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Fostering Collaborative Learning Among Online Higher Education Students

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Abstract

This study explores the complex dynamics of collaborative learning among online flexible distance students in higher education. Structural equation modeling collected from 388 students using Smartpls4 for analysis reveals complex relationships between interactions with tutors, social presence, social media use, and the mediating role of digital learning attitudes. The research makes important contributions to theory and practice by deepening our understanding of the determinants of collaborative learning in online university education. This knowledge can guide targeted interventions and policy initiatives to promote collaborative learning that positively impacts the learning environment. This study provides strong support for all seven hypotheses and provides strong results that increase the

credibility of the identified relationships, providing empirical evidence to guide future research and evidence-based decision-making to strengthen collaborative learning in online universities. In addition, this study contributes to the field by illuminating the complexities underlying digital collaborative learning. A detailed analysis of the relationships between different variables provides valuable information about the factors that contribute to successful cooperative learning. This study highlights the importance of promoting digital learning attitudes and improving communication in an online educational environment. It also provides a strong foundation for educational leaders and policymakers to develop effective strategies that promote collaborative learning among online students in higher education, thereby improving the overall quality of the learning environment. These findings support strong empirical evidence and pave the way for more informed decision-making and future research in the field of digital education.

Keywords: Interaction with Tutor, Social Presence, Social Media Usage, Digital Learning Attitude, Collaborative Learning

Introduction

Collaborative learning in online distance learning provides students with diverse perspectives and enriches the educational experience (Wieser and Seeler, 2018). It improves problem-solving and communication skills by promoting cultural competence and preparing students for an interactive workforce (Haugland et al., 2022). The diverse background of the participants promotes cross-cultural understanding, and teamwork in a virtual environment sharpens collaborative skills (Strauß and Rummel, 2020). Resource sharing and global networking come to the fore, while encouragement and peer support in a virtual community further enrich the experience (Mustakim et al., 2021). Collaborative learning provides students with skills and perspectives that are important in the globalized digital age and shape the future of education (Dewi and Muhid, 2021). Malaysia has a dynamic approach to education that capitalizes on the diverse cultural background of the country. This encourages the exchange of ideas and experiences between students from different regions and backgrounds and promotes a rich learning environment (Ravana et al., 2023). This collaborative model improves problem-solving skills and cross-cultural competence by promoting teamwork in a virtual environment. Together, Malaysian students can respond to global challenges, prepare for the digital workforce, and access a global network (Hisham et al., 2023). In addition, it creates a sense of community and support among online students and fosters motivation and peer bonding in the Malaysian context, where the online education world is rapidly evolving to embrace these collaborative learning opportunities (Hashim et al., 2023). A significant problem in the Malaysian online distance learning context is the limited integration and effective implementation of collaborative learning strategies (Ismail, 2023). Students learning online often find it difficult to collaborate meaningfully due to, for example, different time zones, irregular internet connections, and cultural diversity (Ravana et al., 2023). This hinders the development of critical multicultural competencies and problem-solving skills that are essential in Malaysia's diverse society and globalized labor market (Hashim et al., 2023). In addition, the lack of structured teaching and resources for teachers and students is a significant challenge to the effective use of collaborative learning (Jamalai and Krish, 2023). Addressing these issues is critical to realizing the full potential of collaborative learning in Malaysia's online distance learning environment and fostering a more inclusive and effective learning environment (Hamzah et al., 2023). Investigating the collaborative learning of online distance learners in the Malaysian context is of utmost

importance in several key dimensions. It addresses the urgent need to improve intercultural competence and problem-solving skills, adapt to Malaysia's multicultural society, and prepare students for the global workforce. It also facilitates the optimization of online education by providing information on effective collaborative strategies that can bridge geographic and cultural gaps and provide more inclusive and interactive learning. In addition, the findings of this study can guide educators and policymakers to develop tailored pedagogical approaches, resource allocation, and support structures to foster a robust online education ecosystem that aligns with Malaysia's efforts to achieve educational excellence and innovation in the digital age. This study aims to assess the direct and indirect relationship between interaction with the tutor, social presence, and social media usage with collaborative learning and the role of digital learning attitude as a mediator.

Literature Review

Underpinning Theory

Constructivism is a fundamental educational philosophy that profoundly shapes modern teaching and learning processes. Rooted in the idea that meaningful learning occurs when individuals actively seek to comprehend the world by filtering new ideas through existing knowledge structures, it emphasizes the role of the learner as an active knowledge builder. Constructivist approaches draw inspiration from the works of Piaget and Vygotsky (Tzuo, 2007), which underscore the student's active role and the importance of social interaction in knowledge acquisition. The theory of constructivism highlights that learning is a dynamic, relational process driven by developing new understandings through existing knowledge. It asserts that people construct their own interpretations of reality based on observations and experiences, with these processes influenced by social interaction, culture, and community. In constructivist classrooms, students are encouraged to collaborate in groups, creating an interactive learning environment that fosters engagement. This theory forms the basis for measuring student learning outcomes, particularly through collaborative learning, emphasizing the significance of communication in achieving active engagement. Constructivism is harnessed to improve learning outcomes and achieve educational goals, with a strong focus on factors that influence collaboration among undergraduate students. It serves as the foundational framework for the research model's development (Al-Rahmi et al., 2019).

Relationships among Interaction with Tutor, Digital Learning Attitude, and Collaborative Learning

The relationship between student-tutor interaction and collaborative learning, mediated by a digital learning attitude, is a multifaceted one (Katsarou & Chatzipanagiotou, 2021). Directly, when students engage in meaningful interactions with tutors in a digital learning environment, they often gain a deeper understanding of course content, receive personalized guidance, and experience increased motivation (Simpson et al., 2020). These positive outcomes can subsequently enhance their inclination to participate in collaborative learning activities (Cochrane et al., 2022). Indirectly, digital learning attitudes, which encompass factors like self-efficacy, comfort with online tools, and a sense of belonging to the virtual community, mediate this relationship (Febriyanti et al., 2022). Students with positive digital learning attitudes are more likely to perceive tutor interactions as valuable, feel empowered to engage in collaborative learning and foster a sense of shared purpose in the digital learning space (Hautopp & Buhl, 2020). Recognizing and nurturing this interplay between student-

tutor interaction, digital learning attitudes, and collaborative learning can significantly impact the overall quality and effectiveness of online education, ultimately benefiting the learning experience (Gay & Betts, 2020). In view of the above hypotheses' development, the following hypotheses were proposed:

H1: There is a relationship between interaction with the tutor and digital learning attitude among students of online flexibility distance learning higher education institutions
H2: There is a mediating effect of digital learning attitude on the relationship between interaction with tutors and collaborative learning.

Relationships among Social Presence, Digital Learning Attitude, and Collaborative Learning
The relationship between social presence, collaborative learning, and digital learning attitude is intricate, encompassing both direct and indirect connections (Molinillo et al., 2018). Directly, social presence refers to the extent to which students feel connected with their peers in an online learning environment. When students experience a strong sense of social presence, they are more inclined to actively engage in collaborative learning activities (de Medeiros & Gemes, 2022). The interpersonal connections, trust, and shared understanding fostered by social presence create a conducive environment for effective collaboration. Indirectly, digital learning attitudes serve as a mediator in this relationship (Miao et al., 2022). A positive digital learning attitude encompasses elements like self-efficacy in using online tools, comfort with the digital platform, and a sense of belonging to the virtual learning community (Frania & Correia, 2022). When students have a favorable digital learning attitude, they are more likely to perceive social presence as meaningful and collaborative learning as a valuable part of their educational experience (Al-Rahmi et al., 2022). This, in turn, encourages greater participation and active involvement in collaborative tasks, as students feel confident and motivated to engage with their peers. Recognizing the interplay between social presence, digital learning attitudes, and collaborative learning is essential for educators and institutions in online education (Alismaiel et al., 2022). Fostering a sense of social presence and nurturing positive digital learning attitudes can significantly enhance the overall quality and effectiveness of collaborative learning experiences in the digital realm (Stewart, 2021). This interconnected relationship contributes to a more engaging and fulfilling online education environment, ultimately benefiting students and their learning outcomes (Sabah, 2023).

H3: There is a relationship between social presence and digital learning attitude among students of online flexibility distance learning higher education institutions
H4: There is a mediating effect of digital learning attitude on the relationship between social presence and collaborative learning.

Relationships among Social Media Usage, Digital Learning Attitude, and Collaborative Learning
The relationship between social media usage and collaborative learning, mediated by digital learning attitude, is a complex and evolving dynamic in contemporary education (Kaur et al., 2023). Directly, social media can facilitate collaborative learning by offering platforms for students to interact, share resources, and work together on projects. Students who actively use social media for educational purposes are more likely to engage in collaborative learning activities, benefiting from the real-time communication and information sharing that these platforms offer (Qureshi et al., 2023). Indirectly, digital learning attitudes play a crucial

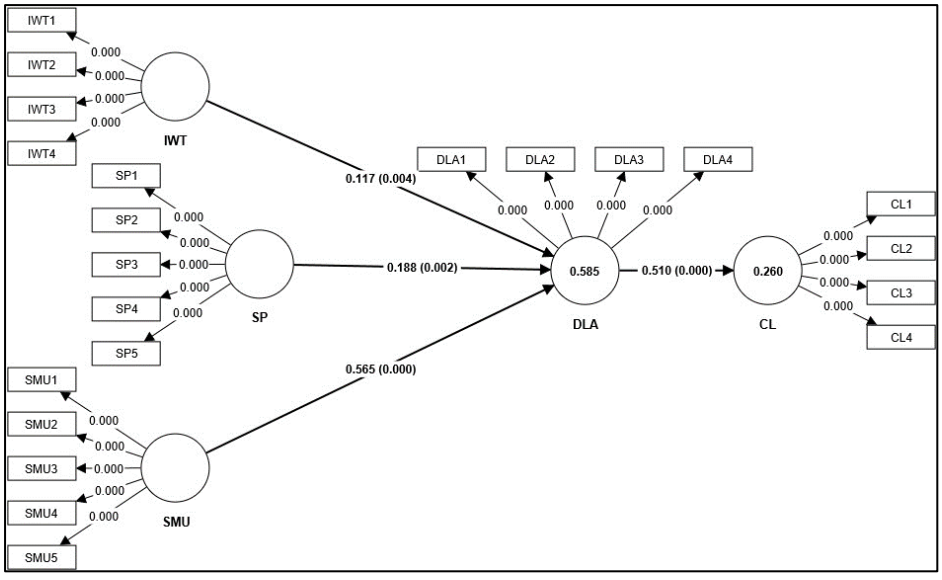
mediating role in this relationship. A positive digital learning attitude encompasses factors like self-efficacy in using digital tools, comfort with online platforms, and a sense of belonging to a virtual learning community (Sabah, 2023). When students have a favorable digital learning attitude, they are more inclined to view social media as a valuable educational resource and a means to enhance collaborative learning. This, in turn, encourages them to actively participate in collaborative tasks, leveraging the power of social media platforms for knowledge exchange and collaboration (Al-Rahmi et al., 2022). However, it's worth noting that the relationship between social media usage, digital learning attitudes, and collaborative learning is not without potential pitfalls. Excessive or unstructured social media usage can lead to distractions and information overload (Grothaus, 2022). Therefore, educators should guide students in using social media effectively for collaborative learning and promote the development of positive digital learning attitudes (Alismaiel et al., 2022). By recognizing the intricate interplay between these elements, institutions can harness the benefits of social media for collaborative learning, ultimately enhancing the overall quality of online education experiences (Wang et al., 2023).

H5: There is a relationship between social media usage and digital learning attitude among students of online flexibility distance learning higher education institutions

H6: There is a mediating effect of digital learning attitude on the relationship between social media usage and collaborative learning.

H7: There is a relationship between digital learning attitude and collaborative learning among students of online flexibility distance learning higher education institutions

Figure 1: Research Framework



Notes: IWT=Interaction with Tutors SP=Social Presence SMU=Social Media Usage DLA=Digital Learning Attitude CL=Collaborative Learning

Methodology

The research methodology adopted in this study adheres to a quantitative approach, with a specific focus on students enrolled in online distance-learning programs offered by online distance-learning higher education institutions in Malaysia. The primary method for data

collection was the distribution of a survey questionnaire, thoughtfully adapted from previous research studies, signifying the careful selection of well-established measurement instruments to assess the key constructs under investigation. In total, the study encompassed 23 observed variables, each uniquely contributing to their respective constructs: 'interaction with tutors' was assessed using four measurement items, 'social presence' with five measurement items, 'social media usage' with another five measurement items, 'digital learning attitude' was gauged through four measurement items, and 'collaborative learning' encompassed four measurement items. The survey distribution yielded an impressive response rate, with 481 returned questionnaires out of the 480 distributed, representing an 83.5% response rate. After the data collection phase, meticulous data cleaning and screening procedures were implemented to ensure data integrity and quality. This rigorous process resulted in a final dataset comprising 388 clean and meticulously prepared samples, ready for in-depth analysis. To analyze the complex relationships between the variables of interest, the study employed structural equation modeling (SEM), a sophisticated and versatile statistical technique renowned for its ability to explore and evaluate intricate patterns within research data. SEM allows for the assessment of both measurement and structural relationships within the research framework. In this study, Smart-PLS 4 software (Ringle et al., 2022), a well-established and widely recognized tool for SEM analysis, was chosen to perform the statistical and structural modeling tasks. The utilization of Smart-PLS 4 underscores the commitment to robust data analysis and modeling, providing researchers with valuable insights into the intricate relationships and patterns within the context of online distance learning in Malaysian higher education institutions. This methodology reflects a systematic and comprehensive approach to examining and understanding the complexities of the chosen research constructs and their interrelationships within the specific context of online distance learning in the higher education landscape of Malaysia.

Data Analysis

Respondents' Profile

The gender distribution of 388 study respondents, revealed a near-even split with 48.7% identifying as male and 51.3% as female. This balanced gender representation enhances the study's credibility and applicability by ensuring that findings are not skewed toward a specific gender perspective. The majority, 44.6%, falls within the 31-40 years age range, with 39.7% being under 30 years. However, it's notable that the study also includes a diverse representation of older age groups, with 12.4% between 41-50 years and 3.4% aged 51-60. This diverse age representation is significant as it suggests that the study encompasses participants from various age brackets. Notably, a substantial portion, 24.7%, is in their third year of study, with 20.9% in their second year, and 18.6% in their first year. This distribution indicates a diverse range of educational backgrounds and levels of experience among the participants, which can significantly influence their perspectives on digital learning. Additionally, 16.2% are in their fourth year, 11.6% are in their fifth year, and 8.0% have been studying for more than five years. The majority, 65.7%, hold a bachelor's degree, while 21.4% have completed a diploma program. Moreover, 7.0% are pursuing a master's degree, and 4.9% are engaged in doctoral studies. The table indicates a high willingness among the 388 respondents to recommend collaborative learning, with 99.2% responding positively, while only 0.8% expressed a negative sentiment. This overwhelmingly positive response underscores the strong endorsement of collaborative learning among the study participants.

Common Method Bias

A common problem in management research is common method bias, which occurs when the variance of a study is supposed to represent constructs but actually represents the measurement method used. To address this issue, the researcher in this study used Harman's one-factor test method to evaluate the measurement items. The results of the test showed that the main factor accounted for only 39.7% of the variance, indicating that common method bias was not a major problem in the study. This finding is consistent with Podsakoff and Organ's (1986) suggestion that common method bias is not a problem when the principal component explains less than 50% of the variance.

Measurement Model

In this study, the evaluation of construct validity and reliability was conducted using the PLS-SEM algorithm, by the recommendations outlined by Hair et al. (2022). Table 1 presents the results of reliability and validity measures for five different constructs in a research study. First, Cronbach's alpha values range from 0.794 to 0.858, indicating a satisfactory level of internal consistency for all constructs. The values are generally above the recommended threshold of 0.700, suggesting that the items within each construct reliably measure the underlying concepts. Next, Composite reliability values are reported, and they also demonstrate good internal consistency, with values ranging from 0.856 to 0.903, respectively. These values indicate that the constructs are highly reliable, as they exceed the commonly accepted threshold of 0.700. The Average Variance Extracted (AVE) values range from 0.545 to 0.700, reflecting the amount of variance explained by the items relative to measurement error. While all constructs have AVE values above 0.500, suggesting that they possess adequate convergent validity, it's worth noting that the construct "Social Media Usage" has the lowest AVE (0.545), indicating that a relatively smaller portion of the variance is accounted for by the items in this construct compared to the others. Overall, the analysis of the table suggests that the measures exhibit good reliability and convergent validity. To ascertain discriminant validity, a detailed examination of the measurement items was carried out to assess whether the loadings of each item on its intended construct were consistently higher than its loadings on other constructs, as shown in Table 1. This examination confirmed the presence of discriminant validity. Moreover, the analysis of Heterotrait-Monotrait (HTMT) ratios, also presented in Table 1, further substantiated the discriminant validity of the constructs. Specifically, all four construct ratios were found to be below the recommended threshold of 0.9, by the guidelines by Henseler et al. (2015). In summary, this study effectively established the reliability and validity of all latent constructs, aligning with the recommendations made by Hair et al. (2022). The adoption of the PLS-SEM algorithm and the thorough evaluation of measurement properties served to enhance the trustworthiness and strength of the study's findings.

Table 1:
Constructs' Reliability & Validity, Cross-Loadings & HTMT Ratios

						HTMT Ratios			
Constructs	Items	Loadings	CA	CR	AVE	CL	DLA	IWT	SMU
Collaborative Learning	CL1	0.808	0.823	0.882	0.652				
	CL2	0.828							
	CL3	0.835							
	CL4	0.755							
Digital Learning Attitude	DLA1	0.806	0.810	0.877	0.645	0.620			
	DLA2	0.886							
	DLA3	0.866							
	DLA4	0.631							
Interaction with Tutor	IWT1	0.874	0.858	0.903	0.700	0.552	0.513		
	IWT2	0.850							
	IWT3	0.840							
	IWT4	0.779							
Social media Usage	SMU1	0.799	0.794	0.856	0.545	0.659	0.881	0.504	
	SMU2	0.700							
	SMU3	0.731							
	SMU4	0.684							
	SMU5	0.769							
Social Presence	SP1	0.784	0.846	0.890	0.620	0.604	0.743	0.474	0.808
	SP2	0.802							
	SP3	0.817							
	SP4	0.842							
	SP5	0.685							

Notes: CA=Cronbach Alpha CR=Composite Reliability AVE=Average Variance Extracted

Structural Model

In this study, the structural model was evaluated by simultaneously analyzing both pathway coefficients (β) and coefficients of determination (R2), following the approach described by Hair et al. 2017. We employed the Partial Least Squares (PLS) method and conducted this assessment using 5000 subsamples to determine the significance of the path coefficients. Detailed results of the hypothesis tests, which include the path coefficients (beta), t-statistics, and p-values, can be found in Table 2. This thorough analysis offers valuable insights into the importance and reliability of the connections among the variables in the structural model. H1 posits a relationship from interaction with tutors to a digital learning attitude. The beta coefficient of 0.117 is positive, indicating a positive relationship. The T statistic of 2.919 is statistically significant (P = 0.004), supporting the hypothesis. The effect size (f^2) of 0.026 suggests a small but practical significance, and the VIF of 1.266 indicates no multicollinearity issues. The confidence intervals (2.50% to 97.50%) range from 0.039 to 0.197. H2 proposed the mediating effect of digital learning attitude on the relationship between interaction with tutors and collaborative learning. The statistical beta coefficient of 0.060 is also positive, and the T statistic of 2.676 is significant (P = 0.007), supporting this extended hypothesis. The effect size (f2) is 0.019, indicating a small but practically meaningful relationship. The confidence intervals range from 0.106 to 0.106. H3 explores the relationship between social

presence to digital learning attitude. The beta coefficient of 0.188 is positive, and the T statistic of 3.149 is highly significant (P = 0.002), confirming the hypothesis. The effect size (f^2) of 0.045 suggests a moderate practical significance. The VIF of 1.888 indicates no multicollinearity issues, and the confidence intervals range from 0.063 to 0.297. H4: proposed the mediating effect of digital learning attitude on the relationship between social presence and collaborative learning. The beta coefficient of 0.096 is positive, and the T statistic of 3.004 is significant (P = 0.003), supporting this extended hypothesis. The effect size (f^2) is 0.033, indicating a small but practically significant relationship. The confidence intervals range from 0.158 to 0.158. H5 examines the relationship between social media usage and digital learning attitude. The beta coefficient of 0.565 indicates a positive and significant relationship, and this is supported by a very high T statistic of 8.660, with a p-value of 0.000, confirming the hypothesis. The effect size (f^2) of 0.402 suggests a substantial practical significance, indicating that social media usage has a notable impact on digital learning attitudes. The VIF (Variance Inflation Factor) of 1912 shows no issue of multicollinearity. The confidence intervals, ranging from 0.223 to 0.350, provide a reasonable level of precision. H6 proposed the mediating effect of digital learning attitude on the relationship between social media usage and collaborative learning. The beta coefficient of 0.096 is positive, and the T statistic of 3.004 is significant (P = 0.003), supporting this mediating hypothesis. The effect size (f^2) is 0.033, signifying a small but practically meaningful relationship. The confidence intervals range from 0.158 to 0.158. H7 examines the direct relationship between digital learning attitude and collaborative learning. The beta coefficient of 0.510 is positive, and the T statistic of 11.737 is highly significant (P = 0.000), strongly supporting the hypothesis. The effect size (f^2) is substantial at 0.352, indicating a robust practical significance. The VIF of 1.436 suggests no multicollinearity issues, and the confidence intervals range from 0.414 to 0.585.

Effect sizes (f^2) in this study were assessed following the criteria established by Cohen in 1992, where they are categorized as small (0.020 to 0.150), medium (0.150 to 0.350), or large (0.350 or greater). The observed effect sizes in our study ranged from small (0.026) to large (0.402). It's noteworthy that the acceptance level demonstrates a significant amount of variance explained in the endogenous constructs, with an R^2 value of 0.260, as depicted in Figure 1. When we consider the mediators, specifically digital learning attitude, the model accounts for approximately 58.5% of the variance in the structural components, as indicated by an R^2 value of 0.585. A critical focus of our analysis shifts to the model's ability to predict outcomes in out-of-sample scenarios, which is crucial for drawing conclusions and providing managerial recommendations.

Table 2:
Hypotheses Testing Results, f2 & VIF

	Beta	T statistics	P values	f^2	VIF	LLCI 2.50%	ULCI 97.50%	Decision
H1: IWT -> DLA	0.117	2.919	0.004	0.026	1.266	0.039	0.197	*Supported*
H2: IWT -> DLA -> CL	0.060	2.676	0.007			0.019	0.106	*Supported*
H3: SP -> DLA	0.188	3.149	0.002	0.045	1.888	0.063	0.297	*Supported*
H4: SP -> DLA -> CL	0.096	3.004	0.003			0.033	0.158	*Supported*
H5: SMU -> DLA	0.565	8.660	0.000	0.402	1912	0.223	0.350	*Supported*
H6: SP -> DLA -> CL	0.096	3.004	0.003			0.033	0.158	*Supported*
H7: DLA -> CL	0.510	11.737	0.000	0.352	1.436	0.414	0.585	*Supported*

In order to evaluate a specific aspect, we employed the PLSpredict procedure to assess business performance, following the methodology outlined by Shmueli and colleagues in 2016 and 2019. We utilized Q2 as a key metric, where a value exceeding 0 signifies that the predictions generated by the PLS-SEM model outperform those predicted by a straightforward mean value approach, as elaborated in Table 3. Moreover, we compared the root mean square error (RMSE) of the PLS-SEM predictions with that of a linear model (LM) prediction benchmark in all instances, consistently finding that the PLS-SEM model exhibited smaller RMSE values, thereby reinforcing its predictive power, as demonstrated in Table 3. Additionally, in accordance with the recommendation by Hair et al. in 2022, we incorporated the Cross-Validated Predictive Ability Test (CVPAT) to assess the predictive performance of the PLS-SEM model, similar to the approach followed by Liengaard and colleagues in 2021 alongside the PLSpredict analysis. The CVPAT used an out-of-sample prediction approach to quantify the model's prediction error and calculate the average loss value. To gauge the model's predictive superiority over benchmarks, we compared two benchmarks: the average loss value based on predictions using indicator averages (IA) as a straightforward benchmark, and the average loss value of a linear model (LM) forecast as a more conservative benchmark. Establishing the model's enhanced predictive abilities required observing a lower average loss value for PLS-SEM, which results in a negative difference in average loss values. The CVPAT aimed to determine whether this negative difference in average loss values between PLS-SEM and the benchmarks was statistically significant, signifying the model's superior predictive capabilities. The outcomes of the CVPAT, presented in Table 4, unambiguously confirm that the average loss value of PLS-SEM indeed outperformed that of the benchmarks. This is supported by the negative difference in the average loss values, providing robust evidence of the model's superior predictive capabilities, aligning with the principles advocated by Ringle and Sarstedt in 2016 and Hair et al. in 2018.

Table 3:
PLSpredicts

	Q^2predict	PLS-RMSE	LM-RMSE	PLS-LM
CL1	0.256	0.623	0.653	-0.030
CL2	0.187	0.628	0.638	-0.010
CL3	0.210	0.696	0.692	0.004
CL4	0.144	0.721	0.730	-0.009
DLA1	0.374	0.546	0.653	-0.107
DLA2	0.441	0.576	0.587	-0.011
DLA3	0.450	0.583	0.578	0.005
DLA4	0.207	0.714	0.707	0.007

Table 4:
Cross-Validated Predictive Ability Test(CVPAT

	Average loss difference	t-value	p-value
CL	-0.114	7.836	0.000
DLA	-0.232	7.22	0.000
Overall	-0.173	8.726	0.000

Ultimately, an importance-performance analysis (IPMA) enables the merging of the significance of underlying factors that clarify adoption (total effect) and how well they perform (average score on a scale from 0 to 100), as illustrated in Table 5. This additional information serves to reinforce the practical recommendations, following the approach outlined by Ringle and Sarstedt in 2016, and supported by Hair et al. in 2018. The Importance-Performance Map Analysis reveals critical factors in digital learning in education. Digital learning attitude is significant (0.510), but there's room for improvement in enhancing it. Interaction with tutors is important, with effective performance, encouraging continued support. Social media usage is moderately important (0.288), and integrated effectively, suggesting expansion for academic and social use. Social presence is also moderately important (0.096); although performance is good, improvements can be made, emphasizing the need for a stronger sense of community through peer interaction. Institutions should prioritize fostering digital learning attitudes, maintaining tutor interaction, expanding social media usage, and enhancing social presence for a holistic digital learning experience.

Table 5:
Importance-Performance Map Analysis

	Total Effect	Performance
DLA	0.510	63.659
IWT	0.060	66.939
SMU	0.288	67.141
SP	0.096	66.325

Discussion

In response to research findings and the need to promote optimal digital learning environments, HEIs can strategically strengthen interaction with instructors, social presence, and social media usage connections using collaborative learning and integrating digital learning attitudes as mediators. In particular, educational institutions should prioritize

promoting positive attitudes toward digital learning among students and teachers through digital literacy training and information campaigns. Improving the quality and accessibility of communication between students and teachers is critical, which requires the creation of effective communication channels and feedback mechanisms that ultimately foster a climate that supports learning. Creating a strong sense of social presence is equally important, as encouraging peer interaction, group discussions, and collaborative projects, and fostering virtual communities and online forums to strengthen student connections and motivation. Harnessing the power of social media platforms for collaborative learning can be revolutionary, allowing faculty to use them as additional tools for discussion, resource sharing, and collaborative projects. In this strategic paradigm, digital learning attitudes act as a mediator that combines the positive effects of interaction with teachers, a sense of social presence, and the use of social media to enhance the benefits of collaborative learning outcomes. By implementing this comprehensive strategy, colleges can create an ecosystem that not only supports effective digital learning but also increases student engagement and collaboration, improving the overall educational experience and better preparing students for the demands of the digital age. Furthermore, the success of this strategy depends on careful planning and continuous evaluation. Educational institutions should invest in faculty development so that educators know how to use digital tools and technologies effectively. Teachers should be encouraged and empowered to experiment with innovative teaching methods and incorporate digital resources. In addition, regular feedback from students and educators should be obtained to monitor the effects of the strategy and identify areas for improvement. Collaborative learning initiatives and the use of social media should be included in the curriculum that promotes digital citizenship and responsible use of social media in addition to academic collaboration. As the digital landscape evolves, institutions must remain adaptable and stay abreast of new technologies and pedagogical best practices to ensure the continued success of this integrated approach. In this way, higher education institutions can create a dynamic, learner-centered, and digital ecosystem that is ready for the future.

Theoretical Implications

The study presents several notable theoretical implications. First, it emphasizes the importance of the digital learning attitude as a mediator and emphasizes its central role in connecting the different elements of the digital learning environment. This mediating concept can be explored and applied in other educational settings, shedding light on the importance of student attitudes and beliefs about technology adoption. In addition, the study emphasizes the dynamic nature of digital learning and emphasizes the need for colleges to continuously adapt and integrate new technologies and pedagogical strategies. It also contributes to the ongoing debate about the transformative potential of social media and the importance of social presence in promoting engaging digital learning. Overall, the study enriches our theoretical understanding of the complex dynamics of digital education. In addition, the study provides an overview of the Importance and Performance Analysis (IPMA) as a valuable tool to assess the effectiveness and importance of factors in the context of digital learning. This analytical framework can be applied beyond a specific study and is a methodological contribution to the field of educational research. It encourages a more thorough assessment of the factors influencing digital learning and highlights the complex interplay of these variables. Highlighting the mediating role of digital learning attitudes, the study encourages further research into the psychological and motivational aspects of technology adoption in

educational environments, contributing to a broader understanding of online learning and its implications for educational theory.

Managerial Implications

The study has several important managerial implications for HEIs. Firstly, it underlines the importance of prioritizing digital learning attitudes, which requires investment in training programs to improve digital literacy and promote positive attitudes towards technology. To improve the overall educational experience, institutions must allocate resources to facilitate communication with teachers and ensure that teachers are approachable and responsive. Encouraging peer engagement, fostering a sense of social presence and effective use of social media platforms are key strategies for educational institutions to foster a collaborative learning environment. By following these recommendations, institutions can adapt to the changing educational landscape and ensure they remain competitive and meet the expectations of today's students, preparing them for the digital workforce.

Contextual Contributions

In the landscape of online distance learning in higher education institutions, collaborative learning (CL) takes center stage, as illustrated in Figure 1. Interaction with Tutors (IWT) emerges as a critical catalyst for collaborative endeavors, influencing how learners engage collectively. Social Presence (SP) amplifies the sense of connection in collaborative spaces, shaping the quality of shared learning experiences. Social Media Usage (SMU) introduces an additional layer to collaborative dynamics, offering diverse channels for interaction and knowledge exchange. Learners' Digital Learning Attitude (DLA) becomes pivotal, influencing and being influenced by the collaborative learning process. Recognizing these interconnected variables in the research framework is paramount for institutions seeking to enhance collaborative learning in the digital realm, guiding strategies to optimize interactions, bolster social presence, and foster positive digital learning attitudes within the online higher education landscape.

Suggestions for Future Studies

The study opens the door to several promising avenues for future research on digital education. First, further research can delve into the specific factors that influence and shape the digital learning attitudes of students and teachers and provide a more comprehensive understanding of how these attitudes can be effectively cultivated and implemented. In addition, it would be useful to examine the nuanced dynamics of social media usage in educational institutions, including its impact on different disciplines or age groups. In addition, future research can examine the long-term effects of these strategies on student achievement and academic success. Finally, the application of Importance and Effectiveness Analysis (IPMA) in different educational contexts can provide insight into the generalizability and applicability of this evaluation framework.

Conclusion

In summary, the study highlights the central role of digital learning attitude as a mediator in complex interactions with teachers, social presence, social media use, and collaborative learning in higher education. This underlines the importance of promoting a positive digital learning mindset and enhancing the quality of communication between students, teachers, and peers. The use of social media for collaborative learning is recommended, but at the same

time, the need for constant adaptability in a rapidly evolving digital environment is recognized. These findings provide a comprehensive framework for strengthening digital education in higher education and promoting engaged and digitally literate learners.

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