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Factors Influencing Undergraduates' Engagement and Satisfaction with Online Teaching in Chengdu, China

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Abstract

Purpose: This study examines factors influencing undergraduates' engagement and satisfaction with online teaching in Chengdu, China. The conceptual framework explores the relationships among teachers' self-efficacy, technical readiness, empathy, responsiveness, students' sensory requirements, engagement, and satisfaction. **Research design, data and methodology:** A multistage sampling technique was used to select 500 undergraduates from Xihua University in Chengdu, China. Data were collected through a questionnaire survey. Reliability was assessed using Cronbach's Alpha, while skewness and kurtosis tests evaluated data normality. Confirmatory Factor Analysis (CFA) ensured model validity, and Structural Equation Modeling (SEM) tested model fit and hypotheses. **Results:** The findings indicate that teachers' self-efficacy and technical readiness significantly influence students' engagement. Moreover, teachers' self-efficacy, technical readiness, responsiveness, empathy, students' sensory requirements, and engagement significantly impact students' satisfaction. **Conclusions:** All eight hypotheses were supported, achieving the research objectives. Universities should enhance teachers' self-efficacy and online teaching skills while prioritizing students' emotional well-being. Strengthening student engagement in online learning can significantly improve satisfaction and learning outcomes.

Keywords: Online Teaching, Undergraduate, Engagement, Satisfaction

JEL Classification Code: A22, I20, L80, M10

1. Introduction

Remote teaching, or online education, refers to delivering instruction via digital platforms over the Internet without in-person interactions between students and educators (Alarabiat et al., 2021). It enables learners to engage in self-directed learning using multimedia resources, moving away from traditional lectures and textbooks (Briggs et al., 2023). Wang (2016) defines online education as a method where teachers and students are geographically separated, utilizing the Internet to deliver courses and facilitate learning. This approach improves accessibility and flexibility while addressing institutional challenges (Poehlein, 1996).

In China, online education has evolved since the 1990s, with significant growth following the introduction of live streaming and short videos in 2013. The COVID-19 pandemic in 2020 further spurred its expansion, marking a milestone in online education globally (China Internet Network Information Center, 2021). By the end of 2023, China's MOOCs offered over 76,800 courses and engaged millions of learners, both domestically and internationally, through initiatives like "MOOCs Going Global." The National Smart Education Platform also registered over 100 million users by 2023, showcasing China's leadership in online education (Lotu Technology, 2023).

Despite its benefits such as accessibility, cost-effectiveness, and interactive features—online education

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presents challenges, including limited interaction, difficulties in monitoring student engagement, and technical issues (Arifiati et al., 2020). The shift to digital and hybrid teaching models requires educators to adapt to new technologies and instructional strategies (Naidoo et al., 2023; Sia et al., 2023).

While research on online education has explored factors such as teacher effectiveness, platform quality, course content, and learner self-management (Chen, 2017; Xu, 2021), existing studies often focus on motivation and teacher capabilities, overlooking the broader influences on student engagement and satisfaction. Few studies examine how factors such as teachers' self-efficacy, technical readiness, responsiveness, and empathy, alongside students' sensory requirements, impact engagement and satisfaction in online learning environments.

Understanding the factors influencing students' engagement and satisfaction is crucial for improving the effectiveness of online education. This study aims to address the research gap by examining the relationships among teachers' self-efficacy, technical readiness, responsiveness, and empathy, as well as students' sensory requirements, engagement, and satisfaction. By analyzing these factors, this research seeks to provide insights that can enhance the quality and outcomes of online education in China.

2. Literature Review

2.1 Teachers' Self-efficacy

Teachers' self-efficacy, defined as confidence in organizing and executing teaching tasks (Skaalvik & Skaalvik, 2007), is a critical determinant of instructional effectiveness and student engagement (Miller et al., 2017). High self-efficacy leads to innovative teaching strategies, greater adaptability to students' needs, and increased motivation, particularly in online settings (Poulou et al., 2019). In online education, teachers with higher self-efficacy are more likely to create engaging learning environments, effectively manage technological tools, and foster student participation (Lu & Mustafa, 2021; Maini et al., 2021). While Rashidi and Moghadam (2014) found only a modest positive correlation between teachers' self-efficacy and student satisfaction, Maini et al. (2021) highlighted a stronger influence in synchronous online courses, suggesting that digital engagement may magnify the role of self-efficacy. Despite extensive research on self-efficacy in traditional classrooms, studies often overlook its nuanced impact on online student engagement and satisfaction. Existing literature focuses primarily on teacher motivation rather than examining how self-efficacy shapes online pedagogical effectiveness. This study addresses this gap by analyzing its direct and indirect effects in a fully digital learning environment. Therefore, the following hypotheses are proposed:

H1: Teachers' self-efficacy has a significant influence on students' engagement.

H2: Teachers' self-efficacy has a significant influence on students' satisfaction.

2.2 Teachers' Technical Readiness

Technical readiness, a key component of technology acceptance, influences how teachers adopt and integrate digital tools in their teaching (Davis & Venkatesh, 1996; Parasuraman, 2000). In online education, teachers must navigate complex platforms, troubleshoot technical issues, and adapt their pedagogical strategies to virtual environments (Maini et al., 2021). Studies highlight that teachers' familiarity with digital tools enhances student engagement by improving the interactivity and effectiveness of online learning (Geng et al., 2019; Kapuza et al., 2022). However, while Joseph et al. (2021) demonstrated that technical proficiency positively influences student engagement, Badri et al. (2014) noted that technological challenges can reduce students' learning motivation. Institutional readiness also plays a role, as emphasized by Vital-López et al. (2022), who found that inadequate institutional support limits the benefits of individual teacher readiness. Existing studies primarily focus on teacher attitudes toward technology rather than examining its direct impact on student engagement and satisfaction. Additionally, research often overlooks the interplay between institutional support and individual technical readiness. This study aims to bridge this gap by assessing how technical proficiency influences students' online learning experiences. Therefore, the following hypotheses are proposed:

H3: Teachers' technical readiness has a significant influence on students' engagement.

H4: Teachers' technical readiness has a significant influence on students' satisfaction.

2.3 Teachers' Responsiveness

Teachers' responsiveness, or their ability to provide timely and effective support, is a key predictor of student satisfaction (Ahmed et al., 2010; Darawong & Widayati, 2022). In online learning, where students lack face-to-face interaction, responsiveness becomes even more critical in maintaining engagement and reducing feelings of isolation (Kavanagh et al., 2020). Empirical studies confirm the positive relationship between responsiveness and satisfaction (Ahmed et al., 2014; Raman et al., 2022). However, findings vary—Anwar and Surarchith (2015) found that while responsiveness enhances satisfaction, other

factors like reliability may have a weaker or even negative correlation. This suggests that responsiveness alone may not be sufficient to ensure high student satisfaction. Most studies examine responsiveness in traditional settings, with limited exploration of its role in online education. Additionally, prior research lacks a clear differentiation between responsiveness and other dimensions of teacher support. This study seeks to clarify how responsiveness specifically influences student satisfaction in online learning. Therefore, the following hypothesis is proposed:

H5: Teachers' responsiveness has a significant influence on students' satisfaction.

2.4 Teachers' Empathy

Empathy in teaching enhances communication, fosters a supportive learning environment, and improves student satisfaction (Trad et al., 2022; Zaki, 2014). In online education, empathy is particularly important due to the absence of physical cues, requiring educators to be more intentional in demonstrating care and understanding (Parahoo et al., 2016). While Choi and Yang (2011) highlight empathy's role in emotional support, Maamari and Majdalani (2017) argue that empathetic teachers enhance student retention and institutional reputation. Magasi et al. (2022) reinforce empathy as a key predictor of student satisfaction. However, these studies often focus on general student well-being rather than linking empathy directly to learning outcomes in virtual classrooms. Existing literature primarily discusses empathy in traditional learning environments, neglecting its unique challenges in online education, where non-verbal communication is limited. This study examines how teachers' ability to convey empathy virtually influences student satisfaction. Therefore, the following hypothesis is proposed:

H6: Teachers' empathy has a significant influence on students' satisfaction.

2.5 Students' Sensory Requirement

Sensory engagement, which includes visual, auditory, and interactive elements, is crucial for online learning effectiveness (Overby, 2008). Research suggests that students require a high level of sensory stimulation to stay engaged in digital environments (Alarabiat et al., 2021; Batista-Toledo & Gavilan, 2023). Alarabiat et al. (2021) found that sensory requirements influence students' satisfaction and continued platform usage, while Batista-Toledo and Gavilan (2023) highlight the need for well-designed visual and auditory content. However, research on sensory requirements remains largely theoretical, with limited empirical studies investigating their direct impact on student satisfaction. Most studies discuss sensory engagement in terms of technology design, rather than its effect on students' learning experiences. This study examines how sensory requirements contribute to student satisfaction in online education. Therefore, the following hypothesis is proposed:

H7: Student's sensory requirements have a significant influence on students' satisfaction.

2.6 Students' Engagement

Student engagement refers to the level of interest, Student engagement, encompassing behavioral, emotional, and cognitive involvement (Axelson & Flick, 2010), is a key predictor of academic achievement (Carini et al., 2006). Engagement in online education depends on active participation, discussions, and collaborative learning (Bishop et al., 2018). Maini et al. (2021) found that engagement directly influences student satisfaction, while Yousaf et al. (2023) emphasized its role in improving learning motivation. However, existing studies rarely examine the factors that drive engagement in digital learning. While previous studies confirm the link between engagement and satisfaction, few explore the specific teacher-related factors that enhance engagement in online settings. This study aims to address this gap. Therefore, the following hypothesis is proposed:

H8: Student's engagement has a significant influence on student's satisfaction.

2.7 Students' Satisfaction

Student satisfaction is a dynamic perspective that arises from evaluating a student's educational experience (Athiyaman, 1997). In online learning, it is characterized by effective assessment methods, innovative evaluation techniques, and student progress (Maini et al., 2021). In e-learning, student satisfaction reflects the fulfillment of expectations within a virtual educational environment (Ali et al., 2022). Key predictors of student satisfaction include teaching quality, institutional identity, and reputation, which also play roles in student retention and advocacy (Al Hassani & Wilkins, 2022). Student satisfaction reflects students' perceptions of academic excellence and their contentment with the educational journey (Ikram et al., 2023). A primary factor influencing satisfaction is the perception that teachers genuinely care about students' learning needs and progress (Rogers & Smith, 2011). Preparedness for virtual learning both for teachers and students also significantly impacts satisfaction (Maini et al., 2021).

Cultural differences affect the factors influencing satisfaction; for instance, reliability is more important for Thai students, while empathy is more significant for

Indonesian students (Darawong & Widayati, 2022). Additionally, satisfaction is shaped by the adequacy of the learning process and the effectiveness of online systems, which influence students' willingness to continue using online education (Alarabiat et al., 2021). High service quality enhances overall satisfaction, encouraging students to engage actively in learning and enjoy campus life (Bui et al., 2023). Furthermore, the quality of digital communities, information technology, and course design directly affects satisfaction with e-learning outcomes (Nikou & Maslov, 2023).

3. Research Methods and Materials

3.1 Research Framework

A conceptual framework visually or narratively represents the key elements, variables, and their interconnections within a study (Miles et al., 2014). This framework is developed based on prior research and is adapted from three theoretical models. First, Maini et al. (2021) explored the effects of teachers' self-efficacy (TSE) and teachers' technical readiness (TTR) on students' engagement (SE) and student satisfaction (SS), as well as the influence of SE on SS. Second, Darawong and Widayati (2022) identified positive effects of teachers' responsiveness (TRS) and teachers' empathy (TEM) on student satisfaction. Third, Alarabiat et al. (2021) examined the relationship between students' sensory requirements (SSR) and student satisfaction.

The proposed research framework shown in figure 1 includes seven variables. There are five independent variables, namely, teachers' self-efficacy, technical readiness, responsiveness, empathy, and students' sensory requirements and two dependent variables of students' engagement and satisfaction. This study investigates how these factors influence students' satisfaction with online learning and examines the causal relationships between variables, identifying key contributors to effective online learning.

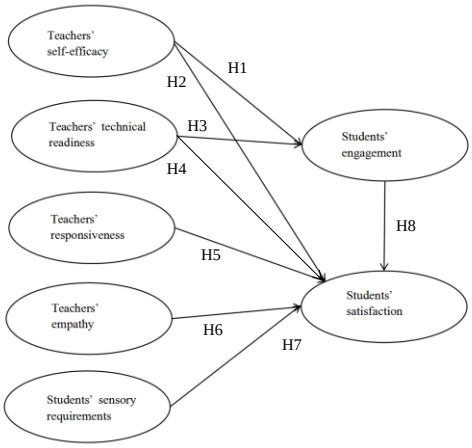

Figure 1: Research Framework

3.2 Research Methodology

This research adopts a quantitative approach to select college students from an undergraduate institution in Chengdu as the study participants, with a predetermined sample size of 500. Data collection is initially conducted through a questionnaire survey. The item-objective congruence (IOC) index is used to assess content validity, while Cronbach's Alpha evaluates reliability. A pilot test with 50 students is conducted to refine the questionnaire and minimize potential misinterpretations.

The study employs both probability and non-probability sampling methods to enhance representation while accommodating practical constraints. The questionnaire is disseminated online, which may introduce selection bias, as participation is voluntary and may overrepresent students with higher digital literacy or stronger opinions on online learning. To mitigate this, reminders are sent to encourage diverse participation. For data analysis, Confirmatory factor analysis (CFA) is employed to establish the convergent and discriminant validity, as well as the goodness of fit of the indicators, followed by data analysis. Structural Equation Modeling (SEM) is then employed to test hypotheses and evaluate the relationships between the study variables. SEM is chosen due to its ability to analyze complex, multivariate relationships and account for measurement errors, making it a robust method for validating the proposed conceptual framework.

3.3 Population and Sample Size

The term target population refers to the group of people who need information (Casteel & Bridier, 2021). The target population specified in this study pertains to undergraduate college students in Xihua University in Chengdu, China, who have engaged in online teaching. The recommended minimum sample size for this study was 425, with the

researchers opting for a sample size of 500 based on prior research, deemed suitable for the application of the structural equation modeling (SEM) statistical technique.

This study delineated the sampling process into 3 stages. Initially, non-probability sampling was employed, utilizing a purposeful sampling technique, also known as judgment sampling, to select four colleges with online teaching experience from Xihua University in Chengdu. Subsequently, probability sampling was implemented through stratified random sampling. In the third stage, non-probability sampling was utilized, employing a convenience sampling approach to distribute questionnaires online via social networks as shown in Table 1.

Table 1: Number of Questionnaires Distributed to Each College in Xihua university

College	Number of Undergraduate Students	Proportional Sample Size
Management	2930	166
Computer	2437	138
Automotive and Transportation	2140	121
Economics	1318	75
Total	**8825**	**500**

These data were collected over approximately 6 months from July to December 2024. The data filtering process has been carried out to ensure the correct target audience. The online version is spread through social networks such as Mike CRM, Wenjuanxing and Email. Respondents are encouraged to share survey links with their classmates.

4. Results and Discussion

4.1 Demographic Profile

The study sample consists of 500 undergraduate students with a nearly balanced gender distribution (48.4% male and 51.6% female). Students from various academic levels participated, with the majority in their second year (36.0%), followed by first-year (27.4%), third-year (23.8%), and fourth-year (11.8%) students, while a small fraction (1.0%) reported being in other academic stages. Participants represent diverse academic disciplines, with the largest proportion from the Management College (33.2%), followed by Computer Science (27.6%), Automotive and Transportation (24.2%), and Economics (15.0%). This distribution provides a well-rounded perspective on students' engagement and satisfaction with online education across different fields of study.

4.2 Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis (CFA) is a statistical technique within structural equation modeling that focuses on understanding the relationships between observed measures (such as test items or behavioral scores) and latent variables or factors. The main objective of CFA is to identify the underlying factors that explain the variance and relationships among the observed indicators (Brown & Moore, 2012). The analysis aims to evaluate a pre-established structure or compare different theoretical models. Unlike exploratory factor analysis, which is used for generating theories, CFA is used for testing existing hypotheses. The hypotheses in CFA are based on solid theoretical or empirical grounds (Stapleton, 1997). CFA was used prior for analyzing the measurement model with structural equation model (SEM). The result of CFA indicated that all items in each variable are significant and have factor loading to prove discriminant validity. Guidelines recommended by Hair et al. (2007) is also employed in defining the significance of factor loading of each item and acceptable values in defining the goodness of fit.

As shown in Table 2, the result revealed the constructs have coefficient of internal consistency under the rules of thumb that the value must be 0.70 or above to represent as acceptable (Dikko, 2016). In summary, the reliability values of each dimension of the questionnaire indicating that the questionnaire has a good reliability value and can be continued for subsequent factor analysis. Factor loadings are higher than 0.50 and p-value of lower than 0.05. Furthermore, aligning with the recommendation from Fornell and Larcker (1981), the Composite Reliability (CR) is greater than the cut-off point of 0.7 and Average Variance Extracted (AVE) is higher than the cut-off point of 0.4. All estimates are important. The values in this study are greater than the acceptable values. Therefore, the convergence effectiveness and discriminant effectiveness are guaranteed.

Table 2: Confirmatory Factor Analysis (CFA), Composite Reliability (CR), and Average Variance Extracted (AVE) Results

Variable	Source of Questionnaire (Measurement Indicator)	No. of Item	Cronbach's Alpha	Factor Loading	CR	AVE
Teachers' self-efficacy (TSE)	Tschannen-Moran et al. (1998)	5	0.930	0.849-0.863	0.931	0.729
Teachers' technical readiness (TTR)	Davis and Venkatesh (1996)	3	0.840	0.785-0.83	0.844	0.643
Teachers' responsiveness (TRS)	Ahmed et al. (2010)	5	0.888	0.74-0.796	0.888	0.615
Teachers' empathy (TEM)	Darawong and Widayati (2022)	4	0.848	0.724-0.789	0.849	0.584
Students' sensory requirements (SSR)	Overby (2008)	5	0.870	0.746-0.771	0.870	0.573
Students' engagement (SE)	Axelson and Flick (2010)	5	0.943	0.862-0.89	0.945	0.773

Variable	Source of Questionnaire (Measurement Indicator)	No. of Item	Cronbach's Alpha	Factor Loading	CR	AVE
Students' satisfaction (SS)	Ali et al. (2022)	5	0.971	0.927-0.936	0.971	0.871

Note: CR = Composite Reliability, AVE = Average Variance Extracted

Furthermore, GFI, AGFI, NFI, CFI, TLI, and RMSEA are used as indicators for model fitting. As shown in Table 3, the statistical values of each indicator are compared with the acceptable standards. Among them, CMIN/DF = 1.043, GFI = 0.946, AGFI = 0.935, NFI = 0.889, CFI = 0.999, TLI = 0.998, RMSEA = 0.009, which are within the criterion, indicating a model fit.

Table 3: Goodness of Fit for Measurement Model

Index	Criterion	Statistical Value
CMIN/DF	< 5.00 (Wheaton et al., 1977)	1.043
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.946
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.935
NFI	≥ 0.80 (Wu & Wang, 2006)	0.889
CFI	≥ 0.80 (Bentler, 1990)	0.999
TLI	≥ 0.80 (Sharma et al., 2005)	0.998
RMSEA	< 0.08 (Pedroso et al., 2016)	0.009

Note: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI = normalized fit index, CFI = comparative fit index, TLI = Tucker Lewis index and RMSEA = root mean square error of approximation

Discriminative validity refers to the accuracy and validity of a measurement tool or evaluation method in evaluating or measuring a particular concept. Through analysis shown in Table 4, the diagonal values, that is, the AVE square roots in this paper, are 0.854, 0.802, 0.784, 0.764, 0.757, 0.879 and 0.933, respectively, which are all larger than the values in the same column, indicating that this questionnaire has good discriminative validity.

Table 4: Discriminant Validity

Variable	Factor Correlations						
	TSE	TTR	TRS	TEM	SSR	SE	SS
TSE	**0.854**						
TTR	0.568	**0.802**					
TRS	0.547	0.394	**0.784**				
TEM	0.494	0.394	0.371	**0.764**			
SSR	-0.561	-0.423	-0.362	-0.319	**0.757**		
SE	0.582	0.631	0.388	0.387	-0.439	**0.879**	
SS	0.769	0.707	0.605	0.565	-0.634	0.739	**0.933**

Note: The diagonally listed value is the AVE square roots of the variables

4.3 Structural Equation Model (SEM)

Structural equation modeling (SEM) is used for analyzing multivariate data that examines relationships between independent and dependent variables, whether they are continuous or discrete, measured or latent (Ullman, 2006). The goodness of fit indices for Structural Equation Model (SEM) is measured as demonstrated in Table 5. The results of fit index were presented good fit which are CMIN/DF = 2.567, GFI =0.850, AGFI = 0.826, NFI = 0.915, CFI = 0.946, TLI = 0.941 and RMSEA = 0.056, according to the acceptable values. The model construction is reasonable, and subsequent path analysis can be carried out.

Table 5: Goodness of Fit for Structural Model

Index	Criterion	Statistical Value
CMIN/DF	< 5.00 (Wheaton et al., 1977)	2.567
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.850
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.826
NFI	≥ 0.80 (Wu & Wang, 2006)	0.915
CFI	≥ 0.80 (Bentler, 1990)	0.946
TLI	≥ 0.80 (Sharma et al., 2005)	0.941
RMSEA	< 0.08 (Pedroso et al., 2016)	0.056

Note: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI = normalized fit index, CFI = comparative fit index, TLI = Tucker Lewis index and RMSEA = root mean square error of approximation

4.4 Research Hypothesis Testing Result

The significance of the relationships among the constructs was determined using regression weights, standardized path coefficients, t-values, and R^2 variances. Hypotheses were considered supported if $p<0.05$ and $t>1.96$. The results of the analysis are presented in Table 6 and Figure 2. All proposed hypotheses were statistically validated.

The results indicate that teachers' self-efficacy and technical readiness have direct positive effects on students' engagement, which in turn significantly influences students' satisfaction. Additionally, teachers' self-efficacy and technical readiness also indirectly enhance students' satisfaction through their impact on engagement. Teachers' responsiveness and empathy contribute directly to students' satisfaction, highlighting the importance of teacher support in online learning. However, students' sensory requirements show a negative effect on satisfaction, suggesting that unmet sensory needs may hinder learning experiences. These findings emphasize the critical role of both teacher-related factors and student engagement in shaping overall satisfaction with online education.

Table 6: Hypothesis Testing Result

Hypothesis	Standardized path coefficients (β)	t-value	Test Result
H1: TSE → SE	0.387	9.572*	Supported
H2: TSE → SS	0.334	9.569*	Supported
H3: TTR → SE	0.550	11.752*	Supported
H4: TTR → SS	0.331	7.877*	Supported
H5: TRS → SS	0.274	8.809*	Supported
H6: TEM → SS	0.227	7.254*	Supported
H7: SSR → SS	-0.305	-9.496*	Supported
H8: SE → SS	0.337	7.853*	Supported

Note: *=p-value<0.05

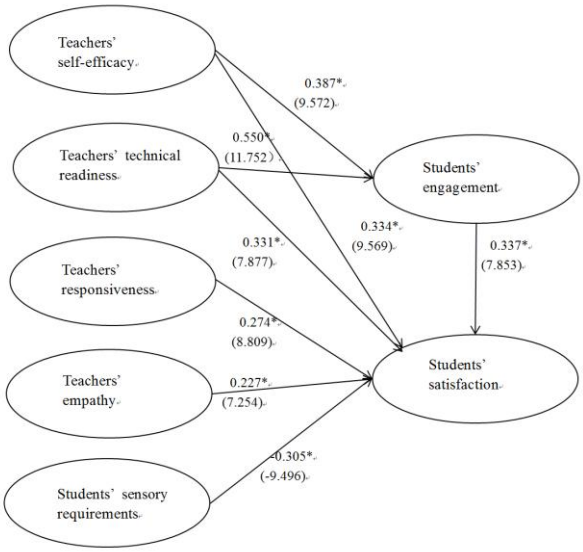

Figure 2: Results of Research Framework
Note: Solid line reports the Standardized Coefficient with * as p<0.05, and t-value in Parentheses

The statistical result from Table 6 can be refined that:

H1: The analysis results supported the hypothesis that teachers' self-efficacy significantly influences students' engagement, with a standardized coefficient value of 0.387. This positive influence on students' learning and development corresponds with the research of Lu and Mustafa (2021) and Maini et al. (2021)

H2: The analysis has postulated the significant impact of teachers' self-efficacy on students' satisfaction, with a standard coefficient value of 0.334. Rashidi and Moghadam (2014) and Lu and Mustafa (2021) also agreed on the positive correlation to student satisfaction.

H3: The analysis has proven that teachers' technical readiness is one of the key drivers of students' engagement, with a standard coefficient value of 0.550 in the structural pathway. Technical preparedness is a crucial dimension that impacts students' competencies and learning experiences in a blended learning environment (Geng et al., 2019; Vital-López et al., 2022)

H4: The analysis has postulated the significant impact of teachers' technical readiness on students' satisfaction, with a standard coefficient value of 0.331. This emphasizes the needs of technical readiness to enhance student learning satisfaction in online courses (Al-Awidi & Aldhafeeri, 2017; Maini et al., 2021).

H5: The analysis indicates that teachers' responsiveness has a significant impact on students' satisfaction, with a standard coefficient value of 0.274. The responsiveness of teachers can affect students' satisfaction with educators and academic institutions, thereby improving their academic performance (Ahmed et al., 2010).

H6: The analysis can be seen that teachers' empathy has a significant impact on students' satisfaction, but its influence on other variables is lower, with a standard coefficient value of 0.227. The empathy of teachers and staff tends to express concern for student issues (Darawong & Widayati, 2022).

H7: The student's sensory requirements have a significant impact on students' satisfaction and are negatively correlated, with a standard coefficient value of -0.305. Students who believe that the learning process requires high sensory needs are more likely to experience lower satisfaction and a lower willingness to continue using online learning (Alarabiat et al., 2021).

H8: The students' engagement on students' satisfaction demonstrated the value of 0.337 on standard coefficient which reinforced the significant impact of H8. Student participation makes them satisfied with regular courses and make commitments (Maini et al., 2021).

5. Conclusions and Recommendation

5.1 Conclusions

This research investigates factors influencing college students' satisfaction with online education in Chengdu, Sichuan Province, China. The study examines the roles of teachers' self-efficacy, technical readiness, empathy, responsiveness, students' sensory requirements, and engagement. An online questionnaire was distributed to 500 students with online learning experience, and data analysis was conducted using confirmatory factor analysis (CFA) and structural equation modeling (SEM) to validate relationships and test hypotheses.

The results indicate that teachers' self-efficacy and technical readiness significantly impact students' engagement. Teachers' self-efficacy, technical readiness, responsiveness, and empathy positively influence students' satisfaction, with students' engagement being the most significant factor. Students' sensory requirements, however, have a significant negative effect on satisfaction.

Among the factors influencing engagement, teachers' technical readiness has the greatest impact, followed by self-efficacy. Teachers proficient in using technology are better able to engage students, while a lack of technical readiness can hinder understanding and participation. Similarly, higher self-efficacy encourages teachers to actively involve students in online learning.

Students' engagement has the strongest influence on satisfaction, as active participation leads to greater satisfaction with online education. Teachers' technical readiness and self-efficacy also significantly impact satisfaction directly and indirectly by fostering engagement.

While teachers' responsiveness and empathy positively influence satisfaction, their effects are less pronounced, possibly due to the reduced need for direct feedback and care in online learning. Students' sensory requirements negatively affect satisfaction, as those who prefer face-to-face interaction and real environments tend to be less satisfied with online teaching.

While providing valuable insights, the study is limited to a single university, primarily considers teacher-related factors, and does not directly examine the link between satisfaction and learning outcomes. Future research should broaden the sample, incorporate student-centered variables, and explore long-term effects of online learning to enhance educational effectiveness.

5.2 Recommendations

The research findings have significant implications for school administrators, teachers, and students. Key factors influencing students' satisfaction with online teaching include teachers' technical readiness, self-efficacy, responsiveness, empathy, students' engagement, and sensory requirements.

For school administrators, the results highlight the importance of investing in online teaching infrastructure and regularly organizing technical training for teachers to ensure proficiency in using online teaching tools. Administrators should establish effective teacher incentive mechanisms to recognize teaching achievements, enhance teachers' self-efficacy, and support effective online instruction. Collaboration with teachers to develop strategies for increasing student engagement and collecting regular feedback from students is also essential. Policies should be implemented to encourage student participation in online classrooms. Additionally, administrators should promote the diversification of teaching resources by incorporating animations, videos, and other materials to meet students' sensory needs. Efforts should also focus on optimizing the teaching platform to ensure clear visuals and audio, enhancing the overall learning experience.

For teachers, it is crucial to stay updated on the latest online teaching technologies, such as advanced virtual classroom features and innovative teaching applications. Continuous optimization of the teaching process, including ensuring the quality of teaching videos with clear visuals and sound, can improve instructional effectiveness. Teachers can enhance their confidence by observing best practices and participating in professional development seminars. Designing engaging and interactive classroom activities, such as group projects and knowledge competitions, can further stimulate student participation. Teachers should establish effective communication channels with students, promptly address their questions and feedback, and demonstrate empathy by understanding students' learning challenges and providing targeted support. Employing diverse multimedia resources and creating vivid, engaging teaching content can also enhance the learning experience.

For students, as active participants in online education, it is important to engage fully in discussions and maintain positive interactions with teachers and peers. Students should leverage the advantages of online learning to improve academic outcomes. When encountering challenges or having suggestions, they should communicate with teachers in a timely manner to express their needs. Providing feedback on sensory experiences during the learning process can assist teachers in improving instructional approaches. Furthermore, students should cultivate self-learning abilities, manage their study time effectively, actively explore knowledge, and develop strong self-management skills to optimize their online learning experience.

5.3 Limitation and Further Study

This study has several limitations. First, in terms of sample selection, the research focuses on four colleges from a single university in Chengdu, resulting in a relatively narrow scope. The findings may not be generalizable to other schools or regions, as differences in educational resources, cultural environments, and teaching philosophies could lead to different results. Second, the study primarily considers factors from the perspective of teachers, including self-efficacy, technical readiness, responsiveness, empathy, sensory requirements, and engagement. While teachers play a critical role in the teaching process, focusing solely on their influence overlooks the impact of students' own traits and abilities on learning outcomes and satisfaction. Factors such as students' technology adoption, autonomy, learning ability, and self-efficacy should be included in future research. Lastly, the study does not explore the relationship between student satisfaction and learning outcomes in depth. Future studies could examine this connection while proposing targeted improvements to teaching strategies and methods. By doing so, the overall quality of online education can be optimized to better meet students' needs and enhance educational outcomes.

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