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Abstract: Learner satisfaction is a crucial indicator of the overall quality of the e-learning experience. While numerous studies have focused on identifying the “what”—the factors that predict satisfaction—there has been limited investigation into the “how,” or the mechanisms linking these factors to satisfaction. This study addresses this gap by examining the role of two key individual factors: motivation and self-regulation. It posits that while these factors are directly related to learner satisfaction, they also have an indirect effect through their connection with the Community of Inquiry (CoI) presences, namely, social, cognitive, and teaching presences. Data were collected from 247 master's students enrolled in online programs at three state universities in Iran, and path analysis was conducted to explore the interactions between these variables. The findings provide valuable insights into the complex relationships at play, revealing that self-regulation is a more significant predictor of learner satisfaction than motivation. Moreover, while both factors were directly associated with satisfaction, their effects were also mediated by the three CoI presences. Among these, cognitive presence emerged as the most influential mediator, emphasizing its pivotal role in enhancing the e-learning experience. The findings of this study offer new insights into designing effective e-learning environments that not only engage learners but also effectively support their satisfaction.

Introduction

In most universities, e-learning has now emerged as a prominent teaching method to facilitate distance learning. However, several studies underscored the benefits of e-learning over traditional methods, highlighting superior outcomes in students' academic achievement (Yu et al., 2022), engagement (Chen et al., 2010), and motivation (Sandybayev, 2020). Meanwhile, empirical studies and meta-analyses offer a more nuanced view, suggesting that e-learning's effectiveness can either match that of traditional learning – with comparable results (Bulić & Blažević, 2020) – or show minimal improvements, particularly in student knowledge gain (Lahti et al., 2014). On the flip side, there are also studies demonstrating the superiority of traditional learning over e-learning in terms of students' perceived learning outcomes (Kumari et al., 2021). These inconclusive findings can be attributed, in part, to learner satisfaction, a pivotal metric that encapsulates the entire e-learning experience (Yunusa & Umar, 2021). In particular, previous research has highlighted the crucial roles that motivation and self-regulation play in shaping learners' satisfaction in e-learning settings (e.g., Chen & Jang, 2010). Therefore, if motivation and self-regulation have the potential to modify satisfaction levels, they likely interact with the essential learning processes occurring during the e-learning experience. Also, at the heart of these processes is the concept of the Community of Inquiry (CoI) ,a widely adopted framework for designing and evaluating meaningful e-learning experiences (Richardson et al., 2017). Recognizing the fundamental role of CoI presences in successful e-learning, it is important to investigate how key individual factors, such as motivation and self-regulation, may interact with these presences and contribute to learners' satisfaction. The findings of several studies(e.g., Cho et al., 2017; Kilis & Yıldırım, 2018) suggest that CoI presences may play a mediating role in linking motivation and self-regulation to satisfaction, though this potential role remains largely unexplored. Moreover, to our knowledge, no study has yet simultaneously investigated the interplay between these two key individual factors, all three CoI presences, and satisfaction in e-learning. Such a comprehensive exploration would provide an opportunity to compare these relationships in terms of their direction and strength. It would also offer deeper insights into how motivation and self-regulation predict satisfaction, which can inform the development of more effective instructional strategies and support systems within e-learning environments. So, the current study aims to address the aforementioned gap



by investigating the mediating role of CoI presences between the key individual factors—motivation and self-regulation—and learners' satisfaction with e-learning.

Conceptual framework

The CoI framework

The CoI framework is a widely used model in e-learning, rooted in social constructivism, which underscores meaningful knowledge construction through interaction among learners, peers, and instructors (Garrison et al., 2001). It identifies three interrelated elements: social presence (authentic interpersonal engagement), cognitive presence (meaning-making through reflection and discourse), and teaching presence (structured and supportive facilitation) (Anderson et al., 2001).

Motivation and the perceived CoI presences

Motivation is crucial in education, influencing engagement, behavior, and learning outcomes (Tokan & Imakulata, 2019). In e-learning environments, it drives learners to participate in discussions (Xie & Ke, 2011), collaborate with peers (Serrano-Cámará et al., 2014), and engage deeply with content. These activities enhance their perceptions of social, cognitive, and teaching presences. However, empirical findings on the relationship between motivation and CoI presences are inconsistent (Kilis & Yıldırım, 2018). Building on these insights, this study aims to explore the following hypotheses:

- H1: Motivation is significantly associated with the perception of social presence in e-learning.
- H2: Motivation is significantly associated with the perception of cognitive presence in e-learning.
- H3: Motivation is significantly associated with the perception of teaching presence in e-learning.

Self-regulation and the perceived CoI presences

Self-regulation involves learners managing their learning through goal setting, strategy use, and reflection (Lai & Hwang, 2023, p. 3757). In e-learning, self-regulation is vital for navigating autonomous environments and enhances perceptions of CoI presences (Kilis & Yıldırım, 2018). It fosters productive interactions (Verstege et al., 2019), emotional management (Yu et al., 2022), and deep content engagement (Panadero et al., 2015). Building on these insights, this study aims to explore the following hypotheses:

- H4: Self-regulation is significantly associated with the perception of social presence in e-learning.
- H5: Self-regulation is significantly associated with the perception of cognitive presence in e-learning.
- H6: Self-regulation is significantly associated with the perception of teaching presence in e-learning.

The perceived CoI presences and satisfaction with e-learning

Social, cognitive, and teaching presences are pivotal in determining learners' satisfaction with e-learning. Social presence fulfills belonging and connection needs (Gao et al., 2017), cognitive presence supports deep engagement and critical thinking (Lim & Richardson, 2021), and teaching presence ensures clarity and guidance (Anderson et al., 2001). Research shows these presences positively correlate with e-learning satisfaction (Salimon et al., 2021). Building on these insights, this study aims to explore the following hypotheses:

- H7: Social presence is significantly associated with satisfaction with e-learning.
- H8: Cognitive presence is significantly associated with satisfaction with e-learning.
- H9: Teaching presence is significantly associated with satisfaction with e-learning.

The mediating role of perceived CoI presences

The preceding sub-sections have provided a detailed theoretical and empirical examination of the relationships between learners' motivation and self-regulation with the perceived social, teaching, and cognitive presences in e-learning environments, as well as the relationship between these perceived presences with learners' overall satisfaction with e-learning. While a substantial body of literature acknowledges the direct associations of motivation and self-regulation with learner satisfaction in such settings (Chen & Jang, 2010), this research extends the discourse by suggesting that social, cognitive, and teaching presences not only contribute to satisfaction independently but also mediate these relationships by putting forward the following hypotheses:

- H10: Motivation is significantly associated with learners' satisfaction with e-learning.
- H11-13: The perception of social (H11), cognitive (H12), and teaching (H13) presences mediates the relationship between motivation and satisfaction with e-learning.

H14: Self-regulation is significantly associated with learners' satisfaction with e-learning.

H15-17: The perception of social (H15), cognitive (H16), and teaching (H17) presences mediates the relationship between self-regulation and satisfaction with e-learning

Method

This study adopted an exploratory study design and used path analysis to explore the structural relationships between motivation, self-regulation, perceived CoI presences, and satisfaction with e-learning. 247 master's students from three state universities in Iran, all offering fully online courses, were recruited using a convenience sampling method. the study was conducted in November 2022, using an online survey. The SPSS software and Lisrel software were utilized to analyse the data. COI presence developed by Arbaugh et al. (2008) , The MSLQ, developed by Pintrich and DeGroot (1990), The Online Self-Regulated Learning Questionnaire developed by Barnard et al. (2009) and The Learner Satisfaction Survey (LSS), developed by Chang (2013) was used in this study to collect data.

Results

Structural equation modeling was employed to examine the relationships among the variables, evaluating both the measurement models and the structural model. The measurement model for each construct was assessed for convergent and discriminant validity. Based on composite reliability and average variance extracted values, the constructs in the model satisfied the criteria for convergent validity. Furthermore, the results demonstrated that the constructs achieved discriminant validity, as confirmed by the Fornell and Larcker method. Additionally, the Model Fit Indices obtained were $\chi^2/df = 1.823$, $p < .001$, SRMR = .017, NFI = .991, CFI = .953, RMSEA = .065, GFI = .982, and AGFI = .902, indicating that the structural model adequately fit the data. Squared multiple correlations (R^2) from the structural equations revealed that perceived social presence ($R^2 = .58$), cognitive presence ($R^2 = .49$), and teaching presence ($R^2 = .55$), along with learners' satisfaction with e-learning ($R^2 = .61$), exhibited large effect sizes. These findings suggest that 61% of the variance in learners' satisfaction with e-learning is explained by the combined effects of perceived CoI presences, motivation, and self-regulation. Furthermore, motivation and self-regulation accounted for 58% of the variance in social presence, 49% in cognitive presence, and 55% in teaching presence, highlighting their significant predictive power (see Figure 1 and Table 1).

Figure 1
Results of Path Coefficients of the Research Model

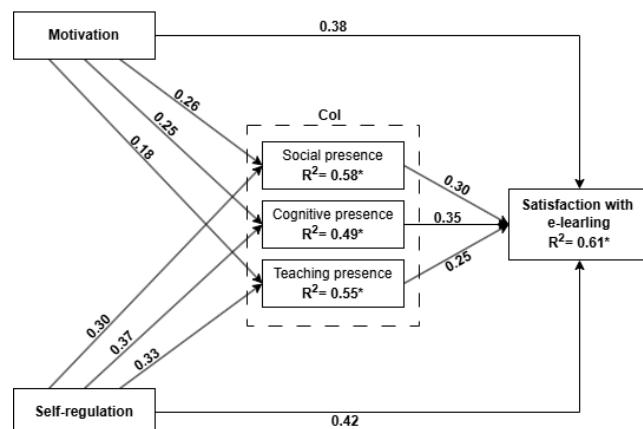


Table 1
The Summary of Direct, Indirect, and Total Effects

Hypothesis	Proposed relationship	Direct effect	Indirect effect	Total effect
H1	Motivation → SP	.26	-	.26
H2	Motivation → CP	.25	-	.25
H3	Motivation → TP	.18	-	.18
H4	Self-regulation → SP	.30	-	.30
H5	Self-regulation → CP	.37	-	.37

H6	Self-regulation	→ TP	.33	-	.33
H7	SP	→ Satisfaction	.30	-	.30
H8	CP	→ Satisfaction	.35	-	.35
H9	TP	→ Satisfaction	.25	-	.25
H10	Motivation	→ Satisfaction	.38	-	.38
H11	Motivation	→ SP	.38	.08	.46
H12	Motivation	→ CP	.38	.09	.47
H13	Motivation	→ TP	.38	.04	.42
H14	Self-regulation	→ Satisfaction	.42	-	.42
H15	Self-regulation	→ SP	.42	.09	.51
H16	Self-regulation	→ CP	.42	.13	.55
H17	Self-regulation	→ TP	.42	.08	.50

Note. SP = Social Presence, CP = Cognitive Presence, TP = Teaching Presence

Additionally, the results of the path analysis revealed that while both motivation ($\beta = .382$, $t = 4.514$, $p < .001$) and self-regulation ($\beta = .421$, $t = 5.571$, $p < .001$) were directly associated with satisfaction with e-learning, their associations with satisfaction were stronger when examined in conjunction with perceived CoI presences as mediators. The results of the Sobel test indicate significant mediating effects of perceived CoI presences in relationship between self-regulation and motivation with satisfaction ($p < .05$). Specifically, social presence significantly mediated the effect of motivation ($Z = 2.47$, $p < .05$) and self-regulation ($Z = 2.66$, $p < .05$) on satisfaction. Similarly, cognitive presence significantly mediated the effect of motivation ($Z = 2.52$, $p < .05$) and self-regulation ($Z = 3.09$, $p < .05$) on satisfaction. Finally, teaching presence significantly mediated the effect of motivation ($Z = 1.99$, $p < .05$) and self-regulation ($Z = 2.43$, $p < .05$) on satisfaction. This indicates that all research hypotheses are confirmed.

Conclusion

Learner satisfaction is widely recognized as a key indicator of e-learning quality, significantly influencing academic performance and learning success (Yunusa & Umar, 2021). Despite its importance, the underlying mechanisms that shape satisfaction remain complex and not fully understood. This study contributes to addressing this gap by examining how individual factors—motivation and self-regulation—interact with the CoI presences (social, cognitive, and teaching) to influence satisfaction. The findings validate a dual-pathway model, demonstrating that motivation and self-regulation not only have direct relationships with satisfaction but also indirectly shape it by influencing learners' perceptions of CoI presences.

The results of this study have yielded valuable insights into this intricate relationship. Notably, the study has revealed that self-regulation plays a more robust predictive role than motivation concerning learners' satisfaction with e-learning. Furthermore, it has become evident that while both motivation and self-regulation are directly associated with satisfaction, they also have indirect associations by shaping the CoI presences. Within this process, the perception of cognitive presence emerged as a central mediator, highlighting its crucial role in enhancing the e-learning experience.

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