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Towards a Comprehensive COI based Framework for Online Teaching and Learning in Higher Education

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Abstract

COVID 19 has affected many areas in our lives, one of most is our educational system. Teachers and students found themselves immersed in online teaching and learning, an explosive experience that they weren't prepared to. To cope with this new transition and build upon for future online experiences, there was a need to review online frameworks to build upon and propose a comprehensive one. This paper draws on the literature of online learning frameworks mainly the community of inquiry COI framework. The Community of Inquiry framework is a conceptual model that describes the essential elements of a successful online higher education learning experience. Three elements constitute the original framework: Cognitive Presence, Teaching Presence and Social Presence. The literature describes the progress of this framework and recommends adding more elements namely learner, emotional, or technical managerial presences. On the basis of these findings, an integrated comprehensive framework is proposed based on six suggested elements. This online learning comprehensive framework can be used by educators to design and assess online training programs and also to develop tools to measure the perceptions and outcomes online instruction.

Introduction

With the spread of the COVID-19, most of the countries tried implementing emergency plans to substitute weeks of universities and schools closure. Despite the massive stress accompanied this period, it was an opportunity to develop alternative education opportunities, namely distance learning. Access to online learning wasn't on educational systems horizon so it was a challenging task especially with the absence of legislation for laws to regulate distance learning in many countries around the world.

Online Learning

E-learning, Internet learning, distributed learning, networked learning, tele-learning, virtual learning, computer-assisted learning, web-based learning, and distance learning are terms used to designate online learning. Educators have defined online learning as the use of the Internet as a medium to carry out the teaching learning process e.g. access learning materials and support, interaction with the content, instructor, and peers in order (Ally, 2004). The central pedagogical approach to online learning is mostly based on constructivism, where

learners are active to create knowledge in a personally relevant and meaningful way in contrast to the passive, receptive approach in a traditional face-to-face instructional setting (Moisey & Hughes, 2008).

Just as many learning theories have emerged for instruction in general, the same is right for online education. Transactional Distance (Moore, 1993), equivalency, and community of inquiry COI (Garrison, Anderson, & Archer, 2000) are considered as the most widespread example of online learning theories. Many theories and models were developed for the online environment: In addition to Community of Inquiry COI, other examples include Connectivism (Siemens, 2017), Online Collaborative Learning OCL (Harasim, 2017), Anderson's Online Learning Model, Blending with Pedagogical Purpose Model and Multimodal Model for Online Education (Picciano, 2017). Moreover, Picciano (2017) proposed Integrated Models: Examples of a Distance Education Course, a Teacher-Led Fully Online Course and a Mainstream Blended Course.

This study aims to propose a comprehensive framework for distance education based on the Community of Inquiry COI model. An extensive review of the literature about the development and adaptation to COI was conducted to synthetize a comprehensive model joining all the add-on the original model and to cover all the possible areas within the designated pedagogical setting.

Review of Existing Frameworks

Research on online learning leads to the Community of Inquiry COI framework that is widely applied in online teaching and learning (Garrison, Anderson, & Archer, 2010) mainly because it is suitable for online, electronic and blended learning (Horzum, 2015). This conceptual framework was generated by Garrison, Anderson, and Archer (2000) and philosophically, it is compatible with Dewey's theory about inquiry (Garrison, Anderson, & Archer, 2010). The model assures designing online and blended courses as active learning environments or communities where instructors and students share ideas, information, and opinions (Picciano, 2017). COI framework was considered to represent the most comprehensive model for understanding higher education online learning within an epistemic engagement pedagogical approach (Shea & Bidjerano, 2010).

The framework was frequently used in the context of computer conferencing in higher education specifically the asynchronous, text-based group discussions rather than the traditional distance education theoretical perspective where students worked independently from each other. COI framework has undergone many reviews and modifications. Starting with the first model it includes three core elements for an educational experience. These elements constitute a social, cognitive, and teaching presence with categories and indicators specific for each presence.

Of particular note is that "presence" is a social situation and emerges through interactions among students and instructors (Picciano, 2017). The framework strived to summarize not only the vital elements (social, cognitive and teaching presence), but also the dynamics of an online educational experience (Garrison, Anderson, & Archer, 2010). COI framework was validated by many researchers such as Arbaugh et al. (2008) and also was subject to criticism in terms of lack of representation of various educational areas and not been well linked to

learning outcomes (Akyol et al. 2009; Rourke & Kanuka, 2009).

The figure below summarizes COI framework with its three presences.

Figure 1. Community of Inquiry (Garrison, Anderson, & Archer, 2000 p.88)

Cognitive Presence - CP

"Cognitive Presence" is operationalized through the Practical Inquiry model based on the more elaborate phases of Dewey's notion of reflective thought" (Garrison, Anderson, & Archer, 2010, p. 6). This process includes four phases: triggering event, exploration, integration and resolution. In a triggering event, tasks, questions or stimuli are eminent, supporting in learners a sense of suspicion, wonder, puzzlement, and disequilibrium. This cognitive repulsion is the introduction to inquiry; it drives the learner to resolve their cognitive conflict. Triggering stimulates inductive efforts from the learner in their attempt to fill the gap between their prior knowledge and the new information given (Redmond, 2014).

Exploration is the second phase of cognitive presence in which learners reconstruct knowledge through searching for new information to solve their cognitive dissonance. In this phase learners exchange information, share recommendations and prior experiences, brainstorm ideas, share different views and research ideas from the literature (Garrison & Anderson, 2003). The third phase of cognitive presence is integration, in which learners connect between the data collected in the preceding phase to create tentative solutions or justifications. This phase is critical to develop learners' higher level thinking (Garrison & Arbaugh, 2007). In the resolution phase learners defend and test new ideas or solutions. Table 1 summarizes the cognitive presence phase with their indicators.

Table 1. Cognitive Presence Phases and Indicators (Garrison & Anderson, 2003)

Cognitive presence phase	Indicators
Triggering Event	Recognizing problem; Sense of puzzlement.
Exploration	Divergence within the online community; Divergence within a single message; Exchanging information; Suggestions for consideration; Brainstorming; Leaping to conclusions.
Integration	Convergence among group members; Convergence within a single message; Connecting ideas, synthesis; Creating solutions.
Resolution	Vicarious or real world; Application of solutions/ideas; Defending solutions.

Teaching Presence - TP

"Teaching Presence" is defined as the design, facilitation, and direction of cognitive and social processes in order to reach the desired learning outcomes (Anderson et al., 2001). Therefore, it is assumed that the teaching presence begins with the preparation and design of the course and continues thought out the course delivery to ensure an active learning with the adequate teaching strategies and assessments. Anderson et al. (2001) identified three categories of teaching presence indicators: design and organization, facilitating discourse, and direct instruction. Design and organization includes instructional management characteristics and is related to the course development and design, integrating the learning activities, assignments, and assessments. The second category, facilitating discourse, aims to maintain the learner's interest, motivation and engagement in active learning environment as it takes control of connecting content to occasions where students' interaction and socialization with each other (Budhai & Williams, 2016).

Direct Instruction is the final category identified to describe teaching presence. According to Anderson et al. (2001), it takes place when intellectual and academic leadership is provided by the teacher. This can be fulfilled using different pedagogical strategies, and research has shown how instant feedback will affect the student experience (Ladyshewsky, 2013). Table 2 summarizes the teaching presence categories with their indicators.

Table 2. Teaching Presence Categories with their Indicators

Category	Examples of Indicators
Instructional Management	Structuring content; Setting discussion topics; Establishing discussion groups.
Facilitating Discourse	Sharing personal meaning/values; Expressing agreement; Seeking consensus.
Direct Instruction	Focusing and pacing discussion; Answering questions; Diagnosing misconceptions; Summarizing learning outcomes or issues.

Social Presence - SP

"Social Presence" is defined as the ability of learners to project themselves socially and emotionally, to communicate in their learning environment by developing inter-personal relationships and reflecting their own personalities (Garrison & Arbaugh, 2007). From a methodological view, three categories are identified to put the social presence in place: Emotional Expression, Open Communication and Group Cohesion (Arbaugh et al., 2008). Table 3 summarizes the social presence categories with their indicators.

Table 3. Social Presence Categories with their Indicators

Category	Examples of Indicators
Emotional Expression	Emoticons; Autobiographical; Narratives.
open communication	Risk-free expression; Acknowledging others; Being encouraging.
Group Cohesion	Encouraging; Collaborating; Helping and supporting.

Despite the fact that the social presence was perceived by Garrison, Anderson and Archer (2000) as a multi-dimensional construct that overlaps with the other presences, research studies had been directed at social presence as a one dimensional structure cutting it off other presences. Several studies have highlighted the importance of SP and its contribution to the learning at various level, to state d'Alessio et al (2019) Richardson, Maeda, and Caskurlu (2017). And also other researchers reported poor correlation between the SP and students' learning such as Shea and Bidjerano (2008), Akyol and Garrison (2008), Diaz et al. (2010) and Garrison, Cleveland-Innes, and Fung (2010).

COI Development and Integration of New Presences

Learner Presence

In their study, Shea and Bidjerano (2010) suggested a revision for COI model through adding a fourth presence. They named it the Learner Presence. The authors concluded that COI framework and the theoretical construct that they named as "Learner Presence" are positively related. They argued that there are limitations in the COI framework model and suggested improvement by adding the learner role. They further added that the literature on learner self-regulation equips us with a strong basis for articulating the roles of online learners.

They suggested that learner presence constitutes elements such as self-efficacy as well as other cognitive, behavioral, and motivational constructs encouraging online learner self-regulation. Self-efficacy "emphasizes the interface between learner motivation and cognition" and "is viewed as a subjective judgment of one's level of competence in executing certain behaviors or achieving certain outcomes in the future" (Shea & Bidjerano, 2010, p.1723). Effort regulation is "operationally defined as persistence and an ability to deal with failures and setbacks in the process of completing learning related tasks" (Shea & Bidjerano, 2010, p. 1725).

This new presence was used to assess students' perceptions of their own efficacy and effort adding a "self-directed" nature for online learning. Added scales for this presence were self-efficacy and effort regulation. Their indicators of online learner self and co-regulation included efforts to divide up tasks, manage time, and set goals in order to successfully complete group projects. Table 4 summarizes the leaner presence categories with their indicators.

Table 4. Leaner Presence Categories with their Indicators

Category	Examples of Indicators
Self-efficacy	Competence in executing online learning.
Effort regulation	Efforts to divide up tasks; Efforts to manage time; Setting goals in order to successfully complete group projects.

Accomplishing learner self- and co-regulation in online environments necessitates that researchers examine many issues including metacognitive, motivational, and behavioral traits and activities that are controlled by a competent online learner (Shea & Bidjerano, 2010). Campbell (2004) emphasized that online learning is more about metacognitive, reflective, collaborative, and student's self-directed learning. Moreover, Stenbom, Jansson, and Hulkko (2016) stressed on the attempt that has been carried out to examine students' self-regulation and metacognition during learning. They noted that more research is needed to address self-regulation and metacognition.

Akyol and Garrison (2011) criticized the learner presence considering that in the COI theoretical framework there are no independent teacher and learner presences; all participants undertake teaching and learning roles to variable degrees. Teaching presence is not only the description of teacher's activities; it emphasizes delivering

the tasks and roles of a teacher among participants. The fundamental proposition of a COI is that learner agency is shared, as such, it is not easy to see how learner presence could be integrated into, and displays itself, in the original COI framework. Therefore, students' perceptions as to this metacognitive construct should be taken into consideration.

Emotional Presence

Reviewing more the literature on this framework, "Emotional Presence" indicators were added to the measurement of the three current theoretical elements that make up the original framework (Cleveland-Innes & Campbell, 2012). Cleveland-Innes and Campbell (2012) considered that emotion is experienced by online students not only in areas combined with social presence, but also as a unique presence. Emotional presence is not just the affective response embedded in the social presence; rather, it promotes the general online experience. The authors perceived 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). They suggested a revised COI instrument including additional six items designed to measure emotional presence in relation to the instructor, the other students, the technology, and the course. Based on this study, Stenbom, Jansson, and Hulkko (2016) further stressed on the importance of adding emotional presence and considered the following categories: Activity emotion, Outcome emotion and Directed affectiveness. Table 5 summarizes the emotional presence categories with their indicators.

Table 5. Emotional Presence and their Indicators (Stenbom et al., 2016 p.43)

Elements	Categories	Indicators
Emotional presence	Activity emotion	Emotion about the inquiry
	Outcome emotion	Emotion about the consequence of the inquiry
	Directed affectiveness	Emotion towards the other person

Technical Managerial Presence

Huang et al. (2018) considered that some technology tips can assist the social, cognitive, and teaching presence such as using multimedia (e.g., images, audio, animation, and video) for digital content creation and providing audio or video feedback for students. Thus, the effective online teacher should continuously seek learner comfort and competence with the intervening technology, and provide safe environments for them to increase their sense of internet efficacy (Anderson, 2004). Raurte (2019) suggested another modification to COI framework by adding another presence calling it the "Technical Managerial Presence".

The literature highlights the importance of this presence (Adebisi & Oyeleke, 2018; Coppola, Hiltz, & Rotter, 2002; Keengwe & Kidd, 2010). According to Keengwe and Kidd (2010), online faculty is viewed in multiple perspectives, one of those perspectives being a tendency to foster a technical and managerial presence. Coppola Hiltz, and Rotter (2002) considered managerial skills as one of the main roles in online environments. According to them, the managerial role, deals with class and course management. This role includes instructor behavior in relation to course planning, organizing, leading, and controlling. The effort involved in getting the course online is course planning in terms of ensuring connection between the instructor and the administration, between students and the instructor, and among students so that course goals can be accomplished (Coppola, Hiltz, & Rotter, 2002).

According to Raurte (2019), "a technical managerial presence is an area conductive to learning and using technical skills, instructional design, and content management or development for online teaching" (Raurte, 2019, p.2). It includes the ownership of the course design and content and outcomes. Far from the definition of the technical managerial presence, the author didn't identify any categories or indicators related to this presence. To develop corresponding categories and indicators, we reviewed the existing literature and found that it fits within the Digital Competence Framework for Teachers developed by Bigne et al. (2019). Three chosen categories were integrated in this technical presence: Information and data literacy, digital content creation and problem solving mainly related to solving technical problems. Moreover, two categories were adopted from the study of Coppola, Hiltz, & Rotter (2002): Course organizing course controlling. Table 6 summarizes Technical Managerial Presence categories and indicators.

Table 6: Technical Managerial Presence Categories and Indicators

Category	Examples of Indicators
Information and data literacy	Identifying, locating, retrieving, storing, organizing and analyzing digital information; Assessing digital information relevance and purpose for teaching needs.
Digital content creation	Creating and editing new digital content; Integrating and rebuilding prior knowledge and content; Making artistic productions, multimedia content and computer programming; Knowing how to apply intellectual property rights and licenses.
	Identifying needs in the use of digital resources;

Technical Problem solving	Making informed decisions about the most appropriate digital tool depending on the purpose or need; Solving conceptual problems through digital media or digital tools; Using technology creatively; Solving technical problems; Upgrading self-competence and of others.
Course Organizing	Establishing relationships between the instructor and others in administration; Establishing relationships between students and the instructor; Establishing relationships among students so that course goals can be achieved
Course Controlling	Monitoring and evaluating student learning outcomes

Reflection as a New Indicator in the Resolution Phase of Cognitive Presence

Apart from suggesting additional presences to the original COI model, Redmond (2014) recommended modification to the resolution phase of cognitive presence to include reflection as a new indicator. The author argued that the indicators proposed through the four phases of cognitive presence do not cover "reflection", being a parameter included in the definition provided by Garrison, Anderson and Archer (2001) as 'the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry'(Garrison, Anderson & Archer ,2001, p. 11). Consequently, Redmond (2014) proposed an additional indicator to be added to the resolution phase of cognitive presence, being that of reflection.

Redmond (2014) and Rogers (2002) conceptualized reflection as a multidimensional concept rather than a holistic activity and stressed on its complex nature considering it as a process to make meaning. In his study Redmond (2014) defined reflection as "a high level process for synthesizing new knowledge, perspectives and experiences with personal prior knowledge for the purposes of ongoing improvement, learning and intelligent future actions." (p,50). In this essence, the author suggested modifications to the resolution indicators and therefore included reflection, with the socio-cognitive processes of reflecting on learning outcomes and learning processes included. Table 7presents the recommended modifications to the resolution phase of cognitive presence.

Table 7. Modifications of the Resolution Phase as recommended by Redmond (2014)

Phase	Indicators	Socio-cognitive processes
Resolution/Application	Vicarious or real world application of solutions/ideas	Providing examples of how problems were solved; Results of application.
	Defending solutions	Defending why a problem was solved in a specific manner.
	Reflection	Reflecting on learning content and outcomes; Reflecting on learning processes.

Comprehensive COI –Based Framework

Building on all the literature reviewed, our proposed framework is a comprehensive framework that includes six presences: cognitive, teaching, social, learner, emotional and technical managerial presence.

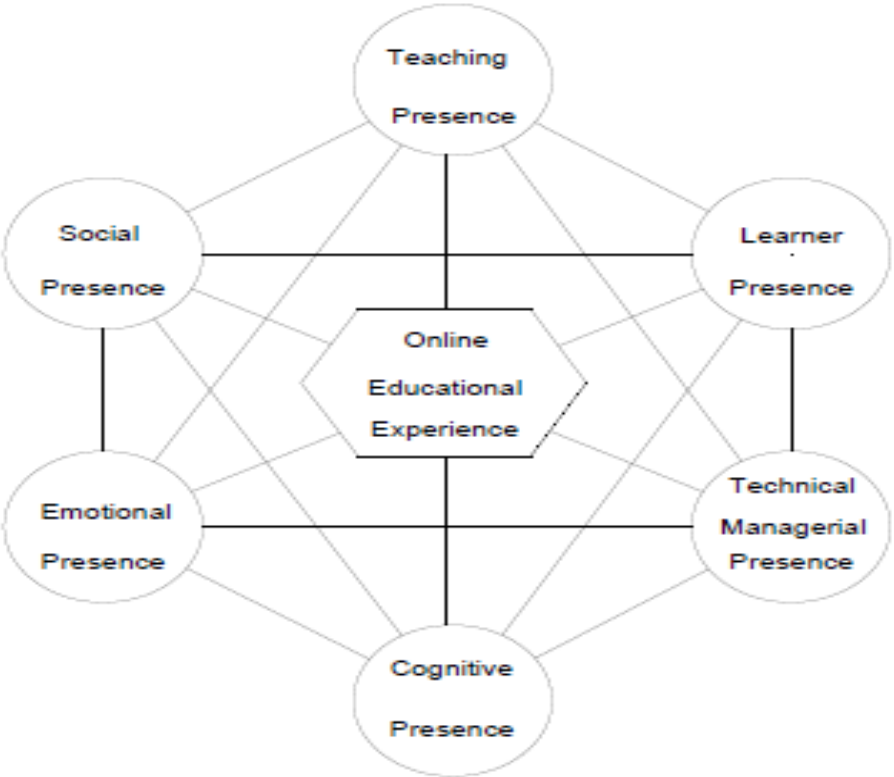

Figure 2. Comprehensive COI based Framework for Online Teaching and Learning in Higher Education

Table 8 below summarizes the six presences with their definitions, categories, and indicators.

Table 8. Proposed Framework with the Six Presences and their Corresponding Categories and Indicators

Element	Definition	Category	Indicators (examples only)
Cognitive presence	"The extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry'' (Garrison et al., 2001, p. 11).	Triggering event	Stating a problem, changing direction.
		Exploration	Brainstorming, broad search for insights, information exchange.
		Integration	Connecting ideas, computations Achieve solution, analysis of solution, implementation.
		Resolution	Reflecting on learning content and outcomes.
Teaching presence	The design and facilitation of the educational experience including "the selection, organization, and primary presentation of course content, as well as the design and development of learning activities and assessment." (Garrison et al., 2000, p. 90).	Design and organization	Establishing interaction, setting parameters.
		Facilitating discourse	Stimulating constructive inquiry, assessing process inquiry.
		Direct instruction	Providing steps to solution, summarizing the discussion.
Social presence	"The ability of participants in the Community of Inquiry to project their personal characteristics into the community, thereby presenting themselves to the other participants as real people." (Garrison et al., 2000, p.89).	Emotional Expression	Exhibiting emotions; Autobiographical; Narratives.
		Open communication	Acknowledging trivial expressions.
		Group cohesion	Encouraging, greeting, Collaborating, Helping and supporting and building links.

Learner presence	"learning presence represents elements such as self-efficacy as well as other cognitive, behavioral, and motivational constructs supportive of online learner self-regulation"(Shea & Bidjerano,2010, p, 1721).	Self-efficacy	Executing online learning.
		Effort regulation/ Co-regulation	Efforts in Dividing up tasks, managing time, setting goals in order to successfully complete group projects.
Emotional presence	"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 and Campbell,2012 p: 283).	Activity emotion	Emotion about the inquiry.
		Outcome emotion	Emotion about the consequence of the inquiry.
		Directed affectiveness	Emotion towards the other person.
Technical and managerial presence	"An area conductive to learning and using technical skills, instructional design, and content management or development for online teaching" (Raurte,2019, p:2).	Information and data literacy	Identifying, locating, retrieving, storing, organizing and analyzing digital information, assessing its relevance and purpose for teaching.
		Digital content creation	Creating and editing new digital content, integrating and rebuilding prior knowledge and content, making artistic productions, multimedia content and computer programming, and knowing how to apply intellectual property rights and licenses

	Problem solving (solving technical problems), and Technical support	Identifying needs in the use of digital resources, making informed decisions about the most appropriate digital tool depending on the purpose or need, solving conceptual problems through digital media or digital tools, using technology creatively, solving technical problems needs, upgrading self-competence and of others
	Course organizing	Dealing with establishing relationships between the instructor and others in administration, between students and the instructor, and among students
	Course controlling	Dealing with monitoring and evaluating student learning outcomes

Conclusion

This paper presents a study about the effective pedagogies in online instruction. Reviewing the literature, results show that the community of inquiry framework with its three presences has been widely used in Online Education literature. In COI research, many studies explore only a single element of the model, such as social, teaching and cognitive presences as separate aspects of online discussion (Horzum, 2015) and there are very few studies examining the three elements simultaneously (Garrison & Arbaugh, 2007). On the other side, fewer studies examine the new added presences proposed by literature such as emotional, learner and technical managerial presences. An effective online experience should take all these presences into consideration. In the light of these results, we proposed a comprehensive framework that builds on the development of COI framework through these twenty years and include the six areas presented here; cognitive, teaching, social, learner, emotional and technical managerial presence. Moreover, we contributed by adding categories and indicators in elements where the literature doesn't provide such as the technical managerial presence. This new proposed framework not only would allow educators learn how to become great online teachers, but they would also become better at designing, evaluating and assessing student learning outcomes and their online teaching content. It could be further used to build online training programs and to develop tools to measure the perceived effectiveness of this online instruction.

Notes

The authors of this research are members of a research team in the Educational Studies & Research Centre of the Faculty of Education at the Lebanese University.

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