

Critical Thinking in Asynchronous Online Discussions: A Systematic Review

La pensée critique dans les discussions asynchrones en ligne : examen systématique

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Abstract

Enhancing critical thinking is a common goal of higher education. Designing and facilitating learning environments in which critical thinking may develop is a key responsibility for instructors. In this paper, we seek to inform future research and practice by investigating instructional strategies that could be used to promote critical and reflective thinking in asynchronous online discussions. Our literature review was qualitative and systematic, and focused specifically on strategies that were effective in fully-online higher education contexts. Thematic analysis was used to synthesize the findings and conclusions from the various studies into recurrent themes and sub-themes. The results of the analysis indicated that practitioners should employ a multi-step approach to facilitating critical thinking and reflection in asynchronous online discussions. Implications for future research and practice are discussed.

Résumé

Améliorer la pensée critique est un objectif courant de l'éducation supérieure. Concevoir et faciliter des environnements d'apprentissage dans lesquels la pensée critique peut se développer est une responsabilité importante pour les instructeurs. Dans cet article, nous cherchons à renseigner les études et les pratiques futures en examinant les stratégies didactiques qui pourraient être utilisées pour promouvoir une pensée critique et réfléchie dans les discussions asynchrones en ligne. Notre examen des publications a été qualitatif et systématique. Il a été particulièrement axé sur les stratégies qui étaient efficaces dans les contextes d'éducation supérieure entièrement en ligne. L'analyse thématique a servi à synthétiser les résultats et les conclusions des différentes études en thèmes et thèmes sous-jacents récurrents. Les résultats de l'analyse indiquent que les intervenants devraient se servir d'une approche en plusieurs étapes pour promouvoir la pensée critique et réfléchie dans les discussions asynchrones en ligne. Une discussion de ce que cela implique pour les recherches et la mise en pratique est incluse.

Introduction

Over time, the number of published literature reviews on any interesting topic tends to increase, making new reviews seem redundant. Cook and West (2012) argue that “... to contribute to the literature, a new review must fill a *meaningful gap* in published reviews and add significantly to current knowledge, in terms of either *quality* or *data* [emphasis added]” (p. 945). A literature review should also provide a synthesis that others may refer to conveniently (Rew, 2011). In this paper we first provide an analysis of existing reviews, identifying both their contributions and their limitations before demonstrating how we plan to build upon them. Our aim in this review is to synthesize, in a systematic and transparent way, the strategies that have been documented in engendering *critical thinking* in asynchronous online discussions (AODs), exclusively in fully-online higher education contexts.

Moreover, in this review, we offer a focus on *cognitive presence*, a canonical conceptualization of critical thinking in text-based learning environments. Garrison et al. (2000; 2001) described cognitive presence as a “vital element” in critical thinking and the principal component in successful higher education. They define it broadly 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, Anderson, & Archer, 2000, p. 89). More specifically, however, it reflects the idealized process of critical thinking and is concerned primarily with higher-order thinking processes rather than learning outcomes (Garrison, Anderson, & Archer, 2001). Cognitive presence, situated in the community of inquiry (CoI) framework, is operationalized by the practical inquiry model (PIM) which defines cognitive presence in four phases (i.e., triggering event, exploration, integration, and resolution) of critical discussion (Garrison et al., 2000, 2001; Kanuka & Garrison, 2004). CoI has become one of the most accepted theoretical frameworks in the research on text-based discussions in online educational contexts (Breivik, 2016; Weltzer-Ward, 2011); and is therefore, an element of the research on online learning that merits inclusion in a review.

Previous Literature Reviews

Searches for previous literature reviews were conducted through Google Scholar and the University of Ontario Institute of Technology’s online library search tools, using cognitive presence or *critical thinking*, *asynchronous discussions* or *online discussions* as search terms in conjunction with the word *review*. This resulted in our identifying seven reviews, several of which focused on methodology for assessing cognitive presence or critical thinking rather than specific instructional strategies that engender them (De Wever, Schellens, Valcke, & Van Keer, 2006; Marra, 2006; Maurino, 2007; Weltzer-Ward, 2011). Nonetheless, we found two reviews that stated a principal focus on exploring strategies for promoting critical thinking (Darabi, Liang, Suryavanshi, & Yurekli, 2013; Schindler & Burkholder, 2014). Additionally, we found one review (Buraphadeja & Dawson, 2008) that can be said to have loosely focused on non-specific theoretical approaches that foster critical thinking.

Findings of Previous Research Reviews

The relevant previous reviews (Buraphadeja & Dawson, 2008; Darabi et al., 2013; Schindler & Burkholder, 2014) support several general and important inferences, which we will

discuss in detail before turning to the key implications the prior reviews had for the current review. Generally, the previous literature reviews:

- sought to address the need to enhance higher-order thinking processes in AODs,
- indicated that pedagogically rich and strategically structured discussions are important for student performance and engagement,
- implied that broad theoretical approaches to instruction such as social constructivism and situated practice may foster critical thinking, and
- indicated that both instructor and student facilitation are effective for promoting critical thinking in AODs.

Critical thinking in AODs. Some previous literature reviews focused on promoting critical thinking (Buraphadeja & Dawson, 2008; Darabi et al., 2013; Schindler & Burkholder, 2014). For instance, Schindler and Burkholder (2014) stated that although AODs are ubiquitously used to promote critical thinking in online courses, the available research demonstrated that high levels of critical thinking were not achieved. They also claimed there was a lack of understanding about the instructional approaches best suited to promote critical thinking in AODs. Accordingly, they focused their review on clearly illustrating “instructional design and facilitation approaches that promote critical thinking in AODs across multiple cognitive constructs” (p. 11). Likewise, Darabi et al. (2013) stated explicitly that their meta-analysis of empirical studies of the effectiveness of discussion strategies was meant to address an argument that online discussion strategies are rarely designed to specifically enhance learners’ critical thinking.

Strategically structured discussions. Previous reviews also suggested that strategically structured and pedagogically rich discussions are effective for enhancing student performance and engagement (Darabi et al., 2013; Schindler & Burkholder, 2014). For example, Darabi et al. posed several research questions to guide their meta-analysis of discussion strategies that may enhance learners’ critical thinking. The researchers wanted to know if learners perform better in strategic discussions than when they participate in conventional online discussions; they also sought to determine if embedding pedagogical features in the design of online strategies affects learners’ performance. They defined conventional strategies as:

...posting of a question about a particular topic of discussion and soliciting responses from the learners in the context of the course without moderation, interaction, or collaboration. Other more complex discussion formats...were considered non-conventional or strategic discussions. (Darabi et al., 2013, p. 230)

Darabi et al. (2013) explained that the interactive presence of the instructor was considered non-conventional, and such interventions within the discussions was what they referred to as pedagogically rich strategies. The researchers concluded that these strategies, which involved instructors monitoring and moderating the discussions through regular interactions with the students, were important for increasing their performance. Further, they found that studies that utilized non-conventional strategies demonstrated overall greater student engagement. For instance, when a discussion was strategic and productive (e.g., involved the application of a scenario), the students participated better than when discussion tasks simply

required them to elaborate. Thus, Darabi et al. highlighted the importance of using structured and well-designed strategies in online discussion.

Theoretical approaches and critical thinking. Buraphadeja and Dawson (2008) suggested that theoretical approaches such as social constructivism and situated practice could enhance learners' critical thinking in AODs. In their review, the researchers explored common frameworks for assessing critical thinking and found indicators embedded within the models that represented social constructivism and situated learning. For example, when analyzing Newman, Webb, and Cochrane (1995) and Newman, Johnson, Webb, and Cochrane's (1997) indicators of critical thinking for content analysis, Buraphadeja and Dawson discovered indicators such as "generating new data from information collected" and "critical assessment/evaluation of own or others' contributions" (2008, p. 138) that they explained to be notions of social constructivism. Therefore, since several models for assessing critical thinking connote notions of these broad theoretical approaches, instructors should utilize discussion strategies which embrace them. They provided Socratic questioning as a facilitation strategy and creating heterogeneous groups of learners with diverse experiences as a design strategy.

Instructor and student facilitation. All prior reviews pointed to the importance of the instructor for implementing strategies to facilitate critical thinking in AODs (Buraphadeja & Dawson, 2008; Darabi et al., 2013; Schindler & Burkholder, 2014); however, Schindler and Burkholder also identified the saliency of student facilitation. In the results of their review, the researchers stated that critical thinking in AODs could be facilitated by both instructors and by students. They explained that since the presence of an instructor, in some instances, could inhibit student interaction, student facilitation strategies such as "showing appreciation, providing comments/opinions/explanations, asking questions, encouraging peers to contribute, giving peer feedback, and summarizing" (p. 22) were all viable options to enhance the quality of AODs. However, they also emphasized that certain student facilitation strategies may not necessarily influence critical thinking. Two of the strategies that they observed to influence critical thinking were prompting other students to elaborate or analyze their own assumptions and providing feedback. Thus, Schindler and Burkholder's finding have provided instructors with practical alternatives to facilitating AODs more effectively.

Limitations of the Previous Reviews

Previous literature reviews have unquestionably contributed significantly to the field of online teaching and learning. However, these reviews contained two salient limitations that we plan to address in our review. First, some previous reviews (e.g., Darabi et al., 2013; Schindler & Burkholder, 2014) did not distinguish precisely between the contexts of the studies that they included. This raises questions about their generalizability across all types of online learning settings. Second, the qualitative reviews (e.g., Buraphadeja & Dawson, 2008; Schindler & Burkholder, 2014) made little use of a systematic methodology that would make them more transparent and objective. Nevertheless, we see the lack of systematic elements in qualitative reviews less as a limitation of the individual reviews than as a trend in higher education research-also noted by Bearman et al. (2012).

The limitations of previous reviews, in conjunction with their pivotal contributions to the field, have had key implications for the current review. Namely, we recognized the need to

identify the precise context in which AODs are used (Lee-Baldwin, 2005). In this regard, we hope to build on the knowledge generated from previous reviews by focusing on qualitative research, which was specifically situated in fully-online, higher education contexts. Further, the lack of methodical elements in previous qualitative reviews has encouraged us to demonstrate a higher level of transparency and objectivity by adhering to systematic protocols, thereby providing practitioners and policy-makers with valuable synthesized conclusions (Bearman et al., 2012).

Methods

In this study, we sought to apply the broad method of a *qualitative synthesis* (Seers, 2012) to pool and interpret the data. A qualitative synthesis is a judgement-based, systematic process that entails searching for research on a specific topic and aggregating the findings from several qualitative studies (Seers, 2012). Notably, as Bearman and Dawson (2013) claimed, qualitative syntheses are likely to yield different insights into the “complex, social and highly-context dependent” field of education (p. 254) and may shed light on educational dilemmas and decisions.

The Review Protocols

A systematic review should have an established protocol to guide the conduct of the review. To guide the protocols in the current review, we drew upon two already established models previously outlined by Rew (2011) as well as Cook and West (2012; see Appendix A for a juxtaposition of these models). We began by posing the following guiding questions to provide a clear focus for orchestrating each subsequent phase of the review:

- What design/facilitation strategies have been documented for promoting critical thinking within text-based asynchronous discussions in fully-online higher education contexts?
- What other frameworks were used to conceptualize critical thinking throughout the literature?
- How did methodologies for coding cognitive presence/critical thinking vary across the studies?

The retrieval processes. From July 2017 to September 2017, sources were collected from the Educational Resources Information Clearinghouse (ERIC) database via the ProQuest and EBSCOhost indices, Google Scholar, and an archival website hosted by Athabasca University. The key words used in all searches were “asynchronous discussions” used in parentheses along with “cognitive presence” and/or “critical thinking,” also in parentheses (to direct the search engine to find exact matches for the phrase within the parentheses). Although we are focused on cognitive presence, critical thinking was included in the search because it is often closely associated with cognitive presence in the literature. The search equation that was used for the ERIC searches became: (asynchronous discussions) and (critical thinking) or (asynchronous discussions) and (cognitive presence). The ERIC via ProQuest search, filtered for doctoral dissertations, books, and journal articles, generated 91 results with publications ranging from 2000 to 2017. The EBSCOhost search, using the same search criteria, generated 43 results comprising only academic journal articles (42) and books (1). Publications ranged from 2003 to 2017. After duplicates were removed from both the ProQuest and EBSCOhost searches, the

remaining total was 91, meaning that all EBSCOhost results were duplicates of those initially retrieved via ProQuest.

The titles and abstracts of the ERIC via ProQuest and EBSCOhost documents were then examined for suitability for the study. Articles with explicit reference to, or focus on, asynchronous discussions and cognitive presence or critical thinking were retained. Articles that did not convey cognitive presence or critical thinking as units of analysis within the discussions themselves were omitted from further examination. For instance, since DeLotell, Millam, and Reinhardt (2010) and Ng, Cheung, and Hew (2010) examined the use of deep learning strategies to affect student retention rates and the impact of scaffolds on students' problem-solving skills, rather than how they could influence cognitive presence, their studies were not collected for this review. However, researchers that measured other constructs such as *reflective thinking* and *knowledge construction* that could be indicators of cognitive presence were also taken into consideration during this process (e.g., De Wever, Winckel & Valcke, 2008 or Liu & Lang, 2014). This also meant that studies that indicated a focus on the development of critical thinking skills as an outcome of participating in asynchronous discussions, such as Cheong and Cheung (2008) or Joiner and Jones (2003), were not included. We made such exclusions because we are concerned with invoking critical discourse and higher-order thinking within the discussions themselves to promote reflection and knowledge creation, not necessarily for the development of measurable knowledge or skills per se. The focus here is on the progression of critical inquiry, emphasizing the process rather than the outcome. Altogether, this process of examining titles and abstracts resulted in a total of 49 sources being removed, leaving 42 for further examination of appropriateness.

In addition to the ERIC search via ProQuest and EBSCOhost, a Google Scholar search was performed. After initial results from the same search expression found 1,090 results, a modified search was used to be more specific. First, the search expression was shortened to filter articles for cognitive presence and asynchronous discussions rather than cognitive presence and critical thinking. The final search expressions became cognitive presence and asynchronous discussions (in Google Scholar searches, quotation marks function in the same manner as parentheses in the other search engines). Second, the range of publications was limited to 2015 to 2017 in order to focus the search on only the most recent research. Ultimately, the results from the modified search displayed a total of 294 results. These results were also examined by title and abstract to determine their suitability by identifying indicators of cognitive presence and critical thinking as units of analysis within the context of asynchronous discussion discourse. Some ostensibly suitable sources were not collected due to a focus on social aspects or community building in online asynchronous discussions. For example, authors who asserted strategies for promoting a "sense of community" such as Trespalacios and Rand (2015) were not included. Also, articles that focused on methods for increasing general socialization or social presence were discarded (e.g., Hung, Flom, Manu, and Mahmoud [2015] and Davidson-Shivers, Rand, Rogers, & Bendolph [2016]). Many of the articles in the remaining list had already been selected in the ERIC searches. From the Google Scholar search, a total of 17 new sources were extracted for further assessment, and the total remaining documents to be further analyzed for inclusion from all three searches (ERIC via ProQuest/EBSCOhost and Google Scholar) was 59.

Lastly, documents were also collected from the Athabasca University Communities of Inquiry archive which is designed to gather published CoI research and to facilitate discussion

among interested researchers and practitioners. Studies from the cognitive presence section of this website were analyzed by title and abstract resulting in 19 new additions, bringing the total number of documents discussed up to this point in our review to 78, suggesting the Athabasca repository is an important source for unique publications in this area.

The inclusion processes. Following analysis of titles and abstracts, we closely examined the sources to ensure that they met the following requirements:

- The study focused on cognitive presence (or related critical thinking) in asynchronous discussions as part of fully-online higher education settings,
- The study focused on design and/or facilitation strategies used within asynchronous discussions to promote cognitive presence and critical discourse,
- The study referenced an established coding scheme (e.g., PIM) to conceptualize and analyze cognitive presence or critical thinking by observing raw discussion data,
- Qualitative or mixed methods of analyses and interpretation were used to investigate the meaning of text-based discussions (e.g., content analysis), and
- The studies were empirical examinations of original data. Therefore, literature reviews, were excluded from this review.

Sixty-two sources failed to meet these requirements, leaving 16 for this analysis. Table 1 summarizes the literature retrieval and inclusion process.

Table 1

The Retrieval and Inclusion of Literature

	ERIC via ProQuest and EBSCOhost (combined)	Google Scholar	Athabasca University Archival Website	Total
Number of search results	134	294	29	457
Sources after abstract/title check and removal of duplicates	42	17	19	78
Sources omitted during inclusion process	35	12	15	62
Total Remaining				16

Data extraction. To align our analysis with the specific research questions guiding the review and to facilitate our synthesis of the data into key themes, we delineated the data in Table 2 with columns that identify the strategies that the authors investigated, the methodologies they used for data analysis, and their conclusions about the efficacy of the strategies that were investigated.

Table 2

Summary of Strategies by Study

First Author (year)	Strategy Investigated/Discussed	Coding Schemes (Unit of Analysis)	Findings/Conclusions
Curtis (2006)	Explicit encouragement of critical reflection from the instructor.	Kember's (1999) Categories of Reflective Thought (single message)	The majority of participants demonstrated critical reflection. Instructors should encourage, challenge, prompt and model critical reflection in asynchronous discussions.
Darabi (2011)	Use of four scenario-based online discussion strategies (structured, scaffolded, debate, and role play)	Park's (2009) Phases of Cognitive Presence (single message)	Strategies that required students to take a perspective in an authentic scenario influenced cognitive presence.
De Leng (2008)	PIM as a procedural facilitation instrument	PIM (single message)	Helped sustain on-topic discourse involving critical thinking in small groups. Critical thinking was moderate.
Gašević (2015)	Externally-facilitated regulation, scaffolding and role assignments based on PIM	PIM (single message)	Externally-facilitated regulation scaffolding had greater effects on cognitive presence than grades. Role assignment also facilitated cognitive presence.
Hand (2015)	Customizing posts with descriptive titles as an advanced organizer	Jeong's (2005) Event Categories (single message)	Significantly higher number of critical thinking indicators found in experimental group.
Hemphill (2007)	Virtual guest speaker postings in discussion forums	PIM (single message)	Higher-order thinking occurred regardless of time spent and posts by guests. Guest speakers can be used sparingly in online discussions while still maintaining quality discourse.

Kanuka (2007)	Various communication activities (i.e., debate, invited expert)	PIM (single message)	The highest phases of cognitive presence were during the well-structured activities (WebQuest and debate) with defined roles that confronted students' opinions.
Liu (2014)	Four types of discussion topics: theory, life-experience, case-based, and debate	PIM (single message or paragraphs)	Students' level of knowledge construction was highest for topics related to life experience and case-study analysis.
Morueta (2016)	Differentiated web-tasks designed according to Bloom's Taxonomy (analytical, evaluative, and creative)	PIM (expression, sentence, or paragraph)	Requirements of tasks increased trends in cognitive presence. For a greater understanding of cognitive presence, content analysis should be combined with other quantitative and qualitative tasks.
Oh (2016)	Open-ended discussion questions for the text-based asynchronous discussions	Bloom's (1956) Taxonomy of Cognitive Learning (single message)	Open ended-questions only resulted in surface-level thinking in students' discussions.
Olesova (2017)	Scripted role assignment	PIM (weekly discussion postings)	Scripted role assignment (starter, skeptic, and wrapper) can be an effective strategy to foster cognitive presence (mainly integration phase).
Sadaf (2017)	Questions designed using PIM	PIM (segments as meaningful units)	Students demonstrated higher levels of cognitive presence in response to questions based on the PIM.
Tzelepi (2015)	Teaching presence (i.e., sequencing discussion tasks and provision of complementary learning content)	PIM (single message)	Familiarizing students with asynchronous forum processes and participating in learning design tasks can help promote cognitive development.

Yang (2005)	Teaching and modelling Socratic questioning	Gunawardena, Lowe, & Anderson (1997) Interaction Analysis Model and Newman et al.'s (1995) Indicators of Critical Thinking (phrase, sentence, and paragraph)	Teaching and modelling Socratic questioning helped increase and maintain students' critical thinking.
Zhao (2017)	Teaching presence via assimilating peer messages	PIM (unit not explicitly stated)	Higher levels of teaching presence were associated with lower participation, interaction, and cognitive presence.
Zydney (2012)	Providing structure to discussions with step-by-step discussion protocols	PIM (unit not explicitly stated)	The use of protocols promoted more shared group cognition.

Data Analysis

To ensure that we selected the most appropriate method of analysis for this qualitative synthesis, we identified the dimensions of our review as *integrative* or *interpretive* (Noblit & Hare, 1988) and as *realistic* or *idealistic* (Barnett-Page & Thomas, 2009). Accordingly, we perceived the current review to be predominantly integrative because it was focused on amalgamating findings and summarizing data about concepts that were already well-defined and specified in the literature (Dixon-Woods, Agarwal, Jones, Young, & Sutton, 2005). Further, the current review seemed to be borne out of a modestly realistic epistemological stance since our main intention was not to problematize the literature but instead to create a product that was clear for practitioners and policy-makers (Barnett-Page & Thomas, 2009). DiPasquale (2017) explained in detail the rationale for categorizing this review as integrative and realist; however, Tables 3 and 4 summarize that thinking.

Table 3

Selection of an Integrative Methodology

Criteria for an Integrative Review	Yes (Integrative)	No (Interpretive)
The concepts being examined are already securely defined and specified before the synthesis.	Yes. The concept of cognitive presence has been canonically established throughout the literature and was clearly defined before commencing the review.	Generally, no. However, some interpretation is required to group related strategies for promoting cognitive presence appropriately.
The review was primarily intended to amalgamate and summarize data not necessarily to develop new concepts and/or theory	Yes. The primary purpose of this study is to create a synthesis of strategies and assessment methods for researcher/practitioner use.	When reporting the results, no. However, interpretation will logically follow in a subsequent section to determine what is relevant for future research/practice.

Note. Criteria were derived from Noblit and Hare (1988) and Dixon-Woods et al. (2005).

Table 4

Analysis of This Study’s Methods According to the Idealist/Realist Dimension

Review Trait	Idealist	Realist	This Study
Searching	Iterative	Linear	Mostly linear
Quality assessment	Less clear, less a priori; quality of content rather than method	Clear and a priori	Somewhat clear, a posteriori
Problematizing the literature	Yes	No	No
Question	Explore	Answer	Mostly explores
Heterogeneity	Lots	Little	Mostly heterogeneous
Synthetic product	Complex	Clear for policy makers and practitioners	Clear for practitioners

Note. The summary table of idealist/realist reviews was adapted from Barnett-Page and Thomas (2009, p. 67).

Thematic analysis method. Thematic analysis is a qualitative synthesis methodology (Bearman & Dawson, 2013). It is considered a flexible method (Clarke & Braun, 2017) for analyzing all forms of qualitative data (Braun & Clarke, 2006) that describes key, recurrent themes in a series of literature (Bearman & Dawson, 2013; Dixon-Woods et al., 2005; Thomas &

Harden, 2008). Thematic analysis was a suitable method of analysis for this review for two notable reasons. First, the method was appropriate for generating the type of output intended for this type of integrative and realistic review (Barnett-Page & Thomas, 2009, p. 63). Second, thematic analysis is commonly used by educational researchers conducting systematic reviews to summarize the current literature (Bearman & Dawson, 2013). The specific process of our thematic analysis is described in the following section.

Results

We regard the strategies we investigated in the literature to reflect interventions by the instructor to influence critical thinking. When Garrison et al. (2000) postulated the CoI framework, they explained that the success of establishing a critical community of inquiry was dependent on the presence of the educator (teacher presence) to directly foster the social and cognitive presences. They described the design and the facilitation of the educational experience as the two essential functions that were required of the educator in creating and maintaining such a community. Thus, those functions might be useful for thematically grouping strategies that enhance critical thinking as we have seen done indirectly in previous reviews.

However, Anderson, Rourke, Garrison, and Archer (2001) described three categories for assessing teaching presence (within discussion transcripts) as *instructional design and organization, facilitating discourse, and direct instruction*. Although these categories were originally outlined as a means to examine discussion transcripts for evidence of teacher presence, we contend that they are also useful for categorizing various instructional strategies for promoting cognitive presence/critical thinking into broad themes which themselves may contain several sub-themes. We believe that using the two chief functions of the educator as broadly described by Garrison et al. (2000)—design and facilitation—would have precluded opportunities for the creation of sub-themes regarding indicators of teacher presence that assess the discourse and the efficacy of the educational process” (p. 101). Such a limitation would have omitted the inclusion of themes pertaining to the methodology (coding schemes and units of analysis) employed by the researchers across the studies, which are relevant to our research questions.

Therefore, the thematic analysis in this study included two stages. The first step involved sorting the various instructional strategies that we observed in the literature into the broad themes of instructional management, building understanding, and direct instruction. The next step was concerned with comparing the characteristics of the interventions (provided by the original authors) and subsequently grouping closely related strategies into composite sub-themes. Sub-themes, however, were only created when a similar strategy was observed to be effective in promoting cognitive presence/critical thinking in more than one study. Therefore, any strategies that were unique to a single study were not grouped into sub-themes or discussed in the results (though they can still be observed in Table 2). These themes and sub-themes are illustrated in Table 5.

Table 5

A Delineation of Strategies that Promote Cognitive Presence

Design and Organization	Facilitating Discourse	Direct Instruction
Structured and scaffolded discussions	Modelling effective discourse	Strategic questioning
Critical thinking constructs	Differentiated coding schemes	Inviting external participants
Role assignment	Single messages	

Instructional Design and Organization

A key indicator of teacher presence within the design and organization category is designing and administering the course activities (Anderson et al., 2001). For our purposes, teacher strategies for promoting critical thinking that corresponded with this category of teacher presence were typically those that involved the process of planning and designing the AOD activities. This translated into finding strategies that shaped the structure of the discussions by providing guidelines for effective discourse, framing the nature of the discourse, and assigning specific roles to students within the discussions. In this regard, we created three sub-themes of strategies that proved to promote critical thinking in AODs, *structured and scaffolded discussions*, *role assignment*, and *critical thinking constructs*.

Structured and scaffolded discussions. Several studies indicated that designing discussion activities to be more structured (Darabi, Liang, Suryavanshi, & Yurekli, 2011; Kanuka et al., 2007; Zydney et al., 2012) as well as providing scaffolding to students (Darabi et al., 2011; Gašević et al., 2015) were effective for promoting critical thinking. For instance, in their study, Kanuka et al. (2007) discovered that activities that were well-structured correlated with the highest phases of cognitive presence. Specifically, they described the use of debates and a WebQuest activity that were particularly useful. The researchers outlined that the WebQuest and the debate discussion activities “require students to actively challenge, argue, debate and aggressively confront conceptual conflicts and assumptions of their own as well as their peers” (p. 268) which led to higher levels of cognitive presence than other discussion activities.

In addition, scaffolding discussions for students were associated with increased instances of critical thinking. For example, after designing four different discussion activities (structured, scaffolded, debate, and role play) that were situated in the same problem-scenario, Kanuka et al. (2007) observed that the scaffolded strategy was strongly associated with the highest level of cognitive presence. Scaffolding involved the use of student mentors to act as peer discussion leaders that were oriented, prior to the discussion, about the nature of the scaffolding process and its significance in an instructional context. Specifically, the scaffolders were tasked with posing questions within the discussion which may advance the discussion towards a consensus. As well, Gašević et al. (2015) presented similar findings that the use of an externally-facilitated regulation scaffold, in the form of improved participation guidelines, had a desirable effect on cognitive presence.

Role assignment. The use of roles was another prevalent theme throughout the literature which was reported as having positive effects on levels of critical thinking (Darabi et al., 2013; Gašević et al., 2015; Kanuka et al., 2007; Olesova & Lim, 2017). However, although several studies incorporated role assignment into their investigations and observed a positive effect on critical thinking, only one focused purely on the use of role assignment on students' cognitive presence. This focused study by Olesova and Lim (2017) found that scripted role assignment was an effective instructional strategy for promoting cognitive presence in AODs. Specifically, the researchers found that assigning scripted roles such as a starter, skeptic, or wrapper that were responsible for getting discussions started, challenging arguments from other students, and summarizing the key points, respectively, resulted in increased instances of *integration* and could “lead to a higher-level of social knowledge construction and collaborative learning” (p. 29). However, no instances of resolution were recorded.

Critical thinking constructs. Some studies revealed positive outcomes from using strategies that were either designed using specific constructs of critical thinking (Morueta et al., 2016; Sadaf & Olesova, 2017) or used a construct as a procedural facilitation instrument in and of itself (De Leng, Dolmans, Jöbssis, Muijtjens, & van der Vleuten, 2009). For the former, two different constructs of critical thinking were used to design disparate discussions strategies. For instance, Morueta et al. (2016) used Bloom's Taxonomy (1956) to create differentiated web-tasks such as analytical, evaluative, and creative tasks that required students to be self-regulated. They found that “the tasks of *creation* [emphasis added] in online group learning processes required a higher level of cognitive participation than other lower cognitive tasks... such as the tasks of analysis and evaluation” (Morueta et al., 2016, p. 128). Similarly, Sadaf and Olesova (2017) used cognitive presence to develop discussion questions based on the PIM. In a comparison to ordinary playground questions, the researchers discovered that the purposefully designed questions corresponding to the PIM resulted in a greater occurrence of the highest levels of cognitive presence.

Facilitating Discourse

Anderson et al. (2001) stated that to maintain students' interest, motivation, and engagement in AODs, instructors need to be effective facilitators who are actively involved in the discourse. An important part of facilitating discourse involves the instructor modelling appropriate behaviour within the AOD, ensuring that the discussion results in the desired learning outcomes, and “assessing the efficacy of the process” (p. 7). For this review, this understanding of the instructor's involvement in discussions resulted in the grouping of strategies that reflected the direct and active facilitation of critical thinking in AODs as well as the methodologies researchers used to measure it thereafter. Thus, we created several sub-themes, *modelling effective discourse*, *differentiated coding schemes*, and *single messages and meaningful units*.

Modelling effective discourse. Two studies indicated that having instructors model effective discourse within AODs was a viable strategy for promoting critical discourse (Curtis, 2006; Yang et al., 2005). For example, in her study about using AODs to promote critical reflection among HIV/AIDS educators, Curtis (2006) explored the way in which students engaged in reflection and subsequently recommended methods that could promote reflective thinking in similar contexts. She observed that students were “more comfortable reflecting on

what they know and how they came to that knowledge than they are in questioning the validity of their own ideas and assumptions” (p. 176) and concluded that although critical reflection does occur in AODs, the type of reflection that is necessary to address issues in the HIV/AIDS education contexts was low. Therefore, Curtis recommended that in order for reflection about difficult issues to occur, instructors should model the kind of *premise reflection* needed for them to question their own beliefs and assumptions. Similarly, Yang et al. (2005) found that modelling Socratic questioning enabled students to demonstrate higher levels of critical thinking skills and maintain those skills for a meaningful amount of time thereafter.

Differentiated coding schemes. Despite a clear majority of the studies utilizing the PIM as a coding scheme (11 of 16), there were a number that employed different models for assessing critical thinking (Curtis, 2006; Darabi et al., 2011; Hand, 2015; Oh & Kim, 2016; Yang et al., 2005). Therefore, it is possible that the reasons for, and descriptions of, the coding schemes provided by these researchers may reveal potential shortcomings within the PIM. For instance, Hand (2015) selected Jeong’s (2005) *Event Categories* due to the scheme’s high inter-rater reliability. As well, some researchers (Darabi et al., 2013; Yang et al., 2005) noted the great amount of subcategories that their selected frameworks provided for coding critical thinking. For example, Yang et al. (2005) remarked the high number (21) of subcategories that Gunawardena et al.’s (1997) *Interaction Analysis Model* afforded. Similarly, Darabi et al. (2011) employed a *Phases of Cognitive Presence* model by Park (2009) which simply created a set of subcategories for each stage of the PIM. Furthermore, one researcher (Curtis, 2006) utilized a coding scheme that allowed for writing to be divided into several categories of reflective thought (content, process, and premise reflection) that, in turn, allowed for “differentiation between introspection, which involves the identification and recognition of thoughts and feelings, and true reflection...” (p. 171).

Altogether, these differentiated choices could indicate that there are issues with PIM’s inter-rater reliability, that PIM does not provide enough subcategories for accurately coding critical thinking, and that PIM does not provide sufficient indicators to assess the precise types of critical reflection that transpire in AODs.

Single messages and meaningful units. A majority of the studies we reviewed used the author’s entire message as a unit of analysis during the coding of discussion data into categories of critical thinking. The researchers generally cited the works of Rourke, Anderson, Garrison, & Archer (2001) and Garrison et al. (2001) as the reason for this choice. Other researchers used a less exclusive definition of a meaningful unit of analysis that typically involved the interpretation of segments, single sentences, expressions, or paragraphs as viable alternatives (Liu & Yang, 2014; Morueta et al. 2016; Sadaf & Olesova, 2017; Yang et al. 2005). These researchers were typically more open to what length of text was considered an appropriate unit. For instance, in their choice of unit of analysis, Morueta et al. (2016) stated:

The units of analysis were the “units of meaning,” not the specific messages. A unit of meaning can be defined simply as a thought or idea (Rourke et al., 2001). Units of meaning include expressions, sentences or paragraphs in which important thoughts and ideas (meanings) are conveyed. Depending on the semantic sense used, several units of meaning could be conveyed in each message. (124)

Like Morueta et al. (2016) who thought it was appropriate to be more flexible and subjective in the defining an appropriate unit of analysis, Liu and Yang (2014), though they principally coded text using single messages, also coded single paragraphs if a posted message contained “more than two main responses” (p. 337). Similar actions were taken by Darabi et al. (2011) along with Sadaf and Olesova (2017) who subjectively segmented postings into illocutionary statements and meaningful units, respectively.

Direct Instruction

Direct instruction is generally characterized by instructors sharing their academic knowledge and leadership with students (Anderson et al., 2001). Anderson et al. (2001) stated that the role of the teacher, in any academic context, whether it be online or face-to-face, involves the utilization of the instructor’s expert knowledge and “pedagogical expertise” (p. 8). That is, instructors must disseminate both content specific knowledge and expert knowledge of the learning process to their students so that they can become reflective learners. For the purposes of this review, two sub-themes were created that reflect, specifically, the instructor’s pedagogical expertise and their connection to a broader knowledge community. In the case of the former, strategies such as teaching and using *strategic questioning* that reflected the instructor’s knowledge of the ideal progression of critical discourse comprised one sub-theme. Whereas the instructor’s connection to an expert community resulted in the grouping of strategies that involved inviting external guests to participate in the AODs.

Strategic questioning. Some researchers investigated the effects of strategic questioning on the impacts of critical thinking in AODs (Sadaf & Olesova, 2017; Yang et al., 2005). Both Sadaf and Olesova (2017) as well as Yang et al. (2005) found that non-conventional methods of questioning in AODs was effective at fostering critical thinking. Such strategic questioning involved, respectively, designing questioning according to the phases of PIM along with teaching and modelling Socratic questioning. In contrast, the more conventional open-ended questioning utilized by Oh and Kim (2016) did not provide similar results. In their study, Oh and Kim compared the quality of discourse that occurred in scaffolded audio-based discussions and conventional text-based discussions in which the instructors used open-ended questioning. Their results demonstrated that the scaffolded, audio-based online argumentation could enhance students’ cognitive presence, however, more relevantly here, the traditional text-based AODs that used conventional questioning strategies only resulted in surface-level thinking to manifest in students’ discourse. They concluded that extra structure and design beyond such conventional methods was necessary for students to engage in cognitive collaboration.

Invited external participants. External participants may encourage critical thinking in AODs (Hemphill & Hemphill, 2007; Kanuka et al. 2007). In their study that observed the effects of virtual guest speakers on facilitating asynchronous discussions, Hemphill and Hemphill (2007) found that cognitive presence progressed beyond the triggering event phase when two guest speakers were present. Their results indicated that critical thinking occurred despite the amount of input from the guest speakers in the discussion. However, although the researchers stated that higher levels of cognitive presence occurred due to the presence of the guest speakers, there was no control group in the study. Likewise, Kanuka et al. (2007) employed a similar tactic by inviting an expert to participate in the AODs. The invited expert discussion was compared to four other discussions which utilized differentiated strategies (nominal group technique, debate,

WebQuest, and reflective deliberation). Their results suggested that the debate and WebQuest discussions yielded the highest levels of cognitive presence; however, the invited expert discussion fared better than the nominal and reflective groups. The findings from both studies suggest that inviting external participants into AODs may modestly enhance cognitive presence.

Summary and Discussion

The results of this study demonstrated that effective strategies for promoting critical thinking in AODs could be grouped into sub-themes within the categories of teacher presence initially described by Anderson et al. (2001). The strategy sub-themes, outlined in Table 4, are generally consistent with findings from previous literature reviews (Darabi et al., 2013; Schindler & Burkholder, 2014) and provided confirmation of some strategies' efficacy in fully-online settings. For instance, similar to the findings of Schindler and Burkholder (2014), the results of this review indicated that providing structure to discussions through the use of scaffolding or role assignment as well as direct instruction techniques were effective methods for fostering critical discussion. Also, our findings corroborate the conclusions made by Darabi et al. (2013) who stated that a strategically designed discussion is more effective at promoting critically reflective discourse than conventional methods. Unlike previous reviews, however, this review identified themes that pointed to the efficacy of designing strategies that correspond to the constructs of critical thinking that the researchers used for examining the discussion data. This is a signal for future research to explore the other ways in which constructs of critical thinking can be used outside of the assessment of discussion data.

As well, the PIM was the most common coding theme used throughout the literature. This, of course, was largely due to our own focus on cognitive presence during the retrieval and inclusion of studies. Altogether, 11 out of 16 studies utilized the PIM as the coding scheme to assess critical thinking. Accordingly, the message as a unit of analysis, as recommended by Garrison et al. (2001), was the most frequently observed. However, the decisions of several researchers to utilize differentiated coding schemes could be suggestive of limitations to the popular construct of critical thinking, and cognitive presence. Further, based on the several interpretations of what constitutes a meaningful unit of analysis there should be further research into what length of text is most appropriate for various contexts and the coding schemes available.

Limitations

Three limitations impacted this review. First, as a consequence of insufficient time and resources, the selection of literature was relatively narrow. For example, our Google Scholar search covered only three years and a restrictive set of search terms. Second, although this research distinguished between the contexts of blended and fully-online learning, it did not do so between online contexts that incorporated AODs as an adjunct to virtual synchronous sessions and those that used AODs as the main avenue for communication in an online course. Finally, a fundamental limitation of this review was concerned with the thematic analysis since we did not discuss strategies that were unique to one study because it would not have constituted a recurrent theme. This left several effective strategies for promoting critical thinking out of the results of this review.

Conclusions

The presence of the instructor as a designer and facilitator is an imperative for ensuring the emergence of critical thinking and reflection during AODs. Our primary focus in this review was to summarize strategies that have been empirically proven as effective methods for promoting critical thinking within AODs in fully-online higher education contexts. This was done through a systematic process that involved retrieving studies through deliberate searches, scrutinizing the studies for suitability, and analyzing the collective findings and conclusions to thematically group related strategies. As well, we wanted to find out what critical thinking constructs (besides cognitive presence) researchers used as a framework for assessing critical thinking in AOD data, and what they determined a meaningful unit of analysis. Ultimately, the product of this review was intended to be an effective resource for practitioners and policy-makers.

Based on the findings of this review, we would recommend that practitioners take a three-step approach to facilitating critical thinking in AODs that corresponds to the three categories of teacher presence described by Anderson et al. (2001). Such an approach would ensure that practitioners are able to actively and proactively employ strategies that can enhance the quality of current and future AODs. First, this would entail adopting strategies pertaining to the proactive design and organization of the discussion activities (e.g., providing scaffolding and assigning roles). Second, direct instruction (e.g., inviting guest experts and strategic questioning) should be worked into the discussions. Third, instructors should facilitate discussions (e.g., modelling effective discourse), and they should plan to use strategies that *assess* the efficacy of their interventions to inform future practice locally. The latter can be achieved by employing a coding scheme and unit of analysis (the length of text that is considered a meaningful unit) that are appropriate for their specific contexts and purposes.

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Appendix A: The Steps in a Systematic Review

Steps by Rew’s (2011, p. 65)	Steps by Cook and West’s (2012)
<ol style="list-style-type: none"> 1. Identify specific research question(s) to be answered. 2. State purpose of the review. What are its aims? 3. Identify inclusion and exclusion criteria. 4. Select search terms to use. 5. Identify appropriate databases to search. 6. Conduct the electronic search. 7. Review outcome of search and match with inclusion/exclusion criteria. 8. Data extraction. Systematically retrieve data from each paper included. 9. Determine quality of studies reviewed. 10. Summarize findings in a table. 11. Interpret meaning of the evidence retrieved. 12. Acknowledge limitations and biases inherent in the process. 13. Publish and apply findings in practice. 	<ol style="list-style-type: none"> 1. Define a focused question: <ul style="list-style-type: none"> ● Consider population, intervention, comparison, outcomes 2. Evaluate whether a systematic review is appropriate to answer the question. 3. Assemble a team and write a protocol. 4. Search for eligible studies: <ul style="list-style-type: none"> ● Identify information sources: indexing databases, previous reviews, reference lists, author files, and experts in the field, ● Define search terms. 5. Decide on the inclusion or exclusion of each identified study: <ul style="list-style-type: none"> ● Define inclusion and exclusion criteria, pilot-test and refine operational definitions, ● Define restrictions, ● Stage 1: review titles and abstracts in duplicate, err on the side of inclusion, ● Stage 2: review full text in duplicate, resolve disagreements by consensus. 6. Abstract data: <ul style="list-style-type: none"> ● Define data abstraction elements, pilot-test and refine operational definitions, ● Abstract data in duplicate, resolve disagreements by consensus. 7. Analyse and synthesise: <ul style="list-style-type: none"> ● Focus on synthesis: organize and interpret the evidence while providing transparency, ● Pool results through narrative or meta-analysis, ● Explore strengths, weaknesses, heterogeneity, and gaps, ● Explore the validity and assumptions of the review itself.

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