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Social Media, Social Presence and Collaborative Learning in Open and Distance Learning: The Mediating Role of Self-Efficacy

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Abstract

Considered key to open, online, and flexible distance learning (OOFDL), collaborative learning provides learners with problem-solving, communication, and teamwork skills crucial for the current higher educational environment. This study examined the effects of social presence and social media on collaborative learning, with learners' self-efficacy as a mediator. Data was collected through a structured questionnaire involving 388 sample respondents selected through purposive sampling, which comprised diverse learners engaged in online and distance learning environments. The data were analysed using the Partial Least Squares Structural Equation Modelling (PLS-SEM) technique. Hypothesis testing findings showed social presence and social media usage played a significant role in collaborative learning. Moreover, the relationship is mediated by learners' self-efficacy as an enabler for effective learning interactions. Additionally, the enhancement of social presence resulted in improved self-efficacy and collaborative learning. The results emphasised the importance of designing interactive, digitally enhanced educational contexts for learner engagement and success. Future research should investigate the impact of various social media platforms, consider the cultural factors that may influence these dynamics, and conduct longitudinal studies to examine the long-term effects of social presence and media use on collaborative learning. Furthermore, the use of qualitative methods could provide more complex insights into learners' individual experiences. This study also has implications for educators and policymakers who are interested in improving the quality of online learning experiences; institutions, for instance, can leverage social media tools to increase social presence and develop better collaborative learning environments to improve learners' self-confidence and educational outcomes. This study provides a useful framework for enhancing learner engagement and promoting the development of crucial collaborative skills in a digital learning environment.

Keywords: collaborative learning, higher education, learners' self-efficacy, open, online, and flexible distance learning, presence, social media, social presence

1. Introduction

Collaborative learning is important in open, online, and flexible distance learning (OOFDL) in higher education because it capitalises on the collective intellectual strengths of a diverse group of learners. This approach is key to developing critical thinking, problem-solving, and teamwork in diverse groups, skills that are increasingly important in our globalised world. Collaborative learning increases interaction and activity in education and supports the development of deeper understanding through shared learning experiences (Strauß & Rummel, 2020). Despite its importance, collaborative learning in OOFDL is nevertheless beset by several challenges, one major problem being the technological gap among learners that leads to unequal participation and engagement (Matee et al., 2022). Another challenge exists in promoting effective interaction among participants, which is crucial to ensure the success of collaborative learning, although this can be difficult to encourage in a virtual setting (Muñoz-Carril et al., 2024). The current trends highlight the use of social media and other digital technologies to improve interaction, but the balance between social and educational use is an ongoing struggle (Alfiyanto et al., 2023; Knopf et al., 2021). As a result, these challenges and trends continue to influence OOFDL practices worldwide.

This study highlights the need to create interactive educational environments that aid collaboration and communication among learners, as effective instructional design based on principles of collaborative learning has been identified as crucial to the success of OOFDL programmes (Pozzi et al., 2023). While there has been some progress in this regard, research gaps remain, especially concerning the future impact of OOFDL environments on learning outcomes and learners' future employability (Saw & Mohamad, 2024). This study emphasises the necessity for policymakers to address infrastructural gaps and establish standards for equal access to online learning platforms. However, future studies should still explore the mechanisms that enable or constrain successful collaboration in diverse teams. More research is further needed to understand the influence of cultural differences on collaborative learning and how to manage them effectively in a virtual setting (Jaramillo & Ávila-Ascanio, 2024).

For educational administrators, this topic highlights a need to strategically invest in digital tools and teacher training to facilitate collaborative learning design. For learners, collaborative learning approaches in OOFDL may enhance study opportunities that may be customised to suit specific needs and thus foster lifelong learning (Muñoz-Carril et al., 2024; Intaratat et al., 2024). As OOFDL continues to evolve, addressing these obstacles and research gaps is thus crucial to unlock the full capabilities of collaborative learning. By creating a supportive and inclusive learning environment, OOFDL can improve academic success and better equip learners to meet the requirements of the modern workforce (Jaramillo & Ávila-Ascanio, 2024).

Although prior studies have examined social presence (Molinillo et al., 2018) and social media usage (Alturki & Aldraiweesh, 2024) as separate predictors of learning outcomes, few have tested their combined influence on collaborative learning through the mediating mechanism of learners' self-efficacy, particularly in an OOFDL setting. For instance, Hu et al. (2024) and Jia et al. (2024) linked social media usage to self-efficacy but did not extend this pathway to collaborative learning behaviour, leaving unclear how environmental and psychological factors interact in practice. Such gaps motivate the present study's integrated model, which explores the relationships between social presence and social media with collaborative learning, with learners' self-efficacy serving as a mediator in OOFDL higher education institutions.

Accordingly, this study addresses the following research questions:

RQ1: Does social presence significantly influence collaborative learning in OOFDL institutions?
RQ2: Does social media usage significantly influence collaborative learning in OOFDL institutions?
RQ3: Does social presence significantly influence learners' self-efficacy?
RQ4: Does social media usage significantly influence learners' self-efficacy?
RQ5: Does learners' self-efficacy significantly influence collaborative learning?
RQ6: Does learners' self-efficacy mediate the relationship between social presence and collaborative learning?
RQ7: Does learners' self-efficacy mediate the relationship between social media usage and collaborative learning?

2. Literature Review

Albert Bandura's social cognitive theory (SCT) offers an in-depth explanation of how people's perceptions of their abilities—known as self-efficacy—influence their motivation and actions (Bandura, 1985). The theory is useful in exploring complex relationships between social presence, social media usage, collaborative learning, and self-efficacy within OOFDL environments. According to the SCT, learning is described as a dynamic and reciprocal interaction of personal, behavioural, and environmental factors (Bandura, 1985). In the context of OOFDL, social presence, i.e., the perception of being connected with other people in a digital environment, can have a significant influence on an individual's self-efficacy. Learners with a strong social presence are more inclined to express self-confidence in their capacity to engage effectively in collaborative learning activities, which consequently enhances their learning experiences and outcomes. Another key factor is the use of social media, which is considered a tool capable of increasing social presence through communication and interaction, and can indirectly increase self-efficacy through greater engagement and positive peer reinforcement according to the SCT (Junco et al., 2011). This improvement in self-efficacy encourages learners to be more active in their participation in collaborative learning, thus implying that social media usage can be an effective enabler in active learning environments. Overall, the SCT offers a solid theoretical lens through which the relationship between these variables can be examined. This suggests that self-efficacy has a mediating role that connects social presence and social media usage to collaborative learning in the OOFDL context.

The relationship between social presence and collaborative learning is crucial to improving educational outcomes, particularly in online settings. The perception of being connected with others—known as social presence—plays an important role in mediating educational dynamics because it helps learners feel more engaged and supported in a virtual environment, consequently affecting their self-efficacy or belief in their success (Gao et al., 2024; Zhang et al., 2023). Higher self-efficacy is correlated with better performance and greater engagement in collaborative learning activities (Intaratat et al., 2024). This relationship has been studied by Wu (2023), who emphasised the mediating role of social presence in the relationship between online learning self-efficacy and learner engagement. Community and learner engagement can improve social presence and learners' confidence to work collaboratively. According to Lee and Kim (2023), strategic facilitation strengthens this sense of connection and support, and can be important for effectively managing social presence in collaborative settings. Moreover, social presence is also an important element because it encourages active learning and peer interaction for educational success (Mudrikah et al., 2024; Yang & Lay, 2024).

Furthermore, social presence and self-efficacy influence each other: greater social presence improves self-efficacy, which in turn leads to better collaborative learning outcomes (Mohamad et al., 2025). This dynamic is essential for educators and policymakers who are looking to optimise online learning experiences and improve learner performance. Against this background, this study therefore proposed the following hypotheses:

H1: There is a positive and significant relationship between social presence and collaborative learning among learners in OOFDL higher education institutions.
H2: There is a positive and significant relationship between social presence and learners' self-efficacy among learners in OOFDL higher education institutions.
H3: There is a mediating effect of learners' self-efficacy on the relationship between social presence and collaborative learning among learners in OOFDL higher education institutions.

Social media has had a huge impact on how learners collaborate in educational settings. Social media platforms are crucial in this respect, as they provide learners with the opportunity to share resources, discuss ideas, and engage in discussions, thus enriching the collaborative learning process (Sahoo & Pradhan, 2025). Such platforms facilitate communication and interaction, which are essential for effective collaborative learning. One important factor that mediates the relationship between social media usage and collaborative learning is learners' self-efficacy, which refers to learners' belief in their capacity to succeed in specific tasks (Hu et al., 2024). Social media can boost self-efficacy through the creation of a supportive environment through which learners can obtain feedback, encouragement, and peer support, which can contribute to improved confidence to actively participate in collaborative assignments (Jia et al., 2024).

Learners are more engaged and motivated when they collaborate through social media, which can have a positive impact on self-efficacy (Alturki & Aldraiweesh, 2024). This increased self-efficacy, in turn, allows them to participate more deeply and effectively in collaborative learning activities (Di & Gu, 2025). Learners who feel empowered are more likely to take the initiative and make a meaningful contribution to group efforts. Social media usage in the learning environment thus supports a more interactive and engaging approach to education. Self-efficacy is a key mediating factor in the relationship between social media usage and collaborative learning, and increases the educational benefits of these digital tools (Nguyen et al., 2024). In this context, the study therefore proposed the following hypotheses:

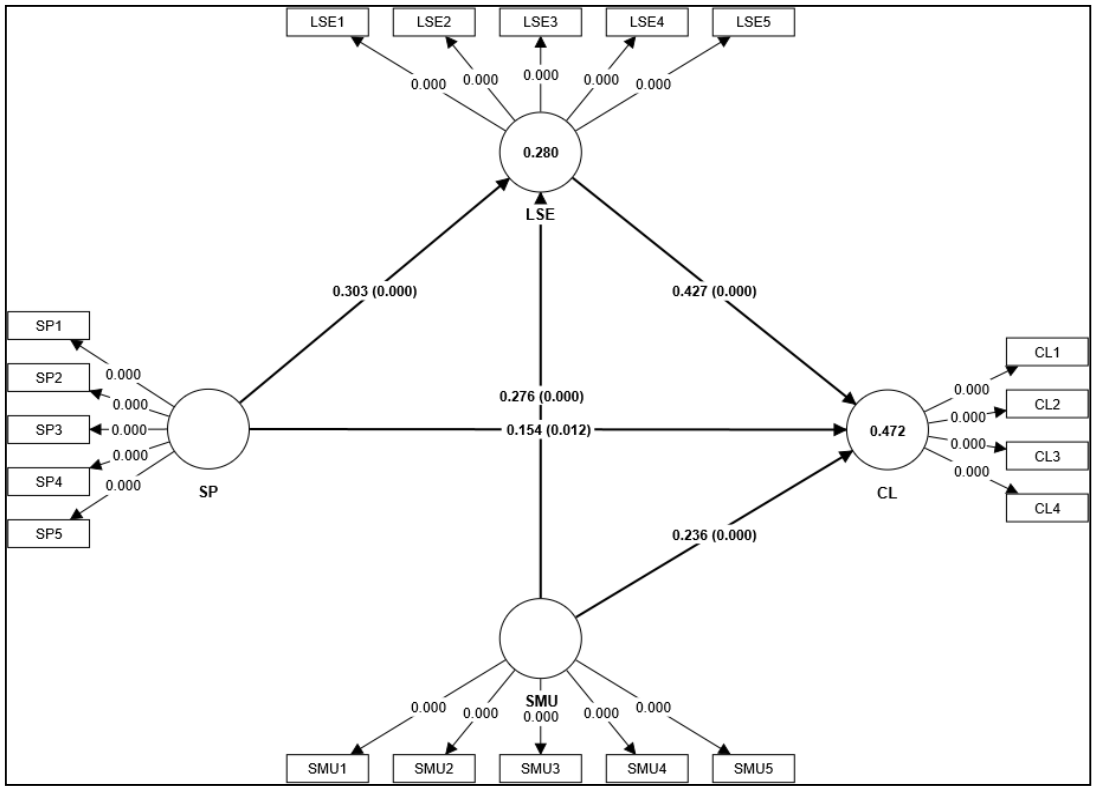
H4: There is a positive and significant relationship between social media usage and collaborative learning among learners in OOFDL higher education institutions.
H5: There is a positive and significant relationship between social media usage and learners' self-efficacy among learners in OOFDL higher education institutions.
H6: There is a positive and significant relationship between learners' self-efficacy and collaborative learning among learners in OOFDL higher education institutions.
H7: There is a mediating effect of learners' self-efficacy on the relationship between social media usage and collaborative learning among learners in OOFDL higher education institutions.

Figure 1 illustrates the research framework of this study, which presents the hypothesised relationships among the four constructs, namely, Social Presence (SP), Social Media Usage (SMU), Learners' Self-Efficacy (LSE), and Collaborative Learning (CL). As shown, SP and SMU are independent variables, CL is the dependent variable, and LSE is the mediating variable. The direct effects considered in this study are the direct paths from SP to CL (H1) and from SMU to CL (H4). The paths from SP to LSE (H2) and SMU to LSE (H5) describe the effect of independent variables on the mediator, while the path from LSE to CL (H6) depicts the direct effect of the mediator on the dependent variable. The mediating effects under investigation are represented by the indirect paths through LSE, namely SP → LSE → CL

(H3) and SMU → LSE → CL (H7). The framework is based on Bandura's (1985) SCT, which posits that environmental factors such as social presence and social media usage influence learners' personal beliefs (i.e., self-efficacy), which in turn affect their behavioural outcomes in collaborative learning. Together, the seven hypotheses developed from this framework provide a comprehensive basis for investigating the direct and indirect impact of collaborative learning in OOFDL environments.

Figure 1

Research Framework



Acronyms: SP = Social Presence, SMU = Social Media Usage, LSE = Learners' Self Efficacy, CL = Collaborative Learning

Prior research has largely examined these constructs in isolation: Molinillo et al. (2018) linked social presence to collaborative engagement without testing self-efficacy as a mediator; Alturki and Aldraiweesh (2024) examined the effects of social media usage on affective learning engagement but not collaborative learning outcomes; while Kang et al. (2019) established learners' self-efficacy as a measurable construct without connecting it to environmental factors such as social presence or social media usage. No study to date has tested social presence and social media usage together as joint antecedents of collaborative learning, mediated by learners' self-efficacy, within an OOFDL setting. By integrating these four constructs into a single model, this study contributes a more complete account of how environmental factors translate into behavioural outcomes through a psychological mechanism, thus extending Bandura's SCT into the OOFDL context.

3. Research Method

This study examined the impact of the use of social media and social presence on collaborative learning, with learners' self-efficacy as a mediating factor, among learners of OOFDL at higher education institutions. The researchers collected primary data using valid and reliable measures from an extensive literature review. Because no comprehensive list of the population was available, purposive sampling was used, and the questionnaires were distributed to selected respondents via email. Analysis was performed based on the following 19 items: social media usage as an independent variable (five items) (Sarwar et al., 2019), social presence as an independent variable (five items) (Molinillo et al., 2018), learners' self-efficacy as a mediating variable (five items) (Kang et al., 2019) and collaborative learning as the dependent variable (four items) (Al-Rahmi & Othman, 2013).

Respondents scored the elements of each construct on a five-point Likert scale, thus providing a rich data set. From a total of 507 questionnaires distributed, 412 were returned, yielding a response rate of 81.2%. This is appropriate for structural equation modelling (SEM) analysis, as the total number of responses deemed suitable for analysis was 388. The researchers used the SmartPLS4 software, which is effective for SEM analysis due to its ability to analyse multivariate data, as recommended by Hair et al. (2022). PLS-SEM was selected over covariance-based SEM (CB-SEM) due to the following reasons: (a) this study is primarily prediction-oriented rather than theory-confirmatory, (b) this study involves a mediation model with multiple structural paths (H1–H7), and (c) the sample (n = 388) and construct measures, while adequate, do not require the stricter multivariate normality assumptions of CB-SEM (Hair et al., 2022). PLS-SEM is also well suited to models combining reflective measurement with mediation analysis, as it provides robust estimation of indirect effects via bootstrapping (Hair et al., 2022), which is central to testing the mediating role of learners' self-efficacy in this study. SmartPLS4 was used to test all hypotheses and perform multivariate analyses, which allowed for a detailed investigation of the measurement and structural models.

4. Findings and Discussion

4.1. Data Analysis

The study respondents represented diverse demographics and educational backgrounds. Gender distribution was nearly equal, although females slightly outnumbered males: 199 respondents identified as female (51.3% of the sample) and 189 respondents identified as male (48.7%). The majority of respondents were aged between 31 and 40 years (287 respondents or 74.2%), while 12.4% (48 respondents) were aged between 41 and 50 years, and 3.4% (13 respondents) were aged between 51 and 60 years. The respondents were relatively evenly spread across their years of study, with the largest group of learners in Year Three (24.7% or 96 respondents), followed by learners in Year Two (20.9% or 81 respondents), and Year One (18.6% or 72 respondents). The remaining learners were in Year Four (16.2% or 63 respondents); Year Five (11.6% or 45 respondents); and beyond Year Five (8.0% or 31 respondents). In terms of academic programmes, the majority of respondents (65.7% or 255 respondents) were enrolled in Diploma programmes, followed by those in Certificate programmes (21.4% or 83 respondents), and Bachelor’s degree programmes (7.0% or 27 respondents). Master's and doctoral learners comprised the smallest fraction of the sample (4.9% or 19 respondents, and 1.0% or four respondents, respectively).

The survey showed that the respondents overwhelmingly supported collaborative learning, with 99.2% (385 respondents) holding positive opinions while only 0.8% (three respondents) did not. This suggests impressive endorsement for collaborative learning among the respondents.

The common method bias analysis was conducted to identify potentially inflated relationships that may be explained by measurement rather than actual correlation among constructs, as described by Kock and Lynn (2012) and later elaborated by Kock (2015). Table 1 shows the results of the Full Collinearity Test, which indicates the variance inflation factors (VIF) of each construct against all others. Specifically, CL has VIF values ranging from 1.502 to 1.847, SP has VIF values ranging from 1.776 to 1.929, SMU has VIF values ranging from 1.499 to 2.024, and LSE has VIF values ranging from 1.388 to 1.695. These VIF values are below the commonly used threshold of 3.3, which indicates that collinearity is not a significant problem in this data set, thereby eliminating common method bias as a serious problem. The results indicate that the associations identified between CL, SP, SMU, and LSE are valid and not largely attributable to methodological artefacts. This reinforces the integrity of the results and strength of the research design.

First- and second-order assessments were performed according to the measurement evaluation approach suggested by Hair et al. (2022), focusing on identifying items with a loading lower than 0.7. The average variance extracted (AVE) values for all the constructs were higher than 0.5—ranging between 0.549 and 0.652, as shown in Table 2—which supports the convergent validity (Hair et al., 2022). Moreover, composite reliability values for all constructs were higher than 0.7 (ranging from 0.795 to 0.865), and Cronbach's alpha values were also higher than 0.7 (ranging from 0.794 to 0.852), also as shown in Table 2. As a preliminary step, the cross-loadings were tested to ensure discriminant validity and accurate measurement and representation of the constructs, as shown in Table 2b. Subsequently, the heterotrait-monotrait (HTMT) ratio was utilised to test discriminant validity in variance-based structural equation modelling (VB-SEM) in line with recommendations by Henseler et al. (2015). As tabulated in Table 3, HTMT ratios of all the constructs were below the 0.85 threshold, indicating adequate discriminant validity.

Table 1

Full Collinearity Test

	CL	SP	SMU	LSE
CL		1.847	1.716	1.502
SP	1.929		1.776	1.916
SMU	1.935	1.499		2.024
LSE	1.388	1.695	1.437	

Table 2

Construct Reliability and Validity and Item Loadings

Constructs	Items	Loadings	CA	CR	AVE
Collaborative	CL1	0.817	0.823	0.828	0.652
Learning	CL2	0.812			
	CL3	0.828			
	CL4	0.771			
Learners'	LSE1	0.804			
Self-Efficacy	LSE2	0.825	0.852	0.855	0.628
	LSE3	0.806			
	LSE4	0.742			
	LSE5	0.783			
Social	SMU1	0.805	0.794	0.795	0.549
Media	SMU2	0.732			

Constructs	Items	Loadings	CA	CR	AVE
Usage	SMU3	0.758			
	SMU4	0.704			
	SMU5	0.702			
Social	SP1	0.764	0.846	0.865	0.619
Presence	SP2	0.789			
	SP3	0.841			
	SP4	0.845			
	SP5	0.684			

Acronyms: CA = Cronbach's Alpha, CR = Composite Reliability, AVE = Average variance Extracted

Table 2b presents the cross-loading results for all measurement items. Each indicator loads highest on its respective construct compared with the other constructs, thus supporting satisfactory discriminant validity and confirming that the constructs are empirically distinct.

Table 2b

Cross Loadings

	CL	LSE	SMU	SP
CL1	**0.817**	0.541	0.525	0.506
CL2	**0.812**	0.461	0.401	0.426
CL3	**0.828**	0.491	0.439	0.434
CL4	**0.771**	0.487	0.377	0.296
LSE1	0.547	**0.804**	0.436	0.429
LSE2	0.493	**0.825**	0.398	0.399
LSE3	0.459	**0.806**	0.342	0.341
LSE4	0.470	**0.742**	0.320	0.359
LSE5	0.459	**0.783**	0.391	0.397
SMU1	0.393	0.365	**0.805**	0.547
SMU2	0.400	0.361	**0.732**	0.445
SMU3	0.338	0.321	**0.758**	0.453
SMU4	0.471	0.394	**0.704**	0.522
SMU5	0.391	0.320	**0.702**	0.513
SP1	0.328	0.323	0.461	**0.764**
SP2	0.389	0.366	0.550	**0.789**
SP3	0.514	0.474	0.605	**0.841**
SP4	0.446	0.402	0.573	**0.845**
SP5	0.330	0.326	0.429	**0.684**

Although the loading for SP5 (0.684) is marginally below the conventional 0.7 threshold, it was retained because its removal did not meaningfully improve the average variance extracted (AVE = 0.619) or composite reliability (CR = 0.865) for SP. Items with loadings between 0.60 and 0.70 are considered acceptable for retention when the construct's AVE and CR values already meet recommended thresholds (Hair et al., 2022).

Table 3

Heterotrait-Monotrait (HTMT) Ratios

	CL	LSE	SMU
LSE	0.729		
SMU	0.659	0.574	
SP	0.604	0.564	0.808

This study evaluated the structural model employing the Hair et al. (2022) methodology, which includes a comprehensive analysis of the path coefficients (β) and coefficients of determination (R^2). The partial least squares (PLS) technique was applied, employing 5,000 subsamples to evaluate the significance of the path coefficients. The hypothesis tests, including confidence intervals for beta coefficients, the t-statistics, the p-values, and results of the hypothesis support, are detailed in Table 4. This fine-grained approach yielded valuable insights regarding the strength and relevance of the variable relationships in the structural model. This methodology provides a more precise and comprehensive understanding of the interactions among the variables under study and contributes to more robust conclusions.

The direct impact of social presence on collaborative learning was found to be significant (β = 0.154, t = 2.527, and p = 0.012), which led to the acceptance of H1. This shows a significant and positive association between SP and CL. H2, which tested the effect of social presence on learners' self-efficacy, showed a significant effect with β = 0.303, t = 4.837, and p = 0.000, which also led to the acceptance of this hypothesis. H3 assessed the mediating role of learners' self-efficacy between social presence and collaborative learning, and yielded considerably indirect effects with β = 0.129, t = 3.951, and p = 0.000. Thus, H3 was also accepted.

H4, which investigated the direct effect of social media usage on collaborative learning, had a significant positive effect with β = 0.236, t = 4.099, and p = 0.000. Similarly, social media usage appeared to have a significant and solid relationship with learners' self-efficacy (H5), with β = 0.276, t = 4.688, and p = 0.000. H6, which assessed the direct effect of learners' self-efficacy on collaborative learning, showed the most significant relationship with β = 0.427, t = 8.527, and p = 0.000. Finally, the mediating effect of learners' self-efficacy between social media usage and collaborative learning (H7) also yielded significant findings with β = 0.118, t = 4.217, and p = 0.000. As such, H4, H5, H6, and H7 were all accepted.

In conclusion, the analysis indicates that social presence and social media usage positively influence learners' self-efficacy and collaborative learning, with self-efficacy acting as a significant mediator in these relationships. This deduction is supported by the statistical significance of all hypotheses shown in Table 4.

Table 4

Hypotheses Testing Results

Hypotheses	Beta	T statistics	P values	LLCI 2.50%	ULCI 97.50%	Decision
H1: SP -> CL	0.154	2.527	0.012	0.031	0.272	*Accepted*
H2: SP -> LSE	0.303	4.837	0.000	0.170	0.418	*Accepted*
H3: SP -> LSE -> CL	0.129	3.951	0.000	0.069	0.197	*Accepted*
H4: SMU -> CL	0.236	4.099	0.000	0.122	0.348	*Accepted*
H5: SMU -> LSE	0.276	4.688	0.000	0.156	0.388	*Accepted*
H6: LSE -> CL	0.427	8.527	0.000	0.322	0.520	*Accepted*
H7: SMU -> LSE -> CL	0.118	4.217	0.000	0.065	0.175	*Accepted*

Note: Significant at p<0.05

Effect sizes (f2) are further detailed in Table 5 using Cohen's (1992) criteria for effect sizes, categorised as small (0.020 to 0.150), medium (0.150 to 0.350), and large (0.350 and above). In this study, the effect sizes varied from small (0.023) to large (0.248), suggesting a variety of effects. Moreover, the variance inflation factor (VIF) values shown in Table 4 are all below the relaxed threshold of five: the highest value is 1.957, which suggests that collinearity is not a significant problem. This confirms the reliability of the interpretation of effect sizes and coefficients in the structural model. Regarding the endogenous construct, a significant amount of explained variance can be observed with an R^2 value of 0.472. In relation to the mediator, R^2 is 0.280, indicating that the model explains approximately 28.0% of the variance. This demonstrates the model's capability to simulate the mediation process and reflect the process accurately.

Table 5

Effect Sizes (f2) and Variance Inflation Factor (VIF)

	f^2		VIF	
	CL	**LSE**	**CL**	**LSE**
LSE	0.248		1.389	
SMU	0.055	0.058	1.935	1.830
SP	0.023	0.070	1.957	1.830

As suggested by Shmueli et al. (2019), the inference and managerial implications of the model were investigated through out-of-sample predictive analysis using the PLSpredict method. PLS-SEM resulted in significantly better Q^2 predictions (> 0) than naive mean predictions, with lower root mean square error (RMSE) values than linear model (LM) benchmarks, as shown in Table 6. This emphasises the high predictive power of the model, shown in Table 6, in which PLS-SEM predictions outperformed the benchmark LM prediction in eight out of nine cases. The development of the cross-validated predictive ability test (CVPAT) by Hair et al. (2022) and its implementation in PLSpredict analysis by Liengaard et al. (2021) have greatly advanced predictive modelling research. Furthermore, as shown in Table 7, PLS-SEM has lower average loss values, which means it has better predictive performance than the indicator averages and LM.

Table 6

PLS-Predict Analysis

	Q^2predict	PLS-RMSE	LM-RMSE	PLS-LM
CL1	0.304	0.631	0.632	-0.001
CL2	0.193	0.635	0.642	-0.007
CL3	0.218	0.688	0.700	-0.012
CL4	0.125	0.738	0.733	0.005
LSE1	0.213	0.623	0.624	-0.001
LSE2	0.181	0.624	0.636	-0.012
LSE3	0.127	0.680	0.688	-0.008
LSE4	0.130	0.690	0.704	-0.014
LSE5	0.178	0.622	0.632	-0.010

Table 7

Cross-Validated Predictive Ability Test

	Average loss difference	t value	p value
CL	-0.120	5.859	0.000
LSE	-0.083	4.709	0.000

The importance-performance map analysis (IPMA) provides useful insights into the constructs with the most significant impact on collaborative learning. The IPMA evaluates the importance and performance of various constructs to highlight areas for improvement (Hair et al. 2022; Ringle & Sarstedt, 2016). The analysis shows that the construct with the highest importance is LSE (0.427); however, its performance is relatively lower at 60.695. On the contrary, SMU and SP are less important, with scores of 0.354 and 0.283, but higher performance marks of 67.403 and 66.557, respectively. To improve collaborative learning outcomes, it is important to focus on the performance of the LSE. Strategies might involve giving learners the opportunity to gain confidence from peer feedback, conducting workshops that develop effective learning strategies, and introducing activities that promote resilience and self-belief. Boosting LSE can contribute significantly to collaborative learning, considering its high importance in this model.

Table 8

Importance-Performance Map Analysis (IPMA)

	Importance	Performance
LSE	0.427	60.695
SMU	0.354	67.403
SP	0.283	66.557

4.2. Discussion

In the context of OOFDL in higher education, enhancing social presence and social media usage can significantly and positively influence collaborative learning, with learners' self-efficacy acting as a pivotal mediator. The results of the hypothesis testing confirm the significance of these elements. For example, social presence had a significant beta value of 0.154 in its direct effect on collaborative learning and, with a beta value of 0.303, an even more significant effect on learners' self-efficacy. This implies that enhancing social presence may improve self-efficacy and thus collaborative learning outcomes. To improve social presence, institutions should implement interactive webinars, face-to-face virtual meet-ups, and discussion boards that facilitate meaningful interaction. These avenues for interaction provide a richer learning experience, creating a sense of community and belonging among learners, which is essential for effective collaborative learning (Gao et al., 2024). Moreover, improving social media usage is essential, as the beta values for its direct effect on collaborative learning and self-efficacy were 0.236 and 0.276, respectively. The use of digital learning platforms that comprise social media features can create more engaging and participatory learning environments. For instance, platforms such as WhatsApp, Slack, or embedded social media networks related to course content can help with real-time communication and sharing of resources, thus enhancing learner engagement and self-efficacy (Di & Gu, 2025). Learners' self-efficacy functions as a substantive mechanism, not just a statistical link; the effect of social presence on collaborative learning ran mainly through self-efficacy (β = 0.303 indirect versus 0.154 direct), although Molinillo et al. (2018) did find a more direct link. Social media usage showed the same pattern (β = 0.276 indirect versus 0.236 direct), which aligns with findings by Jia et al. (2024). This indicates that learners tend to

internalise confidence before it becomes translated into collaborative behaviour, reinforcing the SCT's reciprocal-influence premise (Bandura, 1985).

The development of these platforms should also include as a strategy the effective training of faculty to moderate and facilitate online interactions. Moreover, institutions should conduct workshops on the use of social media for educational purposes, which can help boost learners' confidence and competence, and in turn, improve their self-efficacy (Wu, 2023). This improved self-efficacy is important as it directly affects learners' ability to participate in and benefit from collaborative learning settings, proven quantitatively in this study by the beta coefficient of 0.427 for its direct effect on collaborative learning. With these strategies, OOFDL institutions can improve collaborative learning results and learners' self-efficacy, which results in a more stimulating and effective online learning experience (Lee & Kim, 2023; Nguyen et al., 2024). These initiatives point to the importance of creating interactive, supportive, and integrated learning environments with technological features that enable not only the acquisition of knowledge but also the development of critical thinking and problem-solving skills.

Theoretically, this study is closely related to the SCT, which is employed as a theoretical framework to explain the complex relationship between social presence, social media usage, learners' self-efficacy, and collaborative learning. The SCT proposes that personal, behavioural, and environmental factors reciprocally influence each other in a dynamic manner, affecting learning and development processes (Bandura, 1985). This study extends the SCT by demonstrating that social presence, an environmental factor that enhances self-efficacy, is a personal factor that positively influences collaborative learning and behavioural outcomes. The findings demonstrate that learners' confidence can be boosted by perceived connectedness and interaction (Di & Gu, 2025; Zhang et al., 2023). Similarly, the use of social media in educational environments is contextually relevant to the SCT's emphasis on environmental factors that influence behaviour. This study shows how social media usage encourages interaction and support, which then further enhances self-efficacy and subsequently collaborative learning (Gao et al., 2024; Wu, 2023). The validation of these pathways provides strong support for the proposed research model, confirming the relevance of the SCT in understanding the potential of modern educational tools and strategies in improving learning outcomes. This theoretical contribution extends the understanding of the SCT in contemporary educational contexts and emphasises the necessity of designing environments that foster self-efficacy and collaborative capacities within OOFDL structures. These insights open up possibilities for future research on the SCT in technology-mediated learning spaces (Hu et al., 2024; Jia et al., 2024).

The practical implications from this study indicate that social presence and social media usage are important in improving collaborative learning, mediating the self-efficacy of learners in OOFDL environments. Educational institutions should aim to improve social presence by creating engaging online environments that encourage learner participation and cultivate a sense of community. Discussion forums and virtual meet-ups can create a feeling of community, boosting learners' confidence and engagement in learning (Gao et al., 2024; Lee & Kim, 2023). Furthermore, this dynamic can be further improved by leveraging social media platforms as a learning tool since they offer informal yet effective channels for communication and sharing resources that may boost learners' self-efficacy (Wu, 2023; Zhang et al., 2023). To maximise their educational potential, it is important to train faculty to moderate and facilitate these digital interactions (Di & Gu, 2025). These strategies can guide institutions to help learners develop key collaborative skills and prepare them for a globally connected, digitally driven workplace. This approach resonates with the growing interest in adaptive learning environments and underscores the necessity of integrating technological competencies into educational systems, with the ultimate goal of improving academic performance and learner satisfaction.

The findings of this study may lead to possibilities for future research. Firstly, longitudinal studies on the impact of increased social presence and social media usage on learners' self-efficacy and collaborative learning experiences in OOFDL contexts would provide useful insights into sustainability and growth over time. It would be interesting to investigate efficacy and engagement levels demonstrated on different types of social media platforms, such as Facebook, WhatsApp, or specialised educational networks, which might reveal differences amongst various user demographics. Secondly, future studies could investigate interactions between cultural and contextual factors in the development of social presence and self-efficacy, which might guide more tailored educational approaches. Qualitative approaches may also be used to understand the learners' experiences and perceptions of social interaction in the online environment**.** Finally, one potential future research direction involves expanding the research model by including factors such as technology acceptance and motivation, which may provide a more complete view of the dynamics that influence collaborative learning in OOFDL settings**.**

5. Conclusion

This study examined the effects of social presence and social media usage on collaborative learning in OOFDL, mediated by learners' self-efficacy. The findings confirmed all seven hypotheses: social presence and social media usage significantly influenced both self-efficacy and collaborative learning, and learners' self-efficacy significantly mediated both relationships. These results extend the SCT by demonstrating that environmental factors influence collaborative behaviour primarily through learners' self-efficacy, rather than through a direct relationship. The study contributes empirical evidence on how these constructs interact in concert within an OOFDL context, an integration previously not tested together. This study has several limitations. Firstly, purposive sampling limits the generalisability of findings beyond the sampled population. Second, the cross-sectional, self-reported design cannot establish causality or capture changes over time. Third, the findings are context-specific to OOFDL learners at Open University Malaysia, Wawasan Open University & Asia e University, and may not generalise to other distance-learning settings or cultural contexts. To address these limitations, future research should employ longitudinal or experimental designs, broader sampling strategies, and cross-context replication.

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