Reflection as an Indicator of Cognitive Presence

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Abstract:

In the Community of Inquiry (CoI) model, cognitive presence indicators can be used to evaluate the quality of inquiry in a given forum. Engagement in critical thinking and deep knowledge can occur through reflective processes. When learners move through the four phases of cognitive presence (triggering, exploration, integration, resolution), the "progression of reflection and discourse through to resolution (i.e. understanding), is essential" (2003, p. 61).

In this paper, data from the online discussion archives within a blended teacher-education course are analyzed using the cognitive presence indicators from the CoI with the additional indicator of reflection. This study indicates that when instructors structure online discussions appropriately, learners are able to "think socially; they allowed discussion participants to document, retrieve and reflect on earlier stages of the learning process" (Bass & Eynon, 2009, ¶ 13). To facilitate the coding of reflective activities and online posts the researcher proposes modifying the resolution phase of the original cognitive presence coding protocol to include an additional reflection indicator.

Introduction

Cognitive presence is defined 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" (p. 11). Dewey (1933) defined reflective thinking as "[a]ctive, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends" (p. 9). Reflection is a significant component of deep learning. When learners progress through the four phases of cognitive presence, the "progression of reflection and discourse through to resolution (i.e. understanding), is essential" (Garrison & Anderson, 2003, p. 61). Reflection is a key element of learning; however, it is not yet sufficiently emphasized in explanations of cognitive presence.

COI

The Community of Inquiry (CoI) developed by Garrison, Anderson and Archer (2000) is based on the assumption that social constructivism and collective inquiry are key elements of educational experience. Garrison, Cleveland-Innes and Fung (2010) suggest that "[t]he premise of this framework is that high-order learning is best supported in a community of learners engaged in critical reflection and discourse" (p. 35).

Social presence represents the ability of learning community participants to identify "with the community, communicating purposefully in a trusting environment, and developing interpersonal relationships" (Garrison, Anderson, & Archer, 2010, p. 7). It represents the social dynamics and the quality of the relationships among the participants. Online learning frequently calls for the learners to share personal experiences or perspectives, and this in turn requires a sense of connectedness, respect and trust (Abedin, Sydney, Daneshgar, & D'Ambra, 2010; Rourke, Anderson, Garrison, & Archer, 1999).

Through teaching presence the dynamic learning experience is designed, managed, facilitated and supported. It is thought to link "all the elements of a community of inquiry together" (Garrison & Anderson, 2003, p. 29), focusing on "the design, facilitation and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Anderson, Rourke, Garrison, & Archer, 2001, p. 5).

Cognitive presence might be thought of as the intellectual climate of the learning experience (Garrison, 2003). Cognitive presence represents "the analysis, construction, and confirmation of meaning and understanding within a community of learners through sustained discourse and reflection" (Garrison & Anderson, 2003, p. 55). "Cognitive presence is defined as the exploration, construction, resolution and confirmation of understanding through collaboration and reflection in a community of inquiry." (Garrison, 2006, p. 65). It is a multi-phased process that occurs through a cyclical process of inquiry that is seen to enable learners to co-construct meaning and validate understandings (Garrison & Anderson, 2003). The phases in this process are: triggering event, exploration, integration and resolution.

In a triggering event, tasks, questions or stimuli are prominent, encouraging in learners a sense of doubt, puzzlement, unsettledness or disequilibrium. This cognitive dissonance is the initiation to inquiry; it compels the learner to resolve their cognitive conflict (Rodgers, 2002). "For there to be inquiry, there must be some doubt that all is well, some recognition that one's situation contains troubling difficulties and is somehow problematic" (Lipman, 2003, p. 94). Triggering stimulates inductive efforts from the learner in their endeavor to fill the gap between their prior knowledge or position and the new information or perspectives provided.

Exploration is the second phase of cognitive presence in which learners seek new information or perspectives as part of the process of resolving their cognitive dissonance. It can be seen as a kind of knowledge re-construction. In the exploration phase learners clarify the issue, exchange information, share suggestions and prior experiences, brainstorm new ideas, share alternative perspectives and seek ideas from the literature (Garrison & Anderson, 2003).

The third phase of cognitive presence is integration, in which learners make connections between the information gleaned in the previous exploration phase. They analyze and

synthesize the various data sources to creative tentative solutions or justifications. This phase "typically requires enhanced teaching presence to probe and diagnose ideas so that learners will move to higher level thinking in developing their ideas" (Garrison & Arbaugh, 2007, p. 161). Educators are expected to encourage learners to continue to question, to build on the ideas of others and to justify their statements at this phase.

 In the resolution phase learners defend and test new ideas or solutions (Garrison & Anderson, 2003). The proposed solutions can be tested in practice, where the learners "apply the newly gained knowledge to educational contexts or workplace settings" (Garrison & Arbaugh, 2007, p. 161) or through a "vicarious test using thought experiments and consensus building within the community of inquiry" (Garrison et al., 2001, p. 11). The testing of the solution may result in the learners having to return to the exploration and other phases of the cycle of inquiry rather than seeing the issue as resolved.

In developing the CoI Garrison and his coauthors (2001) have provided examples of participant actions or indicators for each of the presences. Instructors can use the indicators to facilitate quality learning experiences just as researchers have used them to identify the characteristics and value of contributions to academic conversations. Table I below provides the four phases of cognitive presence, along with the indicators and sample behaviors at each phase.

Table I
Cognitive Presence Phases and Indicators

Cognitive Presence Phase	Indicators	Socio-cognitive processes
Triggering Event	Recognise problem	Presenting background information that culminates in a question
	Sense of puzzlement	Asking questions Messages that take discussion in a new direction
Exploration	Divergence – within the online community	Unsubstantiated contradiction of previous ideas
	Divergence – within a single message	Many different ideas/themes presented in one message
	Information exchange	Personal narratives/descriptions/facts (not used as evidence to support a conclusion) Sharing of literature/resources Questions of clarification
	Suggestions for consideration	Author explicitly characterises message as exploration, e.g., "Does that seem about right?" "Am I way off the mark?"
	Brainstorming	Adds to established points but does not systematically defend/justify/develop situation
	Leaps to conclusions	Offers unsupported opinions
Integration	Convergence – among group members	Reference to previous message followed by substantiated agreement (e.g., "I agree because . . .") Building on, adding to others' ideas
	Convergence – within	Justified, developed, defensible, yet tentative

	a single message	hypotheses
	Connecting ideas, synthesis	Integrating information from various sources – text book, articles, personal experience
	Creating solutions	Explicit characterisation of message as a solution by participant
Resolution	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

Source: (Garrison & Anderson, 2003, pp. 15-16)

The cognitive presence dimension of the CoI is said to provide "a comprehensive framework that reinforces the development of critical thinking skills within a context of reflective pedagogies" (Guthrie & McCracken, 2010, p. 5). The term 'reflection,' however, is not as explicit in the CoI framework as it might be, although Garrison et al. (2010) argued that learners move through the four phases of cognitive presence "in an environment of reflection and discourse; analysis and synthesis" (p. 32). On this basis this study advocates for a further indicator of reflection to be included in the resolution phase of cognitive presence.

Reflection as an Element of Cognitive Presence

Rogers (2002) suggests that reflection is difficult to identify, differentiate, and research because of the lack of universal language and common meaning. Dewey (1933) defines reflective thinking as "[a]ctive, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends" (p. 9). Lipman (2003), using contemporary cognitive vocabulary has explained that reflection involves "recursive thinking, metacognitive thinking, self-corrective thinking" (p.27) and relates to the learning process as well as the content of the learning experience. Still others explain: "An important facet of developing higher order thinking skills is the ability to reflect on the learning experience and incorporate new knowledge with pre-existing knowledge" (Stoney & Oliver, 1999, ¶ 26).

Reflection can be considered as a kind of interaction with oneself, "a sort of 'inner dialogue', where the learner takes on both the protagonist and the antagonist roles sequentially in an attempt to reframe his understanding" (Soo & Bonk, 1998, p. 3). In this form, reflection is seen as "critical to learning. In fact, this is ultimately where learning occurs and learners retreat from interaction to focus on individual and internal reflections" (p. 6). This aligns with Aminifar and Bahiraey's (2010) assertion that "self reflection and internalization of the materials read or received through others or books against personal experience and prior knowledge making interaction meaningful, leading to changes that are referred to as learning" (p. 414).

"[R]eflective decision-making and thoughtful problem solving [is] about what to believe and do" (Facione & Facione, 2007, p. 44). Reflection takes place both during learning and as a result of learning. It is not a static process and leads to future actions.

Rogers (2002) endeavors to clarify the term 'reflection', by reviewing the literature. The following six criteria describe the nature of reflection:

- Reflection as a meaning-making process;
- Reflection as a rigorous way of thinking;
- Reflection in community;

- Reflection as a set of attitudes;
- Reflection requires curiosity; and
- Reflection for a desire to grow (Rodgers, 2002).

Using reflection to assist in making meaning, (criterion one) requires learners to consider how to use their experiences to gain a "deeper understanding of its relationships with and connections to other experiences and ideas" (Rodgers, 2002, p. 845). The second criterion presumes learners use reflection as part of their disciplined, systematic, and rigorous thinking processes: where they have an open mind, to take on new or different meanings, rather than only those ideas which align with their initial perspectives. The third criterion suggests that reflection should occur through interaction with others. Rodgers (2002) indicates that shared reflection has three benefits: a) it affirms and values personal experience; b) it allows learners to view the world from different perspectives and/or provides different meaning; and c) it can sustain ongoing inquiry.

Reflection as a set of attitudes, (criterion four), "requires attitudes that value the personal and intellectual growth of oneself and of others" (Rodgers, 2002, p. 845). When reflection is supported by personal characteristics such as directness, open-mindedness, responsibility, and whole-heartedness the resulting outcome is more likely to expand one's knowledge and understanding. Overall it requires participants to take intellectual responsibility which "acknowledges that the meaning we are acting on is our meaning" (Rodgers, 2002, p. 862) and may not correspond to the same meaning of other participants. The fifth criterion, curiosity, "bespeaks a positive, wide-eyed attitude toward both one's own and others' learning" (Rodgers, 2002, p. 851). In the case of the sixth criterion, a desire for growth, Rodgers emphasizes that the capacity to suspend prior beliefs is an important prerequisite.

Reflection should been seen as a journey rather than a destination. It is a practice or process in which raw experience is transformed into deep meaning that serves the purpose of ongoing growth (Rodgers, 2002). Reflection requires both cognitive and attitudinal self-control to ensure the search for different interpretations or perspectives.

The cognitive presence indicators provide "a comprehensive framework that reinforces the development of critical thinking skills within a context of reflective pedagogies" (Guthrie & McCracken, 2010, p. 5). The elements of cognitive presence that are connected with reflection include:

- Thinking for oneself;
- Reasonableness (employ rational procedures in a judicious manner, capacity of listening, to be open to reason);
- Reflective (reflective reading, deep reading, reflective questioning, and reflective discussion including attentive listening);
- Provoking in the quest for meaning; and
- Questioning (Lipman, 2003; Tinto, 2003).

The phases of cognitive presence have been highly influenced by the processes identified by Dewey (1933) in his description of reflective thinking: "(1) a state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates, and (2) an act of searching, hunting, inquiring, to find material that will resolve the doubt, settle and dispose of the perplexity" (p. 12). Critical reflection is determined by Larrivee (2000) to be the merging of "the two concepts of critical inquiry and self-reflection" (p. 294). Within the CoI both inquiry and reflection are key elements of the community processes.

These processes align with the cognitive presence phases developed by Garrison et al. (2000). However, the term 'reflection' does not overtly exist within the indicators of cognitive

presence as defined by Garrison and his coauthors. In a recent publication, these authors assert that learners move through the four phases of cognitive presence "in an environment of reflection and discourse; analysis and synthesis" (Garrison, Cleveland-Innes, et al., 2010, p. 32). Based on the discussion above this paper proposes an additional indicator be added to the resolution phase of cognitive presence, being that of reflection.

"[C]ritical thinking begins with reflections on practical activity and eventuates in judgment" (Lipman, 2003, p. 74) and productive reflection (Davis, 2006) is an analytical action rather than descriptive activity. For the purposes of this study, reflection is defined 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. In essence it is the "re-examination and evaluation of experience, beliefs and knowledge … and involves looking back or reviewing past actions" (Kember, McKay, Sinclair, & Wong, 2008, p. 370) and infers "a transformation of perspective" or knowledge development. Table II provides suggested modifications to the resolution indicators to include reflection, with the socio-cognitive processes of reflecting on learning outcomes and learning processes included.

Table II
Recommended Modification to the Resolution Phase of Cognitive Presence

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

The "dimensions of high-order learning emerge from the concepts of reflective inquiry, self-direction and metacognition" (Garrison, 2003, p. 1). Table II introduces reflection an explicit element of cognitive presence as Garrison et al define it. Instructors' teaching presence can promote reflection and critical thinking, particularly in their design and facilitation of learning experiences (Garrison & Arbaugh, 2007; Soo & Bonk, 1998).

As is evidenced above, reflection has been conceptualized and classified in various ways. If reflection is reduced to a series of steps or elements rather than treated as a holistic activity it is in danger of becoming a checklist of things to do rather than a process to make meaning. The terms reflection, inquiry, meta-cognition, critical thinking are often used interchangeably (Rodgers, 2002). This paper offers the rationale for using the word reflection rather than other terms in that it is a key concept from which cognitive presence originates. Surprisingly, in their early papers Garrison et al. (2000; 2001) do not define reflection although it is at the heart of concept of cognitive presence.

To assist educators and researchers to operationalize the additional coding protocols, descriptions of socio-cognitive processes associated with reflection are provided below. The socio-cognitive processes recommended for inclusion with the additional reflection indicator are two-fold: 1) reflection on learning matter and outcomes and 2) reflecting on learning processes themselves. The labeling of these processes aligns with the earliest paper of

Garrison et al. (2000) where they describe the concept of practical inquiry, which operationalizes cognitive presence. The authors share that the practical inquiry model is based on "reflection on practice" and "the assimilation of information and the construction of meaning" (p. 98), reflecting on learning processes, with the goal of improving future practice. The inclusion of these processes is supported by the work of Lipman (2003) who considers that reflective thinking "involves *thinking about its procedures* at the same times as it involves *thinking about its subject matter*" (p, 26). In Henri's (1992) discussion she also considers it important for learners to be able "to identify the characteristics of the learning process" (p. 131).

The first recommended socio-cognitive process *reflecting on learning content and outcomes* relates to knowledge acquisition, where learners identify their increased knowledge and skills in the subject area. Learners should be able to articulate specifically what they have learnt and the relevance of this new knowledge. For example, they should be able to express how they might be able to use the knowledge or skills in future learning, employment, etc. This emphasizes learning beyond an initial experience and reinforces a long-term impact of what they have learnt beyond 'passing the test'.

Reflecting on learning outcomes or subject matter is substantive thinking (Lipman, 2003), and may be considered practical and can easily be identified or assessed. It takes place when the learner generates new knowledge or can identify additional knowledge gained through an educational experience and apply it in new contexts. Garrison and Anderson (2003) commented that working through the phases of cognitive presence enables learners to construct meaning and shape understanding. Adding a reflective indicator highlights the learner's ability to recognize and articulate what they have learnt and to consider how that knowledge may be used in the future.

The second socio-cognitive process constitutive of reflection, *reflecting on learning processes* is closely aligned with metacognition. Henri (1992) suggests that learners should have both declarative and procedural knowledge of learning processes. They should be able to comparing themselves to others, being aware of how they approaches a task, and strategies for achieving success, evaluating themselves their planning, organization and ability to self-aware. When reflecting on learning processes learners might articulate and evaluate their own cognitive strengths and weaknesses (Henri, 1992) and those processes encouraged or required by the learning experience.

The notion of reflection on learning processes, aligns with Schon's (1987) concept of reflection-on-action as a means of self-improvement and gaining enhanced outcomes. It is "procedural or methodological thinking" (Lipman, 2003, p. 26). This process is about the learner reflecting on their practice of learning in a deliberate manner for the purposes of improving their future learning: [r]eflection on experiences enhances learning though experience" (Loughran, 2002, p. 35).

Reflective thinking as an additional descriptor for the CoI model combines both reflection on learning outcomes and reflection on learning processes. As (Lipman, 2003) explains,

> Reflective thinking includes recursive thinking, metacognitive thinking, self-corrective thinking, and all those other forms of thinking that involve reflection on their own methodology at the same time as they examine their subject matter (p. 27).

It requires attentiveness to the method of learning in addition to the content of what is being learnt. It is also future orientated, in that the content being learned can be applied in other contexts and understanding the processes of learning can be used to improve learning in the future. The two additional indicators provided for reflection in this paper may be used by educators to guide the development of learning experiences and assess reflection in courses which aim to promote reflection and improve critical thinking. They can also be used as protocols for research and evaluation.

Context and methodology

Participants for this research were second year pre-service teachers from the Secondary specialization. The course focused on curriculum and pedagogy for the middle phase of learning. The course was a blended course where the use of the online environment was purposefully designed into the teaching, learning and assessment of the course. Thirty-six pre-service teachers consented for their online discussion posts to be analyzed for the purposes of research. The pre-service teachers had the opportunity, and were encouraged through assessment, to interact with peers, academics and experts in the field. The learning experience ran over a six-week period, provided flexibility of access and supported critical inquiry to make links between theory and the real life issues teachers' deal with when teaching in diverse and technology enhanced secondary classrooms.

The learning experienced was designed to allow pre-service teachers to select the topics for discussions and the questions for inquiry. There was no content provided by the instructor, and this learning activity required the learners to create the content by sharing experiences, literature etc. The instructor provided a structure for the learners but the content was not pre-determined or 'canned'. This process aligns with Fabro and Garrison's (1998) perspective as they remarked that the quantity of "content must be limited if students are to have the time to critically analyze and construct deep meaning" (p. 51).

The key activity had five phases:

- Phase 1: introduce self to the larger group, respond to peers and read some stimulus text;
- Phase 2: within small groups create an overview of the stimulus material including pedagogical issues the stimulus raised;
- Phase 3: the instructor selected two inquiry questions pre-service teachers created in phase 2 to stimulate inquiry dialogue around issues identified by pre-service teachers;
- Phase 4: in-service teachers and consultants, as experts, joined to pre-service teachers in dialogue; and
- Phase 5: pre-service teachers wrote a reflective piece related to their participation within the learning activity.

The archived online discussions were used as the data-set for this study. Data was also collected from the course materials and the instructor's reflections during the course of the semester. The pre-service teachers' posts were analyzed using phases and indicators of cognitive presence including the additional reflection indicator.

The unit of analysis was each pre-service teacher's post. Here the pre-service teacher decided on the length and content of each post. by Weltzer-Ward (2011) conclude that the use of a single post as a unit of analysis supported "reliable and valid analysis" (p. 18). When analyzing the data the researcher coded the discussion posts and then several months later recoded the posts. This resulted in an intra-rater reliability (or agreement level) of 92% using Holsti's (1969) reliability coefficient.

Findings and discussion

The instructor, who is also the researcher, was familiar with the CoI and the four phases of cognitive presence. Familiarity with the characteristics of the four phases enabled the instructor to make ongoing improvements to the course to encourage pre-service teachers to move produce communication commensurate with these characteristics and support the development of the pre-service teachers' critical thinking. The online discussion space was used to extend the reach of the conversation to international experts in the field. The experts stimulated conversations, questioned pre-service teachers, provided examples, resources, and strategies and shared alternative perspectives to the issues under discussion.

The course was a blended course so pre-service teachers had the opportunity to discuss in the face-to-face classes in addition to the online discussion space. Table III presents an analysis of the pre-service teachers' online discussion contributions. The introductory posts were not included as part of the analysis. During the six-week period that this learning activity ran, the average number of posts per pre-service teacher was three (excluding the introductory posts made in the first week). This was much lower than anticipated given the assessment mandate for their participation.

Table III
Cognitive Presence Analysis from Discussion Forums

Practical inquiry Phase	Indicators	Number of posts
Triggering Event	Recognise problem	0
	Sense of puzzlement	3
Total		(3%) 3
Exploration	Divergence – within the online community	0
	Divergence – within a single message	0
	Information exchange	48
	Suggestions for consideration	4
	Brainstorming	1
	Leaps to conclusions	0
Total		(49%) 53
Integration	Convergence – among group members	7
	Convergence – within a single message	2
	Connecting ideas, synthesis	8
	Creating solutions	0
Total		(15%) 17
Resolution	Vicarious or real world application of solutions/ideas	0
	Defending solutions	0
	Reflection	36
Total		(33%) 36

Table III provides a summary of the discussion forum analysis, showing that first phase in the inquiry process, triggering, occurred only in 3% of the posts. This number may have been low because much of the initial discussion for the activity occurred in the face-to-face environment rather than online. The pre-service teachers asked a few questions of clarification at this phase but it appeared that the indicators of problem recognition and sense of puzzlement did not form a significant element of pre-service teachers' online discussion contributions.

The majority of the posts were coded at the second phase, exploration. In particular, pre-service teachers' posts at this level were at the information exchange indicator where pre-service teachers shared literature, resources and personal narratives of their experiences related to the topic. Other researchers (Garrison et al., 2001; Gorsky, Caspi, Antonovsky, Blau, & Mansur, 2010; Kanuka & Anderson, 1998; Luebeck & Bice, 2005; Redmond & Mander, 2006; Vaughan & Garrison, 2005) working in a range of different contexts have found similar results. The following pre-service teacher post is an example of the types of exploration posts:

> When I was in high school it was abundantly clear who the "leaders" and who the "followers" were. The "leaders" were the … I find it really strange why this is typically … Do girls generally have a competitive nature or a "cattiness" that they can't help? I understand why bullies bully I just wonder why it is so much more prevalent in teenage girls? Can anyone help me?

Only 15% of the total posts were coded as being in the integration phase of the inquiry process. The pre-service teachers were able to refer to previous messages and connect ideas from various external sources within this phase. It was comforting to see that the pre-service teachers were reading and providing links to resources and literature beyond the course materials provided. At this phase the pre-service teachers contributed to the online discussions with a more informed voice. A sample pre-service teacher post at this phase is provided below:

> My personal approach would be to identify who is involved and assess the incident; its level of severity, when and where are the incidents occurring (home or school?), and frequency. I would gain this information by speaking to each individual student privately. As Drew pointed out, the severity of the situation would determine what type of action to take from here. This could range from … As a teacher, I would hope that my school has policies and procedures set out to guide my decisions. I imagine that dealing with a situation involving any form of bullying in an uninformed, careless way or simply ignoring the problem because you are unsure of how to handle it is very poor practice and could have potentially dire ramifications on the students involved.

The final phase of cognitive presence, resolution, corresponded with 33% of the pre-service teachers' posts. At this point in the online forum, students were asked to provide a response to a scenario in which they needed to apply/test their new knowledge or skills to resolve an issue or problem. It is anticipated that 'prompting' increased the number of posts at the resolution phase.

While reflecting on their learning outcomes the learners articulated specific knowledge that they had learnt and demonstrated that they could relate this new knowledge to their future teaching. The following pre-service teacher quotes provide examples of what reflection on learning outcomes might look like in written texts.

- "Significant points that were raised during this project regarding bullying were … "
- "What I have now learnt is that intervention does not necessarily need to be targeted toward a particular individual or group. A key learning curve for me was discovering that the … Much of what I have learnt will be very useful when I have my own classroom and group of students and I feel much more equipped now to deal with these issues thanks to the input from my fellow students and from the information provided by the experts."
- "One key learning that I drew … was that students and communities of lower socio-economic status did not necessarily experience more recurrent or severe bullying. I personally had the assumption previously that school communities of low socio-economic status would suffer more from bullying, and it was interesting and unexpected to have this presumption broken down."

When exploring the new indicator of reflection and the process of reflecting on learning outcomes in particular, it was clear that the learners in this study were able to recognize and express aspects of the development of their new knowledge. They could also identify some characteristics of their previous bias and prejudice. It may be conjectured that this awareness of previous assumptions and personal perspectives combined with the development of new knowledge deepened the learners' understanding of the topic. The learners could also articulate that their understanding of the subject matter had future uses.

In their reflection on learning processes, learners shared their perceptions of their own participation in the learning experience in addition to reflecting on the design of the learning experience. The pre-service teachers expressed the following when reflecting on their learning processes:

- "I found the idea of posting my thoughts and ideas for all to view and analyze very daunting."
- "We were able to share ideas, opinions, experiences and resources that I found greatly assisted my personal understanding of many issues that I will face as a teacher in the 21st Century classroom. Furthermore, through the collaboration with the experts and other education students I have developed recognition of how these issues will impact the future pedagogical practices that I utilize."
- "Some of the strengths include the opportunity to hear the opinions of people who live across the other side of the world and also the professional advice of people … It was also very convenient …. it was a totally new experience for me was great in that it made me expand my technological skills and helped me to become more comfortable in an online discussions area ….. The weaknesses…having only the words in front of you, it was often difficult to distinguish the tone in which the post was being said and I was continually worried that I was taking a different meaning from them then what was intended."
- "Collaboration such as this enables us to approach classroom issues from a different perspective by receiving different views and policies towards these issues."

Quotes like these indicate that the learners recognized their growth through the learning experience. They could identify the processes involved in the experience and articulate how those processes inhibited or enhanced their learning. When reflecting on the methodology of their learning experience the learners seem to have progressed to a higher cognitive level as would be expected in the final, resolution, phase of cognitive presence. Using the original table developed by Garrison et al (2000) posts of a reflective nature would not be coded at this higher, more deeply reflective, level of cognitive activity.

At the same time it should be noted that, the outcomes of this research are limited to the context of this study. The findings are relevant to the specific course offering, instructor and pre-service teacher cohort. The recommended modifications for the resolution phase of cognitive presence should be tested in a range of contexts. The next steps would be to conduct statistical testing to confirm the validity and reliability of the inclusion of the additional reflection indicator within the cognitive presence element. Further directions for future research would be to analyze discussions across a range of disciplines within both graduate and undergraduate courses with the additional indicator present.

How might reflection be positioned within cognitive presence?

As previously stated reflection is a process which is associated with high levels of thinking and as such should be coded at the higher level of critical thinking, within the resolution phase. Instructors are able to facilitate discussion which provides learners with the opportunity to "document, retrieve and reflect on earlier stages of the learning process" (Bass & Eynon, 2009, ¶ 13). To facilitate the coding of reflective online posts and other reflective activities within a course, the researcher proposes a modification to the resolution phase of the original cognitive presence coding protocol as shown in Table IV.

Table IV
Modified Cognitive Presence Indicators

Practical Inquiry Phase	Indicators	Socio-cognitive processes
Triggering Event	Recognise problem	Presenting background information that culminates in a question
	Sense of puzzlement	Asking questions Messages that take discussion in a new direction
Exploration	Divergence – within the online community	Unsubstantiated contradiction of previous ideas
	Divergence – within a single message	Many different ideas/themes presented in one message
	Information exchange	Personal narratives/descriptions/facts (not used as evidence to support a conclusion) Sharing of literature/resources Questions of clarification
	Suggestions for consideration	Author explicitly characterises message as exploration, e.g., "Does that seem about right?" "Am I way off the mark?"
	Brainstorming	Adds to established points but does not systematically defend/justify/develop situation
	Leaps to conclusions	Offers unsupported opinions
Integration	Convergence – among group members	Reference to previous message followed by substantiated agreement (e.g., "I agree because . . .") Building on, adding to others' ideas
	Convergence – within a single message	Justified, developed, defensible, yet tentative hypotheses
	Connecting ideas,	Integrating information from various

	synthesis	sources – text book, articles, personal experience
	Creating solutions	Explicit characterisation of message as a solution by participant
Resolution	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 outcomes Reflecting on learning processes

Source: Modified from Garrison, Anderson and Archer (2001, pp. 15-16)

During the last decade many researchers have validated the current coding protocols of the CoI. Garrison and Arbaugh (2007) have suggested that the CoI categories be reviewed to "fully describe the elements i.e., presences of the community of inquiry" (p. 166). Modifications to teaching presence have already been recommended by Shea, Hayes and Vickers (2010) within the direct instruction indicators, as well as including an additional category called *Assessment* which has indicators referring to formative and summative feedback and assessment. In a recent publication, a fourth presence - Learner Presence - was recommended by Shea and Bidjerano (2010), which would have the indicators of self-regulation and self-efficacy. This additional presence has yet to be tested in other research. Richardson and Ice (2010) have also suggested that the indicators of cognitive presence should be re-examined.

Henri (1992) reminds us that reflection "is difficult to observe within a traditional teaching/learning situation , as it is rarely … intentionally expressed by the learner" (p. 131). In the online space learners often reveal or are asked to share their learning processes or additional knowledge gained through online experiences. The addition of a reflective indicator to cognitive presence would assist educators to design in or research about reflective processes.

Garrison and Anderson (2003) suggest that students be asked to create a "reflection piece" (p. 98) to illustrate their contributions to and learning from the educational experience. They recommend that "students should be given guidance" (p. 98) and that it could be in the form of the indicators and examples provided in their original tables describing social, cognitive and teaching presence. This researcher suggests in addition that the addition of a reflection indicator as an element of cognitive presence would provide learners with more structure to support the self-assessment of their contributions and learning outcomes.

In their paper reviewing the issues and future directions of research regarding the CoI, Garrison and Arbaugh (2007) proposed that future research might focus on "the impact of increasing student metacognitive awareness on the quality and development of the discourse and learning outcomes" (p. 168). Following this, Akyol and Garrison (2011) explored the possibility of creating a *Metacognition* presence within the CoI. Their research established that, rather than appear as a separate presence, it could be part of cognitive presence by learners monitoring their own learning and within teaching presence by monitoring the learning of others.

To include a new indicator of named reflection rather than metacognition may broaden the scope of cognitive presence. The additional indicator stays true to the original construct of cognitive presence, as evidenced from its origin in Dewey's epistemology. It would also provide the opportunity for reflective posts to be coded at the higher level in the inquiry

process, specifically, the level of resolution. This may also overcome some of the concerns that many researchers (Gorsky et al., 2010; Kanuka & Anderson, 1998; Luebeck & Bice, 2005; Redmond & Mander, 2006; Vaughan & Garrison, 2005), including the authors of the original framework, have directed towards the final phase of the framework, in that learners rarely move to the higher cognitive levels of the resolution phase.

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