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Analysis on the Determinants of University Students' Online Learning Satisfaction under the Repeated Pandemic Attack: an Empirical Study Based on Structural Equation Model

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Abstract: The measurement of online learning satisfaction of university students by structural equation model (SEM) finds that students' self-management ability has the greatest impact on learning satisfaction, followed by teaching satisfaction, and teacher-student interaction satisfaction. The platform satisfaction has the smallest impact, but its total effect is the largest and most significant. The direct effect of platform satisfaction is less than its indirect effect, which indicates that mediating variables such as teachers' teaching and teacher-student interaction have strong influence. Teachers and students should try to be familiar with the platform operation. Internet ability of teachers and students has a significant positive impact on satisfaction; The richer the teaching forms of teachers, and the more advanced and diverse the internet tools of students, the lower the learning satisfaction; Girls' online teaching experience is worse than boys', and they prefer offline teaching. In the future, online teaching should not unilaterally pursue the diversity of teaching forms, but should give priority to improving the Internet ability of teachers and students, improve students' self-management ability, and also pay attention to psychological counseling for girls.

Keywords: Online Learning; Satisfaction; Structural Equation Model; Determinants; Total Effects

1. Introduction

At the beginning of 2020, the sudden outbreak of the Pandemic compelled higher education institutions across the country to swiftly transition to online teaching, which soon achieved comprehensive coverage across all academic fields. During the pandemic, 97.1% of college students nationwide participated in online learning [1]. The rapid expansion of online learning not only accelerated the transformation of college teaching models but also reshaped perceptions of teaching and learning. How, then, did faculty and students perceive this shift to online teaching? What efforts should educators, students, and educational authorities make to enhance the effectiveness of online instruction? To conduct a thorough analysis and accurate evaluation of the teaching outcomes and students' satisfaction with online teaching during this period, and to draw lessons for future online teaching initiatives, it is essential to employ methods such as the Structural Equation Model to measure and analyze students' satisfaction with online teaching.

The Pandemic served as both an initial exposure for teachers and students to online teaching and a comprehensive test of its implementation. Under conditions of limited prior experience, all educators and learners were compelled to adapt hastily. Post-pandemic education should not simply revert to offline teaching; instead, it should vigorously develop blended teaching that integrates online and offline approaches, building on the lessons learned from this round of online instruction. Accurately identifying the multidimensional facets of students' satisfaction with online teaching, exploring the key influencing factors of online teaching satisfaction among college students, and measuring the magnitude and direction of their impact hold significant theoretical and practical importance for helping educational administrators and teachers enhance students' satisfaction with online learning in a targeted manner.

2. Literature Review

With the advancement of information technology and educational practices, online learning has become a significant means for

college students to acquire knowledge and develop skills. The 2015 Babson Report in the United States indicated that online teaching has entered the mainstream, with over 25% of American students enrolled in at least one online course [2]. Comparisons of the differences between online and offline teaching have prompted in-depth research into the influencing factors of students' satisfaction with online teaching. Among these studies, Arbaugh et al. (2018) focused on identifying the key influencing factors of online teaching satisfaction of college students [3].

Teaching satisfaction. Simon et al. (2020) investigated the impact of instructional technology on the experience of the online teaching audience [4]. Eom (2016) examined the influence of factors such as the teacher's role and course design on students' satisfaction with online teaching [5]. Bai Xiaohan et al. (2025) note that online teaching satisfaction exerts a significant positive influence on the support for online teaching [6].

Students' self-management ability. Wu Daguang and Shen Zhonghua (2020) posited that learning motivation, learning style, online self-efficacy, and learning stage affect students' satisfaction with online learning [7]. From the perspective of learning motivation, Yin Rui and Xu Huanyun (2017) found that the fulfillment of needs is a significant influencing factor for students' satisfaction with online learning [8]. Simon et al. discussed the importance of students' learning reflection [4], while Eom specifically examined the impact of learning motivation and other factors on students' satisfaction with online teaching [5].

Teacher-student interaction satisfaction. Sebastianelli et al. (2015) note that, compared to in-person teaching, online teaching entails a separation in time and space between teachers and students [9]. You Jianxin and Wang Cenlan (2020) argue that effective online learning requires both teachers and students to possess strong communication awareness [10]. Simon et al. discuss the necessity of online teacher-student interaction [4]. Eom examines the impact of teacher-student interaction on students' online learning effectiveness and satisfaction [5], while Cornell et al. (2019) suggest that a constructive feedback mechanism should be established between teachers and students in online teaching [11]. Liu Chunrong (2024) note that, effective teacher-student interaction in online teaching enhances learning outcomes for college students [12]. Yuan Xiaowen (2025) found that online teaching interactions facilitated by internet technology can not only enhance students' learning efficiency but also enrich the content of classroom instruction [13].

Platform satisfaction. Shih et al. (2019) posit that a well-designed personalized virtual environment positively contributes to enhancing students' online learning effectiveness [14]. Simon found that information technology exerts a significant influence on satisfaction with online teaching [4]. Wang Chaoying and colleagues argue that as information technology becomes increasingly integrated into education, innovative teaching models and multidimensional assessment methods enabled by information technology can help meet students' needs for personalized learning. They further suggest that such approaches enhance students' abilities in self-monitoring, reflection, and collaborative communication [15].

Based on the existing literature, the fundamental constructs of online teaching satisfaction of college students should encompass teachers' teaching satisfaction, students' self-management satisfaction, teacher-student interaction satisfaction, and platform satisfaction. To conduct an in-depth analysis and accurately measure the subjective experience of college students regarding online teaching, it is necessary to employ a Structural Equation Model for a multidimensional construction of online teaching satisfaction of college students. This approach facilitates the analysis of how each construct influences overall satisfaction and explores effective pathways for steadily enhancing satisfaction with online teaching.

3. Research Design

3.1 Structural Equation Model

A complete Structural Equation Model consists of two components: a measurement model and a structural model [12]. The four constructs of online teaching satisfaction of college students — teachers' teaching satisfaction, students' self-management satisfaction, teacher-student interaction satisfaction, and platform satisfaction — are latent variables that cannot be directly observed. Therefore, a measurement equation must be established for each construct, using

observable variables to measure them. These constructs are not independent of one another; complex structural relationships often exist among latent variables, which can be measured using structural equations.

The Structural Equation Model offers distinct advantages over traditional regression analysis, as it can measure latent variables that are not directly observable, explore the hidden relationships between these latent variables, and evaluate the reliability and validity of measurement scales. This makes it particularly suitable for investigating college students' satisfaction with online teaching. Employing the Structural Equation Model, this study aims to identify the influence of various latent and measurement variables on the overall satisfaction with online teaching, clarify their structural relationships, and propose strategies to promote the steady development of online instruction.

3.2 Item Development

To measure online teaching satisfaction of college students and explore the relationships among latent variables, it can be divided into five constructs: overall satisfaction (Total), self-management satisfaction (Self), teaching satisfaction (Teaching), interaction satisfaction (Interact), and platform satisfaction (Platform).

Overall satisfaction serves as the explained variable in this study. Existing literature typically measures overall satisfaction based on items such as general perception, willingness to repeat the experience, and perceived advantages over traditional methods. Accordingly, it is hypothesized that overall satisfaction is positively correlated with the following three observable variables.

H1: Overall perception is positively correlated with overall satisfaction.

H2: Willingness to continue online teaching after the pandemic is positively correlated with overall satisfaction.

H3: Perceived advantages of online teaching compared to offline teaching are positively correlated with overall satisfaction.

Shih et al. (2019) posit that students' self-management ability is related to their personal traits, as well as their knowledge needs and academic orientation [11]. Consequently, it is hypothesized that students' self-management satisfaction is positively correlated with the following three characteristics.

H4: Clarity of learning objectives is positively correlated with self-management satisfaction.

H5: Effort to keep pace with the teaching rhythm is positively correlated with self-management satisfaction.

H6: Extent of pre-class preparation is positively correlated with self-management satisfaction.

Satisfaction with teacher instruction is undoubtedly the most significant influencing factor on the online teaching satisfaction of college students. Based on relevant literature concerning teacher instruction and student learning satisfaction, the following four hypotheses are proposed.H7: Teacher conscientiousness is positively correlated with teaching satisfaction.

H8: Clarity of instruction is positively correlated with teaching satisfaction.

H9: The richness of provided resources is positively correlated with teaching satisfaction.

H10: The effectiveness in maintaining classroom order is positively correlated with teaching satisfaction.

Platform satisfaction is primarily related to the tools, internet speed, fluency, and stability of the teaching platform used by students during online teaching. Correspondingly, the following four hypotheses are proposed.

H11: Platform popularity is positively correlated with platform satisfaction.

H12: Platform maturity and stability are positively correlated with platform satisfaction.

H13: Platform ease of learning and use is positively correlated with platform satisfaction.

H14: Platform audio and video quality is positively correlated with platform satisfaction.

The focus of teacher-student interaction is to make students feel the teacher's attention, guidance, and assistance. Based on existing literature, it is hypothesized that interaction satisfaction has a positive influence on four observable variables.

H15: The frequency of teachers calling on students to answer questions is positively correlated with teacher-student interaction satisfaction.

H16: The perceived level of teacher attention is positively correlated with teacher-student interaction satisfaction.

H17: The extent to which teachers provide help and guidance is positively correlated with teacher-student interaction satisfaction.

H18: The diversity of teacher-student interaction forms is positively correlated with

teacher-student interaction satisfaction.

As illustrated in Figure 1, overall satisfaction, self-management satisfaction, teachers' teaching satisfaction, platform satisfaction, and teacher-student interaction satisfaction are measured by the following observable variables: g11, g12, and g13; g21, g22, and g23; g31, g32, g33, and g34; g41, g42, g43, and g44; and g51, g52, g53, and g54, respectively. The numbering scheme for these observable variables is detailed in Table 1.
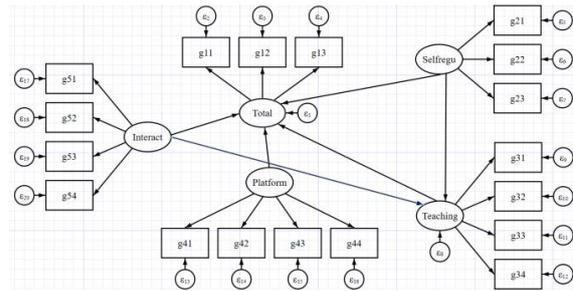

Figure 1. Theoretical Model of Factors Influencing College Students' Satisfaction with Online Teaching

Table 1. Online Teaching Satisfaction Evaluation Index System

Evaluation variable	Evaluation Criteria	Item Symbol
Overall Satisfaction	Overall Impression	G11
	Willing to Continue After the Pandemic	G12
	Advantages of online teaching	G13
Self-Management Satisfaction	Degree of Clarity in Learning Objectives	G21
	Effort to keep up with the pace	G22
	Degree of preparation before class	G23
Teacher Teaching Satisfaction	Teacher's Diligence and Responsibility	G31
	Clarity of Explanation	G32
	Abundance of Resources	G33
	Degree of Maintaining Classroom Order	G34
Teaching Platform Satisfaction	Popularity of the platform	G41
	Platform Maturity and Stability	G42
	Ease of use of the platform	G43
	Platform audio and video effects	G44
Teacher-Student Interaction Satisfaction	Frequency of teacher calling on students for questions	G51
	Degree of teacher's attention	G52
	Teacher Provides Help and Guidance	G53
	Diversity of interactive forms	G54

After establishing the relationships between the five latent variables and their corresponding observed variables through the measurement model, it is necessary to further explore the relationships among the latent variables based on the structural model. To this end, eight hypotheses concerning the structural equations are proposed.

H19: Students' self-management ability is positively correlated with overall satisfaction.

H20: Teachers' teaching satisfaction is positively correlated with overall satisfaction.

H21: Platform satisfaction is positively correlated with overall satisfaction.

H22: Teacher-student interaction satisfaction is positively correlated with overall satisfaction.

H23: Students' self-management ability is positively correlated with teachers' teaching satisfaction.

H24: Teacher-student interaction satisfaction is positively correlated with teachers' teaching satisfaction.

H25: Platform satisfaction is positively correlated with teacher-student interaction satisfaction.

H26: Platform satisfaction is positively correlated with teachers' teaching satisfaction.

3.3 Scale Design and Data Collection

The survey targeted college students enrolled at a particular university who participated in online teaching in 2022. The questionnaire comprised six dimensions: overall satisfaction of online teaching, students' self-management satisfaction, teachers' teaching satisfaction, platform satisfaction, and teacher-student interaction satisfaction, which were measured through 18 items, along with 10 questions capturing the respondents' demographic characteristics. The design of the questionnaire primarily drew upon evaluation indicators for online teaching satisfaction proposed by Wu

Daguang and Shen Zhonghua (2020) and Chen Yaoli and Tang Wanmei (2018), among others [13,14]. A seven-point Likert scale was adopted for scoring each indicator, ranging from "very satisfied" (7 points) to "very dissatisfied" (1 point). After removing items with excessively low factor loadings from the initial questionnaire, the final version consisted of 18 measurement variable items and 10 demographic items (see Table 1).

A total of 372 questionnaires were distributed, with 340 valid responses collected, resulting in an effective response rate of 91.4%. Given the confirmatory nature of the analysis, it was necessary to first assess the reliability and validity of the sample. The results of the relevant tests are presented in Table 2.

Table 2. Results of Overall Reliability and Validity Testing for the Scale

Inspection Indicator	Test statistic	Inspection Conclusion
Cronbach's Alpha	0.9641	Very Good
Bartlett's Test Statistic	Chisq=6162.489	Good
	Df=153	
	P=0.0000	
KMO Test Statistic	0.9456	Very Good

3.4 Test of Overall Reliability and Validity of the Scale

Following the completion of the scale design, the internal consistency of the scale variables was primarily assessed using Cronbach's alpha coefficient. As shown in Table 2, the scale achieved a Cronbach's alpha of 0.9641, indicating an overall reliability that is "excellent." Both exploratory factor analysis and confirmatory factor analysis require an examination of the correlation among scale variables and the homogeneity of variance. In this study, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were employed to evaluate these properties. Table 2 indicates that the p-value for Bartlett's test of sphericity is 0.0000, which means the correlation matrix is significantly different from an identity matrix. The KMO statistic is 0.9456, suggesting that the scale variables exhibit a high degree of correlation and are highly suitable for confirmatory factor analysis.

4. Measurement Result

Demographic characteristics of the survey subjects.
Table 3 presents the demographic characteristics

of the respondents. In terms of gender, males accounted for 44.7% and females for 55.3%, which is generally consistent with the gender structure in higher education where female students outnumber males. Regarding academic year, sophomores and juniors constituted a high proportion of 89.1%, which can represent the overall perspective of the main student body in colleges on online teaching. As for place of origin, the respondents were primarily from county towns, prefecture-level cities, and small towns, with these three categories collectively accounting for 74.8%, a figure that aligns with China's urbanization level. However, students from rural areas comprised a notable 15%, indicating that internet speed may be one of the key factors influencing the online teaching satisfaction of college students.

Table 3. Demographic Characteristics of Survey Subjects

Category	Frequency	Percentage (%)
Gender		
Male	152	44.7
Female	188	55.3
Total	340	100
Grade		
Freshman	66	19.4
Sophomore	132	38.8
Junior	137	40.3
Senior	5	1.5
Total	340	100
Home Location		
Rural	51	15
Town	80	23.5
County Seat	95	27.9
Prefecture-Level City	83	24.4
Provincial capital city	31	9.1
Total	340	100

Table 4 shows that the composite reliability (CR) and Cronbach's alpha (CA) values for all constructs exceed 0.87, indicating high reliability of the latent variables. The average variance extracted (AVE) for each construct is greater than 0.69, demonstrating good convergent validity. The CA, CR, and AVE values for all five measurement equations meet the requirements for confirmatory factor analysis. The loadings of each latent variable on its observable variables are all significantly greater than 0.75, which suggests that the measurement model possesses strong measurement capability.

Regarding discriminant validity, following the

approach of Fakhar Shahzad et al. (2019), Table 5 presents the test results, which indicate that the correlation coefficients between constructs are all lower than the square root of their respective average variance extracted (AVE). As shown in Table 5, the square root of the AVE for each latent variable exceeds the maximum correlation coefficient between that latent variable and any other latent variable. This demonstrates that the measurement variables possess satisfactory discriminant validity.

Table 4. Estimation Results of the Modeling Model

Model Structure	Metric	Standard Load	Standard error	Z	P	CA*	CR	AVE
Overall Satisfaction	Overall Perception	0.899	0.0138	65.11	0	0.8947	0.8988	0.7485
	Perceived overall effect	0.923	0.0121	76.1	0			
	Self Satisfaction	0.7942	0.0225	35.25	0			
Satisfaction with Self-Management	Clarity of Learning Objectives	0.8224	0.0218	37.77	0	0.8724	0.8741	0.6988
	Effort Level	0.886	0.0175	50.54	0			
	Level of pre-class preparation	0.8053	0.0233	34.6	0			
Satisfaction with Teacher Instruction	Level of Responsibility	0.9251	0.0102	90.72	0	0.9372	0.9375	0.7895
	Clarity of Explanation	0.9037	0.012	75.41	0			
	Resource richness	0.85	0.0168	50.52	0			
	Degree of maintaining classroom order	0.8844	0.0138	64.17	0			
Satisfaction with Teaching Platform	Platform Popularity	0.8849	0.0141	62.84	0	0.934	0.9346	0.782
	Platform Maturity and Stability	0.8989	0.0129	69.55	0			
	Ease of use and learnability of the platform	0.8572	0.0165	51.98	0			
	Platform audio and video quality	0.89	0.0136	65.49	0			
Satisfaction with Student-Teacher Interaction	Teacher's frequency of calling on students for questions	0.866	0.0159	54.53	0	0.9232	0.9249	0.7558
	Perceived level of teacher attention	0.9308	0.0108	85.97	0			
	Teacher's assistance and guidance	0.8207	0.0202	40.7	0			
	Diversity of Interaction Forms	0.8524	0.0172	49.57	0			

Note: * CA is the acronym for Cronbach's alpha.

Table 5. Comparative Analysis of Correlation Coefficients between Constructs and AVE Square Root

	Overall satisfaction	Satisfaction with Self-Management	Teacher Teaching Satisfaction	Satisfaction with Teaching Platform	Satisfaction with Teacher-Student Interaction
Overall Satisfaction	1				
Self-Management Satisfaction	0.7281***	1			
Teacher Instruction Satisfaction	0.7226***	0.6584***	1		
Teaching Platform Satisfaction	0.6958***	Overall satisfaction	0.7738***	1	
Teacher-Student Interaction Satisfaction	0.6779***	0.6188***	0.6966***	0.7139***	1
AVE Square Root	0.8652	0.8359	0.8885	0.8843	0.8694

Figure 2 presents the fitting results of the initial model. The modification index (MI) between students' self-management ability and platform satisfaction reached as high as 155.825, indicating the need to add a relevant path to modify the model. Although the sample size was large, the CMIN/DF value of the model was 5.5545, which suggests that modification was necessary. The fitting results of the final modified model are shown in Figure 3.
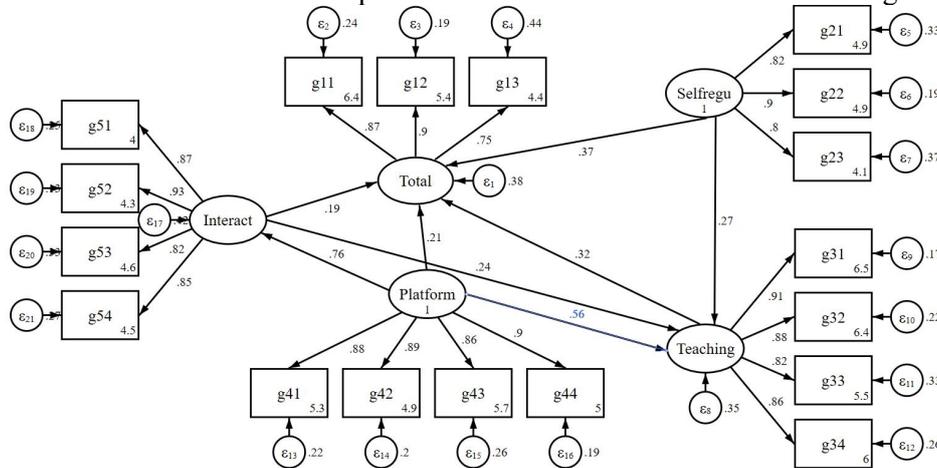

Figure 2. Initial Model of Influencing Factors on College Students' Satisfaction with Online Teaching
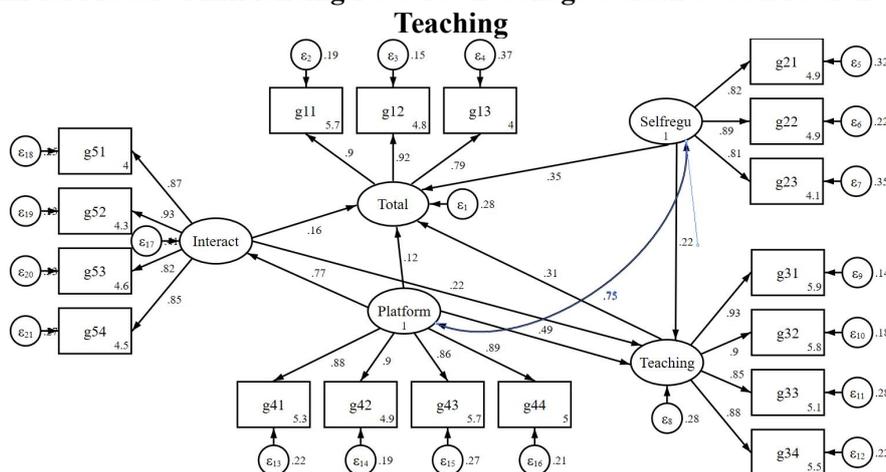

Figure 3. Revised Model of Factors Influencing College Students' Satisfaction with Online Teaching

Compared to the initial model, the revised model demonstrates a significant improvement in fit. Notably, the factor loading of the latent variable overall satisfaction on its third observed variable, G13, increased from 0.75 to 0.79. The influence of platform satisfaction on teacher-student interaction shows a slight increase, while its effect on teaching quality exhibits a marked decrease. This pattern aligns more closely with the actual situation.

Table 6 indicates that the majority of evaluation indicators suggest a good fit for the structural equation model of online teaching satisfaction among college students. The chi-square/degrees of freedom ratio, which is greater than 2 and less than 5, shows that the established model is acceptable. Given a sample size of 340 observations, a chi-square/degrees of freedom

value of 3.93 indicates a very good model fit. Values of CFI > 0.90, NFI > 0.90, RMSEA 0.90 all demonstrate an excellent model fit. While an AGFI > 0.80 suggests the model fit is acceptable, a GFI < 0.90 reveals that the model still has some shortcomings.

Table 6. Evaluation of Structural Equation Modeling Fit Results

Goodness of Fit Indicator	Adaptation value	Whether it meets the fitting standards
AGFI	0.806	Compliant
GFI	0.857	Compliant
RMSEA	0.093	Compliant
Incremental Fit Index		
CFI	0.94	Compliant
TLI	0.927	Compliant
NFI	0.921	Compliant

Parsimonious Fitness Index		
PNFI	0.759	Compliant
PGFI	0.631	Compliant
CMIN/DF	495.210/126=3.930	Acceptable
Residual Size Indicator		
SRMR	0.044	Compliant
CD	0.989	Compliant
Information Criterion Index		
AIC	12389.971	Compliant
BIC	12562.274	Compliant

To enhance the interpretability of the model, the structural equation model was further refined under the constraint that the modification index should be less than 4. The final model, as shown in Figure 4, was thereby determined. In this final model, the coefficients of all variables remained unchanged, while only the variances of the residuals for a few variables exhibited minor and statistically insignificant adjustments. This indicates that the model possesses a high degree of robustness.
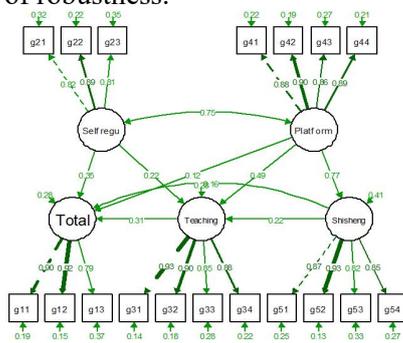

Figure 4. Final Model of Influencing Factors on College Students' Satisfaction with Online Teaching

Based on the eight hypotheses proposed earlier regarding the relationships among the five latent variables, Table 7 presents the estimation results of the structural model. As shown in Table 7, the influence of the four constructs on the online teaching satisfaction of college students follows this order: students' self-management satisfaction, teacher teaching satisfaction, teacher-student interaction satisfaction, and teaching platform satisfaction. The impact of teaching platform satisfaction on overall satisfaction is not statistically significant. The factors affecting teacher teaching satisfaction, in descending order of influence, are teaching platform satisfaction, students' self-management satisfaction, and teacher-student interaction satisfaction. Additionally, teaching platform satisfaction exerts a decisive influence on teacher-student interaction satisfaction. These findings are fully consistent with the eight hypotheses stated earlier, indicating that the Structural Equation Model possesses high content validity.

Table 8 shows that teaching platform satisfaction has the greatest impact on the overall satisfaction of online teaching, followed by students' self-management satisfaction, then teacher teaching satisfaction, with teacher-student interaction satisfaction having the weakest influence. Although teaching platform satisfaction exhibits the largest total effect on overall satisfaction, its direct effect is smaller than its indirect effect. This indicates that the mediating variable exerts a strong influence, which should be emphasized. All participants in online teaching should become familiar with platform operations and fully utilize its relevant functions.

Table 7. Estimation Results of Structural Model

latent variable	Model structure	Standardized Loadings	Std.err.	Z	P
Satisfaction with Self-Management→	Overall Satisfaction	0.3544***	0.0641	5.53	0
Satisfaction with Teacher's Instruction→	Overall Satisfaction	0.3148***	0.0743	4.24	0
Satisfaction with Teaching Platform→	Overall Satisfaction	0.1173	0.0834	1.41	0.16
Satisfaction with Teacher-Student Interaction→	Overall Satisfaction	0.1626**	0.0636	2.56	0.011
Satisfaction with Self-Management→	Teacher teaching satisfaction	0.2197***	0.0591	3.72	0
Satisfaction with Teaching Platform→	Teacher Teaching Satisfaction	0.4949***	0.0674	7.35	0
Satisfaction with Teacher-Student Interaction→	Teacher teaching satisfaction	0.2166***	0.0591	3.66	0
Satisfaction with Teaching Platform→	Teacher-student interaction satisfaction	0.7712***	0.0262	29.4	0

Table 8. Direct and Indirect Effects of Online Teaching Satisfaction among College Students

Hypothesis	Direct Effect	Indirect effect	Total effect	Z
Self-Management Satisfaction → Overall Satisfaction	0.3428***	0.0669***	0.4098***	6.31
Teacher Teaching Satisfaction → Overall Satisfaction	0.2982***	No Path	0.2982***	4.14
Teaching Platform Satisfaction → Overall Satisfaction	0.1094	0.3115***	0.4210***	6.81
Teacher-Student Interaction Satisfaction → Overall Satisfaction	0.1265**	0.0531***	0.1795***	3.57

Table 8 also indicates that teacher teaching satisfaction does not have an indirect effect on overall satisfaction. While experience suggests a correlation should exist between teacher teaching satisfaction and teacher-student interaction satisfaction, the model test does not support this empirical conclusion. Therefore, there is no indirect effect between teacher teaching satisfaction and overall satisfaction.

5. Impact of Characteristic Variables

Following the approach of Shen Zhonghua and Wu Daguang (2020), after obtaining the estimation results of the Structural Equation Model, linear regression was further conducted to explore the influencing factors of online learning satisfaction in greater depth. In these regressions, the five constructs of online teaching satisfaction of college students served as the dependent variables, while the basic demographic characteristics of the respondents were used as the explanatory variables [13]. The respondents' basic demographic characteristics primarily included: gender, grade level, location for receiving online courses, the teacher's online teaching mode, the terminal device used for online courses, network fluency, the teacher's network competence, the student's network competence, online classroom discipline, and willingness to continue participating in blended teaching. To facilitate the study, all items in the survey questionnaire were scored positively. Specifically, for the gender variable, male was coded as 0 and female as 1. The variable for class location was an ordinal variable based on the administrative level or scale of towns and villages. The results of the linear regression analysis are presented in Table 9.

Table 8 indicates that, overall, the variables exerting a significant influence on the five constructs are, in order, teachers' internet competence, students' internet competence, students' grade level, willingness to continue online teaching after the pandemic, acceptance of online course attendance requirements, gender, and class location. Other variables are generally not significant. Among these, both teachers' internet competence and students' internet competence have a significant positive impact on all five constructs, suggesting that enhancing the internet application skills of both teachers and students, as well as their familiarity with the platform, contributes to higher student satisfaction with online learning.

Students' grade level and their acceptance of online course attendance requirements show a relatively significant positive influence on the five constructs. This implies that students in higher grades are more likely to appreciate the challenges of online teaching, and those more willing to accept attendance constraints tend to report higher satisfaction with online teaching. The regression coefficient for class location was significantly positive in the models for teaching satisfaction and platform satisfaction, while it was not significantly positive in the other three constructs. This indicates that larger cities, with more stable and smoother internet connectivity, are associated with higher student satisfaction with online teaching, whereas students in rural areas tend to report lower satisfaction.

The willingness to continue online teaching after the pandemic had a significantly positive impact on overall satisfaction, teaching satisfaction, and teacher-student interaction satisfaction, and also showed a positive influence on the other two constructs. This suggests that the desire to resume online instruction primarily affects teaching quality and teacher-student interaction, which in turn positively influences overall satisfaction.

In the models for the five constructs, the coefficient for gender was negative across all, and significantly negative in the models for overall satisfaction and self-management satisfaction. This reveals that, compared to male students, female students reported a poorer experience with online teaching and lower satisfaction. The diversity of teaching formats exhibited a negative coefficient in the models for platform satisfaction and teacher-student interaction satisfaction. This indicates that a greater variety and liveliness in teaching formats imposes higher demands on network

performance, which in turn is detrimental to platform operation and teacher-student interaction.

The diversity and sophistication of teaching tools showed negative coefficients in the models for teaching satisfaction and platform satisfaction. This suggests that students who use a greater number of and more advanced tools for online teaching have higher expectations for both teaching quality and platform performance, leading to greater disappointment. Furthermore, it cannot be ruled out that the use of an excessive number of overly advanced tools may distract some students, resulting in lower ratings for teaching satisfaction and platform satisfaction.

Table 9. Regression Results with Construction as Dependent Variable

Variable	Overall Satisfaction	Student Self-Management Satisfaction	Teacher Teaching Satisfaction	Satisfaction with teaching platform	Satisfaction with teacher-student interaction
Gender (Male=0, Female=1)	-0.472**	-0.641**	-0.053	-0.184	-0.577
	(-1.969)	(-2.536)	(-0.168)	(-0.551)	(-1.602)
Grade	0.266*	0.058	0.416**	0.810***	0.666***
	-1.812	-0.374	-2.139	-3.962	-3.012
Teaching Location (from Village to Provincial Capital City)	0.107	0.075	0.273**	0.335**	0.13
	-1.093	-0.721	-2.105	-2.458	-0.88
Diversity of Teaching Methods	0.159	0.266	0.151	-0.002	-0.144
	-0.85	-1.346	-0.607	(-0.007)	(-0.512)
Diversity and Sophistication of Teaching Tools	0.032	0.001	-0.18	-0.122	0.181
	-0.35	-0.01	(-1.484)	(-0.959)	-1.314
Network Stability and Smoothness	0.008	-0.079	0.007	0.085	-0.057
	-0.088	(-0.794)	-0.056	-0.649	(-0.399)
Teacher's Internet Competence	0.343**	0.378**	0.583***	0.764***	0.928***
	-2.476	-2.585	-3.183	-3.963	-4.454
Student's Internet Competence	0.565***	0.520***	0.704***	0.373**	0.722***
	-4.655	-4.06	-4.387	-2.207	-3.959
Acceptance of Online Course Attendance	0.338***	0.271**	0.23	0.260*	0.149
	-3.065	-2.33	-1.578	-1.692	-0.897
Willingness to Return to Online Classes After the Pandemic	0.423***	0.155	0.361***	0.121	0.347**
	-4.591	-1.598	-2.965	-0.947	-2.502
Constant Term	4.434***	6.219***	9.096***	8.924***	6.382***
	-4.254	-5.651	-6.595	-6.148	-4.069
Number of Observations	340	340	340	340	340
R-Squared	0.36	0.227	0.309	0.251	0.297

Note: 1. The values in parentheses represent t-statistics; 2. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

6. Conclusion and Implications

Based on 340 questionnaires, this study employed a Structural Equation Model to measure online teaching satisfaction among college students, analyze the relationships among its different constructs, and explore the magnitude and direction of the influence of characteristic variables on their satisfaction. The findings reveal that students' self-management ability exerts the greatest impact on online teaching satisfaction, followed by teacher teaching satisfaction and then teacher-student interaction satisfaction. In contrast, the influence of teaching platform satisfaction is not only small but also statistically insignificant. Teaching platform satisfaction, students' self-management ability, and teacher-student interaction satisfaction all have a significant effect on teacher teaching satisfaction. Moreover, teaching platform satisfaction plays a decisive role in influencing teacher-student interaction satisfaction. Although the impact of teaching platform satisfaction on overall satisfaction is minimal and statistically insignificant, its total effect is the largest and most significant. Based on the ranking of total effects, platform satisfaction exerts the greatest

influence on the overall satisfaction of online teaching, followed by students' self-management ability, then by teacher instruction, and finally by teacher-student interaction. Despite platform satisfaction having the largest total effect on overall satisfaction, its direct effect is smaller than its indirect effect. This indicates that mediating variables such as teacher instruction and teacher-student interaction hold substantial influence. All participants in online teaching should become proficient with platform operations to fully leverage its functionalities.

The internet proficiency of both teachers and students has a significant positive impact on online teaching satisfaction, suggesting that enhancing the internet utilization skills of instructors and learners is an effective approach to improving satisfaction with online teaching. The student's grade level and their understanding and acceptance of online course attendance management have a significant positive impact on online teaching satisfaction, indicating that enhancing students' tolerance can contribute to improved satisfaction with online teaching. The location from which students participate in online teaching also exerts a significant positive effect on their overall satisfaction, suggesting that larger cities, with more stable and smoother internet connections, are associated with higher student satisfaction.

Not all influencing factors have positive effects. Compared to male students, female students report a poorer experience and lower satisfaction with online teaching, with particularly significant negative impacts on overall satisfaction and self-management satisfaction, reflecting a preference among female students for offline teaching. When teachers employ a greater variety of teaching forms in online instruction, student satisfaction with online teaching decreases, a trend especially evident in platform satisfaction and teacher-student interaction satisfaction. This indicates that diversity in teaching forms often conflicts with the stability and smoothness of the platform. The more advanced and diverse the tools students use for attending classes, the lower their satisfaction tends to be. This may indicate that as students have access to more and better-performing tools, their expectations regarding teaching delivery and platform performance increase, leading to greater disappointment when these expectations are not met.

In the future, online teaching should prioritize enhancing both teachers' and students' ability to use the internet and improving their proficiency with teaching platforms, so as to fully utilize the platforms' relevant functions. It is also important to strengthen students' self-management and self-control, foster their tolerance, and increase their understanding and acceptance of online teaching arrangements during the pandemic. Greater attention should be paid to providing psychological support to students participating in online learning, with particular emphasis on addressing the needs of female students. The diversity of teaching methods adopted by instructors should be aligned with the stability and smoothness of the teaching platform, as well as the internet speed available to the majority of students. It is not advisable to prioritize the pursuit of varied and rich formats at the expense of these fundamental technical and operational requirements.

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