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The Relationship Between Quality Factors and Online Education Satisfaction: The Moderating Role of Communication Quality in Shanghai, China

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ABSTRACT

Purpose: The rapid advancement and technology have turned every page of life and have primarily affected the student life and education domain. Since COVID pandemic, the education sector embraced the online medium and tried its best effort to effectively continue the learning stream and to evaluate the student satisfaction with the online education system, this study developed an empirical model framing the impact of interactivity, course availability and learning style on the student satisfaction with the catalytic role of cognitive engagement and the external role of communication quality. **Method:** The study was conducted in the education sector and students who use online platforms and learning materials were targeted within the boundaries of China and the sample size was decided according to item response theory i.e., 440. The SPSS and Amos were used for data analysis. **Findings:** The findings revealed the significant effects of all the direct and indirect effects and moderation was also accepted for the course availability and interactivity. **Conclusion:** This research examines the complex interplay between quality metrics, communication quality, and overall satisfaction among online learners to develop a deeper understanding of satisfaction in digital education. The study highlights the impact of three key quality factors on happiness in online learning contexts: interactivity, course accessibility, and learning preferences. It focuses on unraveling how these variables relate to and influence each other as well as learner contentment in virtual classrooms.

Keywords: Online education satisfaction, Communication quality, interactivity, course availability, Learning style

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INTRODUCTION

Online education has grown as a popular form of delivering education, distinguished by its emphasis on student interaction and learning-centred approaches. This revolution shifts the educational paradigm away from the traditional model of teacher-led "teaching" and towards a more student-driven approach to "learning" aided by teacher guidance (Yuan, 2021). It improves student satisfaction by catering to individual preferences and encouraging engagement through personalized experiences. This study aims to investigate how the shift to online education influence the satisfaction level of learners in Shanghai, China.

Satisfaction in online learning is influenced by elements such as educational quality, interaction, technology, academic experience, subject knowledge, student support, and evaluation systems (Abdel-Salam et al., 2022). Better information and service quality may assist universities in increasing college students' intention to continue online studying during the pandemic (Cui, 2021). MOODLE, an open-source platform, aid open universities in delivering their courses and content online. Engaging students in online learning, particularly with recorded videos, poses a challenge. Whereas, interactive videos crucial as they enable learner engagement during viewing (Afify, 2020).

Learner satisfaction might be challenged by online education at times. Basuony et al. (2021) claimed that due to social distance rules, the shift from in-person to online learning poses issues for social work education. This transition has an impact on both instructors and students, particularly because social work courses frequently include hands-on components and direct engagement, which can be difficult to recreate online, particularly for students with limited access to technology.

Understanding the characteristics that significantly impact students' satisfaction levels is vital in light of the growing reliance on digital learning platforms (Basu, 2021), particularly in a dynamic urban context like Shanghai. This study aims to investigate the various dimensions of quality parameters in online education, with the goal of understanding their impact on student satisfaction while focusing on the educational dynamics that exist in Shanghai's academic sector. The study aims to provide insights essential to refining and optimizing online education strategies specific to Shanghai's educational landscape, thereby contributing to the ongoing evolution of educational practices in this dynamic

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metropolitan region by investigating the relationship between these quality factors and satisfaction levels.

This study is imperative because it investigates the subtle relationship between factors of quality and satisfaction in online education in the setting of Shanghai, China. Its uniqueness lies in its attempts to examine the mediating role of cognitive engagement and moderating influence of communication quality. Understanding these relationships can have a significant impact on the improvement of online education strategies, providing useful insights into how improving quality can potentially increase overall satisfaction, guiding the refinement of educational practices in Shanghai's online learning landscape.

LITERATURE REVIEW

Theory of Acceptance and use of Technology

The rationale of integrated premise of recognition and exploit of technology (UTAUT) is to illustrate addict intents to utilise an in sequence system as well as ensuing occupy behaviour (Vega et al., 2019). The idea identifies four primary constructs:

1) Expectancy of performance
2) Expectancy of effort
3) Social Influence
4) Facilitating Conditions.

Expectancy of performance signifies the user's confidence in how well a technology can improve their performance. Expectancy of effort relates to how much effort the user believes is necessary to use the technology effectively. Social Influence encompasses the impact of social factors and peer influence on the adoption of technology. Facilitating Conditions refer to the level of support and resources accessible to the user to aid in using the technology.

This theory holds importance in the exploration of the affiliation linking quality variables and fulfilment in online education. UTAUT provides a structured framework to comprehend how various factors, such as expectancy of performance, effort, social manipulate, and facilitating circumstances, influence users' intentions and behaviours towards adopting online educational tools in the context of examining the relationship between quality aspects and satisfaction levels in online learning environments. This study uses the UTAUT model to

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examine how these factors determine satisfaction levels in online education, perhaps providing insights into the elaborate dynamics that pressures users' experiences and contentment with virtual learning platforms in the setting of Shanghai, China.

Interactivity and Online Education Satisfaction

Considerations include the use of interactive collaborative software tools in online learning environments, students' satisfaction with their online education, their perception of teachers' presence, and their engagement. A study suggests that the interactive communication technology improves perceived teacher presence, which improves student engagement and satisfaction. Because they affect student involvement and enjoyment, the interactive communication tool and the instructor are therefore essential elements of the online learning process (Roque-Hernández et al., 2023). An expectation-confirmation model (ECM)-based research model was presented in a study to examine the potential effects of course quality and interactivity as antecedents to student beliefs on students' satisfaction and intention to stick with the cloud-based electronic learning system in the educational institution. The results demonstrated a good correlation between students' assessments of interaction, course design, and material quality and their perceived utility, corroborating (Cheng, 2020). According to the findings, the value of video for learning efficacy is dependent on the amount of interactivity. Students in the e-learning class with interactive video were far more satisfied than students in other settings (Mir et al., 2022).

H1: Interactivity within online education positively influences the satisfaction levels of learners.

Course Availability and Online Education Satisfaction

An essential element in the pleasure of online learning is the availability of courses. Studies examine how satisfied students are with distance learning. A "gearing together" of student concerns led to increased satisfaction with online learning among students. The main characteristics of these issues include student expectations for the duration and location of online learning, self-motivation, and other people's engagement, such as classmates and the teacher. The last factor that determines student satisfaction is how well the student's expectations in these areas match their larger learning objectives and personal reasons for enrolling in the course (Landrum et al., 2021). Institutions of higher learning are always looking for new and creative ways to manage their knowledge resources, boost student

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engagement, and enhance the quality of instruction. Technology is having a huge impact on education. Technology-mediated learning is developing quickly, and blended learning is being used in schools. The adoption of a blended course in a 'Management' course on university premises has led to research that focuses on student satisfaction. It focuses on components of the Learning Management System (LMS) that affect students' satisfaction and self-efficacy. The results show that LMS self-efficacy positively affects students' satisfaction with their education (Prifti, 2022).

H2: Course availability of online education positively influences the satisfaction levels of learners.

Learning style and Online Education Satisfaction

A study examined how a user's preferred method of learning affects their level of happiness and how successful their web-based learning system is. According to this study, learning outcomes are significantly impacted by students' happiness with the web-based learning environment (Cheng et al., 2017). One of the main goals of e-learning is student pleasure, thus factors that affect this satisfaction should be carefully examined. a research that evaluated how dental students' e-learning satisfaction was impacted by their learning preferences and levels of general self-efficacy (GSE). The active part of information processing exhibited a substantial correlation with the degree of pleasure, according to the association between learning style characteristics and satisfaction (Baherimoghadam et al., 2021).

Research that assessed the satisfaction and learning styles of students enrolled in distant education programmes and examined the connection between the two. It was shown that students enrolled in distant education programmes are just as satisfied with their courses regardless of their preferred method of studying (Bayrak et al., 2017).

H3: Learning style of online education positively influences the satisfaction levels of learners.

Cognitive Engagement mediates the relationship between Interactivity and Online Education Satisfaction

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A study looks at how learner satisfaction (LS) is affected by instructor presence (IP) and virtual learning platforms. Additionally, this study looks into how learner engagement, or LE, contributes to the improvement of the LS. The results demonstrated that OP positively impacted both IP and LE. Moreover, there is a significant positive association between IP and LS, IP and LE, and LE and LS. The importance of the IP and LE in relationships is validated by the mediation research (Jain et al., 2023). Since learning engagement is linked to both student achievement and the calibre of online education, it is considered a critical component in the assessment of online courses. The moderating roles of academic emotions and online learning self-efficacy in the relationship between interaction and learning engagement in online learning are examined in a study that uses a self-report survey (Wang et al., 2022). By examining the influence of student engagement on perceived learning effectiveness (PLE) in the context of Indian higher education, a research contributes to the body of information on the effectiveness of e-learning. Through the mediating effect of all facets of student participation, the ISE affects the PLE. Additionally, there is a connection between student grades and PLE (Panigrahi et al., 2021).

H4: Cognitive engagement mediates the significant relationship between interactivity and online education satisfaction.

Cognitive Engagement mediates the relationship between Course Availability and Online Education Satisfaction

Understanding the importance of teacher presence in student learning can aid in the improvement of online instruction. The results provide insight on how teacher presence affects students' cognitive conflict-based learning engagement and provide educators with useful guidance for remote instruction (Wang & Stein, 2021). The surge in enrollment in distant learning programmes, in particular, adds a new degree of complexity, prompting academics to look for strategies to boost engagement in the online course environment. Organisations continue to place a premium on cooperation, and many instructors have integrated group projects into their online courses to teach students this vital ability (Wolverton et al., 2020). A research that looked at the relationship and process between high school students' cognitive engagement and a blended synchronous learning environment (BSLE), with motivation serving as a mediator (Shi et al., 2021). In Northern Malaysian public institutions, a research looked at the effects of cognitive absorption and perceived social presence on e-satisfaction and e-retention the core variables of the technology

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acceptance model among undergraduate students. The results of the study demonstrate that perceived usefulness and ease of use of e-learning platforms are positively impacted by cognitive absorption in a direct, significant, and beneficial way (Salimon et al., 2021).

H5: Cognitive engagement mediates the significant relationship between course availability and online education satisfaction.

Cognitive Engagement mediates the relationship between Learning style and Online Education Satisfaction

In an immersive virtual reality-based learning environment for Taiwanese high school students, a study examined the relationship between learning style, sensation of presence, cognitive load, and emotional and cognitive learning results. This study discovered that, while students' learning styles had no effect on learning results, they do have an effect on their subjective sensation of presence and cognitive load throughout the learning process. According to the findings of this study, the mechanism of sensation of occurrence and cognitive load had conflicting prognostic impacts on emotional and cognitive erudition upshot, correspondingly (Huang et al., 2020). Adaptive e-learning is seen to be a stimulating way to increase learning and boost student engagement; building up suitable adaptive e-learning environments aids in individualised instruction and reinforces learning outcomes. These test findings imply that learners can become engaged in the learning process in an adaptive online environment (El-Sabagh, 2021).

H6: Cognitive engagement mediates the relationship between learning style and online education satisfaction.

Moderation of communication quality

Interactivity, as a critical component of method dimension, aids in emotional sustenance and task completion, facilitating the preservation and growth of an online learning community. A study stated that, despite the range of communicative systems and technologies, it is the essence of interaction that greatly contributes to learners' task fulfilment and social-emotional satisfaction, and therefore indirectly to their intention to continue learning. This study shown that the promoted element of interaction has a considerably beneficial influence on learners' sense of community and perceived utility of online education, and that it plays a somewhat mediating function in their desire to continue learning (Zhao et al., 2020). To overcome this

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gap and promote communication and engagement, many technology solutions are deployed. The essay delves into the many features of communication in online learning settings, as well as the various types of engagement involved. A study may be useful to communication researchers and scholar-practitioners, online learning designers, and institutional managers looking for teaching personnel for online educational courses (Vlachopoulos & Makri, 2019).

H7: Communication quality moderates the relationship between interactivity and online education satisfaction.

The process of changing one's conduct as a result of experience is known as learning. Students employ a variety of learning resources to gain experience. Which learning medium are most effective is still an issue that needs to be researched. A study used to characterise the many forms of online communication medium that students utilise for learning, as well as their efficacy (Wiyono et al., 2020). A study shows that digital teaching materials have a strong perceptual function, which is obvious from cadet attitudes and significantly corresponds with their pleasure with the linked communication part of e-learning. In addition, the results discussion aims to contribute to the field of information and communication sciences by clarifying the significance and description of DTM information constructs through classification, which makes it possible to assess the degree of significance and legality between information objects of learning outcomes. Nevertheless, the paper also highlights interdisciplinary research initiatives, with a focus on new technologies in teaching (Tuta & Luić, 2020).

H8: Communication quality moderates the relationship between course availability and online education satisfaction.

The use of virtual learning environments (VLEs) and distance education (DE) as instruments for student-teacher interaction has expanded into a massive global study field. By observing how distant education students interacted with the virtual learning environment and making an attempt to correlate their conduct with their learning style, a research tried to connect the concept of learning styles to the behaviour of these students (Costa et al., 2020). Study findings revealed variables that vary the intensity of the correlations between the three sub-dimensions of teaching presence direct instruction, facilitation, and design and organization and the relationship between student outcomes and teaching presence (Caskurlu et al., 2020). A research offers a comprehensive structural model to explore whether or not students'

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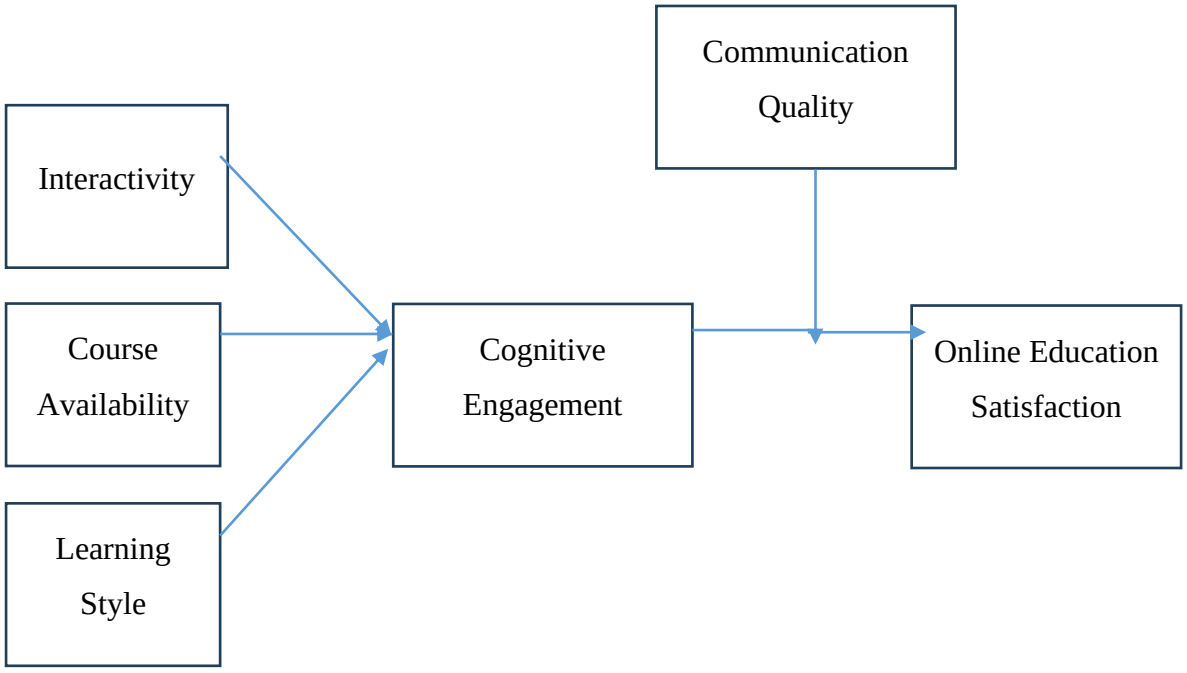
perspectives and readiness for online learning affect their performance and level of course satisfaction. It was shown that there is a mediated relationship between students' computer/Internet self-efficacy for online learning readiness and their views of online learning, course satisfaction, and online discussion score (Wei & Chou, 2020).

H9: Communication quality moderates the relationship between learning style and online education satisfaction.



The diagram explains that Online Education Satisfaction is the dependent variable while Interactively, Course Availability and Learning Style all are independent variables. Cognitive Engagement used as a mediator to persuade the association connecting the dependent and all independent variables while Communication quality plays the role as a moderator to examine the association among the dependent and independent variables.

METHODOLOGY

3.1. Research Design and Targeted Sector

This study aimed to illustrate the effect of different education and learning-related factors that influence online education satisfaction. Based on the underlying main theme of the study the quantitative research strategy has been approached and the primary data was gathered to evaluate the significance level of the variables. The study was conducted within the context of China and has targeted the educational sector to ground the key findings of this study.

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3.2. Participants and Sample

As mentioned in the previous heading the study has education-oriented variables and has selected the education sector of China. So, to evaluate the association's significance, the students of the education sector were chosen as the unit of analysis. In students, those students who were using the online learning platforms, materials and content provided by their respective educational institutes and other was primarily accessed for getting a response from filled. As it was evident that the number of students in the education sector was not available, consequently, the study had to pursue some appropriate non-probability sampling technique i.e., purposive sampling technique. The students who use online learning mediums were purposively targeted and their viewpoints on the targeted variables.

3.3. Measures for the Instrument

The measurement of the measures was explored from past literature studies that have measured the same targeted variables with the same items and have indicated good reliability and validity figures for the measurements. All the measurement items used for the variable measurement with their brief and necessary information and one example item has been attached in the following table to effectively present the details of the measure.

Table 3.1. *Measurement items*

Items	Adopted for	Source of the items	Example item
3	Interactivity	(Puljak et al., 2020)	This online celebrity often interacts with us.
15	Course availability	(Puljak et al., 2020)	The instructions given by the majority of teachers. (e.g., about participation in lessons, modes of examination, solving tasks, or writing a seminar) are. tailored to e-learning
8	Learning style	(Renou, 2008)	"Follow written directions better than oral directions"
6	Cognitive engagement	(Shi et al., 2021)	"I find reviewing previously solved problems to be a good way to study for a test." "When studying, I try to combine different pieces of information from course material in new ways".

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5	Communication Quality	(Mohr & Sohi, 1995)	"To what extent do you feel that your communication with this manufacturer is: • Timely/untimely"?
7	Online education satisfaction	(Roque-Hernández et al., 2023)	"Taking my online classes makes me feel satisfied". "Taking my online classes makes me feel good".

3.3. Instrument and Data Collection

The study used a widely applied structure of questionnaires and divided the questionnaire using different sections. The first section was confined to the prelude information of the researcher, this research, and the main key purpose of data collection. The second part was a demographic based on the general questions related to the respondents who gave a filled response sheet. The demographic questions were the age, gender, and education level. The third and last but most important part of the survey tool was the scale items adopted from the previous studies that were added to get the respondents' thoughts on the variables of the study.

Next was the step of the data collection. As afore-highlighted online students were the target respondents of the study that's why many online communication sources and many platforms were utilized to reach the maximum number of respondents. The university and higher education institutes were accessed online, and an online Google Doc link was shared with them along with the criteria description of the target population to ensure the exact and relevant population viewpoints collection. Further, some social media platforms were also utilized for accessing the respondents.

ANALYSIS AND RESULTS

Demographic of Population

The respondents of the target population of the study were 244 out of 443. Female students were 199. This highlights that more male students participated in the survey practice.

Table 4.1. *The gender demographic*

	Gender			
	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**

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	male	244	55.1	55.1	55.1
Valid	female	199	44.9	44.9	100.0
	Total	443	100.0	100.0	

The students who filled out the response sheet of the questionnaire were in the age range between 18 to 21. The second high-ranked age group of the students in the responses was 22-25. Some students were from an age range of 26 and above, but the majority of the study findings are based on the viewpoint of the students who have an age range of 18 to 25 overall.

Table 4.2. *The demographic age*

	Age				
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	18-21	233	52.6	52.6	52.6
	22-25	191	43.1	43.1	95.7
	26-28	19	4.3	4.3	100.0
	Total	443	100.0	100.0	

More bachelor's students participated in the survey practice and other students who showed a high response rate were the students in the master's program.

Table 4.3. *The education demographics*

	Qualification				
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Intermediate	98	22.1	22.1	22.1
	Bachelor	218	49.2	49.2	71.3
	Master	111	25.1	25.1	96.4
	Other	16	3.6	3.6	100.0
	Total	443	100.0	100.0	

Descriptive Analysis and Normality

The normality of the variables was computed with the help of skewness and the computed results showed all values within the range of -1 to +1 and the mean values of the constructs also reflected the positive reflection of the respondents for the addressed concepts in the questionnaire.

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Table 4.4. *The descriptives*

Descriptive Statistics								
	N	Minimum	Maximum	Mean		Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Std. Error
IIN	443	1.00	5.00	3.5613	.05271	1.10937	-.421	.116
CQ	443	1.00	5.00	3.8582	.04627	.97384	-1.032	.116
OES	443	1.00	5.00	3.8504	.04939	1.03944	-.689	.116
CE	443	1.00	5.00	3.4970	.05475	1.15230	-.358	.116
LS	443	1.00	5.00	3.4515	.06052	1.27386	-.334	.116
CA	443	1.00	5.00	3.6096	.05476	1.15255	-.621	.116
Valid N (listwise)	443							

IIN: Interactivity; CQ: communication quality; OES: online education satisfaction; CE: cognitive engagement; LS: learning styles; CA: course availability.

Sample Adequacy

The sample adequacy and the redundancy of the data were evaluated and the KMO value above 0.6 and the significance of the Bartletts test confirmed the appropriateness of the data sample to provide significant and effective results.

Table 4.5. *The sample adequacy*

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.943
Bartlett's Test of Sphericity	Approx. Chi-Square	31330.116
	df	946
	Sig.	.000

Exploratory Factor Analysis

The exploratory factor analysis EFA was conducted with the help of a rotated component matrix, and the computed factor loadings revealed the effectiveness and quality of the data with no cross-loading, double loading and missed loading. Additionally, all factor loadings were above 0.6 which reflected a good quality of the data with respect to each item.

Table 4.6. *EFA*

	1	2	3	4	5	6
LS1		.865				
LS2		.870				
LS3		.863				

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LS4		.878				
LS5		.846				
LS6		.822				
LS7		.864				
LS8		.895				
CE1				.683		
CE2				.730		
CE3				.918		
CE4				.895		
CE5				.902		
CE6				.915		
OES1			.793			
OES2			.779			
OES3			.775			
OES4			.781			
OES5			.763			
OES6			.801			
OES7			.768			
IN1						.859
IN2						.880
IN3						.869
CQ1					.783	
CQ2					.789	
CQ3					.821	
CQ4					.824	
CQ5					.745	
CA1	.912					
CA2	.920					
CA3	.957					
CA4	.954					
CA5	.946					
CA6	.949					
CA7	.945					
CA8	.954					
CA9	.957					
CA10	.949					
CA11	.953					
CA12	.947					
CA13	.958					
CA14	.954					
CA15	.917					

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Correlation Testing

The inter-association between the variables computed with the Pearson correlation indicated a significant association between the variables and reflected the effectivity of the designed model with high significant correlations.

Table 4.7. *The Pearson correlation*

Correlations						
		IIN	**CQ**	**OES**	**LS**	**CA**	**CE**
IIN	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	443					
CQ	Pearson Correlation	.398**	1				
	Sig. (2-tailed)	.000					
	N	443	443				
OES	Pearson Correlation	.464**	.463**	1			
	Sig. (2-tailed)	.000	.000				
	N	443	443	443			
LS	Pearson Correlation	.275**	.325**	.319**	1		
	Sig. (2-tailed)	.000	.000	.000			
	N	443	443	443	443		
CA	Pearson Correlation	.095*	.200**	.398**	.037	1	
	Sig. (2-tailed)	.045	.000	.000	.433		.004
	N	443	443	443	443	443	443
CE	Pearson Correlation	.415**	.480**	.441**	.445**	.136**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.004	
	N	443	443	443	443	443	443

4.6. Model Fitness

The CFA confirmatory factor analysis was performed to evaluate the model fitness and the indicators of CMIN, IFI, CFI, and RMSEA showed excellent and values respective to the benchmark values and highlighted the significance and fitness of the designed model. Figure 4.1. was encountered as the output graphical standardized output of the CFA test.

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Table 4.8. *The model fit measures*

Measure	Estimate	Threshold	Interpretation
CMIN	2409.297	--	--
DF	876.000	--	--
CMIN/DF	2.750	Between 1 and 3	Excellent
CFI	0.951	>0.95	Excellent
SRMR	0.030	<0.08	Excellent
RMSEA	0.063	<0.06	Acceptable
PClose	0.000	>0.05	Not Estimated

Reliability and Validity

The reliability and the convergent validity of the variables were computed with the composite reliability and Average Variance extracted AVE respectively. The calculated was compared with the threshold ranges of values above 0.7 and 0.5 for CR and AVE and all values were above the limit.

Table 4.9. *Convergent validity measures.*

Variables	CR	AVE
CAL	0.993	0.903
LST	0.962	0.762
OSET	0.941	0.695
CENG	0.962	0.813
CQL	0.910	0.669
IINT	0.945	0.851

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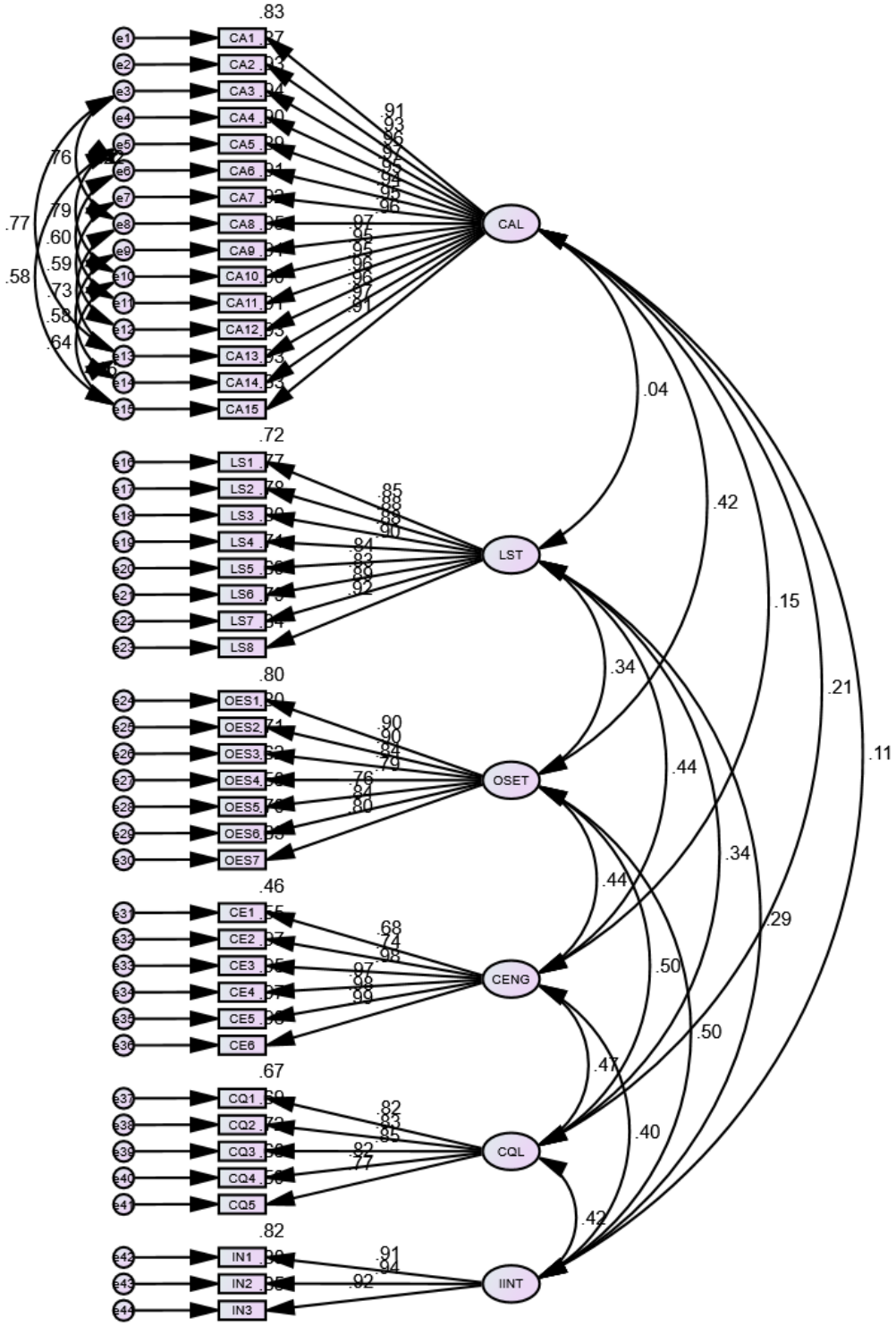

The discriminant validity was measured with the help of HTMT analysis, and the output of the result highlighted all values below 0.9. Thus, by gaining the reliability and validity values within their respective ranges, the data was assured of goodness to be used for hypothesis testing.

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Table 4.10. *The discriminant validity analysis*

	CAL	LST	OSET	CENG	CQL	IINT
CAL						
LST	0.038					
OSET	0.412	0.335				
CENG	0.139	0.463	0.465			
CQL	0.211	0.347	0.501	0.513		
IINT	0.099	0.288	0.493	0.436	0.429	

Hypothesis Testing

The SEM analysis was adopted for hypothesis testing and all the results were evaluated against the significance value of 0.05 or 0.01. The derived results for the direct analysis were significant and all direct hypotheses were accepted.

Table 4.11. *The direct Effects*

Parameter			Estimate	Lower	Upper	P
CE	<---	IIN	.308	.230	.365	.014
CE	<---	CA	.093	.024	.173	.014
CE	<---	LS	.357	.282	.428	.010
OES	<---	IIN	.310	.253	.379	.007
OES	<---	CA	.335	.274	.401	.005
OES	<---	LS	.127	.067	.190	.009
OES	<---	CE	.211	.110	.268	.025

The indirect effects were computed with specific indirect effects and the mediation was accepted between all three independent variables and the dependent variable.

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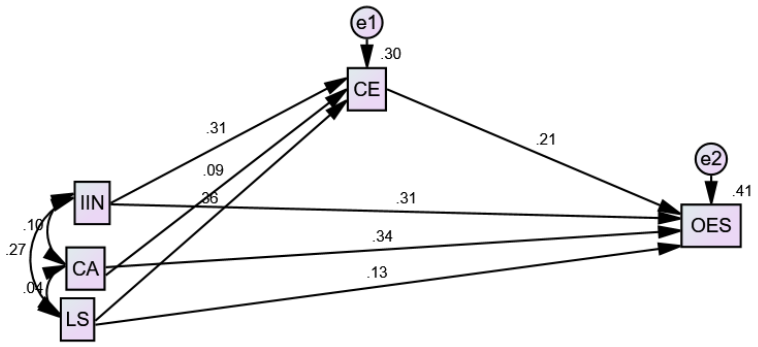

Figure 4.2. The SEM

Table 4.12. *The Indirect effects*

Indirect Path	Lower	Upper	P-Value	Standardized Estimate
IIN --> CE --> OES	0.037	0.090	0.001	0.065***
CA --> CE --> OES	0.005	0.037	0.013	0.020*
LS --> CE --> OES	0.040	0.089	0.000	0.075***

In the last step, the moderation of communication quality was tested between the independent variables and the dependent variable, and the computed results supported the moderating effect of communication quality for the relationship between interactivity, course availability and online education satisfaction.

Table 4.13. *Moderation Results*

Parameter			Estimate	Lower	Upper	P
ZOES	<---	INT_INNQ	.124	.055	.206	.008
ZOES	<---	INT_LSQ	.078	-.002	.149	.118
ZOES	<---	INT_CAQ	-.249	-.316	-.173	.009

DISCUSSION

The study's findings shed light on the complex dynamics driving online education satisfaction in three critical quality factors: interactivity, course availability, and learning style. Each of these indicators has a significant and direct association with Online Education Satisfaction, emphasizing their distinct contributions to online learners' overall satisfaction.

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The relevance of these direct links emphasizes the importance of these quality criteria in moulding student satisfaction levels in online education. The accessibility and richness of course materials, interactive features integrated into learning modules, and course delivery alignment with varied learning styles emerge as crucial drivers impacting student satisfaction. This is consistent with previous studies emphasising the importance of these characteristics in improving the online learning experience (Prifti, 2022; Si, 2022; Sutherland et al., 2019).

Furthermore, the discovery of Cognitive Engagement as a major mediator between the quality indicators and OES provides a more nuanced understanding of the underlying mechanisms influencing online education satisfaction. This mediation shows that the impact of quality characteristics on satisfaction is, at least in part, mediated by learners' level of cognitive involvement. CE serves as a link, indicating how these quality elements indirectly influence pleasure by encouraging a higher level of cognitive involvement, which in turn increases overall happiness with the online learning process. These linkages are supported by the core principles of effective online education. Interactivity, course availability, and flexible learning styles have long been recognized as important factors in the success of online educational programs (Andrade & Alden-Rivers, 2019). The findings of this study reinforce their significance and emphasize the subtle interaction between these factors and learners' cognitive engagement, emphasizing their overall impact on online education satisfaction.

Communication Quality, the moderator of this study, provides greater insights into the effect of quality elements (Interactivity, Course Availability, Learning Style) and Online Education Satisfaction. First, the positive and significant moderation effect of Communication Quality on the link between Interactivity and OES highlights the significance of good communication in enhancing the favourable influence of interactivity on satisfaction. This implies that when communication is robust and efficient within the online learning environment, the beneficial influence of interactive components is enhanced (Vlachopoulos & Makri, 2019), leading to increased learner satisfaction. This highlights the significance of clear and supportive communication channels in reaping the benefits of interactive learning features.

Second, a contrasting scenario is shown by the negative and significant moderation effect of Communication Quality on the link between Course Availability and OES. When communication quality deteriorates, the favourable influence of availability on satisfaction is weakened or even reversed. This unexpected result implies that, while course availability is critical, poor communication may undercut its impact, potentially leading to learner

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discontent. This conclusion emphasizes the critical importance of good communication tactics to supplement course availability for a more fulfilling online learning experience.

Implications

The consequences of this thorough study on the interaction of quality parameters, communication quality, and online education satisfaction are crucial for both educational practitioners and policymakers.

First, comprehending the critical importance of quality factors (Interactivity, Course Availability, and Learning Style) illuminates the essential ingredients that drive online education happiness. Educators can use these findings to deliberately plan and build online courses that prioritize interactive components, assure wider course availability, and cater to a variety of learning styles. This insight enables them to design more engaging and adaptable learning environments, hence improving learner satisfaction and learning results.

The findings further highlight the importance of Communication Quality as a moderator. Creating efficient communication channels within online learning environments emerges as a significant driver in amplifying or dampening the influence of quality parameters on satisfaction. To supplement the availability of courses and interactive features, educators and institutions should prioritize the development and maintenance of solid communication strategies. Recognizing the varied influence of CQ on various quality parameters also highlights the importance of personalized communication tactics, allowing for an optimized learning experience adapted to individual needs.

Furthermore, policymakers should use these findings to develop rules and frameworks that prioritize not just the provision of diverse and dynamic online educational resources, but also the improvement of communication infrastructures inside educational platforms. Recognizing the complex relationship between these characteristics allows policymakers to argue for investments in technology and training that support effective communication while also assuring alignment with the different demands of online learners.

Overall, this study emphasizes the multidimensional character of satisfaction in online education and emphasizes the importance of a comprehensive approach that incorporates quality criteria as well as effective communication tactics. Implementing these implications can pave the way for more engaging, accessible, and ultimately fulfilling online learning

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experiences, leading to improved educational results, and meeting the changing demands of a varied learner community.

CONCLUSION

This study delves into the complicated relationships between quality criteria, communication quality, and overall satisfaction experienced by online learners to provide a thorough knowledge of online education satisfaction. The study emphasizes the importance of three critical quality variables in influencing happiness in online educational settings: interactivity, course availability, and learning style.

The observed direct links between these quality variables and Online Education Satisfaction confirm their unique importance. Interactivity, course availability, and adaptive learning styles emerge as critical drivers impacting online learners' perceived pleasure. These findings are consistent with previous research, emphasizing the critical role these elements play in improving the online learning experience. Furthermore, the recognition of Cognitive Engagement as a substantial mediator between quality characteristics and OES reveals a fundamental channel by which these factors indirectly influence pleasure. This mediation emphasizes the significance of developing cognitive involvement among learners, emphasizing its role in increasing overall happiness with the online learning process. Furthermore, investigating Communication Quality as a moderator broadens our understanding. The research sheds light on the various effects of CQ on the links between quality characteristics and satisfaction. Effective communication is shown to improve the positive influence of interactivity while moderating the negative impacts of poor communication on the impact of course availability on satisfaction.

Recommendations

Recommendations of this study, based on the findings are:

- Include interactive features in online courses to actively engage learners.
- Ensure that a diverse range of courses is available, backed up by clear communication regarding their availability.
- Adaptable course delivery allows you to cater to a variety of learning styles.
- Invest in reliable communication channels to supplement and amplify the impact of quality elements.

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- Encourage learners' cognitive participation to improve overall happiness with the online learning experience.
- Provide educators with training on how to include quality criteria and effective communication strategies into online teaching approaches.

Limitations and Future Directions

While this study provides useful insights into the dynamics of online education satisfaction, numerous limitations should be considered for future research.

The study's concentration on online learners from Shanghai-based higher education institutes limits the generalizability of findings to larger educational settings or cultural contexts. Future research might include a wide range of geographical regions and educational levels in order to have a more thorough picture of online education satisfaction across a wide range of demographics. Moreover, to assess quality aspects, communication quality, cognitive engagement, and satisfaction, the study relies mostly on self-reported surveys. Incorporating multi-method approaches, such as qualitative interviews or observational studies, could provide more comprehensive insights into these dimensions and validate the findings through triangulation.

While this study demonstrates cognitive engagement as a substantial mediator and communication quality as a moderator, the complicated relationship between these factors may entail additional mediators or moderators not investigated in this work. Future research may go deeper into these issues in order to identify more nuanced links. Furthermore, this study takes a cross-sectional strategy, capturing interactions at a single point in time. Longitudinal studies that track changes in satisfaction and the impact of quality characteristics over time may provide a more dynamic perspective that captures the developing nature of online education experiences. Also, improvement of measurement instruments for quality aspects, cognitive engagement, communication quality, and satisfaction could improve assessment accuracy and reliability. This could include creating new scales or altering current ones to better depict the complexities of these frameworks.

Future directions based on these limitations include conducting comparative studies across diverse populations, using mixed method approaches for comprehensive analyses, investigating additional mediators and moderators, using longitudinal designs for dynamic insights, and refining measurement tools for greater precision.

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Furthermore, investigating the integration of emerging technologies, investigating instructor-student interactions, and considering the impact of external factors (such as socioeconomic backgrounds) on satisfaction could enrich our understanding of online education experiences, paving the way for more tailored and effective educational practices in the digital era.

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