



Investigation of community of inquiry framework in regard to self-regulation, metacognition and motivation[☆]

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ABSTRACT

Following theoretical frameworks including social-cognitive theory, constructivism and creating collaborative learning community, this correlational study elucidates the community of inquiry framework in regard to self-regulation, metacognition, and motivation in an online learning setting. Data were collected from 1535 students enrolled to an online *Information and Communication Technology-I* course offered by the Department of Informatics at a well-known public university. The data were collected online through Survey Monkey and then analyzed with descriptive and inferential statistics using multiple linear regression analysis through SPSS version 23 statistical software. The findings notably revealed that self-regulation, metacognition, and motivation significantly contributed to the prediction of community of inquiry and its three presence types. The findings highlighted the importance of self-regulation for overall community of inquiry and its three presence types due to its significantly valuable contribution. This study resulted in a new tentative model, adding a new construct of *regulatory presence*, addressing learners' self-regulation. Further research could concentrate on this new tentative model in addition to the new construct.

1. Introduction

The prevalence of open and distributed learning has led to the emergence of new pedagogies, strategies and methods in order to increase its effectiveness and quality. A more recent and crucial theoretical framework in any kind of open and distributed learning setting is community of inquiry (CoI). Its initial point is creating a community which is so important that it creates the social fabric of learning and learning includes a matter of belonging and intellectual process. A strong community enhances the interactions and relationships based on mutual respect and trust, increment a willingness to share, and encourages collaboration, etc. (Wenger, McDermott, & Snyder, 2002).

Community of Inquiry framework was developed by Garrison, Anderson, and Archer in 2000. It explains an effective educational experience with the intersection of three constructs within a learning community: *social presence* (SP), *cognitive presence* (CP), and *teaching presence* (TP). Its name was borrowed from Lipman (1991) on work based on John Dewey's progressive understanding of education. Dewey (1933) stated that inquiry is a social activity and goes to the essence of an educational experience. It emerged in the specific context of computer conferencing in higher education and capitalizes on the ease and abundance of interaction with media such as computer conferencing (Rourke, Anderson, Garrison, & Archer, 2007). It was first used specifically in online discussion platforms; however, with the development of synchronous and asynchronous technologies, it has started to be used in online, blended

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and three-dimensional (3D) virtual learning environments (Bulu, 2012; Garrison, Anderson, & Archer, 2010). The underpinning of this framework is that effective learning occurs within a community and the interaction of three core elements to facilitate higher learning.

The first construct, *social presence* (SP), is defined by Garrison, Anderson, and Archer (2000) as the ability of learners to project themselves socially and emotionally in a CoI. It functions so as to support the cognitive and affective objectives of learning. The second construct, *cognitive presence* (CP), is defined as “the extent to which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication” (Garrison et al., 2000, p. 89). The third construct, *teaching presence* (TP), includes designing and managing learning sequences, providing subject-matter expertise, and facilitating active learning. From the literature, the most common finding is that the three constructs are interrelated and that they positively affect each other (Akyol, 2009; Polat, 2013). TP encompasses the basis to create an online community of inquiry. Teaching presence is paramount to support social presence, which in turn fosters cognitive presence (Archibald, 2010; Garrison, Cleveland-Innes, & Fung, 2010; Shea & Bidjerano, 2009). In order to transition from social presence to cognitive presence, teaching presence must be available from either the facilitator or other students (Tran, 2011). It is the most known element in the CoI model. Social presence has a significant effect on cognitive presence (Kozan & Richardson, 2014; Polat, 2013; Rourke et al., 2007) and can be improved with encouraging cognitive presence through social interaction. However, cognitive presence is the most challenging to study but is the least known element of the framework (Akyol, 2009). The maximum explained variance of cognitive presence by social presence and teaching presence together with some other factors from earlier studies was 69% (Archibald, 2010; Shea & Bidjerano, 2009), which shows there are still unknown elements.

Critics of the community of inquiry model, based on recent studies findings, have concluded that only some elements of the components can be explained in the model, that the remaining parts are still unknown and unidentified in these three presences, especially in cognitive presence, and some make recommendations to update and refine the model. Moreover, self-regulation, which is a crucial factor for success in online learning, even in traditional learning, has been discussed on the basis of the community of inquiry framework, and with some controversy. Some authors suggested adding a fourth construct, *learning presence* (LP), to the model; claiming lack of self-regulation in the community of inquiry model requires its existence (Shea et al., 2012). Similarly, Lam (2015) suggested a new construct, *autonomy presence* (AP), as the drive to inquiry leading to sharing and discussion initiated by learners. Learners directed their own learning and shared the ideas in the discourse without teaching instruction or facilitation and Lam linked it with learning autonomy. Lam highlighted intrinsic motivation, interpretation with the formulation of ideas and inspiring discourse by sharing the ideas, similar to Shea et al.’s (2012) claim. After discussing the proposed components and arguments, Anderson (2016) suggests that:

In the search for the ‘missing’ element(s) in the CoI model is to add agency presence to the CoI trinity. This term is simpler than autonomous, builds on the seminal work of Bandura and captures the components mentioned by both Shea and Lam (p. 1).

Bandura (1989) stated that “in analyzing the operation of human agency in this interactional causal structure, social cognitive theory accords a central role to cognitive, vicarious, self-reflective, and self-regulatory processes” (p. 1175). With all sub-factors, self-regulation should be investigated in-depth. Metacognition has been started to be discussed on this basis; however, there is no evidence and only its existence was proven. Regarding motivation, it has not been studied on this basis; with only its relation studied superficially. Its effect and contribution to the three-construct of community of inquiry has not yet been studied. In light of these issues, and in order to address the literature gap, this current study aims to examine all three elements of the community of inquiry framework. Specifically, the study will investigate students’ perceptions toward community of inquiry and its three presence types (*social*, *cognitive*, and *teaching*) in the online course context for an in-depth understanding, as well as to reveal the associations and contributions of self-regulation, metacognition, and motivation. With regard to the community of inquiry framework, its components and aforementioned variables, there is now a growing body of literature, which is described in the following section.

2. Literature review

There is a growing prevalence in the literature on the issue of community of inquiry framework. This part first presents a review of the literature with regard to the three presences of the CoI framework and then, the recommended tentative versions of the CoI framework are provided.

2.1. Social presence

Earlier studies contended that in order to establish a community of inquiry, social presence was essential (Garrison et al., 2000) since it impacts learning due to social interaction (Richardson & Swan, 2003; Swan & Shih, 2005; Tu & McIsaac, 2002). Akyol (2009) maintained that social presence predicts the perceptions of cognitive presence. Social presence can be developed in online learning settings with the help of different mediums and improved course design. Akyol also found it was enhanced by using collaborative activities, more discussion, and final projects and by creating a comfortable and easy social climate. Similarly, Rourke et al.’s (2007) study showed social presence supporting cognitive presence through its ability to instigate, sustain, and support critical thinking in a community of online learners. Social presence can be enhanced via encouraging cognitive presence through social interaction. Also, efforts to facilitate cognitive presence also somewhat increment social presence. Overall, the most common results from studies is that social presence significantly and positively contributes to cognitive presence and is therefore important to cognitive presence (Garrison, Cleveland-Innes, et al., 2010; Ke, 2010; Shea & Bidjerano, 2009). Being central to CoI, social presence requires more

attention to establish and be maintained in the nature of online learning communities (Garrison & Arbaugh, 2007). A recent study conducted by Gordon (2016) sought for social presence in an undergraduate writing course by trying to utilize Facebook, one of the social networking services. She facilitated learners' social presence with the features offered by Facebook for enhanced communication. Similarly, another recent study concluded that there was a higher level of improvement of learners' social presence due to the features of Facebook (Keles, 2018). The recent studies highlights using new ways to improve social presence such as using Skype or Google + rather than traditional online forums and chats (Moke & Wright, 2017; Padilla & Kreider, 2018; Tang & Hew, 2017). Another issue is the argument of Armellini and De Stefani (2016), in that the nature of social presence has changed based on 21st century learning, and it has become more prominent. As a result, further research on social presence is still required by focusing on more characteristics.

2.2. Cognitive presence

Notable, cognitive presence is the most challenging to study (Akyol, 2009) and develop in online courses among the three components of community of inquiry framework, since it's a practical inquiry cycle in which learners move deliberately from understanding the problem/issue to exploration, integration and application (Garrison & Arbaugh, 2007), and students face difficulty arriving at the resolution phase (Garrison, Anderson, & Archer, 2001; McKlin, Harmon, Evans, & Jones, 2002; Vaughan & Garrison, 2005). Meyer (2003) suggested that instructors should be more directive in assignments since integration and resolution require more time for reflection. Celentin (2007) contended that learners cannot reach the resolution phase due to the instructors' role; mirroring the results of other studies (Garrison et al., 2001; Luebeck & Bice, 2005). The other reason claimed by Archibald (2010) is that much of the discussion demonstrated exploration and integration; however, few were considered resolution level. Archibald also suggested that students can achieve resolution with a project, paper or research proposal, concluding that time is crucial to reach resolution since it requires both the development of critical thinking and the application of an idea or solution. Archer (2010) also stated that term papers can be beneficial to achieving higher levels, and that prior online learning experience, an explanatory variable on cognitive presence, requires further research as still conflicting among researchers. A recent study focused on the effects of protocols within online discussion to develop more sense and concluded it had a significant positive effect on students' cognitive presence (Chen, deNoyelles, Patton, & Zydney, 2017). Cho, Kim, and Choi (2017) studied the effect of self-regulation in an online course, and indicated its significant positive influence on learners' sense of cognitive presence and called for further research. Distinctly, the findings of another latent study designed small group collaboration facilitated by mobile instant messaging showed a low level of students' cognitive presence (Qiao, Tang, & Hew, 2018). In summary, to facilitate students learning better cognitive presence in online learning environments still requires more attention.

2.3. Teaching presence

Teaching presence is the foundation of creating an online community of inquiry. It functions as the mediating and regulating element of CoI (Akyol, 2009) and therefore of great importance (Kozan & Richardson, 2014). It is paramount to support social presence, which in turn fosters cognitive presence (Archibald, 2010; Garrison, Cleveland-Innes, et al., 2010; Shea & Bidjerano, 2009). Also, it must be available, either from the facilitator or other students to transition from social to cognitive presence (Garrison & Cleveland-Innes, 2005; Tran, 2011). Additionally, it is a significant predictor for sense of community and learning outcomes (Garrison & Arbaugh, 2007). Archibald (2011) found that strong and statistically significant contributions of teaching presence explain cognitive presence; with similar results in other studies (e.g., Garrison & Cleveland-Innes, 2005; Garrison, Cleveland-Innes, et al., 2010; Shea & Bidjerano, 2009).

A recent study concluded that online group discussion provided with a protocol had balanced distribution of instructional design, facilitating discourse and direct instruction in comparison to non-protocol group and therefore increment teaching presence (Zydney, deNoyelles, and Seo (2012). A recent study supports these findings by indicating a significant improvement on students' teaching presence with protocol-based online discussions (Chen et al., 2017). Feng, Xie, and Liu (2017) concluded that through design and implementation of sufficient levels of scaffolds for online learners, they were able to enhance teaching presence. It can be inferred from the literature that understanding the influence of various factors on teaching presence and how it can be improved is a multifaceted issue that requires more attention.

2.4. Self-regulation

Self-regulation's importance was noted in terms of community of inquiry and its three elements. Shea and Bidjerano (2010) stated that self-regulation was an important mediator of the links among the three presence types. The trend in recent work is learning presence addressing learners' self-regulation. However, the claim was based on community of inquiry overall, rather than solely any of the three presence types. Shea and her colleagues have continued to study on this issue, and they highlighted the importance of self-regulatory and co-regulatory processes and skills in the CoI framework (Shea et al., 2014). In an online course of 180 participating college students, Cho et al. (2017) focused on the effect of self-regulation on the CoI framework. They concluded that higher self-regulated learners are likely to perceive a higher sense of the CoI and also higher social presence, cognitive presence, and teaching presence. They also recommended further research on this issue with larger samples and/or challenging tasks. The current study is therefore considered by the researchers to be paramount to the literature by discovering the effect of self-regulation on the CoI framework and its three presences with a significantly large-sized sample.

2.5. Metacognition

Within online and/or virtual learning environments, one major challenge faced by educators is the creation of a critical community of inquiry. Such a community requires experience and knowledge through critical analysis, questioning, challenging and being reflective (Dewey, 1993; Lipman, 1991). On this point, CoI framework is extremely valuable for higher-order learning, reflective discourse and for critical thinking skills.

Metacognition encompasses both the process, as in - the acquisition of deep and meaningful understanding, content-specific critical inquiry abilities, skills, and dispositions- and an outcome-, as in -educational activities including complex and (only indirectly) accessible cognitive processes (Ennis, 1985; Garrison et al., 2001). Therefore, enhancing the critical thinking skills of students leads to difficulties for educators, especially within an online learning setting. A CoI framework grounded in critical-thinking (Garrison et al., 2000) may augment and enhanced enhancing critical thinking skills.

Critical thinking and inquiry is attributed to the awareness and ability of learners taking responsibility and control for constructing meaning and confirming knowledge. This awareness and ability has been labeled as metacognition by the developers of the CoI framework (Akyol & Garrison, 2011). It is now time to disseminate and realize its educational potential, especially for the online learning setting. Metacognition is found at the intersection of the cognitive and teaching presence elements (Garrison & Akyol, 2015). Although there are some claims that metacognition or self-regulation are not included in the model itself, it is proposed that metacognition can be found by moving beyond self-regulation and co-regulation that are already inherent in the structure of the model (Garrison & Akyol, 2015).

More recently, research has commenced on metacognition in the sense of community of inquiry. Akyol and Garrison (2011) declared that critical thinking and inquiry are attributed to the awareness and ability of learners to take responsibility, and thereby control, in order to construct meaning and to confirm knowledge, which is known as metacognition, at the intersection of the cognitive and teaching presence elements. However, there are some opponents to this idea who argue the absence of metacognition or self-regulation in the model itself. However, Garrison as a pioneer of the model, together with Akyol (2009) advocated to that metacognition can be found in the CoI model by moving beyond self-regulation and co-regulation which are already inherent in the structure of the model. They elaborated the categories of metacognition and developed a questionnaire in order to examine metacognition better within the e-learning community after concentrating on the intersection of CP and TP. Snyder and Dringus (2014) focused on the exploration of metacognition in asynchronous student-led discussions based on defined categories Garrison and Akyol (2015) defined. Snyder and Dringus (2014) concluded with the result that the metacognition survey was useful in exploring and examining deep instances of metacognition. However, they did not apply the metacognition questionnaire purely a qualitative research, and also suggested further elaboration on metacognition similar to Akyol and Garrison (2011), suggesting to focus more on the intersection of the three presences so as to comprehend the dynamics of metacognition in CoI model.

Thus, how metacognition contributes to the prediction of community of inquiry and its three elements remains unknown; hence the current study is seen as the first to consider the effect of metacognition.

2.6. Motivation

With the increment in online enrollments, scholarly interest in motivation has also increased (Dabbagh & Kitsantas, 2004; Green & Azevedo, 2007). It has been investigated in depth within the nature of the online learning environment. However its effect on the CoI framework or on its three constructs has only been the subject of two studies. The first was conducted by Polat (2013) with 165 students, which concluded that no significant relation was found between motivation and the perceived scores of online students on the three presences. However, this somewhat surprising result may have resulted from the course design, context, or research design, etc. The second study was conducted by Kim in 2015. He did not investigate the effect of motivation on the CoI overall; instead choosing to separately examine the effect of motivation only on the three-presence of the CoI, and concluded that there was a positive significant correlation between motivation and each of the three presences. Therefore, there is no consensus between these two studies and it is clear that these two studies alone are inadequate to form a clear understanding of motivation's effect on the CoI framework and its three-presences. Based on this point, it is considered important to study the effect of motivation on the CoI framework and its three presences separately. Hence, further research should be required. At this point, the current study is worthy of note as it aim to investigate the effect of motivation both on the community of inquiry framework and its three-presences, on a significantly large-sized sample together with some other constructs.

2.7. Recommended versions of community of inquiry framework

Since its initial appearance, community of inquiry (CoI) framework has been incrementally discussed. Through ongoing research, some tentative versions have appeared along with the recommended; the most notably being the absence of learning presence (LP) in addressing learners' self-efficacy. Shea and Bidjerano (2010) added LP in a proposed new CoI framework version after examining the association between learner self-efficacy and ratings of their learning quality in virtual learning environments. They concluded with a strong positive correlation among CoI framework's three presence types and self-efficacy; further suggesting a new construct of learners' self-efficacy. In earlier studies, opponents of this idea claimed learner dimension was lacking in the model and should be added. Shea and Bidjerano continued their studies based on their initial argument and focused on their proposed version in a later study with other colleagues (Shea et al., 2014). They reconstituted their proposed version of community of inquiry framework addressing the gap of self- and co-regulatory processes; and concluding tentative representation by reflecting the unique

contributions of students and instructors embedding the social dimension as part of each presence: Social-Learning Presence (SLP), Social-Teaching Presence (STP) and Socio-Cognitive Presence (SCP).

The third recommended version belongs to [Cleveland-Innes and Campbell \(2012\)](#), who focused on emotions beyond the influence found in social presence. They called the new construct emotional experience, both in the combination with SP and also its clusters as a unique presence. They removed the personal-affective category in social presence and produced a new presence by extending it. They defined emotional presence as the “outward expression of emotion, affect, and feeling by individuals and among individuals in a community of inquiry, as they relate to and interact with the learning technology, course content, students, and the instructor” ([Cleveland-Innes & Campbell, 2012, p. 283](#)).

The fourth proposed version belongs to [Lam \(2015\)](#), who focused on the community of inquiry framework's components in a more complete way; concluding that learners experienced learning on some occasions with their intrinsic drive rather than any teaching presence. Learners directed their own learning and shared ideas in the discourse without teaching instruction or facilitation and Lam linked it with learning autonomy. [Lam \(2015\)](#) then proposed the addition of autonomy presence as the drive to inquiry leading to sharing and discussion initiated by learners.

Another study, conducted by [Armellini and De Stefani \(2016\)](#), focused on the three presence types and concluded SP is more prominent than TP and CP. They believed the three-core-element remains the same, yet their nature changes based on 21st century teaching and learning; e.g., integrating social networking sites (SNS) in teaching-learning process. They also claimed that teaching presence and cognitive presence should also become social.

The final attempt, by [Dunlap, Verma, and Johnson \(2016\)](#), combined CoI framework with Kolb's experiential learning cycle to guide online course designers and educators. They found the integration of prescriptive stages of Kolb's experiential learning cycle with CoI helped create productive, meaningful, and flexible learning experiences for prospective STEM teachers and their study proposed a new version framework; *Presence + Experience* (P + E). They claimed that course design structure proposed in the original framework may not always be suitable. Therefore, they sought a generic guideline in designing any course type and defined factors to be taken into consideration as context, content, learning objectives, and audience.

Overall, most studies place emphasis on the absence of self-efficacy or socialization. The current study discusses all recommended versions of CoI framework (see [Discussion & Conclusion](#)) in accordance with the study's findings. In light of the issues discussed in the literature, the current study focuses on self-regulation, metacognition, and motivation in order to gain a better understanding. Specifically, the current study aims to investigate students' perceptions of toward community of inquiry and its three elements of *social, cognitive, and teaching presence* in an online course context by examining the effect of their self-regulation, metacognition and motivation. This is based on discovering their associations with and contributions to their perceived levels of social presence, cognitive presence, and teaching presence in order to reveal how much these variables contribute to the explanation of overall community of inquiry, as well as its three elements separately. With this purpose, the research questions that guide this study are as follows;

1. What are the students' perceived levels of community of inquiry, social presence, cognitive presence, teaching presence, self-regulation, metacognition and motivation in the online course context?
2. To what degree do students' perceived levels of self-regulation, metacognition, and motivation levels in the online course context predict their perception of
 - (a) community of inquiry,
 - (b) social presence,
 - (c) cognitive presence, and
 - (d) teaching presence?

The next section describes the research methodology including research context, participants of the study, data collection instruments and procedure, and data analysis.

3. Method

This research is a type of correlational study to discover associations among variables. It particularly seeks to explain and discover the contribution of self-regulation, metacognition, and motivation to the overall CoI and its three elements separately in an online learning setting. Considering the layers of research design as suggested by [Saunders, Lewis, and Thornhill \(2007\)](#), the research philosophy behind the current study is positivism concerned with observation and prediction of outcome, being highly structured and mostly measurable, and thus includes a significantly large amount of quantitative data, and unaffected by researcher' bias or values. Relying upon pre-existing theory and then formulating research hypothesis to test it, the study thereby applies a deductive approach. The current study is a methodologically mono-method research, which is where either quantitative or qualitative data is collected, rather than both together with and the corresponding analysis procedure. A correlational research design has been applied as the strategy in the next level of the union. The research has been designed in order to study subjects at a single point of time, rather than over a period of time. Therefore, the current study is cross-sectional when looking at time horizons.

The study was conducted on an online *Information and Communication Technology-I* (ICT-I) course during the 2015–2016 fall semester at a well-known public university. The Department of Informatics offers ICT-I as a compulsory two-credit course for all enrolled students; given by four instructors based on identical curriculum and syllabus, and prepared in accordance with the

Table 1
Distribution of participants by gender, year of study, and age range.

Variable	Frequency	%
Gender		
Female	1078	70.2
Male	457	29.8
Year of Study		
Freshman	726	47.3
Sophomore	478	31.1
Junior	308	20.1
Senior	18	1.2
Other	5	0.3
Age Range		
17-21	1258	82.0
22-26	187	12.2
27-31	38	2.5
32-36	26	1.7
37-41	11	0.7
42-46	7	0.5
47-51	4	0.3
52-56	4	0.3
Total	1535	100.0

European Computer Driving License (ECDL). The course aims to teach the main concepts of computer technology, how it works, the hardware and working principles, operating system and working principles, the Internet and benefits, e-mail, and Microsoft Office and Libre Office software. Moreover, it aims at students gaining computer literacy both in daily life and in the teaching-learning process. Course assessment is based on both formative and summative evaluation methods. Moodle was the course management system and a Facebook page was also utilized. Adobe Connect was used to deliver synchronous 100-min weekly instruction. During these sessions, instructors employed direct instruction, demonstration, and drill and practice instructional methods. Class videos and course materials were shared via Moodle for non-participants' usage.

3.1. Participants of the study

In educational research, accessing probability sampling is not always possible each point in time, the current study applied nonprobability sampling technique in which the subject subjects were selected based on their availability, having volunteered, being convenient, and representative of the characteristics that the researchers sought to study (Creswell, 2012). In the current study, from two types of nonprobability sampling techniques, convenience sampling was employed. Among 6000 students enrolled to the ICT-I course, 3708 students were selected based on convenience sampling method, considering the criteria of availability, voluntary participation, convenience and representation plus prior online learning experience. Among the 3,708, an initial sample of 1740 students completed the online questionnaire, representing a response ratio of 47%. However, 1535 subjects were finally included after eliminating missing cases (72) and extreme outliers (133). Distribution of participants based on gender, year of study, and age range are presented in Table 1.

See Table 2 for faculty distribution.

Table 2
Distribution of participants by faculty.

Faculty	Frequency	%
State Conservatory	4	0.3
Languages, History and Geography	561	36.5
Pharmacy	188	12.2
Religion	23	1.5
Communication	51	3.3
Engineering	51	3.3
Health Sciences	257	16.7
Health Services Vocational School	101	6.6
Medicine	86	5.6
Veterinary Medicine	51	3.3
Agriculture	153	10.0
Other	9	0.6
Total	1535	100.0

As can be seen in Tables 1 and 2, there is heterogeneity at the grade level, age range, and the disciplines of the participants, which enhances generalizability of the results.

3.2. Data collection instruments and procedure

Data were collected through application of the Community of Inquiry Survey (CoI Survey), Online Self-Regulated Learning Questionnaire (OSLQ), Metacognition Questionnaire (MCQ), and Motivating Strategies for Learning Questionnaire (MSLQ).

Students' perceptions of community of inquiry and its three presence types were measured using CoI Survey, originally developed by [Arbaugh et al. \(2008\)](#) and adapted and validated by [Öztürk \(2012\)](#). The survey consists of 34 five-point, Likert-type items (TP: 13-items, SP: 12-items, CP: 9-items). Construct validity for confirmatory factor analysis (CFA) indicated the translated version had three factors, matching the original. Chi-square goodness-of-fit statistics were found significant, and indicated the model fit the data. Its reliability was provided with internal consistency through a Cronbach alpha value of .92 for teaching presence, .88 for social presence, .75 for cognitive presence and .97 for the whole scale ([Öztürk, 2012](#)). As for its validity, confirmatory factor analysis yielded $\chi^2 = 996.25$ ($SD = 524$, $p < .001$), (χ^2/SD) = 1.90 RMSEA (Root Mean Square Error of Approximation) = .081, RMR (Root Mean Square Residual) = .072, NNFI (non-normed fit index) = .80, CFI (Comparative Fit Index) = .81, GFI (Goodness of Fit Index) = .70, and AGFI (Adjusted Goodness of Fit Index) = .66.

The OSLQ was used to gather data about students' perceptions of self-regulation in online learning setting. Developed by [Lan, Bremer, Stevens, and Mullen \(2004\)](#), OLSQ was later shortened by [Barnard, Paton, and Lan \(2008\)](#) to include 24 five-point, Likert-type items. The questionnaire was adapted by [Kilis and Yıldırım \(2018b\)](#) and validated with data from 321 students. CFA indicated the translated version was appropriate and confirmed. The coefficient alpha value was .95, indicating high reliability which means acceptable internal consistency ([Hair, Black, Tatham, & Anderson, 2010, Kilis & Yıldırım, 2018b](#)). Its validity tests indicated that the worth of fit values were χ^2/df (Chi-Square/Degree of Freedom) = 2.45, RMSEA = .06, RMR = .08, SRMR = .06, TLI (Tucker-Lewis Index) = .89, CFI = .90, GFI = .86, AGFI = .84 and NFI = .80 ([Kilis & Yıldırım 2018b](#)).

Students' perceptions of metacognition was measured using the MCQ developed by [Garrison and Akyol \(2015\)](#), and adapted by [Kilis and Yıldırım \(2018a\)](#); validated with data from 304 students. It includes 26 five-point, Likert-type items in three factors. CFA indicated the translated version was appropriate and confirmed against the original instrument. The coefficient alpha value was .94 which indicates acceptable internal consistency. With regard to its validity, CFA indicated that with a χ^2/df ratio value of 2.25, goodness of fit values of translated instrument were RMSEA = .06, RMR = .05, SRMR = .04, TLI = .94, CFI = .94, GFI = .85, AGFI = .83, and NFI = .89 ([Kilis & Yıldırım, 2018a](#)).

Students' level of motivation was measured using the MSLQ, which consists of 31 seven-point, Likert-type items. Developed by [Pintrich, Smith, Garcia, and McKeachie \(1991\)](#), it was adapted by [Büyüköztürk, Akgün, Özkahveci, and Demirel \(2004\)](#). Data were collected online through Survey Monkey over four weeks after 70% of the course sessions were completed, and then analyzed. The detailed explanation of data analysis is in the following subsection.

3.3. Data analysis

The collected data were analyzed using IBM SPSS software, version 23. The data were analyzed through both descriptive statistics and inferential statistics; specifically, four separate standard (simultaneous) multiple linear regression analyses to reveal the contribution of each predictor to community of inquiry and its three presence types were used in accordance with the second research question and sub-questions. Multiple regression analysis was chosen since it aims to produce the most accurate estimated values for the dependent variable by revealing the significant contribution of each predictor (independent) variable ([Gravetter & Wallnau, 2013](#)). Before conducting the analyses, the assumptions for multiple linear regression analyses were normality, linearity, homoscedasticity, independent observation, multicollinearity and influential observations, adequate sample size, outliers and missing data were checked and met the requirements for each. The next section presents the findings retrieved from the data analysis.

4. Results

This section presents the findings of the study in accordance with the two research questions. Considering the first research

Table 3

Descriptive statistics of students' CoI, SP, CP, TP, self-regulation, metacognition and motivation.

	Mean	SD	Minimum	Maximum
Community of Inquiry	3.45	.70	1.00	5.00
Social Presence	3.26	.85	1.00	5.00
Cognitive Presence	3.44	.77	1.00	5.00
Teaching Presence	3.64	.68	1.00	5.00
Self-regulation	3.39	.72	1.00	5.00
Metacognition	3.85	.59	1.00	5.00
Motivation	4.50	.86	1.00	7.00

n = 1535.

Table 4

Multiple linear regression analyses for variables predicting the community of inquiry and its three constructs.

Variable	b	SE	β	t	sr ²	R ²	ΔF
Community of Inquiry							
Model						.62	825.56
1	(Constant)	.21		2.65			
	Self-regulation	.53	.55	26.39*	.174		
	Metacognition	.15	.12	5.97*	.009		
	Motivation	.20	.24	12.34*	.038		
Social Presence							
Model						.50	518.37
1	(Constant)	-.02		-.21			
	Self-regulation	.69	.58	24.60*	.20		
	Motivation	.20	.20	.025*			
Cognitive Presence							
Model						.60	774.39
1	(Constant)	-.05		-.62			
	Self-regulation	.60	.56	26.60*	.18		
	Metacognition	.14	.10	5.02*	.0066		
	Motivation	.20	.23	11.32*	.003		
Teaching Presence							
Model						.45	413.72
1	(Constant)	.69		7.67			
	Self-regulation	.30	.32	12.73*	.059		
	Metacognition	.28	.24	9.86*	.035		
	Motivation	.19	.24	10.28*	.038		

* $p < .01$, $n = 1535$.

question, descriptive statistics (see Table 3) indicated that students' perceived levels of community of inquiry (CoI) in the online course have a mean score of 3.45 over 5.00 and with .70 standard deviation. The findings showed that their perceived levels of social presence (SP) is $M = 3.26$ ($SD = .85$), cognitive presence (CP) is $M = 3.44$ ($SD = .77$), and teaching presence (TP) is $M = 3.64$ ($SD = .68$). Their perceived levels of self-regulation was 3.39 with .72 standard deviation, while metacognition was $M = 3.85$ ($SD = .59$) over 5.00, and the motivation was $M = 4.50$ ($SD = .86$) over 7.00.

Considering the second research question which investigated the predictors of community of inquiry and its three sub-factors, the null hypothesis is no significant prediction of community of inquiry by self-regulation, metacognition, or motivation ($H_0: \beta_1 = \beta_2 = \dots = \beta_k = 0$). An alternative hypothesis is a significant prediction of the community of inquiry by self-regulation, metacognition, or motivation (H_1 : At least one β is not zero). Table 4 presents the findings of four separate multiple linear regression analyses.

The findings indicated that the null hypothesis was rejected, and that the alternative hypothesis was accepted, which claims a significant prediction of community of inquiry by self-regulation, metacognition, or motivation (H_1 : At least one β is not zero). In the prediction of CoI, the model explains 62% of total variance and significance, $F(3, 1531) = 825.56$; $p < .01$. The first predictor of *self-regulation* ($t = 26.39$, $p < .01$) significantly contributes to community of inquiry and uniquely predicts 17.4% of students' perceptions of the CoI. The relative size of the beta values is an indication of the relative contribution of the variables in the standardized form (Gravetter & Wallnau, 2013). With .55 value of β , self-regulation is the best variable contributing to the community of inquiry. The second predictor of *metacognition* ($t = 5.97$, $p < .01$) significantly contributed to the model but with .12 value of β , it is the weakest predictor contributing to the CoI. The third predictor of *motivation* ($t = 12.34$, $p < .01$) significantly contributed to the model with .24 value of β , making motivation the second-best contributor to the CoI. Overall, all three significantly contributed to the perceived levels of students' CoI in the online course context. The best predictor is self-regulation, while the weakest is metacognition among the three predictors that accounted for 62% of total variability of the CoI.

In a similar vein, the null hypothesis for the second sub-question of the second research question claimed no significant prediction of social presence by self-regulation, metacognition, and motivation ($H_0: \beta_1 = \beta_2 = \dots = \beta_k = 0$). An alternative hypothesis was a significant prediction of social presence by self-regulation, metacognition, or motivation (H_1 : At least one β is not zero). The findings indicated that the alternative hypothesis was accepted. The findings further indicated that regarding with prediction of social presence (see Table 4), the model explains 50% of total variance and significance, $F(3, 1531) = 518.37$; $p < .01$. With .58 value of β , self-regulation is the better predictor of social presence. Motivation ($t = .025$, $p < .01$), though significant, was a fairly weak predictor of social presence. Overall, among the predictors, self-regulation is the stronger, while motivation is the weaker, and metacognition failed to significantly contribute the prediction of social presence.

Similarly, a null hypothesis for the third sub-question claimed no significant prediction of cognitive presence by self-regulation, metacognition, and motivation. An alternative hypothesis was a significant prediction of cognitive presence by self-regulation, metacognition, or motivation. Based on the findings, the null hypothesis was rejected. The third multiple regression analysis revealed the factors predicting cognitive presence (see Table 4). The model explains 60% of the total variance and significance, $F(3, 1531) = 774.739$; $p < .01$. All three predictors significantly contributed to the prediction of cognitive presence. Among them, self-regulation ($\beta = .56$) is the strongest predictor, followed by motivation ($\beta = .23$), and metacognition ($\beta = .10$); accounting for 60% of total variance.

With regard to teaching presence, the null and the alternative hypothesis were as follows.

$$H_0: \beta_1 = \beta_2 = \dots = \beta_k = 0$$

H_1 : At least one β is not zero.

The findings indicated that the alternative hypothesis was accepted and further indicated that in the predictions of teaching presence, the model explains 45% of the total variance and significance, $F(3, 1531) = 413.72$; $p < .01$ (see Table 4). All three predictors significantly contributed to the prediction of teaching presence. The strongest predictor of teaching presence was self-regulation and equal weakest were metacognition and motivation.

5. Discussion

The current study investigates community of inquiry framework and its three components, social presence, cognitive presence, and teaching presence separately by revealing the influence of self-regulation, metacognition, and motivation. With this aim, data from 1535 subjects were analyzed through multiple linear regression and the finding discussed and concluded separately for each of the aforementioned predictor variables.

Self-regulation represents an important mediator among the three presence types of the community of inquiry framework (Shea & Bidjerano, 2010). CoI framework cannot be considered separate from self-regulation since online learners monitor their time and cognitive strategies, regulate their study environment, and exercise control over their interactions with technology, peers, and faculty to maximize their learning (Shea et al., 2012). Similarly, Anderson (2016) suggests adding agency presence based on Bandura's (1989) work, who emphasized self-reflective and self-regularity processes. Moreover, another recent study also highlighted the lack of self-regulation skills in the CoI framework. In a similar vein, Cho et al. (2017) in their study revealed that self-regulated learning skills plays an important role in the CoI framework, and self-regulated students demonstrated stronger sense of the CoI elements. Findings of the current study reveal self-regulation as an important predictor and contributor of community of inquiry and its three-type construct corroborates with the published literature (Anderson, 2016; Ma et al., 2017; Pool, Reitsma, & van der Berg, 2017; Shea & Bidjerano, 2010, Shea et al., 2012). In addition, since learners' self-regulation providing managing time, strategies, control of the learning and process etc. gains more importance, especially with online learning characterized by the physical absence of instructors, understanding self-regulation comprehensively promises better results in creating online collaborative community of inquiry learning settings. It is therefore highly recommended that self-regulation, rather than just self-efficacy, is included in the CoI model due to being a strong predictor of community of inquiry and providing control over learning, time and process.

In terms of metacognition, preliminary work solely proved its existence at the intersection of teaching presence and cognitive presence (Garrison & Akyol, 2015), and Snyder and Dringus (2014) focused on the exploration of metacognition in asynchronous student-led discussions. In essence, these studies proved the existence of metacognition and developed an easy method for its measurement. However, no research investigated the effect of metacognition on community of inquiry or its three presence types separately. The current study is the first attempt to discover the effect of metacognition on community of inquiry and yielded its significant contribution, except on social presence. For this reason, the results corroborate the literature and are the base for further research.

For motivation, there is inadequate evidence in the literature about its contribution to either community of inquiry or its three presence types. Kim (2015) examined the effect of motivation on the three presences of the CoI separately, and concluded that there was a positive significant association with each presence. Supporting Kim's study, the current study contributes to the literature by revealing motivation as a significant predictor of the CoI and its three elements. This study therefore serves as a base for further studies and opens up new directions. In order to create a better collaborative community of inquiry in online learning environments, instructional designers and online instructors should take these three factors into consideration in designing, teaching and managing their online courses.

When looking separately at the three-construct regarding social presence, this current study revealed self-regulation as an important mediator for SP and the links among the three types of presence of the CoI framework. Metacognition failed to contribute in the prediction of SP. Since this study is the first attempt to investigate the effect of metacognition, comparison is not possible. In terms of motivation, there is insufficient evidence about its effect on the prediction of social presence, except for Kim's study (2015) revealing a positive effect. Motivated learners could be more interested in learning process, more active and engaged in learning activities; therefore they are expected to be socially present in the learning environment. This study shows the significant contribution of motivation, and thereby contributes to the literature.

In terms of cognitive presence, previous studies essentially addressed self-regulation and its importance for the effective online collaborative community as well as its facilitation (Chmiliar, 2011; Means, Toyama, Murphy, Bakia, & Jones, 2009; Pintrich, 1999; Shea & Bidjerano, 2012). Later, a new dimension named learning presence was proposed, which includes learners' self-regulatory strategies (Shea et al., 2013). The current study revealed it to be the strongest predictor of cognitive presence, elaborating on self-regulation regarding its effect and contribution on cognitive presence, which supports earlier studies by providing more evidence. With no studies in the literature about metacognition and motivation on this issue, the current study has added value. With findings indicating that both variables significantly contributed to the prediction of cognitive presence, the current study has significantly added to the literature and created new insights for further research. Moreover, students perceived cognitive presence at a fairly substantial level in this study. Although earlier studies stated that reaching resolution phase was very difficult or even did not occur, the current study enabled students to reach the resolution phase and reemphasized the importance of addressing real-life topics and assigned cases or scenarios in discussion activities. This matches the recommendations of Liu and Yang (2014) and Redmond (2014).

In relation to teaching presence, the current study found the contribution of self-regulation, metacognition and motivation

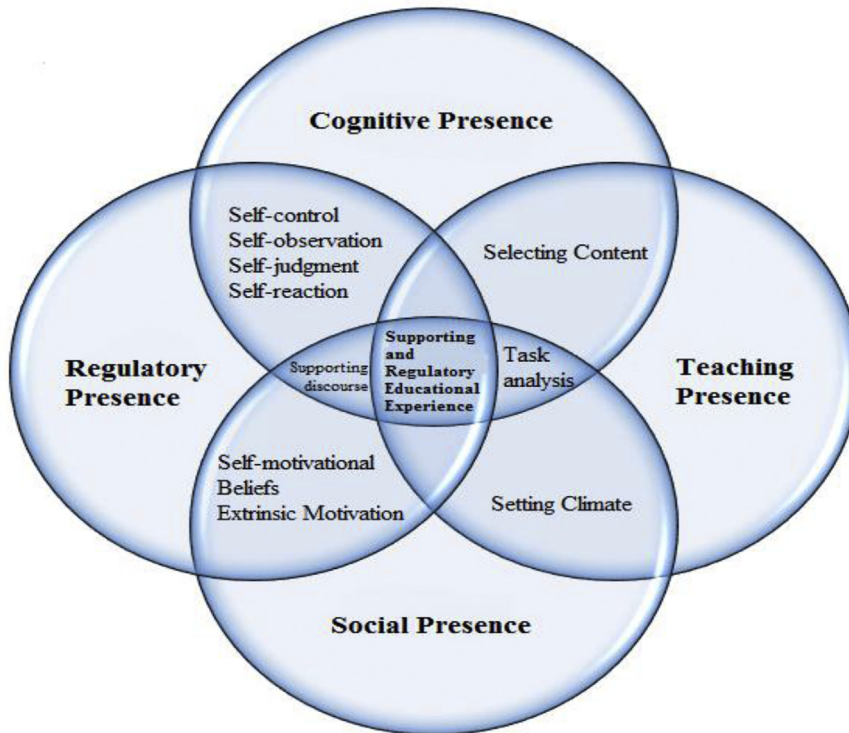


Fig. 1. Reconceptualization of community of inquiry framework.

valuable to the same degree. Among the three elements, self-regulation was the sharpest with its high contribution. Since no satisfactory studies exist in the literature, this study has added value in examining metacognition and motivation for the first time, both on the CoI overall and its three presence types separately.

6. Conclusion

Overall, many studies found the community of inquiry framework to be economical in online collaborative learning communities, with some elements still unknown (Kaul, Aksela, & Wu, 2018; Kozan & Caskurlu, 2018; Ma et al., 2017). This current study investigated self-regulation, metacognition, and motivation on the basis of community of inquiry framework and its three-construct, and concluded with their significant contributions as presented in the previous section. After discussing the proposed components and arguments, Anderson (2016, para. 11) suggested that in the search for the “missing” element(s) in the CoI model, to add agency presence to the community of inquiry trinity which is “simpler than autonomous, builds on the seminal work of Bandura and captures the components mentioned by both Shea and Lam.” Another recent study also highlighted the lack of self-regulation skills in the CoI framework (Pool, Reitsma, & van den Berg, 2017). In addition, Ma et al. (2017) verified the causal relationship among the presences of the CoI framework and validated the existence of learning presence in which they refer to learners' self-regulated learning skills. In a similar vein, another recent study found higher self-regulated learners indicated stronger sense of the CoI elements, thus they highlighted the importance of self-regulated learning skills (Cho et al., 2017). The current study accepts the aforementioned authors' statements and proposes a new construct named *regulatory presence* to reflect all dimensions of learners' self-regulated behaviors and skills during the learning process. This study's findings indicated self-regulation and motivation are missing from the original model and their inclusion would improve it. The tentative reconceptualization of the CoI framework suggested by the current study is visualized in Fig. 1.

This new construct of *regulatory presence* can be addressed as the composition of forethought, performance or volitional control and self-reflection, specifically inclusion of cyclical phases of self-regulation (Schunk & Zimmerman, 1994; Zimmerman, 2000). These three phases could be the categories of regulatory presence.

To further add to knowledge in this area and the literature, this tentative model should become the focus of further research in order to be both proven and validated. Additionally, co-regulation needs to be studied so as to comprehend its position, role and interaction with the other constructs. In addition, the community of inquiry framework could be applied in both blended and pure online learning settings using both synchronous and asynchronous discussions. This attempt could produce a stronger form, having a better understanding other learning settings. In this way, future researchers might reach a consensus about new proposed versions and create a better version, making it more grounded and valuable. Co-regulation and metacognition should also form areas of concentration for further, more complex research.

On the other issue of supporting online learning environment with a user-friendly environment over Moodle, the current study

employed Facebook. Use of a user-friendly and easy-to-use social platform could facilitate students' perceived levels of social presence, and in turn, cognitive presence and teaching presence. Such platforms can be used to support online learning communities to enhance interaction, communication and collaboration, and therefore will improve the CoI elements (Karaoglan Yilmaz, 2017; Keles, 2018). Similarly, a recent study determined better social presence of Facebook users over Moodle in the CoI framework (Kazanidis, Pellas, Fotaris, & Tsinakos, 2018). Therefore, online educators and instructors can benefit from such easy-to-use platforms in their courses either as a main tool or as supplementary. As a concluding recommendation, a longitudinal study could be conducted in order to discover the maintenance and/or changes in learners' perceived levels of community of inquiry, and also its three presence types for a more detailed understanding of the phenomenon.

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