An empirical study on blended teaching satisfaction and its influencing factors—Based on structural equation model

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Abstract

Blended teaching plays an important role in higher education. Based on the full-perspective learning theory, this paper designed a questionnaire that included five factors, including individual characteristics, learning environment, interaction degree, learning effectiveness and learning satisfaction, and investigated the learning effectiveness and learning satisfaction of students participating 260 blended courses from a university in Hubei Province. The structural equation model of teaching satisfaction was established to analyze the influence of each factor on learning satisfaction. The results show that individual characteristics and interaction degree have a direct positive impact on learning effectiveness. Interaction degree and learning effectiveness have a direct positive impact on learning satisfaction. Interaction degree and learning effectiveness play a mediating role in the influence of individual characteristics and learning environment on learning satisfaction. Arranged in the order from strong to weak, the total effect of learning satisfaction is interaction degree, learning environment, learning effect and individual characteristics. It is suggested that in blended teaching, we should strengthen the degree of interaction, ensure the learning environment, and improve the learning effect.

Keywords

Blended teaching; Interaction degree; Learning effectiveness; Studying satisfaction; Structural equation model.

1. Introduction

Domestic and foreign scholars' research on blended teaching satisfaction mainly focuses on the comparison with traditional teaching methods, the evaluation of blended teaching satisfaction and the influencing factors of blended teaching satisfaction [1-4]. In order to further explore the hybrid learning satisfaction relationship between influence factors and influence degree, Liu Weitong based on learners' perspective, building five factors hybrid teaching structural equation model which contains individual characteristics, learning environment, the degree of interaction, learning achievement satisfaction, satisfaction, etc., analyzed various factors' direct effect and indirect effect and total effect on learning satisfaction[5]. Based on the structural equation model of influencing factors of blended learning satisfaction, Libao.et.al. studied the differences in influencing relationships among factors of learners with different learning styles [6].

A university in Hubei province started to build university-level online courses in 2016. By the end of July 2021, the university had built more than 260 online courses, which were online on platforms such as Super Star, Excellent Course Alliance, Love Course and Wisdom Tree. Starting from September 2020, some of the online courses have been built to implement hybrid teaching on campus. However, what is the student's blended learning experience (learning effectiveness and learning satisfaction)? Is there sufficient teacher-student interaction in the blended curriculum? What factors influence the learning effectiveness and satisfaction of blended teaching, and to what extent? How to improve students' blended learning experience? These are the problems that colleges and universities pay attention to when carrying out mixed teaching.

Based on the full-perspective learning theory, this paper designed a questionnaire that included five factors, including individual characteristics, learning environment, interaction degree, learning

effectiveness and learning satisfaction, and conducted a questionnaire survey on the learning effectiveness and learning satisfaction of 260 blended courses in this university in Hubei Province. The structural equation model of influencing factors of blended teaching satisfaction was established to empirically analyze the influencing factors and their influencing paths of blended learning effectiveness and satisfaction of students, and further put forward countermeasures or suggestions to improve students' blended learning experience based on the survey results and the results of structural equation model.

2. Theoretical basis and model hypothesis

2.1 Theoretical basis

The whole perspective learning theory proposed by Danish scholar Illeris mainly focuses on "two processes" and "three dimensions" to explain learning. "Two processes" refer to the "interaction process" between individuals and the environment and the "acquisition process" in which learners process learning materials and acquire learning content. The "acquisition process" includes learning content, motivation, emotion and interaction degree.

Based on the above all-perspective learning theory and taking learning environment into consideration, this paper constructs a hybrid learning satisfaction model, which contains five latent variables, including individual characteristics, learning environment, interaction degree, learning effectiveness and learning satisfaction.

2.2 Model hypothesis

A good learning environment can provide learners with a variety of learning methods, rich course resources and a large learning platform with perfect functions, which can motivate learners to be more actively involved in the course and have more in-depth communication and interaction with the learning environment. Therefore, this paper proposes hypothesis H1: Learning environment has a significant positive impact on the degree of interaction.

Individual characteristics indicate the emotional and personality characteristics of an individual. Blended teaching can combine the advantages of both online and offline teaching. This paper proposes hypothesis H2: individual characteristics have a significant positive impact on the degree of interaction.

Relevant studies show that the higher the degree of interaction between students, the higher the efficiency of students' learning, and the higher their satisfaction with the hybrid education model. This paper proposes hypothesis H3: interaction degree has a significant positive impact on learning effectiveness; H4: Interaction degree has a significant positive impact on learning satisfaction.

Learners with strong adaptability or a good learning attitude in the mixed teaching mode can learn more efficiently, have a stronger sense of gain, and have higher learning achievements and satisfaction. In addition, learners with higher learning achievements have a stronger sense of harvest, and their inner self-improvement makes them recognize the current situation and have a higher degree of satisfaction with blended teaching. This paper proposes hypothesis H5: Individual characteristics have a significant positive impact on learning achievement; H6: Individual characteristics have a significant positive impact on satisfaction; H7: Learning achievement has a significant positive impact on satisfaction.

3. Questionnaire design

The questionnaire is divided into six parts, including basic information, individual characteristics, learning environment, interaction degree, learning achievement and learning satisfaction, with a total of 20 questions. Except the basic information part, all other questions were scored by Likert 5-component scale. Among them, the basic information includes gender, grade, learning region and whether to use online teaching and other four variables (marked with Q1-Q4 variables). Individual characteristics include learning motivation, task value, self-effect and learning emotion (Q5-Q8). Learning environment is represented by four indicators (Q9-Q12), including platform experience,

resource richness, hardware facilities and online learning tools. The degree of interaction is indicated by four indicators (Q13-Q16), which are teacher interaction, teacher feedback, teacher-student interaction and student-student interaction. Learning effectiveness was expressed by two indicators (Q17-Q18), namely, learning efficiency and learning effect. Learning satisfaction mainly measures learners' confidence in the development of blended teaching and whether they are willing to participate in blended learning (Q19-20).

Using Questionnaire star platform to publish questionnaires, from March 15, 2021 to March 21, 2021, a total of 416 questionnaires were collected, of which 350 were valid, with an effective rate of 84.4%.

4. Result analysis

4.1 Sample information

There are 350 valid student samples in this paper, including 148 male students and 202 female students. Freshmen, sophomores, juniors and seniors accounted for 22.3%, 31.4%, 26.4% and 19.9% respectively. Students majored in arts 50.57%, science 43.71% and engineering 5.71%, respectively. The above sample structure is basically consistent with the proportion of the overall situation of students in the school, and the sample is representative to a certain extent.

4.2 Reliability and validity test

The reliability test was measured by the statistical Cronbach's coefficient. Validity test includes content validity test and result validity test. In this paper, experts review content validity and factor analysis method are used to test result validity. Cronbach's value of reliability test and KMO value of content validity test of each latent variable are shown in Table 1.

Table 1 shows that the overall reliability coefficient is 0.892, greater than 0.8, indicating high reliability of survey data. In addition, the reliability coefficients of individual characteristics, learning environment and interaction degree are all greater than 0.7, indicating high reliability of these survey data. The reliability coefficients of learning effectiveness and learning satisfaction were 0.619 and 0.559 respectively, indicating that the reliability of this part of data was acceptable. The KMO value of the overall validity test was 0.935, greater than 0.8, indicating high validity of the survey data. The KMO values of individual characteristics, learning environment and interaction degree were all greater than 0.7, and the KMO values of learning effectiveness and learning satisfaction were all 0.500, indicating that the validity of this part of data was acceptable.

**Table 1** Reliability test of each latent variable

Variable	Question number	Cronbach's Alpha	KMO value	Question amount
Individual characteristics	Q5-Q8	0.711	0.752	4
learning environment	Q9-Q12	0.701	0.741	4
interaction degree	Q13-Q16	0.714	0.744	4
learning effectiveness	Q17-Q18	0.619	0.500	2
learning satisfaction	Q19-Q20	0.559	0.500	2
overall	Q5-Q20	0.892	0.935	16

4.3 Model fitting

Based on the above hypothesis and indicators of latent variables, Amos22.0 software was used to establish the initial model of blended teaching satisfaction. After fitting the initial structural equation model, it can be seen from its parameter test value that the impact of individual characteristics on learning satisfaction is not significant at the 10% level, so the path is deleted and adjusted to obtain the model as shown in Figure 1 below. From Figure 1 and corresponding test values of each indicator variable, it can be seen that C.R. critical values of each indicator variable and path coefficient were all greater than or close to 2, and P values were significant at the 10% level. The parameters of the

adjusted learning satisfaction model are reasonable and the significance test basically passes. The path coefficients between latent variables and their parameter test values are shown in Table 2.

Figure 1 Fitting results of structural equation model after adjustment
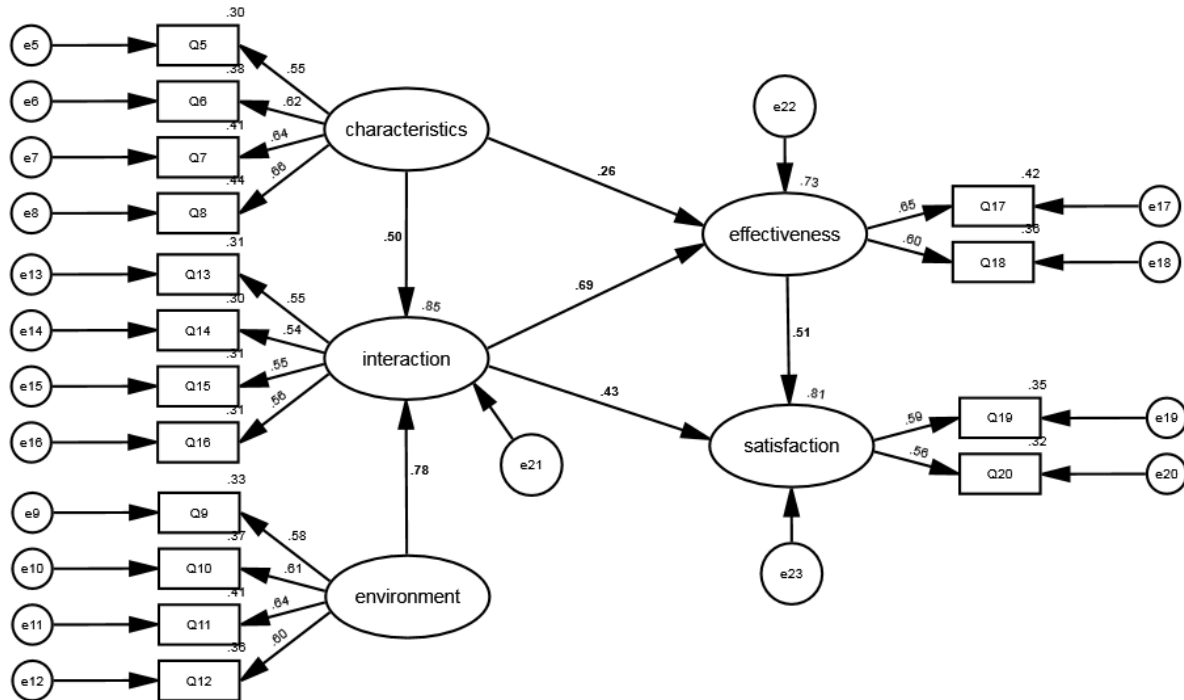
Table 2 Path coefficients and parameter test values of the structural equation model after adjustment

	path		estimate	S.E.	C.R.	P
interaction	<---	environment	0.781	0.117	6.677	***
interaction	<---	characteristics	0.503	0.095	5.320	***
effectiveness	<---	characteristics	0.258	0.136	1.897	0.058
effectiveness	<---	interaction	0.692	0.122	5.680	***
satisfaction	<---	interaction	0.433	0.247	1.755	0.079
satisfaction	<---	effectiveness	0.509	0.262	1.945	0.052

As can be seen from Table 2, the standardized path coefficients of learning environment on interaction degree, individual characteristics on interaction degree, and interaction degree on learning effect are 0.781, 0.503 and 0.692, respectively, and all have significant positive effects at the level of 1%. The standardized path coefficients of individual characteristics on learning effectiveness, interaction degree on learning satisfaction, and learning effectiveness on learning satisfaction were 0.258, 0.433, and 0.509, respectively. These coefficients had a positive influence at the level of 10%. It indicates that in the original hypothesis, all hypotheses are significant except H6 (individual characteristics positively affect learning satisfaction).

In addition, the chi-square value (CMIN), Chi-square degree of freedom ratio (CMIN/DF), root mean square residual (RMR), goodness of fit index (GFI) and root mean square of approximate error (RMSEA) were used to test the fitting degree of the adjusted learning satisfaction model. The CMIN/DF value of the satisfaction model after adjustment was 3.002, which met the fitting standard. RMR value = 0.000 < 0.05, RMSEA value = 0.076 < 0.08, GFI value = 0.918 > 0.90, ADFI value =0.886> 0.8, all meet the requirements of fitting standards. In conclusion, the modified blended

learning satisfaction structural equation model has a high degree of fitting, and the model results are robust and reliable.

4.4 Effect analysis

The direct effect, indirect effect and total effect among potential variables are shown in Table 3.

Table 3 Effect value decomposition of the structural equation model of blended teaching satisfaction

effect	Latent variable	characteristics	environment	interaction	effectiveness
direct effect	interaction	0.50	0.78		
	effectiveness	0.26		0.69	
	satisfaction			0.43	0.51
indirect effect	effectiveness	0.35	0.54		
	satisfaction	0.51	0.61	0.35	
total effect	interaction	0.50	0.78		
	effectiveness	0.61	0.54	0.69	
	satisfaction	0.51	0.61	0.78	0.51

As shown in Table 3, both individual characteristics and learning environment have direct effects on the degree of interaction, with standard direct effect values of 0.50 and 0.78, respectively. Individual characteristics and interaction degree have direct effects on learning effectiveness, and the standard direct effect value is 0.26 and 0.69. Both interaction degree and learning effectiveness have direct effects on learning satisfaction, and the standard direct effect value is 0.43 and 0.51.

The indirect effect value is calculated by multiplying the direct effect value of the multipath. Individual characteristics and learning environment have no direct influence on learning satisfaction, but have indirect influence on learning satisfaction through the mediating effect of interaction degree and learning effectiveness, with standard indirect effect value of 0.52 and 0.61 respectively. Learning environment has no direct effect on learning effectiveness, but has an indirect effect on learning effectiveness through the mediating effect of interaction degree, and the standard indirect effect value is 0.54 respectively. Although the degree of interaction has a direct effect on learning satisfaction, it still has a standard indirect effect value of 0.35 through the mediating effect of learning effectiveness.

The total effect value is the sum of direct effect value and indirect effect value. The total effect of individual characteristics, learning environment, interaction degree and learning effect on learning satisfaction is 0.51, 0.61, 0.78, 0.51, respectively. The total effect of each factor on learning satisfaction is interaction degree, learning environment, learning effect and individual characteristics from strong to weak.

5. Conclusions and suggestions

Based on the full-perspective learning theory and questionnaire data, this paper constructed the structural equation model of blended teaching satisfaction, tested and revised it, and analyzed the direct effect, indirect effect and total effect of various influencing factors of blended learning effectiveness and learning satisfaction. The conclusions and suggestions are as follows:

(1) The degree of interaction has a direct impact on satisfaction, and the overall effect is the largest. In blended teaching, some students lack independent learning ability and are prone to burnout and other negative emotions, resulting in poor learning quality. Teachers can design a variety of teaching activities to mobilize students' enthusiasm and participation. The teaching process should actively give students emotional support and cognitive support. At the same time, students should actively

participate in the study and discussion of the course to create a good learning atmosphere, so as to improve students' learning performance and satisfaction.

(2) Learning effectiveness has a direct impact on satisfaction. Students' satisfaction with blended teaching can be improved by achieving good learning results in blended teaching. This means that in order to improve the satisfaction of blended teaching, it is an effective way to enhance students' sense of achievement in learning.

(3) Learning environment has a great indirect impact on satisfaction. The better the learning network environment, the higher the enthusiasm of teachers to carry out mixed teaching, and the better the enthusiasm of students to learn. The higher quality of learning resources are and the wider the scope of data can be shared, the higher students' satisfaction with blended teaching will be.

(4) Individual characteristics have a certain indirect impact on satisfaction. Learners with strong learning ability can participate in interpersonal interaction more actively, and have higher perception of their own learning results and teaching satisfaction. Therefore, in the long run, it is very important for teaching to cultivate learners' learning ability.

(5) Interaction degree and learning effectiveness play a mediating role in the indirect influence of individual characteristics and learning environment on satisfaction. By improving students' learning ability and creating a high-quality exchange environment, it can promote the degree of interaction and improve students' learning results, thus producing a positive linkage effect on satisfaction.

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