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Enhancing collaborative learning in online flexible distance learning higher education: The role of peer interaction and social presence mediated by learner self-efficacy

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ABSTRACT

This study investigated the role of collaborative learning in flexible online distance education, focusing on the influence of peer interaction and social presence on learners' self-efficacy as a mediator. This study employed a questionnaire-based approach distributed to a sample selected through purposive sampling. Structural Equation Modeling (SEM) with SmartPLS4 software was used to analyze 388 data points. Results showed that all seven hypotheses were supported, with significant paths: peer interaction positively affects students' self-efficacy and collaborative learning, while social presence directly influences students' self-efficacy and collaborative learning. These findings suggest that increasing social presence and peer interaction can significantly improve students' collaborative learning outcomes by strengthening their self-efficacy. Future studies could examine the long-term effects, cultural differences, and integration of new technologies to provide a more immersive learning experience. This study also suggests developing a pedagogical framework based on the Community of Inquiry model to optimize collaborative online learning. The implications of this study are important for educators and institutions in enhancing online education by adopting strategies that can enhance social presence and peer interaction. Institutions can create more engaging and effective learning environments, increasing student confidence and fostering successful collaboration to improve academic achievement in the evolving digital education landscape.

Contribution/ Originality: This study contributes to the literature by integrating the Community of Inquiry (CoI) model to analyze the role of social presence and peer interaction in enhancing collaborative learning, mediated by student self-efficacy.

1. INTRODUCTION

Collaborative learning in online flexible distance learning higher education institutions is increasingly valued for enhancing student engagement, fostering critical thinking, and improving learning outcomes. In light of the limitations on physical interaction, the significance of collaborative learning is heightened, as it helps bridge the gap caused by geographical distances and cultivates a community of inquiry among learners (Herrera-Pavo, 2021). Collaborative learning models are structured to encourage active learning, enhance social interaction, and cultivate essential skills such as communication and problem-solving, which are indispensable for students in today's interconnected and globalized world (Supena, Darmuki, & Hariyadi, 2021). Despite the clear benefits, collaborative

learning in online settings faces several challenges that require thoughtful consideration (Mohamad Kebah, Valliappan Raju, & Zahir Osman, 2019). A significant hurdle is ensuring effective student interaction and engagement through digital platforms, which often lack the immediacy and tangible connection of face-to-face learning environments (Wagino et al., 2023). Maintaining student motivation is pivotal, and personalized feedback is essential in facilitating ongoing knowledge-building and reflecting individualized learning journeys (Zheng, Zhong, & Niu, 2022). Current trends in addressing these challenges include the integration of artificial intelligence to create adaptive learning experiences that cater specifically to individual student needs and employing social networking tools to support robust peer interaction and collaboration (Boruzie, Kolog, Afful-Dazie, & Egala, 2024). However, research gaps remain in comprehensively understanding how collaborative learning strategies impact diverse learning outcomes across various cultural contexts (Yang, 2023). Effective methods for assessing group work remain elusive, and developing students' metacognitive skills within collaborative settings needs further exploration (Haataja, Dindar, Malmberg, & Järvelä, 2022). This study is significant for policymakers and educational institutions as it provides critical insights into designing robust, responsive online collaborative learning frameworks to enhance student learning performance and engagement (Ng, Chan, & Lit, 2022). This study contributes a conceptual understanding of collaborative learning techniques for academicians while encouraging innovative teaching methods tailored to different learning settings (Pozzi, Manganello, & Persico, 2023). By focusing on the direct and indirect influence of peer interaction and social presence, with learners' self-efficacy as a mediator, this study offers a comprehensive view of collaborative learning dynamics in online flexible distance learning contexts (Kebah, Raju, & Osman, 2019). By addressing these areas, institutions can better equip students to fulfill the requirements of today's employment environment and foster a culture of lifelong learning. This preparation equips students with the necessary skills to thrive in professional environments and sustains their motivation and engagement in continuous personal and professional development journeys. This study examines the indirect and direct impact of interaction with peers and social presence on collaborative learning with learners' self-efficacy as a mediator among the students in online flexible distance learning higher education institutions.

2. LITERATURE REVIEW

2.1. Underpinning Theory

The Community of Inquiry (CoI) Framework offers a robust foundation for analyzing the interactions and influences in your study on collaborative learning in online flexible distance education. Developed by Garrison, Anderson, and Archer, the CoI Framework posits that compelling online learning experiences are constructed through the interplay of three fundamental elements: teaching, cognitive, and social presence (Garrison, Anderson, & Archer, 2000). In the context of this study, social presence is particularly pertinent as it refers to the capacity of learners to express themselves in social and emotional contexts, thus influencing peer interaction and the sense of community in online learning. High levels of social presence can enhance collaborative learning by increasing engagement, communication, and group cohesion (Richardson & Swan, 2003). This can lead to a more interactive and dynamic learning experience, fostering a supportive environment where learners feel encouraged to participate and collaborate.

Furthermore, the framework also incorporates the notion of cognitive presence, which relates to constructing meaning and understanding through active involvement and sustained communication (Garrison, 2007). By linking these elements, the CoI Framework provides a comprehensive view of how social presence and peer interactions can enhance learners' self-efficacy, as these interactions help build confidence and competence in learners' capacities to participate actively in the educational experience. Thus, the CoI Framework effectively underpins the investigation into how social presence and peer interaction impact collaborative learning outcomes and learners' self-efficacy in online higher education.

2.2. Relationship between Interaction with Peers, Learners' Self-Efficacy, and Collaborative Learning

The relationship between peer interaction and collaborative learning is significantly enhanced when learners' self-efficacy acts as a mediator. Peer interaction in educational settings fosters a supportive learning environment that enhances students' motivation and engagement, leading to better collaborative learning outcomes (Intaratat, Osman, Nguyen, Suhandoko, & Sultana, 2024). Learners with strong self-efficacy are more likely to engage confidently with peers, facilitating effective knowledge-sharing and collaboration (Li, Peng, Lu, Liao, & Li, 2020). This interaction not only aids in academic achievements but also builds essential communication skills. Self-efficacy is a crucial intermediary in enhancing the quality and outcomes of collaborative learning experiences. This sense of self-belief empowers students to tackle challenges collaboratively, harnessing peer support to boost learning outcomes (Zhao & Qin, 2021).

Moreover, high levels of perceived peer support further strengthen this relationship by giving learners a sense of belonging and confidence, boosting their self-efficacy (Huang, 2023). This psychological safety net encourages students to participate more freely and openly in discussions, enriching learning. Studies show that this heightened self-efficacy promotes active participation in collaborative activities and enhances the ability to navigate social learning contexts effectively (Khan, Khan, & Mehmood, 2023). Thus, understanding the interplay between peer interactions and self-efficacy can provide educators with valuable insights to optimize collaborative learning strategies (Li, Rahman, Connie, & Osman, 2020). By harnessing the potential of peer dynamics, educational institutions can significantly enhance learning outcomes and foster a more interactive and rewarding educational environment.

Therefore, the following hypotheses were proposed for this study:

H_1: There is a relationship between interaction with peers and collaborative learning among students in online flexible distance learning higher education institutions.

H_2: There is a relationship between interaction with peers and learners' self-efficacy among students in online flexible distance learning higher education institutions.

H_3: There is a mediating effect of learners' self-efficacy on the relationship between interaction with peers and collaborative learning among the students in online flexible distance learning higher education institutions.

2.3. Relationship between Social Presence, Learners' Self-Efficacy, Collaborative Learning

Learners' self-efficacy significantly mediates the relationship between social presence and collaborative learning. The concept of social presence refers to the capacity of learners to socially and emotionally project themselves in an online environment, enriching collaborative learning experiences through cultivating a community spirit and connection critical for effective collaboration (Wu, 2023). This sense of community encourages students to engage more deeply with their peers, promoting environments that support mutual learning and knowledge sharing (Hu, Huang, Kong, & Hussain, 2023). In this dynamic, self-efficacy acts as a crucial mediator. A strong sense of social presence further empowers learners with high self-efficacy who have confidence in their abilities to succeed in collaborative tasks (Lim, Rosenthal, Sim, Lim, & Oh, 2021). This empowered self-belief drives students to actively contribute and engage in learning activities, bolstering their academic performance and overall satisfaction with online learning (Bailey, 2022). A significant aspect of social presence is its ability to enhance group cohesion and collective efficacy, which are linked to positive academic outcomes (Yoon & Leem, 2021). In group settings, learners' motivation and investment in group tasks increase when their inputs are valued and supported (Osman, Mohamad, Mohamad, Mohamad, & Sulaiman, 2018). Therefore, understanding the mediating role of self-efficacy can guide educators in crafting online courses that strategically leverage social presence. By doing so, educators can create more engaging and effective collaborative learning environments, ultimately leading to improved educational outcomes for learners. This understanding is invaluable for designing interventions to enhance students' psychological and educational experiences online. Thus, the following hypotheses were proposed for this study:

H_5: There is a relationship between social presence and collaborative learning among students in online flexible distance learning higher education institutions.

H_6: There is a relationship between learners' self-efficacy and collaborative learning among students in online flexible distance learning higher education institutions.

H_7: There is a mediating effect of learners' self-efficacy on the relationship between social presence and collaborative learning among students in online flexible distance learning higher education institutions.

2.4. Research Framework

Based on the hypotheses, the research framework is shown in Figure 1 with collaborative learning as the dependent variable, peer interaction and social presence as independent variables, and the learner's self-efficacy as a mediator.

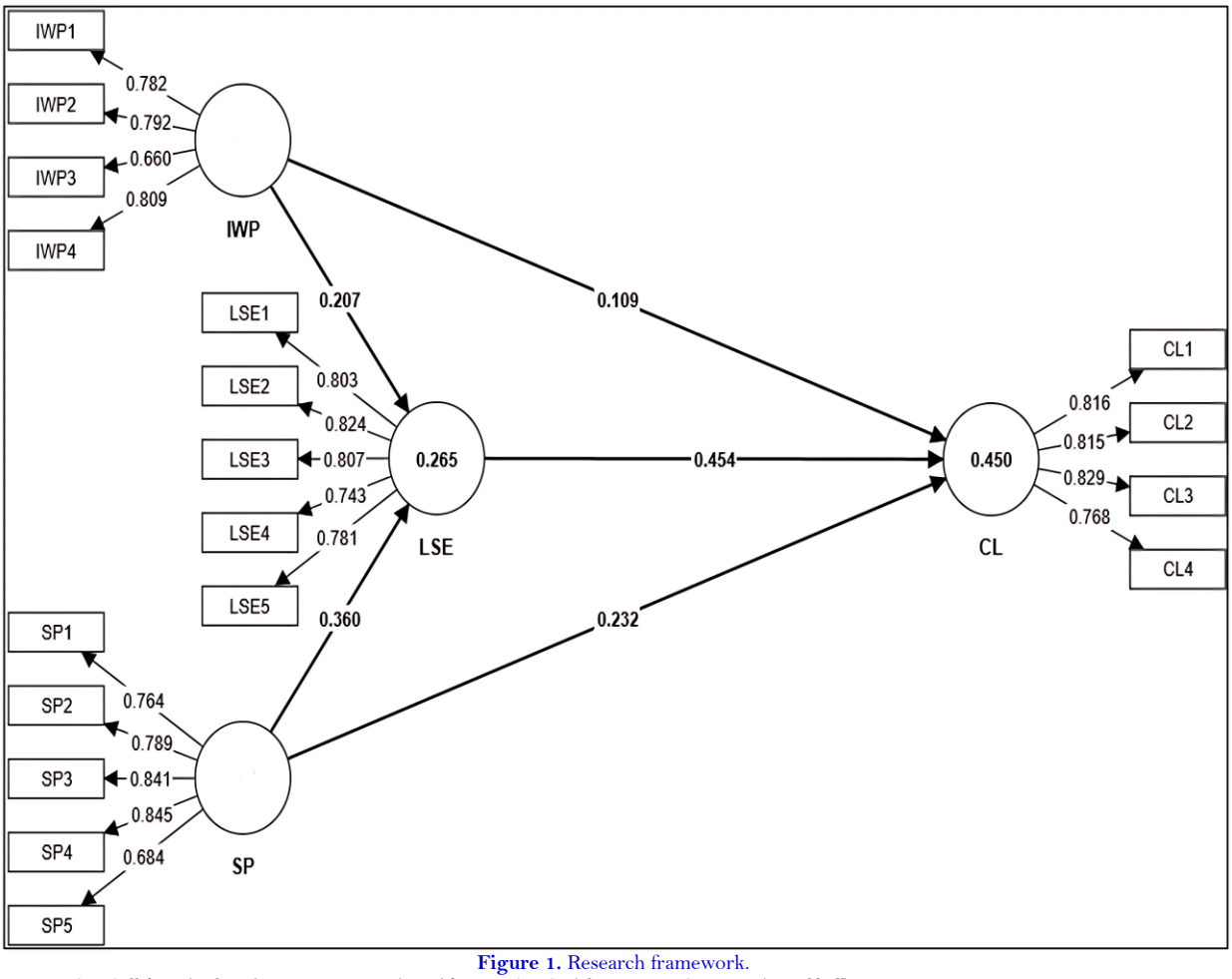

Figure 1. Research framework.

Note: CL=Collaborative learning; IWP=Interaction with peers; SP=Social presence; LSE=Learning self-efficacy.

3. METHODOLOGY

This study explores the direct and indirect effects of peer interaction and social presence on collaborative learning among students following flexible online distance learning at higher education institutions. In this study, students' self-efficacy served as a mediating variable. Primary data collection was conducted by selecting valid and reliable measures based on an extensive literature review. The questionnaire was sent via email to a targeted group of participants using a purposive sampling method, as a complete population list was not available.

The study analysis involved 18 observational variables, including independent variables such as peer interaction (4 items) (Sarwar, Zulfiqar, Aziz, & Ejaz Chandia, 2019) and social presence (Molinillo-Jiménez, Aguilar-Illescas, Anaya-Sánchez, & Vallespín-Arán, 2018) (5 items). In addition, the mediator variable was student self-efficacy (Kang, Chang, Kao, Chen, & Wu, 2019) (5 items), while the dependent variable was collaborative learning (Al-Rahmi & Othman, 2013) (4 items). Participants rated each aspect of the construct using a five-point Likert scale, resulting in a detailed data set.

Of the 507 questionnaires distributed, 412 were returned, giving a response rate of 81.2% suitable for structural equation modeling (SEM) analysis. However, only 388 questionnaires were eligible for use in the final analysis. To ensure the accuracy of the analysis, the researchers used SmartPLS4 software, which is known for its capabilities in SEM techniques. The software's capabilities in analyzing multivariate data are in line with the recommendations of Ringle, Wende, and Becker (2022). SmartPLS4 allows hypothesis testing and multivariate analysis to be carried out comprehensively, thus providing an in-depth assessment of the measurement model and structural model.

4. DATA ANALYSIS

4.1. Respondents' Profiles

Considering the year of study, the respondents show varied representation, with the highest number being in Year 3 (24.7%), suggesting that students in their penultimate year might have more experience or insights into the learning system being evaluated. This is followed by Year 2 students at 20.9% and Year 1 at 18.6%, indicating significant participation from early-stage learners. Representation diminishes in Year 4 (16.2%), Year 5 (11.6%), and Year 6 (8.0%), possibly reflecting completion or graduation rates affecting participation. Regarding academic programs, most respondents are enrolled in Diploma programs, comprising 65.7% of the sample, which highlights a strong focus on this qualification among participants. Certificates are the next most common program at 21.4%, with Bachelor, Master, and Doctorate levels having markedly less representation at 7.0%, 4.9%, and 1.0%, respectively. Finally, when considering the likelihood of recommending collaborative learning to peers, an overwhelming 99.2% of respondents affirmed they would recommend it, signaling high satisfaction or positive perception of their educational experiences. Only a minority of 0.8% would not recommend their program, indicating potential areas for improvement. Overall, the total respondent count stands at 388, providing a comprehensive overview of demographic participation within this study.

4.2. Common Method Bias

The full collinearity test, following the guidelines of Kock (2015) and Kock and Lynn (2012), detects common method bias within the dataset. This test assesses all latent variables' variance inflation factors (VIFs). As indicated in Table 1, the VIFs for collaborative learning, interaction with peers, social presence, and learners' self-efficacy are below the threshold of 3.3, which suggests that common method bias is not a significant concern in this analysis. Specifically, all VIFs for the variables, such as collaborative learning with a maximum VIF of 1.776 and social presence with 1.787, indicate acceptable levels of collinearity, confirming the robustness and reliability of the collected data and subsequent analyses.

Table 1. Full collinearity.

Constructs	CL	IWP	SP	LSE
CL		1.776	1.721	1.404
IWP	1.653		1.312	1.655
SP	1.754	1.437		1.787
LSE	1.355	1.716	1.692	

4.3. Measurement Model

This study utilized the measurement assessment approach recommended by Hair, Hult, Ringle, and Sarstedt (2022) to conduct the first and second assessments, with a particular focus on identifying items with loadings below 0.7. The analysis of reliability and construct validity showed that the Average Variance Extracted (AVE) values for all constructs exceeded the threshold of 0.5, ranging from 0.583 to 0.652 (Table 2), thus confirming convergent validity (Hair et al., 2022).

In addition, all constructs recorded composite reliability scores exceeding 0.7, ranging from 0.761 to 0.865, while Cronbach's alpha values also exceeded 0.7, ranging from 0.758 to 0.852 (Table 2). At the initial stage, cross-loading analysis was conducted to confirm discriminant validity and ensure accurate measurement and representation of the constructs (Table 2). Next, the Heterotrait-Monotrait (HTMT) ratio was used, as suggested by Henseler, Ringle, and Sarstedt (2015), to assess discriminant validity in Variance-Based Structural Equation Modeling (VB-SEM). The HTMT ratio values for each construct, as listed in Table 1, were below the threshold of 0.85, indicating satisfactory discriminant validity.

Table 2. Construct reliability and validity, outer loadings, loadings & Heterotrait-Monotrait (HTMT) ratio.

Constructs	Indicators	Loadings	CA	CR	AVE	HTMT		
						CL	IWP	LSE
Collaborative learning	CL1	0.816	0.823	0.829	0.652			
	CL2	0.815						
	CL3	0.829						
	CL4	0.768						
Interaction with peers	IWP1	0.782	0.758	0.761	0.583	0.560		
	IWP2	0.792						
	IWP3	0.660						
	IWP4	0.809						
Learning self-efficacy	LSE1	0.803	0.852	0.855	0.628	0.729	0.531	
	LSE2	0.824						
	LSE3	0.807						
	LSE4	0.743						
	LSE5	0.781						
Social presence	SP1	0.764	0.846	0.865	0.619	0.604	0.765	0.564
	SP2	0.789						
	SP3	0.841						
	SP4	0.845						
	SP5	0.684						

Note: CA = Cronbach's alpha; CR = Composite reliability; AVE = Average variance extracted; CL = Collaborative learning; IWP = Interaction with peers; SP = Social presence; LSE = Learning self-efficacy.

4.4. Structural Model

In this study, the structural model evaluation followed the methodology recommended by Hair et al. (2022), which includes an in-depth analysis of the pathway coefficients (β) and the coefficients of determination (R^2). This study applies the Partial Least Squares (PLS), utilizing 5,000 sub-samples to assess the significance of the path coefficients. The results of the hypothesis tests, which encompass confidence intervals for path coefficients (beta), t-statistics, and p-values, are comprehensively detailed in Table 3. This comprehensive approach sheds light on the strength and significance of the relationships between variables in the structural model. Table 3 offers an in-depth review of each hypothesis, presenting beta coefficients, T-statistics, P-values, and the outcomes concerning hypothesis support. This methodology enriches the study's conclusions by delivering a more precise and detailed understanding of the interactions among the variables examined.

Analyzing the hypotheses and testing results provides insight into the relationships among peer interaction, social presence, learner's self-efficacy, and collaborative learning. Starting with *Hypothesis 1 (H1)*, which examined the direct impact of peer interaction on cooperative learning, the beta value is 0.109, with a t-statistic of 1.848 and a p-

value of 0.065. Although there is a positive relationship, the p-value exceeds the conventional threshold of 0.05, leading to the rejection of this hypothesis. *Hypothesis 2 (H2)* assessed the impact of interaction with peers on learners' self-efficacy and showed a more robust beta of 0.207, a t-statistic of 3.592, and a significant p-value of 0.000, resulting in acceptance of the hypothesis, indicating a robust positive influence. *Hypothesis 3 (H3)* evaluated the mediating effect of the learner's self-efficacy in the relationship between interaction with peers and collaborative learning. The beta is 0.094, with a t-statistic of 3.155 and a p-value of 0.002, supporting acceptance and illustrating a significant indirect effect. *Hypothesis 4 (H4)* explored the impact of social presence on collaborative learning, yielding a beta of 0.232, a t-statistic of 4.509, and a p-value of 0.000, signifying a strong and statistically significant positive relationship, thus accepted.

Turning to *Hypothesis 5 (H5)*, which explored the link between social presence and learners' self-efficacy, the results are compelling, with a beta of 0.360, a t-statistic of 6.215, and a p-value of 0.000, warranting acceptance. Similarly, *Hypothesis 6 (H6)*, which focused on the effect of learners' self-efficacy on collaborative learning, boasts the highest beta at 0.454, alongside a t-statistic of 8.935 and a p-value of 0.000, clearly affirming the hypothesis. Finally, *Hypothesis 7 (H7)* concerns the mediating role of learners' self-efficacy in the influence of social presence on collaborative learning. With a beta of 0.163, a t-statistic of 5.041, and a significant p-value of 0.000, this hypothesis is accepted, underscoring the substantial indirect effect of social presence on collaborative learning through enhanced self-efficacy.

Table 3. Hypothesis testing results.

Hypotheses	Beta	T statistics	P values	2.50%	97.50%	Decision
H1: IWP -> CL	0.109	1.848	0.065	-0.005	0.224	*Rejected*
H2: IWP -> LSE	0.207	3.592	0.000	0.088	0.312	*Accepted*
H3: IWP -> LSE -> CL	0.094	3.155	0.002	0.039	0.154	*Accepted*
H4: SP -> CL	0.232	4.509	0.000	0.133	0.329	*Accepted*
H5: SP -> LSE	0.360	6.215	0.000	0.241	0.468	*Accepted*
H6: LSE -> CL	0.454	8.935	0.000	0.352	0.550	*Accepted*
H7: SP -> LSE -> CL	0.163	5.041	0.000	0.107	0.233	*Accepted*

4.5. Effect Sizes (f^2) and Variance Inflation Factor (VIF)

Table 4 provides a detailed overview of effect sizes (f^2) using Cohen's (1992) guidelines, categorizing them as minor (0.020 to 0.150), medium (0.150 to 0.350), or large (0.350 and above). Within this study, effect sizes range from small (0.013) to large (0.276), showcasing the varied impacts of the analyzed variables. Additionally, the Variance Inflation Factor (VIF) values detailed in Table 4 remain well below the lenient threshold of 5, with the highest observed value being 1.803, indicating minimal collinearity concerns. This suggests the structural model's interpretation of effect sizes and coefficients is dependable. The endogenous construct reveals a significant explained variance, indicated by an R^2 value of 0.450 (Figure 1). Regarding the mediator, the model accounts for about 26.5% of the variance, as shown by an R^2 value of 0.265. This underscores the model's ability to capture mediation dynamics and accurately represent the underlying processes.

Table 4. Effect sizes (f^2) & variance inflation factor (VIF).

Constructs	f^2		VIF	
	CL	LSE	CL	LSE
IWP	0.013	0.036	1.685	1.627
LSE	0.276		1.360	
SP	0.054	0.108	1.803	1.627

4.6. PLSpredicts and Cross-Validated Predictive Ability Test (CVPAT)

The model inference and managerial implications were thoroughly evaluated through out-of-sample forecast analysis using the PLSpredict approach, in line with the recommendations of Shmueli, Ray, Estrada, and Chatla (2016) and Shmueli et al. (2019). As shown in Table 5, the use of PLS-SEM provides better Q^2 forecasts (>0) compared to the naive average forecast, in addition to showing lower Root Mean Square Error (RMSE) values compared to the linear model (LM) benchmark. This emphasizes the robust predictive capability of the model. Specifically, the PLS-SEM forecast outperforms the LM forecast benchmark in eight cases, as detailed in Table 5, thus highlighting the superiority of its predictive capability.

The introduction of the Cross-Validated Predictor Proficiency Test (CVPAT) by Hair et al. (2022) and its integration with PLSpredict analysis by Liengaard et al. (2021) has brought significant advances in predictive modeling. Furthermore, as shown in Table 6, the predictive ability of PLS-SEM is proven to be superior with lower average loss values compared to the average indicator and the LM benchmark. This finding provides strong evidence of the superior predictive performance of PLS-SEM.

Table 5. PLS predicts.

Indicators	Q^2predict	PLS-RMSE	LM_RMSE	PLS-LM
CL1	0.265	0.650	0.649	0.001
CL2	0.192	0.636	0.643	-0.007
CL3	0.192	0.700	0.703	-0.003
CL4	0.082	0.756	0.757	-0.001
LSE1	0.198	0.628	0.630	-0.002
LSE2	0.171	0.629	0.636	-0.007
LSE3	0.130	0.679	0.685	-0.006
LSE4	0.131	0.690	0.699	-0.009
LSE5	0.158	0.629	0.636	-0.007

Table 6. Cross-validated predictive ability test (CVPAT).

Constructs	Average loss difference	t-value	p-value
CL	-0.104	5.060	0.000
LSE	-0.079	4.444	0.000
Overall	-0.090	5.603	0.000

4.7. Importance-Performance Map Analysis (IPMA)

The Importance-Performance Map Analysis (IPMA), outlined by Ringle and Sarstedt (2016) and Hair, Sarstedt, Ringle, and Gudergan (2018), serves as a strategic tool for pinpointing areas needing enhancement by comparing the importance and performance of various constructs to improve outcomes such as collaborative research. As depicted in Table 7, the learner's self-efficacy holds the highest importance score of 0.454, while its performance is lower at 60.708. This suggests a critical area for improvement, indicating that enhancing learners' self-efficacy could substantially boost collaborative learning. Interaction with peers, though the lowest in importance at 0.203, exhibits the highest performance at 66.748, indicating that current processes are effective. Social presence, with an importance score of 0.396, also performs well at 66.748. In order to improve collaborative learning, strategies should strengthen learners' self-efficacy through targeted initiatives such as training programs and motivational interventions, aligning with their high importance and maximizing their impact.

Table 7. Importance-performance map analysis.

Constructs	Total effect	Performance
IWP	0.203	66.748
LSE	0.454	60.708
SP	0.396	66.557

5. DISCUSSION

Higher education institutions should implement several practical strategies to effectively enhance students' interaction with peers and social presence in open, online, flexible distance learning environments. These strategies are crucial for positively impacting students' collaborative learning, as evidenced by learners' self-efficacy as a mediator.

As indicated in the statistical results, the impact of interaction with peers on learners' self-efficacy (β=0.207) and the subsequent effect on collaborative learning (β=0.094) emphasise the importance of creating an interactive and supportive community (Intaratat et al., 2024). Higher education institutions can facilitate this by creating structured peer-to-peer activities, such as discussion forums and collaborative projects, enabling students to engage and build confidence within a shared learning environment (Li et al., 2020). Additionally, the direct effect of social presence on collaborative learning (β=0.232) and its influence on self-efficacy (β=0.360) underscores the need to enhance social presence through technological and pedagogical methods (Huang, 2023). Educators can employ virtual conferencing tools and integrate social networking platforms to create immersive and interactive experiences, helping students feel more connected and engaged (Zhao & Qin, 2021).

Moreover, integrating adaptive learning technologies that provide personalized feedback can further bolster self-efficacy by offering students critical insights into their learning process and progress (Supena et al., 2021). By focusing on these strategic initiatives, institutions can create an online learning environment that nurtures social presence and peer interaction, enhancing collaborative learning outcomes through improved self-efficacy. This approach addresses the pivotal role of social dynamics in online education. It ensures learners have the confidence and competence to thrive in collaborative scenarios, ultimately leading to a more robust and effective educational experience.

6. IMPLICATIONS

6.1. Theoretical Implications

The Community of Inquiry (CoI) Framework is an essential underpinning theory for the study examining the enhancement of students' interaction with peers and social presence in online flexible distance learning. Garrison, Anderson, and Archer developed the CoI Framework, which identifies three key elements: cognitive, teaching, and social presence, all of which are crucial for a practical online learning experience (Garrison et al., 2000). In this study, social presence emerges as a pivotal component. It involves the ability of students to project themselves socially and emotionally in an online community, which has been shown to significantly impact learners' self-efficacy and collaborative learning outcomes (Ng et al., 2022; Wu, 2023). The model proposed in this study aligns with the CoI Framework by emphasizing how social presence and peer interaction influence collaborative learning, with learners' self-efficacy acting as a mediator. The findings suggest that institutions can improve learners' engagement and confidence by enhancing social presence and peer interaction, facilitating more profound and meaningful learning processes (Richardson & Swan, 2003).

Moreover, leveraging teaching presence within the CoI Framework can further support these dynamics by guiding and motivating students and creating a structured and supportive learning environment. The CoI Framework, therefore, offers a comprehensive lens through which to understand and maximize the impact of online learning environments on collaborative learning (Huang, 2023; Yoon & Leem, 2021). By aligning educational strategies with the CoI Framework, institutions can foster a rich, engaging learning community that enhances students' educational experiences and outcomes.

6.2. Practical Implications

This study has important practical implications for online flexible distance learning institutions aiming to enhance students' collaborative learning experiences.

By emphasizing the roles of peer interaction and social presence, institutions can design more effective learning environments that support improved educational outcomes. The study emphasized the importance of developing strategies that bolster social presence, such as video conferencing tools, discussion forums, and social media platforms, to foster student community and connection (Huang, 2023; Wu, 2023).

These initiatives can help students feel more engaged and emotionally connected to their peers, which is crucial for successful collaborative learning. Furthermore, enhancing peer interaction through structured group activities and peer-supported learning tasks can significantly improve students' self-efficacy and collaborative engagement. This requires careful design and facilitation by educators to ensure meaningful activities and encourage active participation. Institutions should also provide training and resources to equip faculty with the skills to create and sustain an interactive and supportive online learning environment (Ng et al., 2022). By addressing these elements, institutions can ultimately foster an environment where students are more confident and capable of collaborating effectively, leading to richer learning experiences and better academic outcomes (Richardson & Swan, 2003; Yoon & Leem, 2021).

6.3. Suggestions for Future Study

Based on the findings of this study, several avenues for future research can be explored to deepen the understanding of collaborative learning in online flexible distance education. First, future research could investigate the long-term effects of enhanced social presence and peer interaction on learners' academic performance and career readiness. Longitudinal studies would yield important insights into how these elements influence sustained learning outcomes and skill development.

Additionally, further studies could examine the role of cultural differences in shaping social presence and peer interaction. As online distance learning crosses geographical boundaries, understanding how cultural contexts influence interaction and engagement could help institutions tailor strategies to diverse student populations. Investigating the incorporation of cutting-edge technologies, including virtual reality and artificial intelligence, into online learning platforms may also offer new insights into enhancing social presence and collaborative experiences. These technologies could simulate more immersive and interactive environments, potentially increasing students' engagement and learning outcomes.

Finally, future research could focus on developing and testing specific pedagogical frameworks that integrate the Community of Inquiry elements to optimize online collaborative learning. This exploration could lead to standardized best practices for educators, ensuring effective online education delivery that maximizes student interaction and social connectivity. These studies would significantly enhance the development of educational strategies to address the changing requirements of online learners.

7. CONCLUSION

This study offers valuable insights into the dynamics of collaborative learning within online flexible distance higher education environments. Highlighting the crucial roles of peer interaction and social presence underscores the importance of fostering a supportive and engaging online community to enhance students' collaborative learning experiences. Using learners' self-efficacy as a mediator further emphasizes the psychological aspects of effective collaboration. Institutions can leverage these findings to develop targeted strategies to improve social connectivity and interaction, strengthening students' confidence and collaborative skills. Educators can create more prosperous online learning environments by integrating structured peer activities and enhancing social presence through digital tools. Future research can build on these findings by investigating cultural differences, long-term impacts, and new technologies, thereby contributing to the development of comprehensive pedagogical approaches that cater to diverse online learners in a rapidly evolving educational landscape.

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