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PAPER

Online Learning Engagement Factors of Undergraduate Students' Learning Outcomes: Effects on Learning Satisfaction and Performance

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ABSTRACT

This study aimed to explore the factors influencing the learning experience, using the community of inquiry (CoI) framework, that contribute to students' satisfaction with online learning and academic performance during the pandemic. Data were collected from 609 undergraduate students at four private universities in Malaysia through an online questionnaire. The questionnaire was derived from the community inquiry survey and the satisfaction with the online learning questionnaire. The empirical results indicated that the primary factors influencing students' satisfaction with online learning were cognitive presence, social presence, and teaching presence, in that order of importance. The model was further tested with specific measures of online learning satisfaction, including online course interaction, instruction, course management, instructor quality, and satisfaction with the technology used in the course. Factor reduction analysis groups satisfaction into three categories: "interaction, instruction, and course management" were combined into one category, which includes the course instructor and the technology. Stepwise correlation analysis indicated that all the CoI areas had a significant influence on the satisfaction of all three groups, except for the impact of social presence on the satisfaction of online instructors. Among the predictors, cognitive presence consistently played a significant role in all aspects of satisfaction and performance.

KEYWORDS

academic performance, online learning, community of inquiry, satisfaction, cognitive presence, social presence, teacher presence

1 INTRODUCTION

Studies have shown that online learning had been gaining popularity long before the pandemic [1, 2, 3, 4]. Before the pandemic, fully online learning was primarily offered through online distance learning courses. Online courses offered through

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higher education institutions utilize the Internet and web-based technologies, either synchronously or asynchronously, to facilitate teaching and assessment activities [5]. These web-based technologies include using learning management systems (LMS) such as Blackboard and Moodle. These systems support activities and facilitate interaction between the instructor and students, as well as among students themselves. In an online class setting, teaching and learning do not always require the presence of both the instructor and students at the same time. Instead, it can span across time and space [6]. Students can engage with course materials, resources, and discussions at their own pace and convenience. Online learning, besides, is not bound by physical limitations. It offers opportunities for students and instructors to connect and engage, regardless of their geographical locations. Thus, many studies on improving online learning have emerged, and higher learning institutions have discovered methods to enhance e-learning satisfaction [7, 8].

During the COVID-19 pandemic, educational institutions worldwide had to swiftly transition to online delivery in order to continue teaching and learning activities. Online delivery has become a necessity rather than an option. Classes were divided into synchronous delivery, where students attended classes online simultaneously, and asynchronous delivery, where students accessed online materials at their own pace. However, during this abrupt transition, institutions in Malaysia faced challenges and received scrutiny for the rapid shift from face-to-face to online teaching and learning. This transition increased dropout rates [9, 10] and resulted in a lack of student engagement [11]. Mushtaha et al. [12] highlighted that the sudden shift to online learning also affected students' satisfaction with their learning.

Amidst the proliferation of online learning experiences, extensive research has been conducted on the adoption of online teaching and learning during the COVID-19 pandemic. Two commonly used models for assessing readiness for online teaching and learning are the technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT) [6, 13, 14]. Numerous research areas have focused on topics such as the readiness for online learning in higher education [15], the adaptation of online learning, factors influencing online learning, and the influence and competency of instructors and students [16]. Moreover, Azizan et al. [16] examined the impact of behaviors on user satisfaction from an IT perspective.

It has been noted that users who have positive perceptions regarding the benefits of technology adoption are more likely to experience positive outcomes in online learning [13]. The effort, performance, and social expectations will also influence online learning expectations [14]. This research aims to address the gap in understanding the impact of online learning experience and engagement on satisfaction with online learning and academic performance. The concept of the online learning experience is based on the community of inquiry (CoI) framework [17]. In a study conducted by Mouzouri [18], it was concluded that the presence of the Community of Inquiry was crucial in fostering students' engagement with an online course. The following literature review will solely focus on the factors relevant to the present study, specifically the CoI and online learning outcomes.

2 CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 Community of Inquiry

Garrison [19], in his analysis of computer-conferencing transcripts, identified the elements that emerged as valuable tools to support the educational experience.

The concept revolves around the idea that computer conferencing can facilitate the creation of a community of inquiry, especially in an educational context. In today's context, computer conferencing for educational purposes is commonly referred to as online learning. Since then, the CoI framework has been widely used to examine and analyze the interactions and experiences in online learning [20, 21, 22]. (See Figure 1).

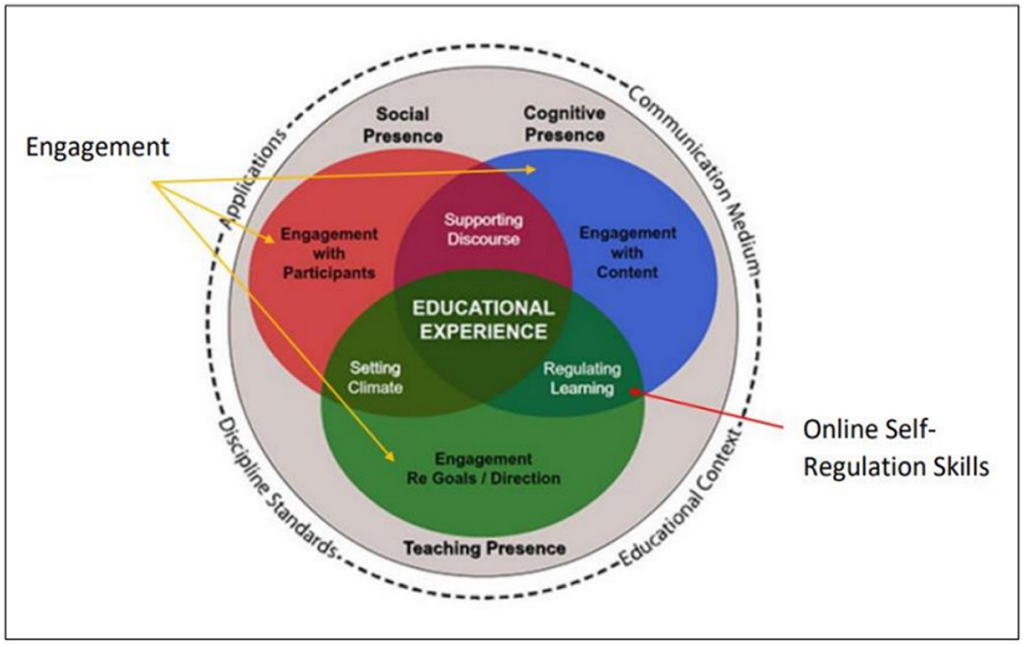

Fig. 1. Community of inquiry framework [19]

The CoI framework consists of three key components: social presence (engagement with participants), cognitive presence (engagement with content), and teaching presence (engagement regarding goals and directions). Social presence refers to the subjective experience of being present with a "real" person and accessing their thoughts and emotions [23]. Garrison [24] referred to social presence as a climate that supports and encourages probing questions, skepticism, and the contribution of explanatory ideas. It supports academic inquiry through three dimensions: group identity, open communication, and group cohesion. Cognitive presence is the degree to which participants in any formation of a community of inquiry can create significance through continuous communication [25]. Teaching presence involves the design, facilitation, and implementation of strategies to achieve educational learning outcomes [26]. The concept of teaching presence evolved from studies on social presence [27] and teacher immediacy [28]. In online learning, teaching involves various skill sets [29] that are different from those required in physical learning. Teachers become facilitators of learning rather than the instructors leading the teaching.

Various research has been undertaken to understand the relationship between social presence, cognitive presence, and teaching presence. Kara et al. [30] found that social presence had an impact on academic achievement, which contradicted the findings of Cakiroglu [31]. Hind et al. [32] reported that there was a significant relationship between cognitive presence and social participation within asynchronous discussions. In another study [33], a moderate level of relationship was established between cognitive presence and perceived teaching presence.

Rajabalee and Santally [34] described a positive and significant correlation between satisfaction and engagement. The relationship between satisfaction and engagement and overall performance was positive but not statistically significant. Most studies suggest a significant positive relationship between social presence and satisfaction with learning [35, 36, 37]. Among the many studies on cognitive presence, Maddrell et al. [24] and Cakiroglu [31] found that only cognitive presence was correlated with academic performance. From the studies discussed above, the outcomes of online learning could include learning satisfaction and academic performance. Learning satisfaction and academic performance will be addressed in the following section.

2.2 Online learning outcomes

Academic performance. Online learning outcomes have traditionally been assessed through indicators such as student satisfaction and academic achievement. In universities, a common measurement utilized is the cumulative grade point average (CGPA), which is calculated by summing the product of credit units and grade points, ranging from 0.0 to 4.0. Understanding the impact of engagement or experience on online learning outcomes is crucial for designing effective online courses [38]. Performance, indicated by CGPA, serves as a strong indicator of effective learning [39]. To ensure positive outcomes in online learning and gain insights into the support students require, it is necessary to examine students' social presence, cognitive presence, and teaching presence as potential predictors of performance [40]. Previous studies have established one or more of these factors as predictors, albeit in different settings [41, 42, 43]. For instance, Guo et al. [41] analyzed predictors from messages posted in online discussions for an online-based project and found that cognitive presence was the only factor positively associated with academic performance, using stepwise regression. Similarly, Riaz et al. [42] examined 166 males and 234 females from selected universities in Lahore, Pakistan. Through a post-hoc test, they identified that students with a lower CGPA (2.5–2.9) exhibited significantly higher cognitive presence. In contrast, Sengara [43] discovered, among 2094 Canadian students, that the presence of teachers had the most influential impact, followed by cognitive presence and social presence.

Students' learning satisfaction. Online learning satisfaction is derived from the field of psychology known as customer satisfaction [44]. Yu [44] defined learning satisfaction as "the feelings or attitudes of learners towards the learning activities."

Some researchers have studied learning satisfaction regarding the three components of CoI-social presence, cognitive presence, and teaching presence. Arbaugh et al. [45] highlighted that social presence, cognitive presence, and teaching presence significantly influence perceived learning and satisfaction with the learning process. Some researchers ranked the predictive power of three factors related to students' satisfaction. Baharudin et al. [46] reported that teaching presence was significantly correlated with students' satisfaction, followed by cognitive presence and social presence. The result found by Zahedi et al. [47] was slightly different. Their research indicated a significant positive correlation between cognitive presence, teaching presence, and student-perceived learning. Baloran et al. [48] measured the relationship between presence and students' engagement and performance. The students' performance was significantly positively correlated with student engagement (social presence) and skills (cognitive presence).

Cognitive presence was found to be the most predictive factor of perceived learning among the others [45, 47]. Çakiroğlu [31] indicated that the role of the instructor and the

ability to effectively manage technology positively influenced cognitive presence. The final exam scores showed a significant positive correlation with cognitive presence.

Teaching presence has also been a subject of study [24, 45, 46, 49, 50]. Gopal et al. (p. 6933) [50] evaluated the quality of the instructor, course design, instructor's prompt feedback, and students' expectations in relation to students' satisfaction. The students' satisfaction was assessed using six items: "the online classes were valuable," "an increase of interest," "improved understanding," "satisfied with course quality," "given enough time to understand the content," and "overall, the best learning experience." The quality of the instructor's teaching presence was significantly positively correlated with students' performance. Similarly, Maddrell et al. [24] reported that only the teaching presence was a significant predictor of students' satisfaction, explaining over 30% of the variance in satisfaction when the other presences were controlled for in the regression analysis.

Al-dheleai et al. [51] explored the impact of various aspects of social presence in online learning and discovered that students who had a stronger sense of social presence were more engaged and, as a result, achieved better academic performance. Cobb [49], Spears [52], and Khalid M. Nasir [37] only studied the relationship between social presence and students' satisfaction. Cobb [49] utilized a satisfaction measurement tool comprising six items: learning through the medium, learning through online discussion, valuable learning experience, interactions with other participants, engagement in discussion, and interest in future course participation. The study indicated that social presence significantly influenced satisfaction with learning. Spears [52] measured students' satisfaction using eleven items, which included the following: "ability to learn, usefulness of learning expectations, instructor meeting learning expectations, course meeting learning expectations, learning activities and assignments meeting learning expectations, discussion assisting in understanding, highest quality of learning, stimulation to do additional research, encouragement to participate in the discussion, and making acquaintances with other participants." In her thesis, she reported a strong correlation between social presence and students' satisfaction with their learning. Almasi and Zhu [53], in a study involving 144 medical students, found that social presence impacted learning, particularly through affective expressions and open communication. Similarly, Khalid M. Nasir [37] examined online satisfaction using five items related to goals, content, recommendations, discussions, and overall satisfaction. The study reported a significant positive correlation between online social presence and course satisfaction.

These studies examined the relationship between the three presences (social presence, cognitive presence, and teaching presence) and students' satisfaction. However, the reported findings were inconsistent. Furthermore, many existing studies have focused on students' satisfaction with online learning during the pandemic [54, 55, 56]. However, these studies have not specifically investigated the impact of students' learning experiences regarding social presence, cognitive presence, and teaching presence on their satisfaction with online learning. Additionally, upon reviewing these previous studies, it was noted that very few considered all of these elements within the Malaysian context. Therefore, the current study aims to contribute to the existing literature on online education in Malaysia.

2.3 Research framework

Based on previous studies, the research conducted after 2019 did not primarily focus on establishing a relationship between the components of the CoI framework

and learning outcomes using a validated instrument. However, students' satisfaction with their online learning experience holds significant potential for shaping future instructional methods. It enables the delivery of more courses in an online mode and encourages increased student participation [57]. Nonetheless, the online learning experience of students requires careful evaluation to help instructors understand their needs and facilitate the learning process effectively [58]. The research framework is presented below (see Figure 2).

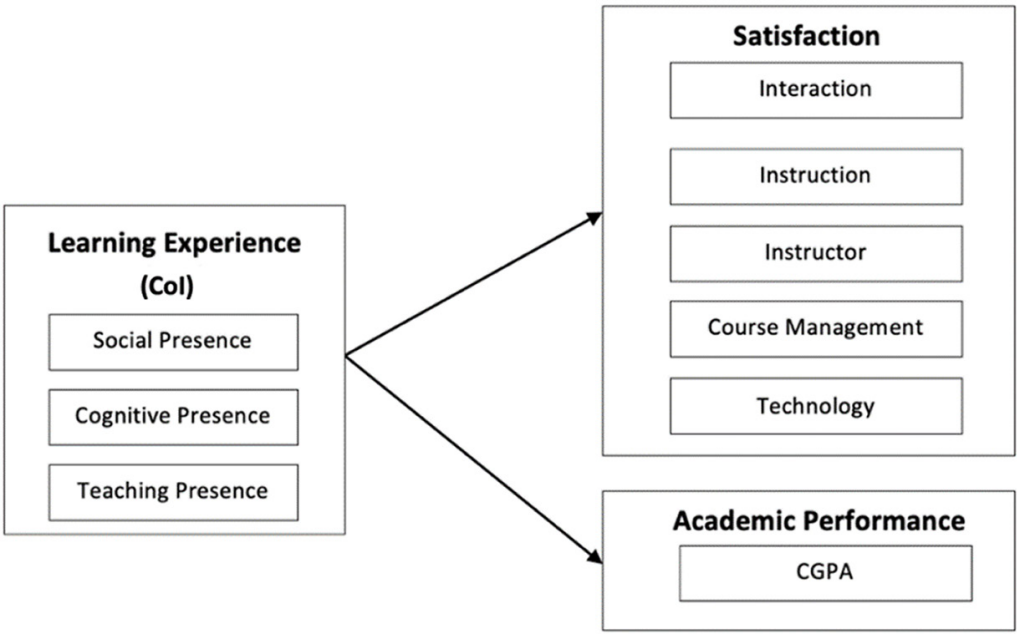

Fig. 2. Research framework to identify the relationship between CoI and learning satisfaction and academic performance

Based on the conducted literature review, this study addresses the following research questions:

1. What is the relationship between the components of CoI and total satisfaction?
2. What is the relationship between the components of CoI and the components of satisfaction?
3. What is the relationship between individual components in CoI and academic performance?

The results of this study would have implications for enhancing online teaching and learning.

3 METHODOLOGY

3.1 Sampling method and participants

The data used in this study was obtained from four well-established public and private Malaysian universities. These universities are located in the northern and central regions of West Malaysia, as well as in East Malaysia. Considering the wide geographical range for data collection, the online questionnaire survey method

was used instead of the traditional method. This method was chosen because it is time-efficient, cost-efficient, and convenient [59, 60]. The link to the online questionnaire was distributed to the students via email and an LMS announcement. Students voluntarily participated in completing this online questionnaire, which took approximately 15 minutes to finish, while adhering to approved research ethics (SUREC 2022/070).

Table 1. Demographics of respondents

Name	Categories	Frequency	Percentage (%)
Gender	Male	239	39.24
	Female	370	60.76
Major	Pure Arts	53	8.70
	Applied Arts	304	49.92
	Engineering	55	9.03
	Computing	47	7.72
	Sciences	45	7.39
	Others	105	17.24
Year	First Year	163	26.77
	Second Year	124	20.36
	Third Year	153	25.12
	Fourth and beyond	169	27.75
Region	East Malaysia	45	7.39
	Northern Peninsular	201	33.00
	Central Peninsular	274	44.99
	Southern Peninsular	89	14.61

The participants were undergraduate students enrolled in degree courses and learning in an online setting during the COVID-19 pandemic. A total of 609 students voluntarily completed the online questionnaire, and this sample size is adequate as it exceeds the rule of thumb of 500 [61]. The cluster sampling method was employed because it is suitable for selecting samples from a wide geographical range, including the northern, southern, and eastern regions of Malaysia. This included five major programs: (a) pure arts, (b) applied arts, (c) engineering, (d) computing, (e) sciences, and (f) other programs. Among the 609 questionnaires collected, 83 were incomplete because the performance score was not recorded. The first-semester students have not received their CGPA, leaving them with unanswered questions. Since the questionnaire was designed to be anonymous, it was not possible to contact these 83 respondents to gather their complete data. Please refer to Table 1 for additional information.

3.2 Survey instruments

There were three sections in the online survey. The first section was designed to gather the respondents' demographic information, including their academic

performance. The second section of the online survey collected data on the respondents' online learning experience, with a specific focus on social, cognitive, and teaching presences, as well as their satisfaction with online learning.

Experience in online learning. The experience of undergraduate students with online learning was measured using the CoI survey. Arbaugh et al. [45] have provided a sample questionnaire to measure the three dimensions of CoI. There were a total of twenty items: nine for teaching presence, seven for social presence, and four for cognitive presence. The factor loadings for most items were accepted within their respective factors, except for two questions on the instructor that were intended to measure social presence and cognitive presence. These questions had higher loadings in the teaching presence factor. Zhang [62] expanded the questionnaire to include thirty-four items to measure the CoIs, with nine items for social presence, twelve for cognitive presence, and thirteen for teaching presence. In this study, the instrument provided by Zhang [62] was used instead of the one proposed by Arbaugh et al. [45] because it contains more items and offers more comprehensive coverage. The instrument was adapted with adjustments to ensure its relevance to the context of the four participating universities.

Learning satisfaction. The section of the online survey used to measure undergraduate students' satisfaction with online learning was adapted from the satisfaction towards blended learning questionnaire (SBLQ) introduced by Saliza et al. [63]. There were five dimensions in this survey, namely interaction (INT), instruction (INS), instructor (INST), course management (CM), and technology (T). The interaction (INT) dimension aims to measure students' level of interaction with other students and lecturers, consisting of six items. the instruction (INS) dimension consisted of six items that measured students' satisfaction with the implementation of online learning. The instructor (INST) dimension included six items to assess students' satisfaction with the instructor in an online class setting. The CM dimension encompassed five items that assessed students' satisfaction with the CM. Lastly, the technology (T) dimension contained five items that measured students' satisfaction with the technology used during their online learning. Past studies have supported the dimensionality and reliability of the satisfaction scale [63, 64, 65].

Academic performance. Students' academic performance was measured using their respective CGPA, which is commonly used in most universities. The CGPA represents the sum of the product of credit units and grade points, ranging from 0.0 to 4.0. It is implied that a higher CGPA score indicates better academic performance, with 4.0 being a perfect score. Therefore, it served as a reliable predictor of academic performance. Among the 609 questionnaires collected, 83 were incomplete because the performance scores were missing. The first-semester students had not yet obtained their CGPA for the semester.

4 RESULTS

4.1 Internal consistency and descriptive statistics

The reliability assessment includes measures of convergent validity, divergent validity, confirmatory factor analysis, and item loadings. The results showed that all items within each construct demonstrated statistically significant convergent validity. Additionally, the use of Pearson's correlation analysis to test divergence validity

provided a preliminary indication that the items within the scale could not be distinguished as separate constructs. The three constructs are social presence, cognitive presence, and teaching presence.

Social presence refers to the subjective experience of being present in a place, either physically, emotionally, or in terms of attention. The three areas encompassing social presence are affective expressions, open communication, and group cohesion. These areas are measured using nine items that have demonstrated sufficient internal consistency (Cronbach-α = 0.926). The average for this engagement is high (M = 3.00, SD = 0.74). The highest score was for "*I felt comfortable interacting with other coursemates* in an online class" (M = 3.08, SD = 0.690). The lowest score was recorded for "*Online communication is excellent for social interaction*" (M = 2.85, SD = 0.827).

Cognitive presence is the "extent to which participants in any configuration of a community of inquiry can construct meaning through sustained communication" [19]. The four areas encompassing cognitive presence are triggering events, exploration, integration, and resolution. These areas were identified through the analysis of 12 items that demonstrated sufficient internal consistency (Cronbach-α = 0.955). All items under cognitive presence indicate a high level of engagement (M = 3.2, SD = 0.62), with the highest level of engagement observed for the statement "*Finding relevant information online helped me to resolve content-related questions*" (M = 3.31, SD = 0.568). while the lowest score was for the statement "*Online course activities promoted my curiosity to learn.*" (M = 3.07, SD = 0.699). This indicates that all items have high levels of agreement (3.00–4.00).

Teaching presence is the design, facilitation, and implementation of strategies to achieve meaningful and educational learning outcomes [26]. The three areas encompassing teaching presence are design and organization, facilitation, and direct instruction. These areas were derived from 13 items that demonstrated sufficient internal consistency (Cronbach-α = 0.966). The level of teaching presence among respondents is high (M = 3.26, SD = 0.64). The highest scores were obtained for the items related to design and organization, specifically "*The lecturer clearly informed the due dates for the learning tasks*" (M = 3.40, SD = 0.577). On the other hand, the lowest scores were given for "*The lecturer reinforced the development of a sense of community among students*" (M = 3.15, SD = 0.69) and *"The lecturer provided feedback in a timely manner"* (M = 3.15, SD = 0.69). Although scoring the lowest within the construct, the value is above 3.0, indicating a high level of agreement.

University students' satisfaction with online learning was measured in five dimensions, namely INT, INS, INST, CM, and T. All dimensions of satisfaction have indicated that students have a high level of satisfaction. Satisfaction through INT (M = 3.01, SD = 0.75), INS (M = 3.14, SD = 0.71), INST (M = 3.21, SD = 0.65), and CM (M = 3.2, SD = 0.69) and for technology (M = 3.21, SD = 0.66). Total satisfaction with online learning was also at a high level (M = 3.15, SD = 0.69). This indicates that students are very satisfied with online learning in all aspects. "*The use of online technology in learning sessions encourages me to learn independently*" was highly rated (M = 3.31, SD = 0.62). This indicates that students were accepting of learning independently using technology. Students were also highly satisfied with instructors who effectively utilized available technology in teaching and learning. The item "The lecturer uses technology appropriately" received the highest score (M = 3.29, SD = 0.60). Students were particularly satisfied with the technology used, as it provided a faster approach to accessing information. This is evident from

their response to the item "*The online platform provides faster access to information*" (M = 3.37, SD = 0.60).

The Keisen Meier Olkin (KMO) statistic is 0.906, indicating a significant Bartlett's test and suggesting that the data is appropriate for further analysis. The item loadings on each construct for satisfaction were above 0.5, which is considered good [26], except for INS1, CM1, and CM5. These items were dropped prior to the main analysis.

Table 2. Exploratory factor analysis

	Interaction, Instruction, Course Management (IICM)	Instructor	Technology
INT1	.913		
INT2	.697		
INT3	.707		
INT4	.656		
INT5	.700		
INT6	.765		
INS2	1.00		
INS3	.797		
INS4	.797		
INS5	.776		
INS6	.560		
INST1		.616	
INST2		.777	
INST3		.805	
INST4		.755	
INST5		.803	
INST6		.802	
CM2		.721	
CM3	.650		
CM4	.603		
T1			.574
T2			.623
T3			.682
T4			.828
T5			.866

Explanatory factor analysis (EFA) was performed on the survey instruments, as shown in Table 2. The items for interaction, instruction, and course management are grouped under one category, IICM. The total variance explained by three factors is 68.09%, which exceeds 50%. The internal reliability test shows a Cronbach

Alpha of 0.96, which exceeds the threshold of 0.7, indicating a high level of reliability, learning experience, and learning satisfaction.

Table 3. Correlation between student online learning experience and total satisfaction

Learning Experience	Total Sample, n = 609			
	1	2	3	4
1. SP	1			
2. CP	0.671***	1		
3. TP	0.612***	0.709***	1	
4. TS	0.702***	0.835***	0.809***	1

Notes: SP: social presence, CP: cognitive presence, TP: teaching presence, TS: total satisfaction. Significance indicator ns – not significant; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3 displays the strength and direction of the linear relationship between the online learning experience and total satisfaction. The correlation analysis showed that all the learning experiences were positively correlated with total satisfaction ($p < 0.01$).

This indicates that as the learning experience is enhanced, total satisfaction is also elevated. Dissimilar to these results, the correlation between the student's online learning experience and academic performance (measured using CGPA) was different, as shown in Table 4. Only cognitive presence showed a significant positive relationship with academic performance ($r = 0.086$, $p < 0.01$). Teaching presence and social presence do not have a significant correlation with academic performance.

Table 4. Correlation between student online learning experience and academic performance

Learning Experience	Total Sample, n = 523			
	1	2	3	4
1. AP	1			
2. TP	–0.039	1		
3. CP	0.086**	.707***	1	
4. SP	–0.004	.608***	.657***	1

Notes: SP: social presence, CP: cognitive presence, TP: teaching presence, AP: academic performance. Significance indicator ns – not significant; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.2 Predictors of online learning satisfaction

To investigate the impact of students' learning experience on their satisfaction with blended learning, a multiple stepwise regression analysis was performed on the entire sample. The results are shown in Table 5. The variance inflation factor (VIF) for all predictors in all models was less than 3, indicating the absence of multicollinearity [48]. No violations were found for the underlying assumptions of normality of the error term distributions, linearity of the relationship between independent and dependent variables, homoscedasticity, outliers, and autocorrelation—specifically, the independence of the error terms.

Table 5. Multiple stepwise linear regression: Student online learning experience in predicting online learning satisfaction

The Whole Sample, n = 609	Total Satisfaction			IICM			Instructor			Technology		
	st. β	t	VIF	st. β	t	VIF	st. β	t	VIF	st. β	t	VIF
SP	0.39***	14.89	1.95	0.20***	6.48	1.95	0.045	1.59	1.95	0.38***	9.72	1.95
CP	0.45***	16.04	2.45	0.53***	15.42	2.45	0.198***	6.24	2.45	0.33***	8.08	2.45
TP	0.16***	6.34	2.16	0.22***	6.73	2.16	0.684***	22.95	2.16	0.14***	3.93	2.16
Adj. R^2 (%)	80.4			72.4			75.0			57.9		
F	834.84***			533.48***			608.21***			278.68***		

Notes: SP: social presence, CP: cognitive presence; TP: teaching presence; AP: academic performance. Significance indicator ns – not significant; * p < 0.1, ** p < 0.05, *** p < 0.01.

The regression model analyzing the predictor for total satisfaction in an online learning setting was found to be significant, with F (3,605) = 834, p < 0.01. Additionally, the model had a coefficient of variation of 80.4%. This indicates that the variation in students' learning engagement explains 80.4% of the variation in the students' overall satisfaction with their learning. The social presence (β = 0.39, t = 14.9, p < 0.01), cognitive presence (β = 0.45, t = 16.04, p < 0.01), and teaching presence (β = 0.16, t = 6.34, p < 0.01) have a positive impact on students' satisfaction with the course. Among the three predictors of total satisfaction, cognitive presence has the greatest impact, followed closely by social presence. The teaching presence has the least impact on overall satisfaction.

The next model analyzed the satisfaction of the IICM predictor. The analysis showed a significant result with F (3,605) = 533, p < 0.01, and a coefficient of variation of 72.4%. This indicates that 72.4% of the variation in the students' learning satisfaction can be explained by the variation in the students' learning engagement. The social presence (β = 0.20, t = 6.48, p < 0.01), cognitive presence (β = 0.53, t = 15.4, p < 0.01), and teaching presence (β = 0.22, t = 6.73, p < 0.01) have a positive impact on students' satisfaction with the course. Among all the predictors of course instruction, cognitive presence has the highest impact. Social presence and teaching presence have an equal impact on students' satisfaction with the course instruction.

The model assessing satisfaction with the instructor was found to be significant, with F(3,605) = 608, p < 0.01. The coefficient of variation of 0.75 suggests that 75% of the variation in instructor satisfaction can be explained by the variation in the students' learning experience. Among the three engagements, only social presence was found to be insignificant. However, both teaching presence (β = 0.68, t = 22.64, p < 0.01) and cognitive presence (β = 0.22, t = 7.68, p < 0.01) had a positive impact on students' satisfaction with the instructor. Social presence does not affect instructors' teaching satisfaction. Teaching presence has the highest impact, more than triple that of cognitive presence.

The predictors of students' satisfaction with technology in an online learning setting were analyzed. The model was found to be significant with F(3,605) = 278.68, p < 0.01. 57.9% of the variation in satisfaction is explained by the variation in social presence, cognitive presence, and teaching presence (R^2 = 57.9). Although the coefficient of variation was lower than that of all the other models, all predictors significantly and positively affect satisfaction with technology. [social presence (β = 0.38, t = 9.72, p < 0.01); cognitive presence (β = 0.33, t = 8.08, p < 0.01); and teaching presence (β = 0.14, t = 3.93, p < 0.01)]. While social presence and cognitive presence have a nearly identical effect on students' satisfaction with the technology used, teaching presence had only half the effect.

To examine the impact of students' learning experience in an online learning environment on academic performance, a multiple linear regression analysis was performed on a sample of 523 participants. The regression model was found to be significant, with $F(3,519) = 6.67$, $p < 0.001$. The coefficient of variation was 32%, indicating that 32% of the variation in satisfaction could be explained by the variations in social presence, cognitive presence, and teaching presence. Cognitive presence has a significant positive effect on student performance ($\beta = 0.28$, $t = 4.28$, $p < 0.01$), and this predictor had the greatest impact. While social presence was not found to be significant, teaching presence had a significant negative impact on students' performance. Cognitive presence did not affect the students' performance, and teaching presence was inversely related. Please refer to Table 6.

Table 6. Multiple stepwise linear regression: Student online learning experience in predicting academic performance

The Whole Sample, n = 523	Academic Performance		
	st. β	t	VIF
SP	–0.046	–3.25	1.90
CP	0.285**	4.28	2.39
TP	–0.206**	–0.77	2.15
Adj. R^2 (%)	32		
F	6.674**		

5 DISCUSSIONS

The study aimed to explore the factors that predict satisfaction with online learning and students' performance in the Malaysian context. The factors being investigated were cognitive presence, teaching presence, and social presence within the framework of the CoI. Learning satisfaction was assessed using the SBLQ survey, while academic performance was indicated by their CGPA scores. A quantitative research design was employed to address the three research questions of the study. The findings of this study revealed that students' overall satisfaction with online learning was primarily influenced by their cognitive presence, followed by social presence and teaching presence.

The findings of this study suggest that students' cognitive presence plays the most important role in determining their satisfaction and performance in online learning. Triggering events, such as problem scenarios and thought-provoking questions, effective facilitation, and the utilization of suitable learning technologies, supported the development of cognitive presence, thereby fostering a meaningful online learning experience [25]. Moreover, students who exhibited higher cognitive presence not only expressed satisfaction with online learning but also demonstrated improved academic performance. Even after two decades, the significance of cognitive presence remains a fundamental component of a meaningful learning experience and highlights its positive impact on student satisfaction [25, 45, 66]. Notably, cognitive presence exhibited the highest predictive power in online learning in this study.

Regarding social presence, the study found that students who were able to effectively project themselves socially and emotionally in an online learning environment expressed higher satisfaction with online learning. Specifically, among the various components of satisfaction, students who had a strong social presence showed particular

satisfaction with online learning technology. These findings align with previous studies [36, 46, 49, 52, 67, 68]. Students are more likely to be satisfied with their learning when they can: a) effectively express themselves, fostering a sense of belonging, making friends, and engaging in online communication; b) engage in open communication, feeling comfortable in the online medium and actively participating in online discussions; and c) experience group cohesion, feeling comfortable expressing differing opinions while maintaining trust and acknowledging the perspectives of classmates in an online classroom. However, social presence was not found to be a significant predictor of academic performance. Higher social presence did not impact performance in any way. This finding contradicts [41, 51], possibly because of variations in the experimental design, control of other predictors, and methods of data collection. While social presence contributes to creating a supportive environment and fostering a sense of belonging, it does not necessarily lead to improved academic performance.

Similar to cognitive presence, teaching presence plays a significant role in predicting both satisfaction with online learning and academic performance. The instructor's design, facilitation, and guidance in the online learning environment contributed to creating a meaningful learning experience for students. This was achieved through timely feedback and clear instructional direction. It was found that the presence of effective teaching had the highest predictive power for students' satisfaction with the online instructor. However, although a more prominent teacher's presence had a positive impact on students' satisfaction with online learning, it did not necessarily enhance academic performance. This finding is consistent with Hosler [69], who also suggested that the age of students has a significant impact on this relationship.

The findings of this study support the importance of the CoI framework in relation to satisfaction with online learning and academic performance. Since cognitive presence has emerged as the most crucial aspect of a positive online learning experience, it is essential to design teaching and learning pedagogies that stimulate critical thinking, foster deep learning, and align with the student's level of study. By doing so, students are more likely to find online learning enjoyable, which can consequently enhance their academic performance. To ensure heightened satisfaction, it is advantageous to foster cognitive presence in students from an early stage, even before they enroll in university.

Teaching presence emerged as another significant factor closely following cognitive presence in terms of its importance for satisfaction in online learning. Higher learning institutions in Malaysia could enhance their teaching engagement by implementing strategies that incentivize online instructors to improve their presence and create a supportive learning environment. This would contribute to students feeling more connected, engaged, and supported throughout their online learning experience.

Furthermore, although social presence may not directly predict academic performance, it still plays a crucial role in enhancing learning satisfaction. Therefore, fostering social presence through various strategies, such as promoting collaborative group projects and facilitating discussion forums, is crucial. By fostering an inclusive and interactive community, students can forge meaningful connections with their peers, instructors, and the learning process, thereby enhancing their satisfaction with the online learning experience.

6 CONCLUSION

This study aimed to investigate the factors influencing students' satisfaction with online learning and academic performance during the pandemic in Malaysia. Drawing from the SBLQ model [63], the study examined a model that encompasses

three predictors of students' learning experience: social presence, cognitive presence, and teaching presence. In terms of importance, the empirical findings revealed that cognitive presence, social presence, and teaching presence were the main factors influencing students' satisfaction with online learning. Additionally, the model was tested with specific aspects of satisfaction in online learning, including satisfaction with online course instruction, the online instructor, and the technology used in the course. All predictors significantly influenced satisfaction across these three categories: IICM, instructor, and technology. Notably, the sense of social presence in online learning did not impact instructor satisfaction. Among the predictors, cognitive presence consistently emerged as a significant factor in all areas of satisfaction.

This study presents several novelties. Firstly, the SBLQ model, which was originally composed of five dimensions, has been adapted to three dimensions that are specifically tailored to the online learning environment in Malaysia. Additionally, in contrast to previous studies [51], this study reveals that a higher level of social presence does not have a significant impact on students' performance. These findings provide valuable insights for Malaysian higher learning institutions to implement strategies that enhance students' social and cognitive abilities. It is crucial to foster students' critical thinking and promote deep learning from an early stage, such as during high school, in order to achieve better outcomes. Therefore, understanding these findings is important for academics and institutional policymakers, especially in the context of online learning. Among the beneficial strategies to consider should be improvements in the technological aspects of the learning management system. This includes enhancing course sites and providing educators with the necessary support to facilitate asynchronous student engagement.

Limitations arise from the study's exclusive focus on students enrolled in online learning programs at four specific higher learning institutions. The restriction on these specific institutions limits their generalizability. To gain a deeper understanding of the subject, future research could examine whether similar findings hold true in a blended learning or hybrid learning environment. This is particularly relevant considering that Malaysian universities have increasingly adopted diverse teaching modes, especially in response to the pandemic. Such research would shed light on potential contrasting factors that influence learning satisfaction and offer valuable insights for future investigations. Additionally, it would be beneficial for future research to explore the relationship between students' satisfaction and performance, with the components of CoI serving as mediators.

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