International Journal of Educational Management and Development Studies
Volume 5 Issue 2 June 2024
DOI: https://doi.org/10.53378/353071

Instructors' presence and communication strategies on student engagement in asynchronous online classes

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Abstract

This study investigated the factors influencing student engagement in asynchronous online classes, focusing on the roles of instructor presence, communication strategies, and demographic profiles. Data were collected from 385 college students employing moderated mediation with parallel mediators. The results revealed significant direct effects of instructor presence and communication strategies on student engagement, highlighting the pivotal role of these factors in shaping the online learning experience. Specifically, stronger instructor presence and effective communication strategies corresponded to higher levels of student engagement, emphasizing the importance of fostering supportive interactions and facilitating meaningful communication in virtual classrooms. Mediation analyses further clear the pathways through which these factors influence student engagement. Perceived instructional support emerged as a robust mediator between instructor presence and engagement, underscoring the significance of establishing a supportive learning environment. Additionally, technology self-efficacy played a modest yet significant role in mediating the impact of instructor presence and communication strategies on student engagement, highlighting the importance of students' confidence in utilizing technology for academic purposes. While moderation analyses did not reveal significant effects of demographic profiles on the relationships between key variables, the findings underscore the universality of effective teaching practices in fostering student engagement across diverse student populations. These findings have important implications for online teaching practices and educational policies, emphasizing the need to prioritize strategies that enhance instructor support, foster effective communication, and promote technological proficiency among students. By addressing these factors, educators and institutions can optimize the online learning experience and promote meaningful engagement among students in asynchronous online classes.

Keywords: *asynchronous online classes, communication strategies, higher education, instructors presence, instructional support, student engagement*

Article History:

***Received**: May 2, 2024* ***Revised**: May 27, 2024*
***Accepted**: June 2, 2024* ***Published online**: June 12, 2024*

Suggested Citation:
Agbong, J.B.G. & Agbong-Coates, I.J.G. (2024). Instructors' presence and communication strategies on student engagement in asynchronous online classes. *International Journal of Educational Management and Development Studies*, 5 (2), 206-232. https://doi.org/10.53378/353071

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1. Introduction

The use of online learning in higher education has grown more widespread, especially due to the COVID-19 pandemic in 2020, which has required the implementation of alternate teaching modalities like asynchronous classes (Aristovnik et al., 2023). This modality provides teachers and students with the freedom and convenience to study at their own pace and location, without being bound by certain time constraints (Fabriz et al., 2021; Scheiderer, 2022). Nevertheless, educators and institutions worldwide continue to face a significant problem in guaranteeing elevated levels of student engagement in asynchronous online classes even post-COVID (Yu, 2022; DeMarchi, 2023).

While online learning offers flexibility and convenience, research suggests that a strong instructor presence (Sheridan & Kelly, 2010; Singh et al., 2022; Richardson et al., 2016; Ladyshewsky, 2013; Park et al., 2020; Roque-Hernández et al., 2024; Li, 2022) and effective communication strategies (Isnawijayani et al., 2022; Kannareth, 2022; Salarvand et al., 2023; Parker, 2012; Germaine et al., 2021; Kaufmann & Vallade, 2021) are necessary to optimize student engagement and satisfaction (Hollister et al., 2022; Gamorot et al., 2022). Prior research confirms its benefits (Fang et al., 2023; Osman, 2022), but optimizing the student experience remains a challenge. According to Fang et al. (2023), there is a need for diverse learning designs in the online classrooms, which may include blended learning approaches (Osman, 2022) and student-teacher interaction (Dziuban et al., 2019). While existing research offers valuable insights on the effectiveness of asynchronous on learning (Zeng & Luo, 2023; Fabriz et al., 2021; Hung et al., 2024; Sakkir et al., 2023; Fernandez et al., 2022; Malkin et al., 2016; Varkey et al. 2023; Abdillah, 2021), only few highlights the importance of instructor's presence and communication strategies (Watson et al. 2023; Preisman, 2014; Ratan et al., 2022; Roque-Hernández et al., 2024). There is even less study in the Philippine setting.

This study examines how instructor presence and interaction strategies can cater to diverse needs and promote deeper engagement and fulfilment, building on the importance of these aspects as highlighted in Dziuban et al. (2019). By understanding how instructors can be more present and interactive asynchronously, it can further enhance student success in online learning. Moreover, prior research by Hollister et al. (2022), Liwanag et al. (2022), and Gamorot et al. (2022) highlighted the importance of instructor involvement, communication strategies, and active support in fostering student satisfaction and engagement in online

learning environments. Hence, this study validates their findings by focusing on instructor presence and interaction strategies in asynchronous settings in the Philippines.

Understanding the role that instructors play in encouraging participation and satisfaction in asynchronous online classes can help educators and institutions develop strategies to raise the standard of online education and better meet the diverse needs of students in the modern digital age (Ong & Quek, 2023). Hence, this study aimed to evaluate whether the perceived instructional support (PIS) and technology self-efficacy (TSE) mediate the association between instructor's presence (IP) and communication strategies (CS) to student engagement (SE) and to assess whether these interactions are being moderated by the demographic profile of the respondents *(age, gender, academic program, academic level, and type of school).* Specifically, this study sought to answer the following questions;

1. Does IP have a direct effect on SE; and CS on SE? If this direct effect exists, will it change considering the demographic profile?
2. On the path from IP to SE, does PIS mediate the relationship between IP and SE? Does TSE mediate the relationship between IP and SE?
3. On the path from CS to SE, does PIS mediate the relationship between IP and SE? Does TSE mediate the relationship between IP and SE?
4. Will demographic profile moderate the indirect effect of IP on PIS? Moderate the indirect effect of IP on TSE? Moderate the indirect effect of CS on PIS? Moderate the indirect effect of CS on TSE? Moderate the indirect effect of PIS on SE? Moderate the indirect effect of TSE on SE?

2. Literature Review

2.1. Instructor's presence in asynchronous online class

Instructor presence is widely recognized as a critical factor in shaping students' experiences and outcomes in asynchronous online courses. While substantive engagement methods, such as content lectures and personalized communication, are emphasized (Watson et al., 2023; Paulson, 2023), these approaches alone may not suffice. According to Kaeppel (2020) and Li (2022), the role of teaching presence in fostering cognitive and social interactions for active engagement in discussions and synchronous communication is necessary for a balanced approach that integrates both substantive engagement and teaching presence. Addressing the negative perceptions of instructor presence (Cowan, 2023) offers

strategies for building rapport with students through proactive communication and personalized interaction. This perspective suggests that simply being present is not enough; the quality of interaction is paramount. Additionally, Wang et al. (2021) emphasize bridging disparities in perceptions of teaching presence between students and teachers, pointing out that effective course comments and instructional design are essential in aligning these perceptions. On the challenge of technology unfamiliarity affecting student engagement, Palama et al. (2023) suggest upskilling activities and training workshops to enhance teaching presence in asynchronous settings.

A strong teaching presence can create a supportive learning environment that encourages student participation and engagement (Gamorot et al., 2022). It is essential in fostering a sense of community and facilitating successful student learning outcomes through effective communication channels and interactive teaching methods. Similarly, integrating technology, institutional support, and teacher training are necessary in overcoming the challenges and enhancing online teaching effectiveness (Barrot et al., 2024; Balbuena et al., 2023). Hence, this study argues that substantive engagement methods and personalized communication must be complemented by robust technological and institutional frameworks to create meaningful learning experiences.

2.2. Communication strategies in asynchronous class

Effective communication strategies are paramount for fostering engagement, collaboration, and positive learning outcomes in asynchronous online classes. The rapid shift towards online learning environments necessitates a deeper understanding of how instructors can leverage communication to optimize the student experience (Dziuban et al., 2019). Research suggests diverse communication strategies suitable for asynchronous settings such as discussion forums and collaborative platforms that offer unique opportunities for student engagement and interaction (Bonanno et al., 2023; Ghazali, 2023). However, these tools rely on effective communication strategies for success, which Mardiana and Afkar (2020) suggest tailoring communication to diverse learners by using translation, code-switching, and comprehension checks. On the other hand, West (2021) suggests asynchronous video lectures to boost student motivation and engagement.

Encouraging interaction and active participation is another key communication strategy. In this regard, Wang et al. (2024) found that incorporating role assignments and dedicated discussion time significantly improved learning experiences and social

communication in asynchronous settings. In addition, instructors can also personalize communication approaches to cater to student preferences**.** Medina et al. (2024) and Eugenio et al. (2024) recommend aligning teaching methods and communication styles with student preferences, particularly in remote learning environments. Customized communication approaches in scientific education must focus on engaging diverse learners and promoting self-regulation (Briones et al., 2023). Building emotional connection through communication is also a crucial aspect of fostering engagement**.** Garcia and Yousef (2022) expect the emotional connection and instructor support in increasing engagement. This requires diverse communication strategies for fostering engagement and positive learning outcomes in asynchronous classrooms. Effective communication requires tailoring approaches to student needs, using technology to facilitate interaction, and building emotional connections with students.

2.3. Student engagement in asynchronous online class

The shift to online learning during the pandemic has prompted a deeper examination of student engagement in asynchronous online classrooms. Understanding the factors that impact student engagement is crucial for developing effective teaching methods and meaningful educational experiences in digital settings. Several studies highlighted the student experience and satisfaction in online class. For example, Hollister et al. (2022) highlighted the challenges in maintaining engagement, particularly in live lectures during the pandemic. Chatterjee and Correia (2019) stressed the importance of collaborative activities in fostering supportive virtual communities while Hussein et al. (2020) identified beneficial aspects and challenges of asynchronous courses that can inform course design and delivery. While there is empirical evidence, Bond et al. (2020) still suggest the necessity of robust theoretical frameworks and comprehensive perspectives on student engagement and educational technology.

In terms of student engagement, numerous scholars suggest different approaches. For instance, Gopez and Gopez (2023) examined the relationship between teacher scaffolding and self-regulation and suggested supportive relationships and the development of self-regulatory skills. On the other hand, Briones et al. (2023) recommended tailored approaches to address diverse learner needs, focusing on online engagement, self-regulation, and self-efficacy while Garcia and Yousef (2022) concluded the importance of emotional connections and instructor support in boosting engagement. In terms of emotional well-being in influencing student

engagement, Sandoval (2023) found that the higher levels of happiness correlate with greater engagement in both synchronous and asynchronous online classes.

These studies illustrate that effective student engagement in asynchronous online classes is multifaceted, involving theoretical understanding, collaborative activities, emotional well-being, and tailored instructional strategies. Addressing these factors can enhance the design and delivery of online courses, ultimately fostering a more engaging and supportive learning environment.

2.4. Perceived instructional support and technology self-efficacy

Understanding the factors shaping students' learning experiences in the shift to online education is crucial for effective instructional design and support. Key among these factors are perceived instructional support and students' confidence in technology use, both pivotal for active engagement and academic success in virtual classrooms. Empirical evidence showed differing levels of instructional support and technology self-efficiency although majority of the studies provide evidence of its effects on student engagement. For example, Lange (2024) found no significant disparity in situational interest across asynchronous and synchronous video lectures overall but noted variations among students with differing self-efficacy levels, highlighting the importance of instructional support, especially for those with lower self-efficacy. Meanwhile, García-Martín et al. (2023) revealed divergent perceptions of teachers' digital tool use efficacy influenced by geographical and socio-demographic factors.

According to Xie and Correia (2023), instructor engagement in asynchronous online discussions have positive implications on student participation and learning outcomes. For this, Kumar et al. (2021) suggest instructional support and technological accessibility while Göbel et al. (2023) stress the significance of prior experiences and institutional support. On the other hand, Fabia (2024) identified essential factors conducive to student success in online learning scenarios, including self-efficacy, and academic achievement. While Briones et al. (2023) advocated for customized pedagogical approaches and support mechanisms to boost student engagement and self-efficacy, Karakaya et al. (2023) reiterated the role of technology self-efficacy and self-regulated learning.

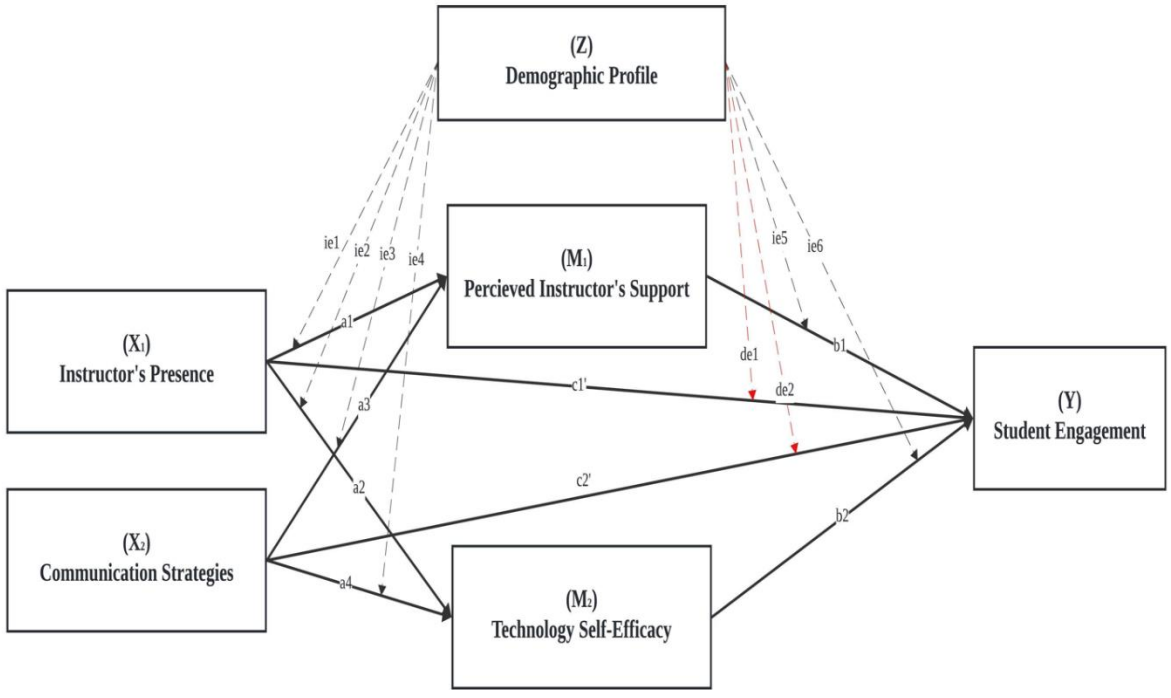
2.5. Theoretical and Conceptual framework

At the forefront of the theoretical framework is the Community of Inquiry (CoI) Framework as proposed by Garrison, Anderson, and Archer (2000), which underscores the pivotal role of teaching presence, encompassing instructional support and communication

strategies, in shaping online learning environments (Garrison et al., 2000). This theoretical viewpoint, which functions as the independent variable in the study, clarifies how communication strategies and teacher assistance affect student engagement. Mediating these relationships are two prominent theories: the Social Cognitive Theory (SCT) by Bandura in 1987 and the Technology Acceptance Model (TAM) by Davis in 1989. SCT emphasizes the significance of self-efficacy in learning processes, particularly in online education where students' technology self-efficacy, influenced by their beliefs in navigating technological tools, mediates the relationship between instructional support, communication strategies, and student engagement (Bandura, 1995). TAM further delves into students' perceptions of technology-mediated instructional support and communication strategies, proposing that perceived usefulness and ease of use mediate the relationship between these variables and students' technology self-efficacy (Davis & Granić, 2024). Finally, the dependent variable, student engagement, is framed within the lens of Expectancy-Value Theory by Wigfield and Eccles (2000). This theory posits that individuals' expectation of success and their value on a task influence their motivation and engagement. Together, these theories provide a holistic view of the mechanisms underlying student engagement in online learning.

Figure 1

Conceptual framework (Hayes Process Model 14)



The conceptual framework illustrated in figure 1 was drawn from Hayes' (2022) Process Model 14 moderated mediation with parallel mediators. The framework begins by examining the direct effects of IP and CS on SE, considering potential moderation by DP. Subsequently, the framework delves into the mediating roles of PIS and TSE, investigating whether they serve as pathways through which IP and CS influence SE. Additionally, it explores parallel mediation, wherein IP/CS may be influenced by PIS, and TSE, impacting SE. Furthermore, the framework scrutinized the moderating influence of DP on the indirect effects of IP/CS on SE through IS and TSE pathways, providing a comprehensive understanding of the factors driving student engagement in asynchronous online classes, while considering the diverse demographic backgrounds of learners.

3. Methodology

3.1. Research design

The study employed a quantitative research approach to examine the relationships among key variables in asynchronous online classes, namely instructor's presence (IP), communication strategies (CS), perceived instructional support (PIS), technology self-efficacy (TSE), demographic profile (DP), and student engagement (SE) (Bhandari, 2023). Utilizing a cross-sectional non-experimental design (Wang & Cheng, 2020) and the causal step approach (David & Sava, 2015) delineated in Process Model 14 of Hayes (2013), the research aimed to analyze moderated mediation with parallel mediators. This methodological framework enables the investigation of potential mediating mechanisms between IP, CS, and SE while considering the moderating role of DP. Additionally, the Generalized Linear Model (GLM) tool, as referenced in Asirit (2023), facilitates the exploration of how moderating factors influence different aspects of the mediation process. Despite inherent limitations of cross-sectional non-experimental designs, efforts were made to mitigate potential validity issues through a Monte Carlo Power Analysis for Indirect Effect (Schoemann, 2023).

3.2. Sample and procedures

The respondents of this study were undergraduate students enrolled in various colleges in the Philippines, specifically in State Universities and Colleges (SUCs), Local Universities and Colleges (LUCs), and Private Universities and Colleges (PUCs), who had experienced asynchronous online classes. Convenience sampling was employed to mitigate common method variance (Wang & Cheng, 2020). Initially, data were collected from no more than 150

students per type of college to minimize the likelihood of intergroup comparisons and enhance data quality. Before data collection, participants were assured of anonymity and informed consent, emphasizing that their responses would be used solely for this research purpose. Additionally, measures were implemented to restrict multiple submissions by restricting internet protocol access. The survey data was collected through the online survey website "Jotform" with encryption.

The survey garnered 450 responses, of which 385 were deemed valid after excluding incomplete or ineligible submissions, resulting in a validity rate of 85.6%. A Monte Carlo Power Analysis for Indirect Effect (Schoemann, 2023) was conducted to assess the power of the mediation model involving parallel mediators. Utilizing 1000 bootstrapped replications with a 95% confidence level, the power analysis for the indirect effects revealed promising outcomes. The analysis indicated significant power for paths related to (IP) and (CS), in (X1), the power values of 0.84 for path a1b1, 1.00 for path a2b2, 0.74 for path a1c1b1, 0.98, and 0.86 for path a2c2b2; while in (X_2), 0.85 for a3b1, 1.00 for path a4b2, 1.00 for path a3c2b1, and 0.98 for path a4c2b2 were generated. These results signify robust conditions for hypothesis testing, providing confidence in the validity and reliability of the study findings (Schoemann et al., 2017).

The demographics revealed a diverse distribution across various categories. Notably, a significant proportion of respondents were aged 20 to 21 years old (31%), with a substantial representation of individuals above 22 years old (34%). In terms of gender, males constituted the largest group (39%), followed by females (32%) and non-binary individuals (29%). Across different college programs, respondents were fairly evenly distributed, with the College of Business, Entrepreneurship, and Accounting and the College of Teacher Education having the highest representation at 21% and 20%, respectively. Year-level distribution showed a balanced spread, with the highest percentage of respondents in the 3rd year (26%) and the 2nd year (26%). Finally, respondents attended various types of schools, with State Universities and Colleges (SUCs) being the most common (36%), followed by Local Universities and Colleges (LUCs) (30%) and Private Universities and Colleges (PUCs) (34%).

3.3. Measures

The research instrument of this study comprises several sections tailored to capture vital elements of the variables. Firstly, Part 1 collects demographic data, including age, gender, academic program, academic level, and type of school. Subsequent sections focused on

measuring specific constructs: Part 2A assesses IP adapted from Watson et al., (2023), while Part 2B evaluates CS adapted from Wang (2003). Parts 3A and 3B gauge PIS adapted from DeCamp et al. (2022) and TSE adapted from Yavuzalp and Bahcivan (2020), respectively. Lastly, Part 4 captures SE adapted from Álvarez and Montes (2021) and Dixson (2015). Each section comprises 10 items rated on a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree," with corresponding engagement descriptions. Content validity was ensured through the Delphi Technique as suggested in Asirit (2024), resulting in a Content Validity Index (CVI) of .92, deemed acceptable (Dixon & Lazenby, 2023). Modifications were made to tailor the instruments to the study's context. Furthermore, an inter-rater reliability test yielded a kappa score of .96, indicative of almost perfect agreement (Ranganathan et al., 2024). These rigorous measures were implemented to guarantee the reliability and validity of the research instrument, thereby establishing a robust foundation for data collection and analysis.

3.4. Data analysis

The data analysis commenced with an assessment of assumptions via multiple regression analyses to ensure their validity (Clement & Bradley-Garcia, 2022). Based on the statistical tests conducted to assess these assumptions, the following observations were made. Firstly, the normality tests, including the Shapiro-Wilk ($p = 0.987$), Kolmogorov-Smirnov ($p = 0.977$), and Anderson-Darling ($p = 0.960$) tests, yielded p-values greater than 0.05, suggesting that the data may follow a normal distribution, thereby not violating the assumption of normality. Secondly, the heteroskedasticity tests, comprising the Breusch-Pagan ($p = 0.987$), Goldfeld-Quandt ($p = 1.00$), and Harrison-McCabe ($p = 1.00$) tests, also returned p-values exceeding 0.05, indicating homoscedasticity in the data and thus not violating the assumption of homoscedasticity. Lastly, the multicollinearity assessment based on the variance inflation factor (VIF) and tolerance values revealed VIF values of 1.76 for PIS, 1.99 for TSE, 2.93 for IP, and 2.42 for CS, all below the threshold of 10, and tolerance values above 0.2, indicating low multicollinearity among the predictor variables. Overall, the statistical tests suggest that the assumptions of normality, homoscedasticity, and multicollinearity are not violated, with autocorrelation requiring confirmation with the Durbin–Watson statistic (Soetaert, 2019; Fox & Weisberg, 2020).

Since the data adhered to the assumptions of multiple regression analysis, the study advanced to moderated-mediation analysis, enhancing robustness and accuracy by employing bootstrapping to assess indirect effects and their significance levels. This methodology ensured

thorough examination, particularly in moderated mediation with parallel mediators analysis using the GLM mediation model in Jamovi version 2.3 software (Gallucci, 2020; RCoreTeam, 2021; Rosseel, 2019; Thejamoviproject, 2022).

3.6. Ethical considerations

This study adhered to the ethical guidelines outlined by Williams (2023) for data collection via surveys. Participants were provided with comprehensive information about the survey's objectives and their involvement, ensuring informed consent. Measures like encrypted data storage with JotForm were employed to uphold confidentiality. The survey design avoided bias and leading questions, ensuring data integrity. Inclusivity across diverse demographics was prioritized, fostering trust through transparent communication about the survey's purpose and data usage.

4. Results and Discussion

Mediation analysis. Table 1 presents the direct effects of IP and CS on SE, exploring potential variations based on demographic profiles. Results found a significant positive direct effect of IP on SE (estimate = 1.03499, $p < .001$), indicating that a stronger presence of instructors in asynchronous online classes corresponds to higher levels of student engagement. This underscores the pivotal role instructors play in creating an interactive and supportive learning environment, which positively influences students' motivation and participation. Additionally, the analysis revealed a marginally significant positive direct effect of communication strategies on student engagement (estimate = 0.10945, $p = 0.039$), suggesting that effective communication strategies contribute to increased student engagement, albeit to a lesser extent compared to the instructor's presence.

Moreover, the study explored the influence of demographic factors on the relationship between the variables. Results indicated that age demonstrated a significant direct effect on student engagement, with older students (20 and above) exhibiting higher levels of engagement compared to their younger counterparts. However, gender, college program, year level, and type of school did not show consistently significant direct effects on student engagement. This suggests that while certain demographic factors may impact engagement levels, their influence is relatively minimal compared to the effects of IP and CS.

Table 1

Direct effect of IP, CS to SE

Effect	Estimate	SE	95% C.I. (a)		β	z	p
IP ⇒ SE	1.03499	0.04553	0.94787	1.12679	1.01664	22.73277	< .001
CS ⇒ SE	0.10945	0.05887	0.06929	0.22090	0.09423	2.93680	0.039
age1 ⇒ SE	0.10909	0.05328	0.00999	0.21987	0.04521	2.04764	0.041
age2 ⇒ SE	0.05034	0.05249	0.05926	0.14373	0.02048	0.95920	0.337
gender1 ⇒ SE	0.00500	0.05432	0.11555	0.10548	0.00199	0.09209	0.927
gender2 ⇒ SE	0.03054	0.05027	0.06107	0.13751	0.01307	0.60764	0.543
college program1 ⇒ SE	0.04560	0.06065	0.07275	0.17326	0.01621	0.75173	0.452
college program2 ⇒ SE	0.05176	0.06293	0.06442	0.18394	0.01823	0.82251	0.411
college program3 ⇒ SE	0.02903	0.07084	0.17485	0.10367	0.01042	0.40978	0.682
college program4 ⇒ SE	0.02401	0.06418	0.09362	0.15280	0.00838	0.37414	0.708
year level1 ⇒ SE	0.04350	0.06186	0.06802	0.18246	0.01666	0.70323	0.482
year level2 ⇒ SE	0.07618	0.06333	0.04448	0.21015	0.02955	1.20293	0.229
year level3 ⇒ SE	0.04025	0.06289	0.07857	0.17430	0.01451	0.64001	0.522
type of school1 ⇒ SE	0.01766	0.05288	0.14292	0.07647	0.00726	0.33397	0.738
type of school2 ⇒ SE	0.02414	0.04475	0.06453	0.11313	0.00973	0.53935	0.590

Overall, these findings align closely with Watson et al. (2023) that instructor's presence and employing effective communication strategies enhance student engagement in asynchronous online classes. Clear, organized classes and timely feedback from instructors are highlighted as crucial elements for fostering student engagement, which directly corresponds to employing effective communication strategies. Educators should prioritize establishing a strong presence in virtual classrooms and implementing communication techniques that facilitate interaction and collaboration among students.

Table 2 presents the mediating roles played by TSE and PIS in the link between IP and SE in asynchronous online classrooms. Examining the path from IP to SE, the mediation

analysis reveals significant findings. Firstly, PIS mediates the relationship between IP and SE ($\beta = 0.52653$, $p < .001$). This suggests that as the instructor's presence increases, students' perception of instructor support positively influences their engagement. Secondly, TSE also demonstrates a mediating effect between IP and SE, albeit marginally significant ($\beta = 0.08025$, $p = 0.054$). This indicates that technology self-efficacy plays a modest role in mediating the impact of the instructor's presence on student engagement.

Table 2

Mediation of PIS and TSE on IP and SE

Effect	Estimate	SE	95% C.I. (a)		β	z	p
IP ⇒ PIS ⇒ SE	0.52653	0.05449	0.42084	0.63445	0.40851	9.66247	< .001
IP ⇒ TSE ⇒ SE	0.08025	0.02170	0.08380	0.10128	0.13122	1.85441	0.054

The results underscore the importance of both perceived instructional support and technology self-efficacy in shaping students' engagement in asynchronous online classes. The mediation of PIS suggests that instructional support can effectively foster student engagement, emphasizing the significance of establishing a supportive learning environment. Additionally, while the mediating role of TSE is less pronounced, it still highlights the relevance of students' confidence in utilizing technology to enhance their engagement levels. These findings carry several implications for online teaching practices and educational policies. Educators should prioritize strategies that enhance instructor support and foster students' technological self-efficacy to promote engagement in asynchronous online learning environments (Nardi & Hamilton, 2020). Furthermore, institutions may consider incorporating interventions aimed at bolstering both instructor support and students' technology-related skills to optimize the learning experience in online settings.

Table 3 shows the mediation roles of PIS and TSE in the connection between CS and SE in asynchronous online classrooms. Results revealed that PIS mediates the link between CS and SE ($\beta = 0.60702$, $p <.001$). This implies that effective communication strategies used by the instructors have a beneficial impact on students' perceptions of instructional support, increasing their engagement. TSE has a marginal mediating effect between CS and SE ($\beta =$

0.05722, p = 0.042), suggesting a minor involvement in the influence of communication strategies on student engagement.

Table 3

Mediation of PIS and TSE on CS and SE

Effect	Estimate	SE	95% C.I. (a)		β	z	p
CS ⇒ PIS ⇒ SE	0.60702	0.04140	0.52593	0.68820	0.57148	14.66365	< .001
CS ⇒ TSE ⇒ SE	0.05722	0.02813	0.00305	0.11333	0.05387	0.033922	0.042

Effective communication strategies coupled with perceived instructor support contribute significantly to students' active participation and involvement in learning activities. Moreover, students' confidence in utilizing technology further enhances their engagement levels, complementing the impact of communication strategies (Birney & McNamara, 2024). The results highlight the critical role of instructional support and technology self-efficacy in promoting student engagement in online learning environments. Educators should focus on cultivating supportive interactions with students and providing opportunities for them to develop confidence in utilizing technology. Additionally, instructional designs should integrate effective communication strategies and provide accessible resources to enhance students' technology-related skills, thereby fostering a conducive learning environment.

Upon examining the moderation effects in table 4, it is evident that none of the p-values are below the conventional significance level of 0.05. This indicates that none of the moderation effects are statistically significant. The non-significant moderation effects mean that demographic profiles do not moderate the indirect effects observed in this study. This suggests that regardless of age, gender, college program, year level, or type of college, none of these demographic variables significantly influence the relationships between instructor support, technology self-efficacy, communication strategies, and student engagement. These findings underscore the robustness of the relationships between these key variables, indicating that they may operate similarly across various demographic groups. Educators can take away that strategies aimed at enhancing instructor support, technology self-efficacy, and effective communication in online learning environments may benefit students regardless of their demographic characteristics.

Table 4

Moderation analysis of demographic profile to the indirect effects

Effect	Estimate	SE	95% C.I. (a)		β	z	p
Age1 ⇒ PIS ⇒ SE	0.07553	0.06904	-0.05505	0.21559	0.03130	1.09393	0.274
Age1 ⇒ TSE ⇒ SE	-0.00544	0.00821	-0.02202	0.01017	-0.00225	-0.66190	0.508
Age2 ⇒ PIS ⇒ SE	0.06017	0.06662	-0.06702	0.19413	0.02448	0.90317	0.366
Age2 ⇒ TSE ⇒ SE	1.19e-4	0.00827	-0.01584	0.01658	4.83e-5	0.01435	0.989
Gender1 ⇒ PIS ⇒ SE	0.00997	0.07058	-0.12678	0.14989	0.00397	0.14123	0.888
Gender1 ⇒ TSE ⇒ SE	0.00277	0.00801	-0.01286	0.01854	0.00110	0.34613	0.729
Gender2 ⇒ PIS ⇒ SE	0.05246	0.06390	-0.06886	0.18164	0.02244	0.82085	0.412
Gender2 ⇒ TSE ⇒ SE	8.20e-4	0.00821	-0.01571	0.01647	3.51e-4	0.09983	0.920
College Program1 ⇒ PIS ⇒ SE	0.01870	0.09013	-0.15859	0.19472	0.00665	0.20753	0.836
College Program1 ⇒ TSE ⇒ SE	-0.02201	0.01583	-0.05295	0.00909	-0.00783	-1.39069	0.164
College Program2 ⇒ PIS ⇒ SE	0.07470	0.09436	-0.11031	0.25956	0.02631	0.79166	0.429
College Program2 ⇒ TSE ⇒ SE	-0.02261	0.01627	-0.05452	0.00927	-0.00796	-1.38962	0.165
College Program3 ⇒ PIS ⇒ SE	-0.01178	0.08880	-0.18444	0.16366	-0.00423	-0.13262	0.894
College Program3 ⇒ TSE ⇒ SE	-0.01024	0.01278	-0.03540	0.01471	-0.00367	-0.80057	0.423
College Program4 ⇒ PIS ⇒ SE	0.11538	0.09106	-0.06323	0.29373	0.04025	1.26709	0.205
College Program4 ⇒ TSE ⇒ SE	-0.02511	0.01692	-0.05836	0.00795	-0.00876	-1.48446	0.138
Year Level1 ⇒ PIS ⇒ SE	-0.15555	0.07031	-0.28998	-0.01438	-0.05958	-2.21241	0.127
Year Level1 ⇒ TSE ⇒ SE	0.00297	0.00945	-0.01591	0.02115	0.00114	0.31448	0.753
Year Level2 ⇒ PIS ⇒ SE	-0.08951	0.07786	-0.24036	0.06483	-0.03472	-1.14966	0.250
Year Level2 ⇒ TSE ⇒ SE	0.00349	0.00998	-0.01630	0.02283	0.00136	0.34992	0.726
Year Level3 ⇒ PIS ⇒ SE	0.02290	0.08511	-0.14434	0.18930	0.00825	0.26902	0.788
Year Level3 ⇒ TSE ⇒ SE	1.03e-4	0.01040	-0.02012	0.02065	3.72e-5	0.00993	0.992
Type of College1 ⇒ PIS ⇒ SE	-0.04523	0.06569	-0.18046	0.07705	-0.01860	-0.68850	0.491
Type of College1 ⇒ TSE ⇒ SE	-6.75e−4	0.00803	-0.01602	0.01544	-2.78e−4	-0.08410	0.933
Type of College2 ⇒ PIS ⇒ SE	-0.00437	0.06645	-0.13947	0.12102	-0.00176	-0.06576	0.948
Type of College2 ⇒ TSE ⇒ SE	-0.00314	0.00825	-0.01898	0.01335	-0.00127	-0.38082	0.703

5. Conclusion

The immediate impacts of instructor's presence and communication strategies on student engagement emphasize the crucial significance of these aspects in defining the asynchronous online learning experiences. Mediation analyses revealed the mediating roles of perceived instructional support and technology self-efficacy, highlighting the pathways through which these factors impact student engagement. While perceived instructional support emerged as a robust mediator between instructor presence and engagement, technology self-efficacy played a more modest role, yet remained significant in influencing engagement levels. Despite the absence of significant moderation effects by demographic variables, the study's findings emphasize the universality of effective teaching practices in fostering student engagement. Regardless of age, gender, college program, year level, or type of school, the relationships between instructor support, technology self-efficacy, communication strategies, and student engagement remain steadfast, emphasizing the resilience of these dynamics across diverse student populations.

Moving forward, educators and institutions should leverage these insights to enhance online learning experiences and promote student engagement effectively. Strategies aimed at strengthening instructor presence, fostering supportive interactions, and promoting effective communication should be prioritized in online course design and delivery. Moreover, efforts to bolster students' technology self-efficacy and provide adequate technological resources should be intensified to empower students in their online learning journey. This includes offering training programs, workshops, and accessible support systems to enhance students' confidence and proficiency in utilizing technology for academic purposes. Furthermore, the findings underscore the importance of inclusive teaching practices that cater to the diverse needs of students. Educators should strive to create learning environments that are welcoming, accessible, and responsive to the unique backgrounds and characteristics of all students, ensuring equitable opportunities for engagement and success.

To further advance the understanding of student engagement in online learning environments, future research could explore additional factors that may influence engagement, such as course design features, instructor characteristics, and student motivations. Additionally, investigating the impact of interventions aimed at enhancing instructor support

and technology self-efficacy on student engagement could provide valuable insights into effective strategies for online teaching and learning.

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