the "12467" characteristic online and offline hybrid teaching mode empowered by "OBE+creativity" has high student satisfaction.

From the research results, it can be seen that students are highly satisfied with the "12467" characteristic blended teaching model empowered by "OBE+creativity", with 90% being very satisfied, 6% being relatively satisfied, 2% being generally satisfied, and 2% being relatively dissatisfied. Among them, out of the 9 research variables, 8 of them passed the significance test and were included in the multiple linear regression equation, including X1, X2, X3, X4, X5, X6, X7, X9. The development of the teaching syllabus (X8) did not pass the significance test, there is no significant correlation with students' satisfaction with the teaching model. This result may be due to students' lack of understanding of how to formulate the teaching syllabus and their low level of perception of the teaching syllabus, which makes this research variable have no significant impact on students' satisfaction with the teaching model.

4.2 Although based on information technology, visualization technology, and artificial intelligence technology, the number of online and offline mixed teaching modes on this front line is inversely proportional to student satisfaction.

From the perspective of impact direction, there is a positive and negative correlation between the independent variable and the dependent variable. Among them, X1, X3, X4, X5, X6, X7, X9 have a positive impact on students' satisfaction with this teaching mode, while the number of teaching objects X2 has a significant negative correlation with the dependent variable, The more teaching objects there are, the lower the satisfaction of students with the teaching model.

It shows that this model is more suitable for small class teaching.It can be seen that although this mixed teaching model introduces information technology, visualization technology, and artificial intelligence technology, enhancing students' sense of experience, identification, and participation, it is not suitable for teaching more students. The better the teaching effect in small classes, and the stronger student satisfaction.So when improving this mixed online and offline teaching mode in the future, it is important to pay attention to the impact of the number of lectures on student satisfaction.

4.3 The optimization of online teaching content and the condition of online teaching facilities are key influencing factors, indicating that when improving students' satisfaction with online and offline blended teaching models, these two aspects need to be taken into account.

From the perspective of impact degree, by sorting the influence degree of factors, it can be seen that X3> X7> X1> X4> X6> X5> X9> X2. Among them, the optimization of teaching content and the condition of teaching facilities have a relatively high impact degree, 0.222 respectively and 0.195 are the main influencing factors for students' satisfaction with the teaching model. When improving students' satisfaction with teaching models, it is necessary to focus on two aspects: improving the design of online teaching content and increasing investment in online teaching software and hardware facilities.

(1) In terms of designing online teaching content, attention should be paid to the integration of teaching resources. On the one hand, draw on the teaching resources of online open learning platforms, and on the other hand, create online SPOC courses to continuously enrich teaching content and improve its applicability.

(2) In terms of investment in online teaching facilities, from the perspective of schools, we should increase the construction of campus information networks, smart classrooms, and smart screens to ensure the smooth use of content modules and interactive modules in the online education courses of Chaoxing. From the perspective of the Chaoxing online education network platform, we should actively and continuously optimize big data technology, actively use artificial intelligence technology, and effectively achieve human-computer interaction.

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