

The influence of self- and co-regulation on the community of inquiry for collaborative online learning: an ODeL context

Self- and co-regulation and CoI

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Abstract

Purpose – This paper aimed to determine the self- and co-regulation influences on the community of inquiry (CoI) for collaborative online learning.

Design/methodology/approach – A quantitative survey was used on a sample of (N = 626) enrolled postgraduate students in a South African Open Distance and e-Learning (ODeL) university. The measuring instruments were the CoI and the shared metacognitive surveys. Correlation and multiple regression analyses were used to determine the association and influence of self- and co-regulation on the CoI.

Findings – The results indicated that self- and co-regulation related to the CoI (teaching, cognitive and social) presences. In addition, the results revealed that self- and co-regulation influence the CoI presences. Self-regulation had the highest influence on teaching and cognitive presence, while co-regulation influenced social presence.

Research limitations/implications – The study's convenience sampling method from a single university limited the applicability of the findings to other online learning environments.

Practical implications – Higher educational teachers who encourage student self- and co-regulation may enhance their online teaching, cognitive and social presence when studying online. The research's findings may be valuable to teachers to enable them to provide a more collaborative and interactive online learning environment and promote productive online communities.

Originality/value – This study contributes to the body of knowledge about the relationship between teaching, social and cognitive presence and self- and co-regulation within the CoI framework. Furthermore, there has also been limited research focussing on the dynamics of shared metacognition within the CoI framework in an ODeL context.

Keywords Community of inquiry, Teaching, Cognitive and social presence, Self-regulation, Co-regulation, Shared metacognition, Online learning

Paper type Research paper

Introduction

New global trends towards more online and self-directed learning coincided with the COVID-19 epidemic and the rapid shift to remote learning (Chaturvedi *et al.*, 2021; Chiroma *et al.*, 2021; Greenhow *et al.*, 2022). It is now vital for teachers to establish an effective online presence to enhance interaction and collaboration for online learning (Murtafi'ah and Pradita, 2024) in higher educational institutions. The community of inquiry (CoI) framework developed by Garrison *et al.* (2000) consists of three presences – teaching, cognitive and social presence – required for effective collaborative online learning. The framework has been widely established to enhance critical thinking, participation and engagement in online learning



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(Nasir and Ngah, 2022). However, students still experience challenges with online engagement, regulation, self-directed learning and a lack of interaction and motivation (Ilduganova *et al.*, 2021; Nasir and Ngah, 2022), resulting in increased dropout rates (Figueroa-Canas and Sancho-Vinuesa, 2020; Khalid and Quick, 2016; Narayanasamy and Elçi, 2020). The goal of this study is to ascertain whether self- and co-regulation influence the community of inquiry presences. A better understanding of this influence may help students improve their online engagement and participation to create a sense of community and belonging.

To reduce the challenges faced by online students, there is a need to improve their experience by applying helpful learning techniques, such as determining how students regulate their online learning practices (Pedrotti and Nistor, 2019). Chan (2012) and Panadero and Järvelä (2015) emphasise that, despite considerable developments in the computer-based online settings for self-regulated learning, research into co-regulated learning in collaborative inquiry is still in its infancy and requires further study. However, numerous studies have begun focussing on how metacognitive processes operate in the online group settings (Kilis and Yildirim, 2018; Koehler *et al.*, 2022; Sadaf *et al.*, 2022). A call for more research on the dynamics of shared metacognition (self- and co-regulation) on the three CoI presences has been issued to advance online collaborative learning environments (Garrison, 2022).

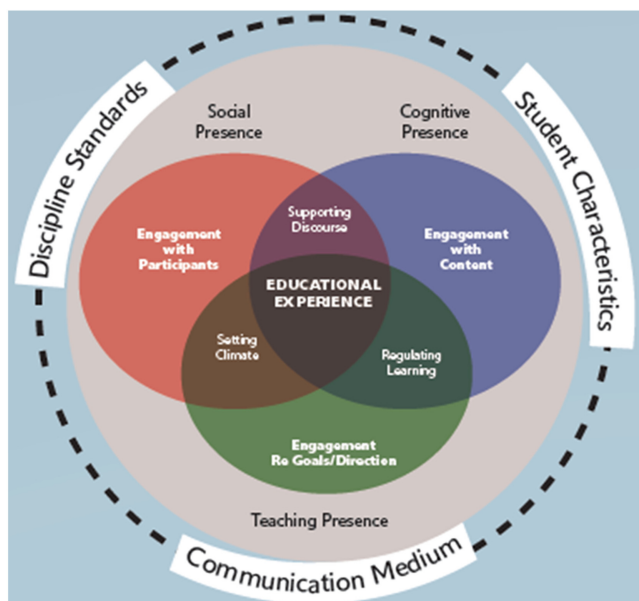
According to Garrison and Akyol (2015), the CoI framework provides the essential elements (teaching, cognitive and social presence) required for analysing and understanding shared metacognition in a learning community. Shea *et al.* (2013, 2022) underlined the significance of self- and co-regulatory processes within the CoI framework, calling for additional research to establish the relationship between the constructs. Researchers could use the shared metacognition questionnaire, as validated by Garrison and Akyol (2015), in conjunction with the established CoI survey (Arbaugh *et al.*, 2008; Huang and Lee, 2022; Mutezo and Maré, 2022; Stenbom, 2018) to further examine the constructs (Garrison, 2022). This study uses the shared metacognition constructs (self- and co-regulation) to determine their influence on the CoI framework for collaborative online learning in an Open Distance and e-Learning (ODEL) setting.

Literature review

One of the most well-known theoretical frameworks for online teaching and learning is the CoI framework (Garrison *et al.*, 2000), which is based on the constructivist theory (Castellanos-Reyes, 2020; Valverde-Berrococo *et al.*, 2020). A CoI provides the conditions for ongoing critical debate, metacognitive understanding and exchanging ideas (Cleveland-Innes and Garrison, 2021; Garrison, 2017). Online students' educational experiences are enhanced when they connect with the teacher, the course material and peers, creating a sense of belonging and reducing online isolation (Luo *et al.*, 2017). Since all three presences are interconnected within the CoI framework, as shown in Figure 1, these elements must be appropriately implemented into an online course.

Figure 1 shows the multidimensional elements of the CoI framework. Planning, facilitating and directing cognitive and social processes to actualise personally meaningful and educationally beneficial learning outcomes is known as teaching presence (TP) (Anderson *et al.*, 2001). The level of a student's ability to develop and validate meaning through ongoing reflection and conversation in a CoI is known as cognitive presence (CP) (Garrison, 2017). The ability to identify with a community or a group, engage in meaningful discourse in a secure environment and eventually establish relationships through projecting one's personality is known as social presence (SP) (Garrison, 2017).

Numerous studies have been conducted on the expansion of the CoI framework in the years since its creation (Anderson, 2016; Castellanos-Reyes, 2020; Dempsey and Zhang, 2019; Hayes *et al.*, 2015; Kilis and Yildirim, 2018; Lam, 2015; Shea *et al.*, 2022; Shea and Bidjerano,



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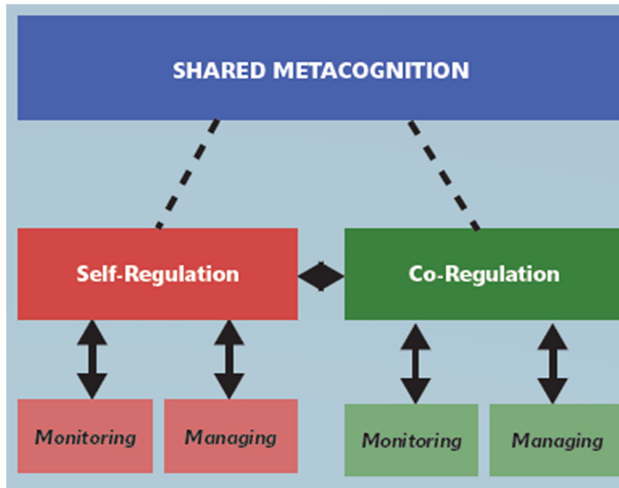
Source(s): Garrison (2017, p. 25)

Figure 1.
The community of
inquiry framework

2010, 2012; Sun and Chen, 2016; Thomas *et al.*, 2017). However, these authors have not come to a consensus on what constructs to include, for example, learning, agency and instructor, social, regulatory and autonomy presence. Zimmerman (2013) asserts that there is still a gap in the knowledge of self-regulation in computer-based online learning. Chan (2012) concurs and indicates that future research should consider the nature of regulation in the online collaborative learning settings, especially co-regulation. Studies by Shea *et al.* (2013, 2022), emphasised the need to include learning presence within the CoI framework because it lacks self- and co-regulation (shared metacognition). This led Garrison and Akyol (2015) to research the CoI and the dynamics of shared metacognition within the framework.

The understanding of one's cognition that it can be utilised to direct and guide mental processes is known as metacognitive knowledge (Pritchard, 2017), and a collaborative inquiry requires creating meaning and knowledge for oneself and other peer students (Garrison and Akyol, 2015). According to Garrison (2022), shared metacognition (self- and co-regulation) sits at the intersection of teaching and cognitive presence and is interdependent, as depicted in Figure 2.

Figure 2 illustrates the self- and co-regulation constructs, which are focused on managing (strategic action) and monitoring (awareness) during the online collaborative learning process (Garrison and Akyol, 2015). How actively a student engages in their learning processes on a metacognitive, motivational and behavioural levels is called self-regulation (SR) (Zimmerman, 1989). According to Zimmerman and Campillo (2003), there are three



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Source(s): (Garrison, 2022, p. 9)

Figure 2.
Shared metacognition
in a community of
inquiry

cyclical stages of self-regulation a student goes through, namely performance (self-control and self-observation), self-reflection (self-judgement and self-reaction) and forethought (task analysis and self-motivation beliefs), while the regulation that emerges when students work together with their peers is known as co-regulation (CR) (Hadwin *et al.*, 2017). Collaboration expands metacognition by considering self- and co-regulatory behaviours (Garrison, 2016).

Self-regulated learning in a CoI should be linked with a co-regulative function because it is a personal and social responsibility for a collaborative inquiry to be monitored and managed effectively (Garrison, 2022). Students are encouraged to take ownership of their learning by, for example, fostering conversation and working together to clarify misunderstandings in the learning community (Garrison and Akyol, 2015). According to Vaughan and Wah (2020), helping students build their ability for shared metacognition requires fostering a feeling of community and collaboration.

Relationship between the shared metacognition and community of inquiry constructs

Over the years, numerous researchers have examined various connections between the presences and metacognitive constructs. For instance, Lajoie *et al.* (2015) focused on metacognition, CR and SP in an online collaborative setting. They discovered a close relationship between co-regulatory behaviours that promote metacognition and a close correlation between metacognitive activities and SP. Kilis and Yildirim's (2018) research revealed that self-regulation, metacognition and motivation all had a role in predicting the CoI and its three presences. Doo and Bonk (2020) found that SR affected SP in an online course. Binali *et al.* (2021) concluded that highly engaged students are more likely to apply self- and co-regulatory strategies in online learning.

Jansson *et al.* (2021) concentrated on TP, CP and SP as well as the degree to which students supported their and other students' inquiry processes. They discovered that students thought their TP was the most significant, and they may have developed metacognition

through SR and CR. [Sadaf et al. \(2022\)](#) showed that CR had the highest association with SP, and CP had a significant relationship with CR and SR. Moreover, CR and SR also correlated significantly, while there was no significant association between shared metacognition and the three presences. Their study also showed that students with higher perceived SP had a tendency towards higher shared metacognition. A recent study by [Zheng et al. \(2023\)](#) found that students' SR is shaped by their social interactions and regulation with others. The findings indicated that a student's CR can significantly predict SR in an online collaborative setting. From our cognisance, there seems to be a paucity of research exploring the influence of SR and CR on the CoI presences in an ODeL higher education institution in a developing country setting such as South Africa.

Aim of the study and research question

This study aims to determine the influence of self- and co-regulation on the CoI presences for collaborative online learning. The study was guided by the following research question: How does the shared metacognitive constructs (SR and CR) influence the CoI elements (TP, CP and SP)? The study thus, proposes the following conceptual framework (refer to [Figure 3](#)), which will determine the influence of the independent variables on the dependent variables.

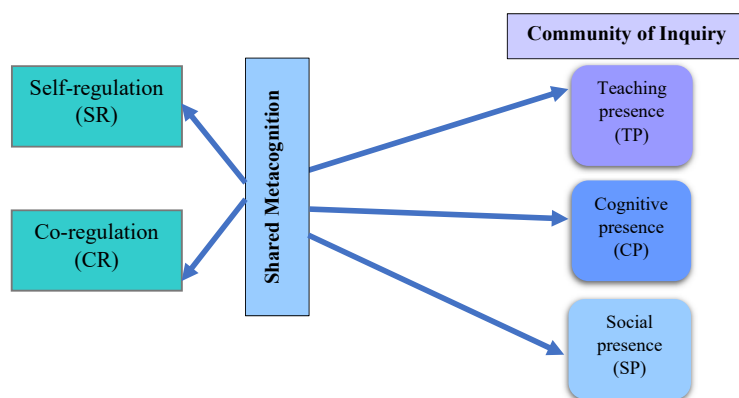
[Figure 3](#) illustrates that self-regulation and co-regulation (shared metacognition) are independent variables (IV), while teaching, cognitive and social presence (CoI) are dependent variables (DV). The arrows in [Figure 3](#) propose the following: (1) SR and CR directly relate to TP, CP and SP and (2) SR and CR influence TP, CP and SP. To address the research question, the following hypotheses were formulated:

- H0.* Self- and co-regulation have no influence on CoI (teaching, cognitive and social) presences.
- H1.* Self- and co-regulation have an influence on CoI (teaching, cognitive and social) presences.

Contextualisation of the study and methodology

Context

The current study sought to explore the influence of SR and CR on the CoI presences manifested among postgraduate honours students at the University of South Africa (Unisa)



Source(s): Authors' own compilation

Figure 3. A conceptual model proposing the influence of the constructs

studying fully online in an ODeL environment. With a history spanning 150 years, Unisa is the first and largest ODeL institution in South Africa and the continent of Africa (Kgabo, 2021; Mudau and Modise, 2022), with approximately 350,000 students studying online (Unisa, 2020, 2021). ODeL enables higher education institutions to bridge the gap between students, teachers and module content through flexible online learning opportunities (Magano, 2022; Sevnarayan, 2023).

In 2020, Unisa was compelled to transition to a fully online mode of education due to the COVID-19 pandemic (Magano, 2022; Unisa, 2020). It had to invest in modern technology to enhance students' online learning experiences on the *myUnisa* learning management system (LMS), which enables both asynchronous and synchronous online interaction and communication to reduce the feeling of isolation and dropout rates of students (Magano, 2022; Sevnarayan, 2023; Unisa, 2020, 2021). The COVID-19 pandemic made it even more crucial for students to actively participate and collaborate online (co-regulation) and assume ownership of their learning (self-regulation).

Design and participants

This study followed a positivist paradigm using a quantitative research approach. The study population consisted of 9,064 registered postgraduate students studying fully online from the College of Economic and Management Sciences (CEMS) and College of Science, Engineering and Technology (CSET) during the 2021 academic year at Unisa. A convenience sample of ($N = 626$) enrolled postgraduate students responded to the survey, which was determined to be adequate for further analysis based on the sample size formula (Fowler, 2009; Goodcalculators, 2015). The sample comprised 57.7% of females and 42.3% of males, with 37% in their early adult years (18–34 years), 62.2% in their mid-adult years (35–59 years) and only 0.8% in their late-adult years (60+ years). Of them, 84.3% were residents in an urban area and 90.3% had internet access. Furthermore, 81.8% were postgraduate students from CEMS and 18.2% were from CSET.

Data collection

The study used the CoI questionnaire (Arbaugh *et al.*, 2008) and the shared metacognition (MC) survey (Garrison and Akyol, 2015) as research instruments to collect data via an online survey. The survey items for both scales were scored on a five-point Likert-type response format ranging from 1 = “strongly disagree” to 5 = “strongly agree”. Data collection took place during the 2021 academic year.

The CoI questionnaire consists of a 34-item scale (Arbaugh *et al.*, 2008; Swan *et al.*, 2008). The scale measures three domains: teaching presence (13 items, e.g. “*The lecturer helps to keep student participants engaged and participating in productive dialogue*”); cognitive presence (12 items, e.g. “*Online discussions are valuable in helping you to appreciate different perspectives*”) and social presence (nine items, e.g. “*Getting to know other student participants gives you a sense of belonging in the module*”). Stronger scores reflect higher student perceptions of TP, CP and SP. Cronbach's alpha for the CoI instrument was reported by Garrison *et al.* (2010) to range from 0.87 to 0.93 and 0.88 to 0.97 for Sadaf *et al.*'s (2022) study. Cronbach's alpha values, which depict the internal consistency of each item and the scale's reliability, ranged from 0.92 to 0.96 for scores from the CoI in the current study.

The MC questionnaire comprises a 26-item scale (Garrison and Akyol, 2015). The scale measures two domains: self-regulation (13 items, e.g. “*You make judgments about the difficulty of a problem.*”) and co-regulation (13 items, e.g. “*You reflect upon the comments of other students*”). Stronger scores reflect higher student perceptions of SR and CR. Kilis and Yildirim's (2018) study showed a Cronbach's alpha coefficient ranging from 0.93 to 0.97, while Sadaf *et al.* (2022) had a range of 0.91–0.92 for the shared MC instrument. For scores from the

shared MC instrument in the current study, Cronbach's alpha values varied from 0.93 to 0.94, demonstrating each item's internal consistency and the scale's reliability.

Ethical considerations

The Research Ethics Committee of CEMS and the Permissions Research Ethics Committee at the University of South Africa (Unisa) approved the study (2021 CRERC 043 (SD)). Following an explanation of the study's objectives and voluntary and confidential nature, the participants consented to participate. The survey was conducted online at the convenience of the respondents.

Data analysis

The Statistical Package for Social Sciences (SPSS) Version 29 for Windows program was used to analyse the data. Descriptive statistics were calculated to determine the mean, standard deviations and Cronbach's alpha (Saunders *et al.*, 2019). Pearson product-moment correlation analysis was used to determine the association between SR and CR and the CoI (TP, CP and SP) (Adams and Lawrence, 2019). For the correlation analysis, the researchers chose the statistical significance cut-off value at $p \leq 0.05$ (95% confidence level) and the practical effect size of $r \geq 0.10 \geq r \leq 0.29$ (small effect), $r \geq 0.30 \geq r \leq 0.49$ (medium effect) and $r \geq 0.50$ (large effect).

Multiple regression analyses were performed to determine the influence of SR and CR on the CoI presences (TP, CP and SP). Prior to computing the regression analysis, a preliminary test was conducted to guarantee no multicollinearity violation in the study's dataset. The tolerance value was 0.89 and the variance inflation factor (VIF) was 1.12 for SR and CR. To measure the goodness of fit for the models, the F ratio ($F > 1, p \leq 0.001$) was used (Keith, 2019). To counter the probability of Type 1 errors, the statistical significance value was set at the 95% confidence interval level ($p \leq 0.05$) (Adams and Lawrence, 2019; Hair *et al.*, 2019).

Results

Descriptive statistics: mean, standard deviation, correlations analysis and Cronbach's alpha coefficients

Table 1 shows that the mean scores ranged from $M = 3.35$ to $M = 4.15$. The sample of participants obtained the highest mean score for SR ($M = 4.15, SD = 0.48$) and CR also had a relatively high mean score ($M = 3.62, SD = 0.68$). In terms of the CoI variables, SP obtained the highest mean score ($M = 3.98, SD = 0.49$), followed by CP ($M = 3.81, SD = 0.65$) and TP with the lowest mean score ($M = 3.35, SD = 0.89$). The level of perceived SR was the lowest, with a standard deviation of 0.48, while TP was found to have the highest variance with 0.89. It was determined that the shared MC and CoI questionnaires had acceptable reliability based on the Cronbach's alpha coefficients ranging from 0.92 to 0.96, as shown in Table 1.

Variables	Items	Mean	Standard deviations (SD)	Cronbach's alpha coefficients α
SR	13	4.15	0.48	0.93
CR	13	3.62	0.68	0.94
TP	13	3.35	0.89	0.96
CP	12	3.81	0.65	0.94
SP	9	3.98	0.49	0.92

Source(s): Authors' own compilation

Table 1.
Descriptive statistics: mean, standard deviations and Cronbach's alpha coefficients (N = 626)

Correlations

Table 2 demonstrates that the shared MC variables, SR correlated positively with CR ($r = 0.33$; medium effect size; $p \leq 0.01$). In terms of the CoI variables, TP and CP had a highly positive correlation ($r = 0.68$; large effect size; $p \leq 0.001$), followed by CP and SP ($r = 0.51$; large effect size; $p \leq 0.001$) and then TP and SP ($r = 0.47$; medium effect size; $p \leq 0.01$). The findings further illustrated a positive correlation between SR and TP ($r = 0.31$; medium effect size; $p \leq 0.01$), SR and CP ($r = 0.48$; medium effect size; $p \leq 0.01$) and SR and SP ($r = 0.34$; medium effect size; $p \leq 0.01$). Finally, a positive correlation was observed between CR and TP ($r = 0.22$; small effect size; $p \leq 0.05$), CR and CP ($r = 0.29$; small effect size; $p \leq 0.05$) and CR and SP ($r = 0.57$; large effect size; $p \leq 0.001$).

Multiple regression analysis

Table 3 indicates the results of the multiple regression analyses conducted to determine the influence of SR and CR on TP, CP and SP.

Table 3 illustrates the three regression models used in the study: Model 1 for TP, Model 2 for CP and Model 3 for SP. In Model 1, TP and the independent variables (SR and CR) showed a statistically significant regression model ($F = 38.06$; $p < 0.001$). SR ($\beta = 0.26$; $p = 0.000$) and CR ($\beta = 0.06$; $p = 0.000$) acted as significant positive predictors of TP, with SR contributing the most towards explaining the variation in the shared metacognitive items. SR and CR influence TP. Therefore, H1: Self- and co-regulation influence teaching presence, is supported by this study.

In Model 2, CP and the independent variables (SR and CR) indicated a statistically significant regression model ($F = 102.22$; $p < 0.001$). SR ($\beta = 0.43$; $p = 0.000$) and CR ($\beta = 0.14$; $p = 0.000$) acted as significant positive predictors of CP, with SR contributing the most towards explaining the variation in the shared metacognitive items. Thus, H1: Self- and co-regulation influence cognitive presence, is supported by this study.

In Model 3, SP and the independent variables (SR and CR) showed a highly statistically significant regression model ($F = 171.76$; $p < 0.001$). SR ($\beta = 0.17$; $p = 0.000$) and CR ($\beta = 0.52$; $p = 0.000$) acted as significant positive predictors of SP. CR contributed the most towards explaining the variation across the shared metacognitive items. This study supports H1: Self- and co-regulation influence social presence.

All the three models were statistically significant ($p \leq 0.001$). Model 1 accounted for 11% ($\Delta R^2 = 0.11$, small effect), Model 2 25% ($\Delta R^2 = 0.25$, small effect) and Model 3 35% ($\Delta R^2 = 0.35$, medium effect) of the variation in the SR and CR variables. The results of the adjusted R squares showed that all the three models were suitable for this study; however, Model 3 had the most exploratory power.

Table 2.
Correlations between
the CoI and shared
metacognition
questionnaires
(N = 626)

Variables	SR	CR	TP	CP	SP
SR	1	0.33**	0.31**	0.48**	0.34**
CR	-	1	0.22*	0.29*	0.57**
TP	-	-	1	0.68***	0.47**
CP	-	-	-	1	0.51***
SP	-	-	-	-	1

Note(s): *, $p \leq 0.05$ ($r \geq 0.22 \geq r \leq 0.29$ [small effect]); **, $p \leq 0.01$ ($r \geq 0.30 \geq r \leq 0.49$ [medium effect]) and ***, $p \leq 0.001$ ($r \geq 0.50$ [large effect])
Source(s): Authors' own compilation

Variables	Model 1			Model 2			Model 3											
	<i>B</i>	β	TP <i>p</i>	<i>F</i> ratio	<i>df</i> 1	<i>df</i> 2	<i>B</i>	β	CP <i>p</i>	<i>F</i> ratio	<i>df</i> 1	<i>df</i> 2	<i>B</i>	β	SP <i>p</i>	<i>F</i> ratio	<i>df</i> 1	<i>df</i> 2
Constant	10.42	-	0.014	38.06***	2	623	11.04	-	0.000	102.22***	2	623	5.29	-	0.005	171.76***	2	623
SR	0.51	0.26	0.000	-	-	-	0.53	0.43	0.000	-	-	-	0.18	0.17	0.000	-	-	-
CR	0.19	0.06	0.001	-	-	-	0.13	0.14	0.000	-	-	-	0.38	0.52	0.000	-	-	-
<i>R</i>			0.33						0.50						0.60			
ΔR^2			0.11						0.25						0.35			

Note(s): *B*, unstandardised coefficient; β , standardised coefficient; *df*, degrees of freedom; *R*, multiple correlation coefficient and ΔR^2 , adjusted *R*-squared and *F* ratio, $p < 0.01^*$, $p < 0.05^{**}$ and $p \leq 0.001^{***}$

Source(s): Authors' own compilation

Table 3.
Multiple regression
analysis: shared MC
scale as a predictor of
the CoI scale (N = 626)

Discussion

Based on the formulated hypotheses, this study aimed to determine the influence of self- and co-regulation on the CoI presences for collaborative online learning in the ODeL context. Our results show that SR and CR related positively with CoI (TP, CP and SP) and also, SR and CR influenced TP, CP and SP. The correlation and regression results will be discussed.

The correlation results (Table 2) indicated that TP, CP and SP related significantly and positively to SR and CR, which aligns with Zheng *et al.*'s (2023) study. The correlation results regarding the three CoI presences revealed a very high significant association with TP and CP, followed by CP and SP and lastly, SP and TP. The results showed that students perceive all three CoI presences as necessary in the online learning setting. The results are supported by the findings of Akyol and Garrison (2008), Mutezo and Maré (2022), Shea and Bidjerano (2010) and Zheng *et al.* (2023), who also found significant associations between the three presences. Huang and Lee's (2022) study echoed this study's findings with the most significant coefficient between TP and CP.

The positive association between SR and CR suggests that students who perform well on SR also perform well on CR and vice versa. These findings are consistent with those of previous studies by Sadaf *et al.* (2022) and Zheng *et al.* (2023), indicating that shared metacognition should include both SR and CR. Furthermore, the correlation results revealed that SR and CP were highly significant and positively related, followed by SP and TP. This result indicates that most students perceived self-regulation with cognitive presence, as confirmed by Sadaf *et al.* (2022). Accordingly, greater SR is mostly correlated with CP, suggesting that cognitive presence fosters students' self-regulatory growth, as Kucuk and Richardson's (2019) study suggested. Therefore, it can be concluded that students with better self-regulation are more cognitively active when learning online in a collaborative setting. A student's capacity for self-reflection, understanding and problem-solving is enhanced when they have high cognitive presence, which encourages them to evaluate their comprehension and knowledge of the material, enhancing their capacity for self-regulation.

The correlation results indicate that CR had a weak association with CP and TP; however, a highly positive correlation was observed between CR and SP. This suggests that students mostly perceive co-regulation with social presence by interacting and collaborating with other students online. According to a 2015 study by Lajoie *et al.*, students have more opportunities to develop their social presence and sense of community and belonging through collaboration and co-regulatory activities.

The multiple regression results (Table 3) show that the shared metacognitive variables influence the three CoI presences. SR had the highest influence on TP and CP while CR had the highest influence on SP. Students' self-regulatory processes influence how they perceive teaching and cognitive presence, while their co-regulatory activities influence online social presence. The results suggest that encouraging student self- and co-regulation may enhance their online teaching, cognitive and social presence, which, in turn, will lead them to be more engaged online. Individual participation in the learning process is a skill that students must acquire (SR). They need to be conscious of their degree of motivation, effort, knowledge and learning in the module. Self-regulation should assist students in engaging more effectively online with the teacher (TP) and the module content (CP). For students to continue participating in the module there must be a sense of trust, community and belonging (SP), which will lead them to challenge other students' perspectives and help them learn from peers (CR).

According to research by Vaughan and Wah (2020), using the CoI framework and shared metacognition empowers students to take ownership of their learning and collectively confirm their understanding through discussion and debate with their peers online. It can be concluded that students who participate in online discussions, communicate with other students, work together and disagree with them tend to feel the need for co-regulatory

activities, which shows that they consider the opinions and criticisms of their peers and question their viewpoints.

Limitations and future studies

The study used a convenience sampling technique from a single university to conduct research, and the results could not be generalised to the other online learning settings. This study only examined the relationship between and the influence of the shared metacognitive constructs on the CoI using correlation and multiple regression analysis. Future research could include studies using the confirmatory factor analysis and structural equation modelling. Research on the functioning of metacognitive processes in the online group contexts is also necessary. Additional research is needed to understand how students perceive self- and co-regulation within the CoI framework and how they regulate their online learning within the different teaching strategies and demographical and social settings.

Implications

The findings of this research add value to the body of knowledge about the relationship between teaching, social and cognitive presence as well as self- and co-regulation within the CoI framework. Furthermore, there has also been limited research focussing on the dynamics of shared metacognition within the CoI framework in the ODeL context. The results will assist higher educational institutions, teachers and module designers in understanding the importance of shared metacognition within the CoI framework and enable them to apply it to their online teaching strategies.

Conclusion

The study's results indicated the shared metacognitive (SR and CR) constructs related to the three CoI presences. SR and CR contributed to explaining SP, CP and TP. It also showed that students who associate CR with working together and collaborating with peers were likely to perceive SP as the most significant. Students need to be reminded by their teachers how crucial it is to enhance their co-regulatory processes. Students collaborate to solve challenges and co-create common knowledge through co-regulation. They ought to be able to work together, analyse the opinions of their peers critically and defend their beliefs.

In addition, the results revealed that SR and CR influence the CoI presences. SR had the highest influence on TP and CP, while CR influenced SP. The significance of students being able to self-regulate their learning should be emphasised by teachers. Students should learn to organise their study environment, manage their time and cognitive processes, foster relationships with teachers and peers and navigate online learning platforms. Teachers who encourage and create awareness of student metacognition may enhance their online teaching, cognitive and social presence when studying online. It also enables teachers to provide a more collaborative and interactive online learning environment and promote productive online communities.

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