University Students' Satisfaction with Online Experimental Courses on the Wisdom Tree Platform: A Case Study from a Key University in Nanjing City

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ABSTRACT

This study focuses on experimental courses in online education and explores the satisfaction of college students and its influencing factors. Centered on the experimental courses offered on the Zhihuishu platform, it delves deeply into the factors affecting student satisfaction. Through a survey of 308 respondents, the research revealed that experimental resources, course quality, and teacher instruction are the primary reasons affecting student course selection. Reliability analysis confirmed the credibility of the questionnaire, and through exploratory factor analysis, six key influencing factors were identified. Among these, the satisfaction derived from demonstration videos and experimental operation guides played a pivotal role in user satisfaction. The objective is to deepen the understanding of the online education sector and promote its continuous innovation and development.

Keywords: Online education; Experimental courses; Student satisfaction; Influencing factors

1 INTRODUCTION

The rise of online education, particularly during the global pandemic, has brought platforms like Wisdom Tree into focus. With unique online experimental courses, it has gained significant attention among university students, especially at institutions like Nanjing Institution. The study aims to examine whether these courses fulfill students' learning needs and expectations, given the increasing demand for practical, innovative, and experiential learning.

1.1 Significance of the Study

The study holds both theoretical and practical significance. Theoretically, it aims to fill the research gap in online education satisfaction, particularly concerning experimental courses. Practically, it seeks to enhance the quality and competitiveness of online education platforms like Wisdom Tree, focusing on students' learning outcomes and satisfaction.

1.2 Research Objectives

The objective is to understand university students' satisfaction with Wisdom Tree's online experimental courses and identify key factors influencing this satisfaction. This insight is intended to guide improvements in online education platforms and contribute to educational science research.

1.3 Domestic Research Review

In China, the satisfaction with online education platforms, including platforms like Wisdom Tree, has been a subject of study, focusing mainly on overall satisfaction and learning effectiveness. Recent advancements in technology, such as AR and VR, have revolutionized online experimental courses, offering more realistic and interactive learning experiences (Jiang et al., 2019). However, integrating these technologies with educational content remains a challenge.

1.4 International Research Review

Internationally, research on online education satisfaction has evolved, with studies exploring student motivation, teacher attitudes, course design, and technology application. International platforms offer specialized tools for creating high-quality experimental courses. Cultural differences in education have also been a focal point in international research (Zhang & Sun, 2022).

1.5 Research Methods

A combination of literature research and quantitative analysis methods is employed. Literature research provides a theoretical framework, while quantitative analysis, using SPSS software, includes data cleaning, descriptive statistics, correlation analysis, regression analysis, and difference analysis (Williamson & Johanson, 2017).

2 RELATED CONCEPTS AND THEORIES

2.1 Definition

Online education, emerging from the advancements in information technology, particularly the internet, extends beyond traditional education by enabling learning beyond geographical constraints (Conrad & Openo, 2018). It emphasizes interactivity, autonomy, and flexibility, allowing students to learn at their own pace and time. However, it requires greater self-discipline and self-directed learning abilities.

2.2 Development of Online Education

1960s-70s: Early distance education using mass media like broadcasting.
1980s-90s: Shift towards networking with the rise of personal computers and the internet.
Early 21st Century: Emergence of MOOCs platforms like Coursera and edX.
2010s: Mobile learning and personalized learning via smartphones and AI technology.
Early 2020s: Rapid expansion due to COVID-19, highlighting challenges in quality and equity.

2.3 Overview of the Wisdom Tree Platform

Founded in 2011 in China, the Wisdom Tree platform addresses issues in higher education with advanced technology (Wisdom Tree, 2003). It offers high-quality courses with interactive and gamified learning experiences, utilizing big data and AI for personalized learning paths. Its importance was particularly highlighted during the COVID-19 pandemic.

2.4 Theories of Student Satisfaction

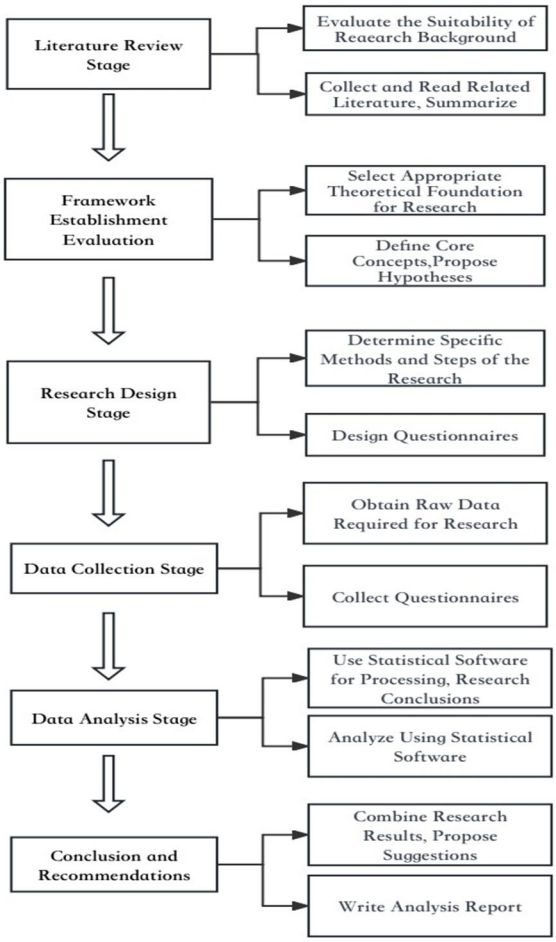
Student satisfaction in education reflects students' subjective evaluation of their educational experiences, encompassing teaching quality, course content, learning resources, and overall educational environment. It's a crucial indicator for understanding students' needs and improving educational offerings (Rueda et al., 2017).

2.5 Characteristics of Online Experimental Courses

Online experimental courses blend traditional experimental teaching with online education's benefits, using simulation software and virtual laboratories. They aim to cultivate practical skills, experimental design abilities, and innovative thinking. Challenges include replicating the real-life experimental experience and ensuring reliability and safety in a virtual setting.

3 DESIGN OF VARIABLES FOR EVALUATING THE SATISFACTION OF ONLINE EXPERIMENTAL COURSES

3.1 Research Roadmap



3.2 Research Hypotheses

Based on the literature review and preliminary theoretical exploration, we propose the following hypotheses:

Table 1:Summary of Research Hypotheses

Hypothesis Item	Hypothesis Content
H1	The clarity of the video positively influences students' course satisfaction.
H2	The understandability of experimental operation guides positively influences students' course satisfaction.
H3	The practicality of experimental interaction positively influences students' course satisfaction.
H4	The quality of resources provided by the course positively influences students' course satisfaction.
H5	The quality of teacher guidance positively influences students' course satisfaction.
H6	Post-course discussion and Q&A sessions positively influence students' course satisfaction.

4 EMPIRICAL TESTING OF FACTORS INFLUENCING UNIVERSITY STUDENTS' SATISFACTION WITH ONLINE EXPERIMENTAL COURSES

4.1 Questionnaire Design

The questionnaire was meticulously crafted based on extensive literature review and expert consultation in online education and experimental courses (Brace, 2008). It underwent five revisions over a month to ensure its scientific soundness and applicability. The process involved:

Organizing and Evaluating: A comprehensive preliminary literature review was conducted to define key concepts and dimensions of online experimental courses and satisfaction. This stage was crucial to ensuring the questionnaire's relevance and scientific validity.

Scale Selection: The final questionnaire comprised 15 items across three categories:

Demographic Information and Background: Collecting basic respondent information like gender, age, educational level, and major.

Usage Situation: Understanding respondents' usage patterns and reasons for choosing the Wisdom Tree platform.

Satisfaction Assessment: Focusing on various aspects of the online experimental courses, including course content, demonstration videos, operation guides, interaction sessions, resources, teacher guidance, and post-experiment discussions. Satisfaction levels were measured using a 5-point Likert scale, ranging from "very dissatisfied" to "very satisfied.".

4.2 Data Collection

The survey targeted users of online experimental courses on the Wisdom Tree platform. The respondents, including university students, graduate students, and professionals interested in online experimental courses, were required to have prior experience with these courses to ensure the specificity of the survey.

4.3 Distribution and Collection of Questionnaires

Data collection was conducted online via social media platforms like WeChat. The survey began on October 1, 2023, collecting 308 questionnaires, of which 300 were deemed valid after data cleanin.

4.4 Data Analysis and Evaluation

The demographic data showed a balanced gender distribution and a majority of young adult respondents. Most students studied for 1-2 hours and completed 3-4 experimental courses. Key reasons for choosing the Wisdom Tree platform included experimental resources, course quality, teacher quality, and convenience. The study concludes that optimizing experimental resources, improving course quality, and enhancing teacher training are crucial for improving student satisfaction and learning effectiveness on the platform.

The paper collected a total of 300 valid samples, describing the respondents' basic information from aspects such as gender, age, education level, and major, as detailed in the following table.

Table 2: Descriptive Analysis of Basic Information

Attribute	Category	Number	Percentage
Gender	Male	159	53
	Female	141	47
Age	18-24 years old	73	24.3
	24-30 years old	135	45
	30 years old and above	92	30.7
Educational Level	Undergraduate /College Student	164	54.7
	Master's Student	86	28.7
	PhD Student	50	16.7
Major	Biology	58	19.3
	Chemistry	97	32.3
	Physics	88	29.3

	Other Related Majors	57	19
Average Weekly Study Time on Wisdom Tree Platform	Less than 1 hour	77	25.7
	1-2 hours	112	37.3
	2-4 hours	69	23
	More than 4 hours	42	14
Number of Experimental Courses Completed on Wisdom Tree Platform	1-2 courses	98	32.7
	3-4 courses	168	56
	5 or more courses	34	11.3

Table 3: Main Reasons for Choosing Online Experimental Courses on the Wisdom Tree Platform?

	Response		**Percentage of Responses**
	Number	**Percentage**	
Convenience	156	19.70%	52.00%
Course Quality	203	25.70%	67.70%
Teacher Teaching	195	24.70%	65.00%
Experimental Resources	237	30.00%	79.00%
Total	791	100.00%	263.70%

From the table, we can deduce that the primary reason for choosing online experimental courses on the Wisdom Tree platform is the experimental resources, constituting the largest proportion at 30%. Following that, the quality of the courses accounts for 25.7%, teacher teaching for 24.7%, and convenience for 19.7%.

4.5 Reliability Analysis

Reliability analysis measures the stability and consistency of research tools (like questionnaires), assisting researchers in ensuring that the measurement tools are reliable across different contexts and over time. In this study, we use Cronbach's alpha coefficient to assess the reliability of each dimension in the questionnaire (Zacks, 2012).

Devellis (1991) suggests that for acceptable reliability, Cronbach's alpha coefficient must be greater than 0.7. In this research, the alpha coefficients for each dimension exceed this standard, indicating that the questionnaire has good internal consistency and reliability.

The reliability analysis table below shows:

Table 4: Reliability Analysis

Dimension	N	α Coefficient
Satisfaction with Demonstration Videos	3	0.784
Satisfaction with Experiment Operation Guides	3	0.829
Satisfaction with Interactive Experiment Sessions	3	0.767
Satisfaction with Resources Provided by the Course	3	0.764
Satisfaction with Teacher's Guidance on Experiments	3	0.807
Satisfaction with Post-Experiment Discussion and Q&A Sessions	3	0.795
Total Scale Reliability	19	0.874

The alpha coefficients for each dimension are all above 0.7, with the highest being for "Satisfaction with Experiment Operation Guides" at 0.829, while "Satisfaction with Resources Provided by the Course" is slightly lower at 0.764. Overall, the total reliability alpha coefficient of the scale is 0.874, indicating good reliability of the questionnaire in this sample. The reliability analysis of this questionnaire shows good consistency, providing a solid foundation for subsequent data analysis.

4.6 Exploratory Factor Analysis

Exploratory Factor Analysis is a statistical method used to detect potential structures within data. In this study, we use Exploratory Factor Analysis to gain deeper insights into the underlying structure of student satisfaction with online experimental courses on the Wisdom Tree platform (Fabrigar & Wegener, 2012). Using SPSS 23.0, the KMO and Bartlett's Test of Sphericity were performed on the scale, with results as follows in the table.

Table 5: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.842**
Bartlett's Test of Sphericity	Approximate Chi-Square	2018.02
	Degrees of Freedom (df)	153
	Significance (Sig.)	.000

The above table indicates a KMO value of 0.842, which is greater than 0.7, and a significant Bartlett's Test of Sphericity (Sig. < 0.001). This suggests that the questionnaire data is suitable for factor analysis. Consequently, further analysis will be conducted using the principal component analysis method for factor extraction, considering factors with eigenvalues greater than 1. The factor rotation will use varimax orthogonal rotation for factor analysis. The results of the analysis are presented in the following table.

Table 6: Factor Analysis Results

	Component					
Item	Satisfaction with Experiment Operation Guides	Satisfaction with Teacher's Guidance on Experiments	Satisfaction with Post-Experiment Discussion and Q&A Sessions	Satisfaction with Demonstration Videos	Satisfaction with Interactive Experiment Sessions	Satisfaction with Resources Provided by the Course
B3	**0.816**	0.191	0.063	0.22	0.095	0.132
B1	**0.81**	0.163	0.156	0.151	0.16	0.111
B2	**0.768**	0.19	0.157	0.162	0.061	0.116
E1	0.21	**0.838**	0.077	0.108	0.065	0.045
E2	0.174	**0.81**	0.165	0.113	0.135	0.098
E3	0.124	**0.762**	0.106	0.132	0.134	0.091
F1	0.051	0.084	**0.832**	0.045	0.111	0.2
F2	0.138	0.128	**0.819**	0.071	0.03	0.127
F3	0.147	0.119	**0.769**	0.132	0.084	0.091
A3	0.127	0.075	0.112	**0.8**	0.153	0.104
A1	0.213	0.173	0.076	**0.798**	0.042	0.052
A2	0.138	0.099	0.063	**0.796**	0.039	0.074
C3	0.063	0.176	0.108	0.034	**0.816**	0.124
C2	0.138	0.092	0.11	-0.014	**0.809**	0.095
C1	0.07	0.048	0.003	0.213	**0.781**	0.009
D3	0.094	-0.003	0.095	0.076	0.049	**0.831**
D1	0.048	0.121	0.123	0.02	0.105	**0.822**
D2	0.198	0.118	0.21	0.148	0.075	**0.719**
Eigenvalues	2.203	2.191	2.164	2.148	2.076	2.053
Percentage of Variance	12.241	12.171	12.025	11.935	11.535	11.407
Cumulative %	12.241	24.412	36.437	48.372	59.907	71.314

From the table above, it can be seen that the factor analysis results identified a total of 6 factors, with a cumulative explanatory power of 71.314%, which is greater than 50%. This indicates that the 6 selected factors have good representativeness. The factor loading coefficients are shown in the table above. Each measurement item's factor loading is greater than 0.5, and cross-loadings are all less than 0.4, with each item falling into its corresponding factor. This demonstrates that the scale has good structural validity.

Before conducting exploratory factor analysis using SPSS 23.0, the KMO and Bartlett's Test of Sphericity were performed. The KMO value reached 0.842, far exceeding 0.7, indicating that the sample data is very suitable for factor analysis. Also, Bartlett's Test of Sphericity was significant (Sig. <0.001), further confirming the suitability of the data for factor analysis.

Principal component analysis was used for extracting common factors, with eigenvalues greater than 1 as the standard for factor extraction. Considering improving interpretability and conciseness, varimax orthogonal rotation was used for factor rotation.

The results revealed 6 factors. The cumulative explanatory power of these six factors reached 71.314%, meaning these factors sufficiently represent most of the information in the original variables. Further observing the factor loadings, we find that each item's factor loading is greater than 0.5, and cross-loadings are less than 0.4. These results meet the requirements for factor analysis, proving the scale's good structural validity.
In line with the study's theme, we found six key dimensions behind the satisfaction with online experimental courses on the Wisdom Tree platform, such as satisfaction with experiment operation guides, teacher's guidance on experiments, post-experiment discussion, and Q&A sessions, etc. This provides valuable insights, aiding the Wisdom Tree platform in further optimizing and refining its experimental courses to meet students' needs and expectations.

In future research, we may consider further verifying the stability and reliability of these factors or exploring other potential factors that might influence student satisfaction.

4.7 Correlation Analysis

After determining the structure of the dimensions and corresponding items through validity and reliability analysis, the average scores of each dimension's items were calculated to represent the score of that dimension, which was then used for correlation analysis (Archdeacon, 1994).

Correlation analysis primarily studies the relationship between variables, with correlation coefficients ranging between -1 and 1. The larger the absolute value, the more closely related the variables are.

This study will discuss the correlation relationships among satisfaction with demonstration videos, experiment operation guides, interactive experiment sessions, resources provided by the course, teacher's guidance on experiments, post-experiment discussion and Q&A sessions, and overall satisfaction based on this standard. The specific results are shown in the following table.

Table 7: Correlation Analysis

	Satisfaction with Demonstration Videos	**Satisfaction with Experiment Operation Guides**	**Satisfaction with Interactive Experiment Sessions**	**Satisfaction with Resources Provided by the Course**	**Satisfaction with Teacher's Guidance on Experiments**	**Satisfaction with Post-Experiment Discussion and Q&A Sessions**	**Overall satisfaction**
Satisfaction with Demonstration Videos	1						
Satisfaction with Experiment Operation Guides	.440**	1					
Satisfaction with Interactive Experiment	.235**	.291**	1				
Satisfaction with Resources Provided by the Course	.245**	.335**	.231**	1			
Satisfaction with Teacher's Guidance on Experiments	.333**	.460**	.303**	.255**	1		
Satisfaction with Post-Experiment	.253**	.344**	.228**	.373**	.322**	1	

Discussion and Q&A Sessions							
Overall satisfaction	.403**	.472**	.298**	.366**	.361**	.372**	1

Note: **, p<0.01

From the table, it can be observed that there is a significant positive correlation between the satisfaction with demonstration videos and overall satisfaction (r=0.403, p<0.01), satisfaction with experiment operation guides and overall satisfaction (r=0.472, p<0.01), satisfaction with interactive experiment sessions and overall satisfaction (r=0.298, p<0.01), satisfaction with resources provided by the course and overall satisfaction (r=0.366, p<0.01), satisfaction with teacher's guidance on experiments and overall satisfaction (r=0.361, p<0.01), and satisfaction with post-experiment discussion and Q&A sessions and overall satisfaction (r=0.372, p<0.01).

All dimensions of satisfaction in this study show significant positive correlations with overall satisfaction, indicating that these dimensions all impact students' overall feelings. Particularly, satisfaction with experiment operation guides shows the highest correlation with overall satisfaction, suggesting that in designing and offering online experimental courses, greater emphasis should be placed on providing clear and specific operation guides to improve students' overall satisfaction.

4.8 Regression Analysis

Using satisfaction with demonstration videos, experiment operation guides, interactive experiment sessions, resources provided by the course, teacher's guidance on experiments, and post-experiment discussion and Q&A sessions as independent variables, and overall satisfaction as the dependent variable, a multiple regression analysis was conducted (Golberg & Cho, 2004).

Table 8: Regression Analysis

Dependent Variable	**Independent Variables**	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**p**	**Collinearity Statistics**	
		B	**Standard Error**	**Beta**			**Tolerance**	**VIF**
1	(Constant)	-0.624	0.348		-1.794	0.074		
Overall Satisfaction	Satisfaction with Demonstration Videos	0.261	0.078	0.18	3.343	0.001	0.769	1.3

Satisfaction with Experiment Operation Guides	0.278	0.072	0.227	3.866	0	0.646	1.547
Satisfaction with Interactive Experiment Sessions	0.128	0.068	0.097	1.901	0.058	0.854	1.17
Satisfaction with Resources Provided by the Course	0.208	0.074	0.149	2.807	0.005	0.796	1.256
Satisfaction with Teacher's Guidance on Experiments	0.106	0.071	0.083	1.491	0.137	0.721	1.387
Satisfaction with Post-Experiment Discussion and Q&A Sessions	0.181	0.068	0.144	2.68	0.008	0.776	1.289
R-squared	0.346						
F	25.881***						

From the table, it is evident that the R-squared value is 0.346, indicating that 34.6% of the variance in overall satisfaction is explainable. With an F-value of 25.881 and $p<0.001$, the model's significance is confirmed. The VIF values being less than 5 indicate no multicollinearity among the variables. Satisfaction with demonstration videos significantly positively impacts overall satisfaction ($\beta=0.18$, $p<0.05$), supporting the hypothesis. Satisfaction with experiment operation guides also significantly positively influences overall satisfaction ($\beta=0.227$, $p<0.05$), validating the hypothesis. However, satisfaction with interactive experiment sessions does not show a significant positive impact on overall satisfaction ($\beta=0.097$, $p>0.05$), thus the hypothesis is not supported. Satisfaction with resources provided by the course significantly positively affects overall satisfaction ($\beta=0.149$, $p<0.05$), supporting the hypothesis. The satisfaction with teacher's guidance on experiments does not have a significant positive effect on overall satisfaction ($\beta=0.083$, $p>0.05$), so the hypothesis is not supported. Finally, satisfaction with post-experiment discussion and Q&A sessions significantly positively impacts overall satisfaction ($\beta=0.144$, $p<0.05$), confirming the hypothesis.

4.9 Analysis of Differences

Gender

An independent sample t-test reveals that there are no significant differences between genders in terms of satisfaction with demonstration videos, experiment operation guides, interactive experiment sessions, resources provided by the course, teacher's guidance on experiments, post-experiment discussion and Q&A sessions, and overall satisfaction. Specific results are shown in the following table.

Table 9: Gender Difference Analysis

	Gender	Mean	Standard Deviation	t	p
Satisfaction with Demonstration Videos	Male	3.704	0.887	0.745	0.457
	Female	3.629	0.865		
Satisfaction with Experiment Operation Guides	Male	3.707	1.066	1.513	0.131
	Female	3.525	1.006		
Satisfaction with Interactive Experiment Sessions	Male	3.554	0.954	0.342	0.733
	Female	3.515	0.975		
Satisfaction with Resources Provided by the Course	Male	3.270	0.876	0.346	0.73
	Female	3.234	0.948		
Satisfaction with Teacher's Guidance on Experiments	Male	3.528	0.936	1.535	0.126
	Female	3.352	1.052		
Satisfaction with Post-Experiment Discussion and Q&A Sessions	Male	3.287	1.004	-0.719	0.473
	Female	3.371	1.015		
Overall Satisfaction	Male	3.460	1.241	0.276	0.783
	Female	3.420	1.310		

The analysis results indicate that there are no significant differences between men and women in terms of satisfaction across various aspects. This suggests that gender does not significantly influence the evaluation of demonstration videos, experiment operation guides, interactive experiment sessions, course resources, teacher guidance, discussion, and Q&A sessions, as well as overall satisfaction.

Age

A one-way ANOVA revealed significant differences in satisfaction with experiment operation guides and overall satisfaction among different age groups, while no significant differences were found in satisfaction with demonstration videos, interactive experiment sessions, resources provided by the course, teacher's guidance on experiments, and post-experiment discussion and Q&A sessions.

Table 10: Age Difference Analysis

	Age	Mean	Standard Deviation	F	p
Satisfaction with Demonstration Videos	18-24	3.753	0.846	2.803	0.062
	24-30	3.538	0.866		
	Over 30	3.794	0.897		
Satisfaction with Experiment Operation Guides	18-24	3.461	1.160	3.297	0.038
	24-30	3.556	1.076		
	Over 30	3.844	0.842		
Satisfaction with Interactive Experiment Sessions	18-24	3.575	0.972	0.987	0.374
	24-30	3.452	0.968		
	Over 30	3.627	0.946		
Satisfaction with Resources Provided by the Course	18-24	3.297	0.970	1.448	0.237
	24-30	3.158	0.910		
	Over 30	3.359	0.851		
Satisfaction with Teacher's Guidance on Experiments	18-24	3.301	1.069	2.709	0.068
	24-30	3.393	1.007		
	Over 30	3.638	0.889		
Satisfaction with Post-Experiment Discussion and Q&A Sessions	18-24	3.279	1.041	0.453	0.636
	24-30	3.296	1.006		
	Over 30	3.409	0.992		
Overall Satisfaction	18-24	3.450	1.302	7.155	0.001
	24-30	3.180	1.332		
	Over 30	3.820	1.058		

The results suggest significant differences in satisfaction with experiment operation guides and overall satisfaction among different age groups. Specifically, participants aged 30 and above rated higher in satisfaction with experiment operation guides and overall satisfaction. No significant differences were found in other aspects among different age groups.

Educational Level

A one-way ANOVA showed significant differences in satisfaction with interactive experiment sessions, resources provided by the course, teacher's guidance on experiments, and overall satisfaction among different educational levels, while no significant differences were found in satisfaction with demonstration videos, experiment operation guides, and post-experiment discussion and Q&A sessions.

Table 11: Educational Level Difference Analysis

	Educational Level	Mean	Standard Deviation	F	p
Satisfaction with Demonstration Videos	Undergraduate	3.646	0.897	1.29	0.277
	Master's Degree	3.609	0.867		
	Ph.D	3.847	0.817		
Satisfaction with Experiment Operation Guides	Undergraduate	3.555	1.019	1.444	0.238
	Master's Degree	3.620	1.080		
	Ph.D	3.840	1.028		
Satisfaction with Interactive Experiment Sessions	Undergraduate	3.413	0.849	6.608	0.002
	Master's Degree	3.519	1.142		
	Ph.D	3.967	0.866		
Satisfaction with Resources Provided by the Course	Undergraduate	3.215	0.904	3.3	0.038
	Master's Degree	3.155	0.923		
	Ph.D	3.547	0.857		
Satisfaction with Teacher's Guidance on Experiments	Undergraduate	3.362	0.983	3.655	0.027
	Master's Degree	3.407	1.006		
	Ph.D	3.787	0.954		
Satisfaction with Post-Experiment Discussion and Q&A Sessions	Undergraduate	3.289	0.958	2.538	0.081
	Master's Degree	3.233	1.080		
	Ph.D	3.613	1.011		
Overall Satisfaction	Undergraduate	3.290	1.291	5.896	0.003
	Master's Degree	3.420	1.260		
	Ph.D	3.980	1.097		

The results indicate significant differences in satisfaction with interactive experiment sessions, resources provided by the course, teacher's guidance on experiments, and overall satisfaction among participants with different educational backgrounds. Specifically, PhD students generally reported higher levels of satisfaction. However, no significant differences were observed in other areas (such as satisfaction with demonstration videos, experiment operation guides, and post-experiment discussion and Q&A sessions) among participants with different educational backgrounds.

Major

A one-way ANOVA showed no significant differences in satisfaction with demonstration videos, experiment operation guides, interactive experiment sessions, resources provided by the course, teacher's guidance on experiments, post-experiment discussion and Q&A sessions, and overall satisfaction among participants from different majors.

Table 12: Analysis of Differences by Major

	Major	Mean	Standard Deviation	F	p
Satisfaction with Demonstration Videos	Biology	3.770	0.819	0.498	0.684
	Chemistry	3.598	0.965		
	Physics	3.659	0.933		
	Other Related Fields	3.702	0.669		
Satisfaction with Experiment Operation Guides	Biology	3.638	0.941	1.097	0.351
	Chemistry	3.677	1.012		
	Physics	3.462	1.167		
	Other Related Fields	3.754	0.969		
Satisfaction with Interactive Experiment Sessions	Biology	3.678	0.856	1.17	0.321
	Chemistry	3.495	1.016		
	Physics	3.417	1.029		
	Other Related Fields	3.643	0.852		
Satisfaction with Resources Provided by the Course	Biology	3.322	0.777	0.224	0.88
	Chemistry	3.261	0.936		
	Physics	3.197	0.973		
	Other Related Fields	3.257	0.902		
Satisfaction with Teacher's Guidance on Experiments	Biology	3.477	0.957	0.781	0.505
	Chemistry	3.516	0.971		
	Physics	3.311	1.088		
	Other Related Fields	3.503	0.920		
Satisfaction with Post-Experiment Discussion and Q&A Sessions	Biology	3.333	1.011	0.617	0.605
	Chemistry	3.392	0.993		
	Physics	3.208	1.023		
	Other Related Fields	3.392	1.020		
Overall Satisfaction	Biology	3.450	1.216	0.184	0.907
	Chemistry	3.510	1.276		
	Physics	3.420	1.345		
	Other Related Fields	3.350	1.232		

Regardless of their major, whether it's biology, chemistry, physics, or other related fields, the analysis shows no significant differences in satisfaction across all aspects. This indicates that participants from different academic majors have similar evaluations for experimental demonstration videos, experiment operation guides, interactive experiment sessions, course resources, teacher guidance, discussion and Q&A sessions, as well as overall satisfaction.

In conclusion, while gender and major do not significantly influence satisfaction evaluations, factors such as age and educational level might impact participants' experiences. Particularly, participants with higher educational qualifications and older age tend to have higher satisfaction ratings.

Table 13: Verification Results of Research Hypotheses

Hypothesis Number	Research Hypothesis	Verification Result	Coefficient	P-value
H1	The clarity of the video positively influences students' course satisfaction.	Supported	0.18	0.001
H2	The understandability of experimental operation guides positively influences students' course satisfaction.	Supported	0.227	0
H3	The practicality of experimental interaction positively influences students' course satisfaction.	Not Supported	0.097	0.058
H4	The quality of resources provided by the course positively influences students' course satisfaction.	Supported	0.149	0.005
H5	The quality of teacher guidance positively influences students' course satisfaction.	Not Supported	0.083	0.137
H6	Post-course discussion and Q&A sessions positively influence students' course satisfaction.	Supported	0.144	0.008

5 CONCLUSION

5.1 Conclusion

This study delves into user satisfaction with online course apps in the era of digital evolution, emphasizing their role in modern education. By conducting a series of analyses on 300 respondents, the research uncovers variations in app usage and identifies key satisfaction drivers like experimental resources, course quality, and teaching effectiveness. The reliability of the survey instruments is confirmed, and six principal influencing factors are pinpointed through exploratory factor analysis. Moreover, correlation analysis sheds light on how different satisfaction dimensions interrelate, guiding the enhancement of online course apps. Overall, the study offers a comprehensive examination of user satisfaction with online course apps, contributing valuable insights to the field of online education.

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