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The Relationship Between Distance Learning Methods and Satisfaction and Achievement of Chinese College Students：A Study of Quantitative Research

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Abstract

This paper examines the relationship between distance learning methods and satisfaction and academic achievement among Chinese college students. As a result of the COVID-19 pandemic, education has been significantly impacted globally, prompting educational institutions to rapidly adopt technology to sustain teaching activities. In China, many universities have turned to online teaching models in response to the epidemic. This study aims to explore how distance learning methods affect student satisfaction and academic achievement. Quantitative data were collected and analyzed through questionnaires and standardized tests. The results showed a significant positive correlation between students' satisfaction with different distance learning methods and their academic achievement. The study also found that teacher performance, teacher-student interaction, curriculum evaluation and other factors are the main factors affecting student satisfaction. The findings provide insights for optimizing the distance education environment and improving student learning experience and satisfaction.

Keywords: Distance Learning, Student Satisfaction Academic Achievement, Educational Technology, Quantitative Research, Distance Education Strategies

1.0 INTRODUCTION

Distance learning, due to its temporal and spatial flexibility, can skilfully cater to the diverse and individualized learning needs of different learners, expand the coverage of educational resources, and promote educational equity and lifelong learning (Reference for Education Response to Public Health Crisis, 2012). After the World Health Organization (WHO) declared COVID-19 a pandemic, millions of students and educators worldwide were affected. To address this challenge, various technological applications were rapidly deployed to facilitate the learning process, enabling students to continue their education during the pandemic (Nainggolan, 2021; Shahzad et al., 2021). In China, in particular, as a temporary measure to cope with COVID-19, many universities transitioned from traditional face-to-face teaching to emergency remote teaching modes to ensure that students and teachers could continue their learning and teaching during lockdowns (Jan, 2020; Edem Adzovie and Jibril, 2022). Chinese universities took the lead in promoting and conducting online learning courses, adopting online learning strategies, and students willingly accepted this move as the new normal (Jin et al., 2021). Preliminary studies indicate that e-influence, students' interest in using e-learning resources, their performance, and motivation impact their willingness to embrace e-learning (Chang et al., 2017; Radha et al., 2020).

In this urgent transition, the satisfaction and academic achievement of university students in distance learning have become particularly important. Studies have shown that university students' satisfaction with online learning is closely related to their academic achievement (Kim and Kim, 2021; Dalipi et al., 2022). During the COVID-19 crisis, the increase in students' participation in academic activities has been seen as a positive trend, further enhancing their satisfaction with distance learning (Ngah et al., 2022). Moreover, research has found that students' digital competence and academic engagement are closely linked to their satisfaction with distance learning and their academic achievement (He and Li, 2019; Heidari et al., 2021). Therefore, enhancing the effectiveness of teaching in distance education and optimizing learning outcomes has become a key focus in contemporary distance education research (Baran, B., & Davis, B. 2014).

Ideally, distance education methods should be able to adapt to the diverse characteristics and individualized needs of learners, provide effective teaching support and services, stimulate learners' initiative and enthusiasm, thus improving learners' learning outcomes and satisfaction. Student satisfaction is the result of achievement and enjoyment and is thus "an enjoyable and successful experience" (Sinclaire, 2011, p.4). This helps students become more confident, develop useful skills, and acquire knowledge in a virtuous cycle. Students' experiences of campus life and the combination of all their experiences affect their overall satisfaction with the institution (Letcher & Neves, 2010).

However, satisfaction is a function of the level of expectation and actual performance (Kotler & Clarke, 1987). Cultural differences influence students' satisfaction with services (Tian & Wang, 2010). For example, the simplification and standardization of teaching content and methods, the lack and delay of teaching interaction and feedback, and the difficulty and inaccuracy of teaching evaluation and supervision can affect learners' learning outcomes and performance (Xie, Y. & Yao, L. 2022). Student satisfaction is a measure of the quality of an educational program and is considered an important factor in course completion. In most cases, students in higher education programs drop out because they are dissatisfied with their courses (McQuillan and James, 2010).

A framework that supports learning can enhance students' satisfaction and success with distance learning programs. When learners transition from traditional face-to-face courses to distance learning programs, adjustments should be made to improve learners' engagement and performance. For instructors engaged in distance education projects, this study is significant as it identifies aspects of distance learning programs that can lead to learner satisfaction. Understanding student satisfaction can enhance the ability of universities to make informed decisions about improving distance learning programs (Gallogly, 2005). Understanding learning satisfaction is important because it provides a starting point for improving student learning (Khiat, 2013). Three important factors affecting student satisfaction have been identified: instructor performance, student-instructor interaction, and course evaluation (Ali and Ahmad, 2011). A combination of institutional, situational, and dispositional factors influences the retention and progression of distance education students (Carroll, 2008).

Therefore, this research aims to explore the relationship between distance learning methods and the satisfaction and academic achievement of Chinese college students. We will focus on students' satisfaction in the distance learning environment and how this satisfaction affects their academic performance. Educators should understand student satisfaction to improve teaching processes, achieve better student performance and retention. This will enable educators to adjust teaching methods and approaches and enhance the ability of universities to make informed decisions about improving distance learning programs.

1.1 Statement of Problem

Distance learning should be flexible to meet diverse learning needs, expand educational resources, and promote equity and lifelong learning. Effective methods should adapt to learners' characteristics, provide strong support, stimulate initiative, and improve outcomes and satisfaction. During the COVID-19 pandemic, universities, including those in China, shifted to emergency remote teaching. Despite adopting online strategies, challenges like standardized content, delayed feedback, and evaluation difficulties impacted learning outcomes and

performance. The shift to distance learning was a response to the WHO-declared pandemic, affecting millions. Rapid technological deployment facilitated continuous education, emphasizing the need to understand factors influencing student satisfaction and academic achievement. Student satisfaction with online learning is closely linked to academic achievement. Increased participation during the pandemic improved satisfaction, but dissatisfaction due to unmet expectations and performance issues can lead to higher dropout rates. A gap exists between the ideal flexible learning environment and the reality of standardized content, delayed feedback, and evaluation challenges. Cultural differences also affect students' satisfaction with distance learning. This research explores the relationship between distance learning methods and the satisfaction and academic achievement of Chinese college students, focusing on how satisfaction affects performance. Understanding student satisfaction is vital for improving teaching processes, performance, and retention. Key factors include instructor performance, student-instructor interaction, and course evaluation. Addressing these can optimize distance education and enhance student experiences and outcomes.

1.2 RESEARCH QUESTIONS

Q1:*What are the distance learning methods used by Chinese college students?*

Q2:*How does the use of different distance learning methods affect the satisfaction of Chinese college students?*

Q3:*What is the relationship between the satisfaction with distance learning methods and the academic achievement of Chinese college students?*

1.3 RESEARCH OBJECTIVES

O1:*To identify the main distance learning methods used by Chinese college students.*

O2:*To analyze the impact of different distance learning methods on the satisfaction of Chinese college students.*

O3:*To explore the relationship between satisfaction with distance learning methods and the academic achievement of Chinese college students.*

2.0 Literature Review

The Literature Review section of this article delves into the concept, importance, and relationship between Distance Learning and student satisfaction and academic achievement.

1. Distance Learning Benefits and flexibility: Literature points out that distance learning can meet the diversified and personalized learning needs of different learners, expand the coverage of educational resources, and promote educational equity and lifelong learning (Reference for Education Response to Public Health Crisis, 2012).

2. Impact of COVID-19 on Education: Since the World Health Organization (WHO) declared COVID-19 a global pandemic, millions of students and educators around the world have been affected. To address this challenge, various technological applications have been rapidly deployed to facilitate the learning process and enable students to continue their education during the pandemic (Nainggolan, 2021; Shahzad et al., 2021).

3. Chinese universities' adaptation to distance learning: Chinese universities have adopted a shift from traditional face-to-face teaching to emergency distance learning models during COVID-19 to ensure that students and faculty can continue learning and teaching during lockdown (Jan, 2020; Edem Adzovie and Jibril, 2022).

4. The Relationship between Student satisfaction and academic Achievement: Research shows that college students' satisfaction with online learning is closely related to their academic achievement (Kim and Kim, 2021; Dalipi et al., 2022). The increase in students' academic engagement during the COVID-19 crisis was seen as a positive trend, further increasing their satisfaction with distance learning (Ngah et al., 2022).

5. Factors affecting the effect of distance learning: Research finds that students' digital ability and academic engagement are closely related to their satisfaction with distance learning and academic achievement (He and Li, 2019; Heidari et al., 2021).

6. The Role of Educational Technology: The literature emphasizes the role of educational technology in distance learning, including simplification and standardization of teaching content and methods, lack and delay of teaching interaction and feedback, and difficulties and inaccuracies in teaching evaluation and supervision, which may affect learners' learning outcomes and performance (Xie, Y. & Yao, L. 2022).

7. Multi-dimensional influencing factors of student satisfaction: Research has identified three important factors affecting student satisfaction: teacher performance, student-teacher interaction, and curriculum evaluation (Ali and Ahmad, 2011).

8. The role of cultural differences: Cultural differences also affect students' satisfaction with

services, which suggests that cultural factors need to be considered when designing and implementing distance learning strategies (Tian & Wang, 2010).

9. Future research directions: The literature review suggests that future research could further explore other factors that influence students' distance learning satisfaction and academic achievement, such as teachers' teaching style, quality of learning resources, and ease of use of learning platforms, to provide more comprehensive and in-depth guidance (Hu.2013).

These literature review sections provide a theoretical basis for the background and importance of the research and indicate the key issues and objectives of the research.

3.0 Research Methodology

As for the methodology, the study is quantitative in that it aims to examine the impact of AI tools on student satisfaction in the context of online learning in China. This study uses a questionnaire survey to obtain data from students who have previously been exposed to AI technology. It is used in this paper because of its efficiency in capturing standardized data from large samples to facilitate statistical analysis and generalization of conclusions.

3.1 Research Instrument

Use a questionnaire to assess Chinese college students' satisfaction with different distance learning methods (e.g., online courses, recorded courses, interactive learning platforms). The questionnaire also includes some basic demographic information (e.g., gender, grade, etc.).

Questionnaire Design:

The questionnaire includes closed questions and the Likert scale, which uses a 5-review subscale to assess student satisfaction with distance learning. Closed questions collect specific data about the type, application, and effectiveness of distance learning methods using single - or multiple-choice question formats.

3.2 Data Collection

Questionnaires are distributed through online platforms (e.g. Google Forms, Question Star) so that students can complete the survey easily and quickly. In addition, the study included standardized tests, using standardized test scores as the primary indicator of students' academic achievement.

The questionnaire generates Ordinal data, including satisfaction ratings in the questionnaire (e.g.,

very satisfied, satisfied, fair, dissatisfied, very dissatisfied). Academic achievement is measured by percentile scores using Interval data.

The dataset contains at least 30 cases, covering students of different genders and grades, ensuring a diverse sample.

3.3 Data Analysis

- Data cleansing: Check the data set for missing values and outliers, replace missing values with the mean, and eliminate or further validate outliers.
- Normality test: The Shapiro-Wilk test was used to check the normality of the data and ensure that the data conforms to the assumptions of subsequent analysis.
- ANOVA analysis was used to compare the impact of different distance learning method choices on student satisfaction.
- The Pearson correlation test was used to analyze the relationship between students' academic performance and satisfaction with distance learning.

3.4 Regression Analysis

Conduct multiple linear regression analysis to analyze the impact of satisfaction on academic performance, using stepwise regression methods to screen meaningful independent variables.

3.5 Assumed Settings

Two hypotheses are proposed:

H_0 *There is no significant relationship between satisfaction with distance learning methods and the academic achievement of Chinese college students.*

H_1 *There is a significant relationship between satisfaction with distance learning methods and the academic achievement of Chinese college students.*

3.6 Ethical Considerations

The study will also ensure high ethical consideration to avoid any harm or violation of the rights of the participant. Key ethical considerations include:

- Informed Consent: All the participants (or their parents if participants are children) will be explained the goals and objectives of the study, procedures involved, conditions, risks and benefits of the study before seeking their consent to participate in the study. Consent forms will be attached to the first page of an online questionnaire.
- Confidentiality: All participants' responses will be anonymous, and the data collected will not contain any specific identification of an individual participant. All reported data will be presented only at the aggregate level.
- Voluntary Participation: In this case, the participation of the individuals in the study will be very voluntary. There will be no coercion used during the study, and participants will be given the option to withdraw from the study at any time without penalty.
- Data Security: Data will be stored electronically and will only be used by the research team who collected it. Paper data will be kept secure and stored in locked cabinets, and electronic data will be encrypted on password-protected devices.
- Approval from Ethical Review Board: To this end, the study will seek clearance from an institutional ethical review board to ensure that all the procedures meet the required standards of ethical conduct.

Thus, by following these ethical considerations of the study, the goal is to complete the research responsibly and with consideration for all of the participants involved. These stringent paradigms guarantee that the results will be credible, trustworthy, and generalizable to improving students' engagement by using Artificial Intelligence Instruments in online learning in China.

3.7 Research Questions and Objectives

Research questions are clearly listed, including which distance learning methods are used, how different methods affect student satisfaction, and the relationship between satisfaction and academic achievement. Research objectives were set, including identifying the main distance learning methods, analyzing the impact of these methods on satisfaction, and exploring the relationship between satisfaction and academic achievement.

Through this methodological framework, research aims to gain insight into distance learning methods, student satisfaction, and how they affect student academic performance, and to provide educators with insights to improve distance learning methods and increase student satisfaction

and academic achievement.

4.0 Data Analysis

This section shows the results of the data analysis, which has been performed through SPSS.

4.1 Raw data process

Data cleaning: Check for missing values and outliers in the dataset, use mean substitution for missing values, and eliminate or further validate outliers.

Normality test: Shapiro-Wilk test was used to check the normality of the data to ensure that the data complied with the assumptions of the subsequent analysis.

(ST is satisfaction, SC is score, and P1 is mode of choice.)

Figure 1 Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	St atistic	df	Si g.	St atistic	df	Si g.
T	.122	30	.200*	.969	30	.508

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

We chose to analyze the way students actually use and students' overall satisfaction with distance learning, before conducting ANOVA to compare the differences, we first calculated to conduct the Shapiro-Wilk test to determine the normality of the data, and the results of $p=0.508>0.05$, so the overall satisfaction of the students in line with the normal distribution, and the histogram of the normal distribution is shown in the following figure.

Figure 2

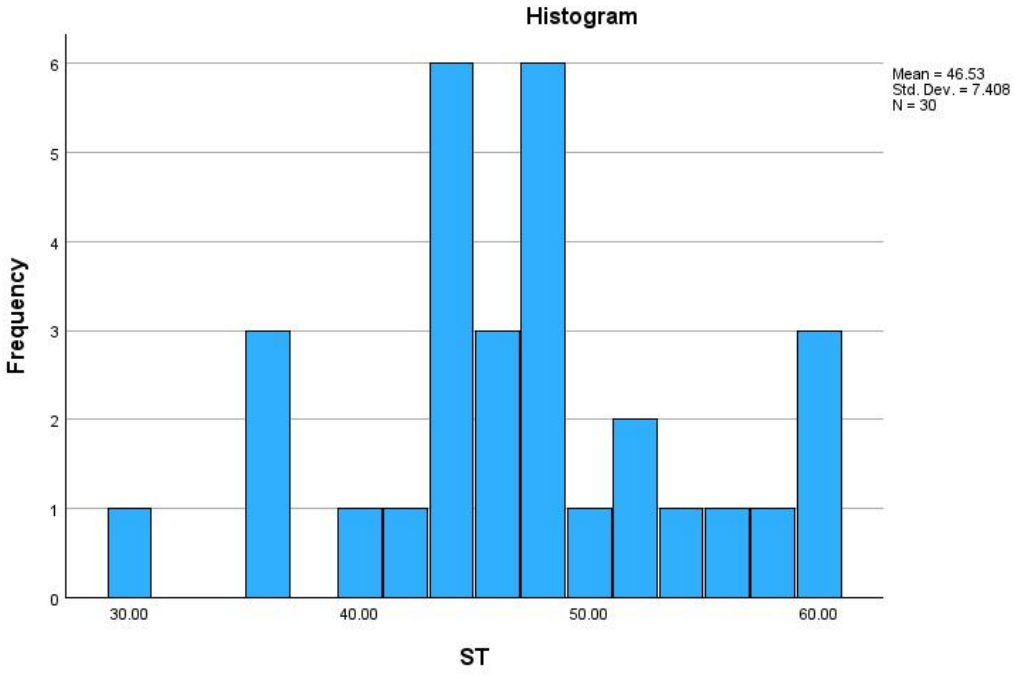

Figure 3 ANOVA

ST

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	97.667	2	48.833	.883	.425
Within Groups	1493.800	27	55.326		
Total	1591.467	29			

The results of ANOVA analysis showed that the level of significance of the difference between the groups p=0.425>0.05, which indicates that the students' choice of distance learning method did not cause a significant difference in the students' satisfaction with distance learning.

Figure 4 Tests of Normality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
C	.131	30	.200*	.944	30	.117

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The test for normal distribution of students' grades was performed, and the level of significance of the Shapiro-Wilk test p=0.117>0.05 shows that the students' grades conform to the normal distribution, so that the relationship between students' grades and students' satisfaction can be analyzed using the Pearson correlation.

Figure 5 Correlations

		SC	ST
C	Pearson Correlation	1	.529**
	Sig. (2-tailed)		.003
	N	30	30
T	Pearson Correlation	.529**	1
	Sig. (2-tailed)	.003	
	N	30	30

Correlation is significant at the 0.01 level (2-tailed).

The results of Pearson's correlation test showed that students' academic performance and students' satisfaction with distance learning showed a strong correlation with a correlation coefficient of 0.529 and a significance level of p=0.003<0.05 representing a reliable result.

4.2 Methods of analysis

Descriptive analysis: descriptive statistics on demographic variables such as gender, grade level, and learning methods.

Figure 1 Descriptive statistics on sample information

Variable	Category	Frequency	Percent(%)	Valid Percent(%)
gender	male	9	30	30
	female	21	70	70
grade_level	Freshman	6	20	20
	Sophomore	4	13.3	13.3
	Junior	8	26.7	26.7
	Senior	12	40	40
Total		30	100	100

The survey sample was 30% male and 70% female: 20% freshmen, 13.3% sophomores, 26.7% juniors, and 40% seniors.

As can be seen from the cross-tabulation, the male sample originated primarily from the upper grades, and the female sample was evenly distributed across the grades.

Figure 2 Cross-tabulation of gender and grade level

	Freshman	Sophomore	Junior	Senior	Total

male	0(0.00%)	0(0.00%)	2(22.20%)	7(77.80%)	9(100.00%)
female	6(28.60%)	4(19.00%)	6(28.60%)	5(23.80%)	21(100.00%)
Total	6(20.00%)	4(13.30%)	8(26.70%)	12(40.00%)	30(100.00%)

As can be seen from the cross-tabulation, the male sample originated primarily from the upper grades, and the female sample was evenly distributed across the grades.

Figure 3

3. What distance learning methods do you often use? [Single-choice question]

Options	Subtotal	Proportion
A. Live Classroom	9	30%
B. Recorded courses	0	0%
C. Online interactive platform	3	10%
D. All three	18	60%
Number of valid responses to this question	**30**	

Figure 4

4.Which distance learning method are you more satisfied with? [Single-choice question]

Options	Subtotal	Proportion
A. Live Classroom	12	40%
B. Recorded courses	0	0%
C. Online interactive platform	18	60%
Number of valid responses to this question	**30**	

Figure 5

17. What aspects of distance learning do you feel satisfied with? [Multiple choice]

Options	Subtotal	Proportion
A. Teaching quality	15	50%
B. Teacher Level	14	46.67%
C. Course Setting	18	60%
D. Learning resources	20	66.67%
E. Learning environment	16	53.33%
F. Communication and Feedback	16	53.33%
Number of valid responses to this question	**30**	

Figure 6

18. What advantages do you think distance learning has? [Multiple choice]

Options	Subtotal	Proportion
A. Convenient and flexible	twenty three	76.67%
B. Save time and cost	25	83.33%
C. Improve learning efficiency	13	43.33%
D. Enhance independent learning ability	14	46.67%
E. Diverse learning methods and resources	19	63.33%
Number of valid responses to this question	**30**	

Figure 7

19. What do you think are the shortcomings of distance learning? [Multiple choice]

Options	Subtotal	Proportion
A. Lack of face-to-face communication and interaction	twenty two	73.33%
B. Learning resources are not rich and complete enough	4	13.33%
C. Technical issues and network lag	20	66.67%
D. Lack of learning atmosphere and collective learning experience	14	46.67%
E. Lack of independent learning ability and lack of self-discipline	12	40%
Number of valid responses to this question	**30**	

Figure 8

20. In the process of distance learning, which aspect do you think has the greatest impact on your learning effect? [Multiple choice]

Options	Subtotal	Proportion
A. The teacher's teaching method	20	66.67%
B. Teachers' teaching content	12	40%
C. Stability of the teaching platform	14	46.67%
D. Your own learning status	twenty two	73.33%
Number of valid responses to this question	**30**	

The graphic content above is a series of survey results on distance education methods, satisfaction, strengths, influences, and weaknesses. They are summarized below:

- Commonly used distance education methods:

- 30 people participated in the survey.
- 30% chose to use Live Classroom.
- No one chose "Recorded courses".
- 10% chose to use the Online interactive platform. 60% chose the Recorded courses option.
- 60% chose "All three".

- Distance education method with the highest level of satisfaction:

- 30 people participated in the survey.
- 40% were most satisfied with Live Classroom.
- No one was satisfied with "Recorded courses".
- 60% were most satisfied with the Online interactive platform.

- Advantages of distance learning:

- 30 people participated in the survey.
- 83.33% think that distance learning "saves time and cost". 76.67% think that distance learning "saves time and cost".
- 76.67% think that distance education is "convenient and flexible". 63.33% think that distance education is "convenient and flexible".
- 63.33% think that distance learning is "rich and diversified in learning methods and resources".
- 46.67% think that distance education "improves independent learning ability".
- 43.33% think that distance education "improves the efficiency of learning".

- Satisfaction with distance education:

- 30 people participated in the survey.
- 50% were satisfied with the "quality of the teaching".
- 46.67% were satisfied with the "level of teachers".
- 60% were satisfied with the "curriculum".
- 66.67% were satisfied with the "learning resources".
- 53.33% were satisfied with the "learning environment" and "communication and feedback".

- Factors affecting learning effectiveness:

- 30 people participated in the survey.

- 66.67% of the respondents thought that "Teachers' teaching methods" had the greatest influence on learning effectiveness.
- 46.67% thought that "the stability of the teaching platform" had a greater impact. 40% thought that "the stability of the teaching platform" had a greater impact.
- 40% think that "teachers' teaching content" affects the learning effect.
- 73.33% think that "their own learning status" is the biggest factor affecting the learning effect.

♦ Disadvantages of distance learning:

- 30 people participated in the survey.
- 73.33% think that the main disadvantage of distance education is "lack of face-to-face communication and interaction". 66.67% think that the main disadvantage of distance education is "lack of face-to-face communication and interaction".
- 66.67% cited "technical problems and network delays" as a disadvantage.
- 46.67% considered "lack of learning atmosphere and group learning experience" to be a disadvantage.
- 40% identified "lack of independent learning ability and self-discipline" as a disadvantage.
- 13.33% considered "lack of richness and completeness of learning resources".

These findings provide insights into preferences, satisfaction, strengths, influences and potential weaknesses of distance education methods.

Correlation analysis: analyze the relationship between learning methods and satisfaction and score using Pearson's correlation coefficient.

Figure1 between Score and the satisfaction with distance learning

Dimensions	r	Sig
Overall_satisfaction	0.328	>0.05
Teacher_teaching_method	0.255	>0.05
Teacher_teaching_focus	0.164	>0.05
Teacher_student_interaction	0.370*	<0.05
Teachers_assign_task	0.252	>0.05
Teaching_software_use	0.504**	<0.01
Teaching_software_function	0.515**	<0.01
Teachers_roles_performance	0.421*	<0.05
Learning_resources	0.303	>0.05
Communication_Feedback	0.407*	<0.05
Schedule_Course_Setting	0.227	>0.05
Impact_academic_performance	0.634**	<0.01

To study the relationship between Score and the satisfaction with distance learning methods, Pearson correlation analysis was used to test the following hypotheses.

H_0: *There is no relationship between Score and the satisfaction with distance learning methods.*

H_1: *There is a relationship between Score and the satisfaction with distance learning methods.*

From the results of the Pearson correlation analysis , Score and Overall_satisfaction,Teacher_teaching_method,Teacher_teaching_focus,Teachers_assign_task,Learning_resources,Schedule_Course_Setting,there is no correlation between.While, Scoreand Teacher_student_interaction($r=0.370$, $p<0.05$),Teaching_software_use($r=0.504$, $p<0.01$),Teaching_software_function($r=0.515$, $p<0.01$),Teachers_roles_performance($r=0.421$, $p<0.05$),Communication_Feedback($r=0.407$,$p<0.05$),Impact_academic_performance ($r=0.634$, $p<0.01$), there is a correlation between.Therefore, reject H_0 and accept H_1.

Regression analysis: Develop a multiple regression model to analyze the effect of learning methods on satisfaction and score.

Figure1 Regression analysis table

		E	eta		ig	IF
Constant	0.913	.232		.040	0.01	
Impact_academic_performance	.860	.814	.634	.334	0.01	.000
R^2			0.401			
F			18.781			
p			<0.01			

To study the impact of the satisfaction with distance learning methods on Score, linear regression analysis was used to test the hypothesis.

***H_0**: The satisfaction with distance learning methods cannot predict Score.*

***H_1**: The satisfaction with distance learning methods can predict Score.*

Multivariate linear regression analysis was performed with Score as the dependent variable and the satisfaction with distance learning methods in different dimensions as the independent variable. When there are many independent variables, to avoid multicollinearity, the Stepwise regression method can be used to screen out meaningful independent variables. The results show that the overall fitting effect of the regression equation is good (R2=0.401, F=18.781, p<0.01). Impact_academic_performance can significantly and positively predict Score (Beta=0.634, p<0.01), while other independent variables cannot predict Score. Based on the unstandardized results, the regression equation can be established: Score=7.860×Impact_academic_performance+50.913. Therefore, reject H0 and accept H1.

5.0 DISCUSSION AND CONCLUSIO

5.1 DISCUSSION OF DATA COLLECTION

In all cases, the role of the questionnaire is to provide a standardized interview for all subjects. This is so that all respondents are asked questions that are appropriate for them, so that when these questions are asked or presented, they are presented in a consistent manner. Asking questions in the same way to different people is key to most survey research (Brace, I. 2018).

The questionnaire is designed to assess college students' satisfaction with various distance learning methods, including online courses, recorded courses, and interactive learning platforms. It also gathers basic demographic information such as gender, grade, and major. The questionnaire consists of 8 closed questions and 12 open questions, and a total of 30 responses have been collected from students ranging from freshmen to seniors. The closed questions utilize single or multiple-choice formats to gather specific data regarding the type, application, and effectiveness of distance learning methods. To evaluate students' satisfaction, a Likert 5-point scale is employed. The Likert scale is one of the most basic and commonly used psychometric tools in education and social science research (Joshi, A.etc,. 2015). The questionnaires are distributed through an online platform called Question Star, facilitating easy and swift completion by the students.

The standard test is a key instrument for gauging students' academic achievements, with its scores serving as the principal indicators of their learning outcomes（School of Education Online）. The data for these tests are hypothetical, meaning that we presume the data has been collected without the need for actual test distribution.

In terms of data types, the questionnaire yields ordinal data, which includes satisfaction ratings from the respondents categorized as Very Dissatisfied, Dissatisfied, Fair, Satisfied, and Very Satisfied. Additionally, academic grades are measured using interval data, represented as percentile grades. The dataset compiled for the study comprises a minimum of 30 cases, ensuring a diverse representation that includes students of various genders and grades. This comprehensive dataset enables a thorough analysis of the students' learning achievements and satisfaction levels.

5.2 DISCUSSION OF DATA ANALYSIS AND FINDINGS

- **ABOUT 4.1**

In exploring the relationship between distance learning methods and college students' satisfaction and achievement in the context of China's COVID-19, we used a variety of statistical methods to

comprehensively analyze the data. First, through the Shapiro-Wilk test, we confirmed that both overall student satisfaction and student achievement conformed to a normal distribution, which provided an effective data base for subsequent ANOVA and correlation analyses.

In the ANOVA session, we found that students' choice of distance learning modality did not result in significant differences in their satisfaction with distance learning. This result may indicate that during the COVID-19, although there were a variety of distance learning modalities, students' satisfaction with these modalities did not depend entirely on the modality itself, but may have been influenced more by other factors, such as the quality of the instructor's teaching, the richness of the course content, and the availability of learning resources. It may also reflect changes in students' attitudes and expectations of learning at times, and they may value the continuity and stability of the learning process more than the specific form of distance learning (Zimmerman et al., 2020).

And when exploring the relationship between students' academic performance and satisfaction with distance learning, the results of the Pearson correlation test showed a strong positive correlation between the two. This finding suggests that the higher students' satisfaction with distance learning, the better their academic performance tends to be. This may be because students with high satisfaction levels are better able to adapt to the distance learning environment and utilize distance learning resources more effectively, resulting in better learning outcomes (Ghasempour et al., 2023).

It is worth noting that while the ANOVA did not show a significant effect of distance learning format choice on satisfaction, the Pearson correlation analysis revealed a strong relationship between satisfaction and academic achievement. This further suggests that the form of distance learning may not be the only or decisive factor influencing students' learning experience and achievement, but that factors such as students' attitudes towards learning, study habits, and personal adaptability in the distance learning environment are equally important（Ghasempour et al., 2023）.

In summary, this study delved into the relationship between distance learning methods and college students' satisfaction and achievement in the context of China's COVID-19. The results showed that although different distance learning methods did not significantly affect students' satisfaction, students' satisfaction showed a strong positive relationship with their academic achievement (Keržič et al., 2021). This finding provides a new perspective for us to understand the effects and impacts of distance learning, as well as useful insights for us to further optimize the distance learning environment and enhance students' learning experience（Zalazar-Jaime et al., 2023）.

In future research: we can further explore other factors affecting students' distance learning satisfaction and academic achievement, such as the instructor's teaching style, the quality of

learning resources, and the ease of use of the learning platform, to provide a more comprehensive and in-depth guide to the practice and improvement of distance learning (Hu.2013).

- **ABOUT 4.2**

The study reveals interesting findings on several dimensions through an in-depth investigation and analysis of the relationship between distance learning methods and college students' satisfaction and achievement in the context of China's COVID-19.

First, from the descriptive statistics of the sample information, the proportion of female students is higher, and the distribution of grades is even, while male students are relatively concentrated in higher grades. This distributional feature may be related to the different strategies of students of different genders in major selection, academic planning, and coping with the academic challenges posed by the epidemic. In addition, the higher sample of males in the upper grades may reflect the fact that in certain majors or fields, male students are more inclined to pursue further education or choose a longer course of study.

Second, the results of Pearson's correlation analysis indicated that students did not show significant correlations between multiple dimensions of the distance learning process (e.g., overall satisfaction, instructor teaching methods, etc.) and their scores. However, aspects such as the use and functionality of the instructional software and the performance of the instructor's role showed a strong positive correlation with students' scores. This finding emphasizes the importance of the quality of the technology platform and the instructor's online teaching performance in distance learning (Zhou, C., & Xiang, Z. 2020). They not only affect students' learning experience but may also be directly associated with students' academic achievement.

Further, multiple linear regression analysis revealed that factors affecting academic performance significantly and positively predicted students' scores, while other independent variables failed to enter the regression equation. This suggests that academic performance becomes a key factor in measuring student learning outcomes in a distance learning environment. This may be because distance learning places greater emphasis on students' independent learning skills and in-depth understanding and application of course content, aspects that are often directly reflected in students' academic performance（Ayang, A., & Richard, N. 2022）.

It is worth noting that although this study revealed some important relationships, there are still other factors that may have an impact on students' distance learning satisfaction and achievement, such as students' motivation, family support, and online environment. These factors deserve further exploration in future studies (Xu et al., 2017).

5.3 OVERALL CONCLUSION

This report discusses the relationship between Chinese college students' satisfaction in distance learning and their academic performance. The report first introduces the importance and widespread application of distance learning during the pandemic, especially in Chinese universities. The results show that the satisfaction of distance learning methods has a significant impact on students' academic performance, especially in the aspects of teacher-student interaction, the use of teaching software, the function of teaching software, teacher role performance and communication feedback. Through multiple linear regression analysis, it is found that the influence of academic performance is an important factor in predicting student achievement. By analyzing distance learning methods, student satisfaction, and their relationship to academic achievement, this study aims to provide a basis for educators to improve teaching methods to improve student learning outcomes and satisfaction.

The results show that the choice of distance learning method has a direct impact on students' satisfaction and academic performance. When students' satisfaction with distance learning is higher, their academic performance is also significantly improved. Specifically, teacher performance, student-teacher interaction, and curriculum evaluation are the main factors influencing student satisfaction (Mohammed et al., 2022). In addition, cultural differences will also affect students' satisfaction with services (Tian & Lu, 2020). For example, the simplification and standardization of teaching content and methods, the insufficiency and delay of teaching interaction and feedback, and the difficulty and inaccuracy of teaching evaluation and supervision will all have an impact on learners' learning effect and performance (Xie et al., 2022).

In addition, the study found that students' use and function of teaching software, teachers' role performance, communication feedback and interaction with teachers are key factors affecting students' satisfaction and academic performance. These results suggest that improving the teaching quality of distance learning, especially in terms of interactivity and feedback mechanisms, can significantly improve student satisfaction and academic achievement (Xu et al., 2017).

Specifically, the interaction between teachers and students has a significant impact on student satisfaction and achievement, indicating that the role of teachers in distance learning is especially important. The use and functionality of instructional software also had a significant impact on student satisfaction and achievement, illustrating the critical role of technical support in distance learning. In addition, teacher role performance and communication feedback also play a significant role in improving student satisfaction and academic achievement (Xu et al., 2017).

By deeply analyzing distance learning methods in the context of COVID-19 in China, this study finds that the quality of instructional software and instructors' online teaching performance are key factors affecting students' distance learning experience and academic achievement. Meanwhile, academic achievement serves as an important indicator of student learning outcomes. These findings provide useful insights for understanding the characteristics and optimization

strategies of distance learning (Mo, 2024).

To further improve the effectiveness of distance learning, it is recommended that relevant institutions and instructors focus on the development and optimization of instructional software to improve the quality and interactivity of online instruction (Ren, 2024). At the same time, they should also focus on the assessment and feedback of academic performance, as well as guiding students to improve their independent learning skills and their in-depth understanding and application of course content. In addition, future research could further explore other factors that may affect students' satisfaction and achievement in online learning, providing more comprehensive and in-depth guidance for the practice and improvement of distance learning (Yang, 2016).

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Appendices

Appendix 1: Questionnaire Survey

1.Your gender

A. Male B. female

2. Your grade level

A. Freshman B. Sophomore C. Junior D. senior

3. What kind of distance learning method do you often use?

A. Live classroom B. Recorded course C. Online interactive platform D. All three

4. Which distance learning method are you more satisfied with?

A. Live classroom B. Recorded course C. Online interactive platform.

5. How satisfied are you with distance learning as a whole?

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

6. The teacher's teaching methods are flexible and varied during distance learning.

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

7. The teacher's teaching focus is clear and concise during distance learning.

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

8. The teacher's language is fluent and interesting, and the interaction is good during distance learning.

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

9. The teacher assigns learning tasks reasonably during distance learning.

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

10. The smoothness of the distance learning software is high, and the transmission is convenient.

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

11. The remote teaching software is full-featured and easy to operate.

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

12. Are you satisfied with the role and performance of teachers in distance learning?

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

13. Are you satisfied with the abundance and quality of learning resources in distance learning?

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

14. How satisfied are you with the communication and feedback mechanism in distance learning?

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

15. How satisfied are you with the schedule and curriculum of distance learning?

A. Very dissatisfied B. Not very satisfied C. Fairly satisfied D. Quite satisfied E. Very satisfied

16. How do you think distance learning affects your academic performance?

A. Significantly reduced B. Decreased C. No significant effect C. Improved D. Significantly improved

17. What aspects of distance learning are you satisfied with?

A. Teaching quality B. Teacher level C. Course curriculum D. Learning resources E. Learning environment F. Communication and feedback

18. What do you think are the advantages of distance learning?

A. Convenience and flexibility B. Time and cost saving C. Improvement of learning efficiency D. Enhancement of independent learning ability E. Diversified learning methods and resources

19. What do you think are the shortcomings of distance learning?

A. Lack of face-to-face communication and interaction B. Lack of richness and completeness of learning resources C. Technical problems and network lag D. Lack of learning atmosphere and collective learning experience E. Lack of independent learning ability and self-discipline

20. In the process of distance learning, which aspect do you think is most affected by your learning effect?

A. the teacher's teaching style B. the teacher's teaching content C. the stability of the teaching platform D. your own learning status

21.Standard Test (

Number	Gender	Grade	Score (Percentage system)
1	Female	Freshman	78
2	Female	Freshman	86
3	Female	Freshman	93
4	Female	Freshman	67
5	Female	Freshman	88
6	Female	Freshman	79
7	Female	Sophomore	90
8	Female	Sophomore	86
9	Female	Sophomore	79
10	Female	Sophomore	63
11	Female	Junior	82
12	Female	Junior	97
13	Female	Junior	94
14	Male	Junior	71

15	Female	Junior	60
16	Female	Junior	89
17	Male	Junior	94
18	Female	Junior	70
19	Male	Senior	90
20	Male	Senior	74
21	Male	Senior	82
22	Male	Senior	89
23	Female	Senior	94
24	Male	Senior	62
25	Female	Senior	76
26	Female	Senior	72
27	Female	Senior	79
28	Male	Senior	86
29	Male	Senior	84
30	Female	Senior	93