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**The Affordances of Social Annotation in the Online Writing Classroom:
A Community of Inquiry Analysis**

by

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A Starred Paper

Submitted to the Graduate Faculty of

St. Cloud State University

In Partial Fulfillment of the Requirements

for the Degree

Master of Science in

Information Media: Instructional Technology

May, 2021

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Table of Contents

	Page
List of Tables	4
Chapter	
1: Introduction	5
Context and Background.....	5
Research Problem	7
Research Questions.....	9
Significance.....	9
Limitations	10
Definition of Terms.....	10
Summary	11
2: Literature Review	13
Introduction.....	13
Methodology	13
Theoretical Frameworks	15
Constructivism/Social Constructivism.....	15
Community of Inquiry (CoI).....	18
Writing Pedagogy	22
Annotation.....	25
Summary	29

Chapter	Page
3: Methodology	30
Introduction.....	30
Institutional Review Board Exemption.....	30
Methodology	30
Timeline	32
Summary.....	32
4: Findings	33
Introduction.....	33
Analysis of Findings	33
Cognitive Presence.....	38
Social Presence	53
Teaching Presence	55
Strategies Identified in the Literature	61
Summary.....	63
5: Conclusion and Recommendations	65
Introduction.....	65
Recommendations for Application	65
Recommendations for Further Research.....	67
Summary	68
References	70
Appendix	77

List of Tables

Table	Page
1 Literature Matrix, Academic Articles	14
2 Summary of Empirical Studies.....	34
3 Preview of Strategies	37
4 Sample Annotations	39
5 Strategies for Incorporating SA.....	62

Chapter 1: Introduction

Context and Background

At United States universities writing is a foundational skill. In their first year undergraduates are often required to take a first-year writing course. Depending on their placement data, they may also be required to take English for Academic Purposes (EAP) or another preparatory language arts course before enrolling in the first-year writing course. First-year writing courses develop skills for the writing required in subsequent coursework. Conley (2007) states, “Writing may be by far the single academic skill most closely associated with college success” (p. 5). Students who major in humanities disciplines will be expected to write extensively and demonstrate sophisticated thinking through their writing. In all cases, class discussion of texts is a key strategy for helping students engage with ideas. Writing teachers in traditional face-to-face courses use Socratic dialog, small group discussion, and other interactive activities to foster critical thinking. As an increasing number of courses are offered in an online format, teachers must facilitate these activities online. This study will explore one useful tool for building community and fostering discussion in online writing instruction: social annotation (SA). SA will be looked at through the lens of Community of Inquiry (CoI), a theoretical framework developed to study online learning.

Online education is increasing in popularity. In 2003, just under 10 percent of higher education students were taking at least one online course, while by 2013 this had risen to 32 percent (Allen & Seaman, 2014). Seaman, Allen, and Seaman (2018) found that in 2016, 47.2 percent of students in distance higher education were taking *only* online courses. Between fall 2015 and 2016, the number of students enrolling in at least one online class increased by 5.6 percent. This was the 14th consecutive years of enrollment increase, while overall enrollment in higher education had been decreasing for 4 years. Clearly online education has become an important delivery model for higher education.

Terms related to online education are sometimes used inconsistently and interchangeably. Allen and Seaman (2014) define an online course as one in which at least 80% of the content is delivered online. In face-to-face courses up to 29% of the content can be delivered online (Allen & Seaman, 2014). The middle ground consists of blended, or hybrid, instruction. Detailed definitions of blended and hybrid vary, but subtle distinctions aside, this type of course incorporates both face-to-face and online instruction methods. An additional dimension to consider is synchronous versus asynchronous learning. Synchronous learning takes place at the same time, though not necessarily the same place. Asynchronous learning requires neither shared time nor location. According to Neal and Miller (2005), “Most distance learning is actually blended learning, which refers to a mix of synchronous, asynchronous, and classroom” (The Definition of Distance Education section, para. 4). A recent development is HyFlex. Beatty (2019) describes HyFlex: “Students choose between attending and participating in class sessions in a traditional classroom (or lecture hall) setting or online environment. Online participation is available in synchronous or asynchronous mode; sometimes both and sometimes in only one online mode” (p. 50). Another term is e-learning. According to Garrison (2017), “e-learning is the utilization of electronically mediated asynchronous and synchronous communication for the purpose of thinking and learning collaboratively” (p. 2). His definition draws explicit attention to the game-changing communication and collaboration potential of Web 2.0 Internet technology. Web 2.0 technologies include interactive applications such as wikis, social networking sites, blogs, and social annotation. Though online education might be regarded by some as an inferior alternative to traditional face-to-face instruction, the web actually offers possibilities for sustained, meaningful interaction not possible in purely face-to-face delivery mode.

The CoI theoretical framework was developed to study online learning. It is consistent with constructivist learning theory (Garrison & Arbaugh, 2007). The inclusion of the word community emphasizes the importance of establishing and nurturing a sense of community in online classes. Garrison (2017) affirms, “A community of inquiry is a collaborative approach to

thinking and learning” (p. 11). The CoI framework is visualized as three intersecting circles (Garrison & Arbaugh, 2007), each of which represents a type of presence: social, cognitive, and teaching. See Figure 1. In this study the CoI framework will be used to assess SA, a digital tool that can be used to support collaborative knowledge construction in the online writing classroom.

Research Problem

Instructors in their first stages of teaching online may feel uncertain about their approach to this new modality (Comas-Quinn, 2011; Horvitz et al., 2015; Islam et al., 2015). Writing instructors in particular are likely accustomed to lively classroom interaction as a cornerstone of their teaching practice. The social nature of writing is widely accepted in composition pedagogy. According to principle 3 of the *Principles for the Postsecondary Teaching of Writing*, established by the Conference on College Composition and Communication (CCCC), “sound writing instruction recognizes writing as a social act” (2015, Principles of Sound Writing Instruction section). The document expands on the principle: “In practice, this means that writers learn the many ways in which writing is a social activity, considering audiences and contexts for reception and potentially working with other writers as they compose” (Principles of Sound Writing Instruction section). In an online context, students do not have the traditional experience of sharing the same physical and temporal space during each class period. Some or all discussion must be mediated through technology, a process presenting both challenges and new possibilities.

The COVID-19 crisis has forced numerous activities, including education, online. According to the 2020 Educause Horizon Report (Brown et al., 2020), online education will continue to grow and “Faculty must be prepared to teach in online, blended, and face-to-face modes” (p. 11). New technologies are opening up the world of online learning. Universities have had an opportunity to experiment with delivery options such as HyFlex delivery. HyFlex offers students a choice of participating synchronously or asynchronously, face-to-face or virtually, making education accessible to students whose location, health, or obligations outside school

might not permit for committing to a traditional set class schedule (Educause, 2020). Teachers will need to expand their repertoire and make informed choices about technology.

E-learning offers unique affordances for building community and facilitating quality discussion. Online discussion can be implemented on private discussion boards incorporated in learning management (LMS) systems such as Canvas, Desire to Learn (D2L), or Blackboard Learning System. Students can write discussion posts and then other students can respond. The instructor can monitor all activity. For discussions around texts, the separation of the forum from a text under consideration requires extra coordination as students navigate back and forth (Wolfe, 2008; Plevinski et al., 2017). The cognitive load imposed reduces energy available for knowledge construction, and therefore “many threaded forum discussion posts do not demonstrate a rich understanding of content, nor do they fully integrate the key ideas from the related readings” (Plevinski et al., 2017, p. 112).

Institutional discussion boards are not as open, creative, and flexible as other web-based experiences. In contrast, social media allow users to post multimedia content, respond with emojis and other nonverbal responses, “like” posts, conveniently engage in alternate communications such as instant messaging, communicate with other people in addition to class members, and control and configure their digital space to suit personal preference. Users also retain access to content as long as they maintain an account. LMS systems are confined to enrolled students and typically lock courses after the end date. Despite the apparent advantages, the use of social media tools in education is debated (Annisette & Lafreniere, 2017; Dron & Anderson, 2014; Garrison, 2017; Sanger, 2010). Their connection with students’ existing social networks, in which social acceptance and reinforcement are emphasized, may discourage critical thinking. Garrison (2017) suggests that “participants connect on a superficial level but are isolated on a deeper more meaningful level” (p. 93). For this and other reasons, “social media have not translated well to supporting effective collaborative learning experiences” (Garrison, 2017, p. 92).

There are other, possibly more academically suited online discussion alternatives to LMS systems and social media. SA is a genre of web-based tools that is particularly promising for writing instruction. Examples include Hypothes.is, Perusall, and Diigo. These applications allow users to annotate texts online and to see and respond to the annotations others have written. Annotations are anchored in the text. A generally accepted term for these tools in the literature is social annotation (Kalir et al., 2020), although other terms appear, including: digital annotation (O'Dell, 2019; Thoms & Poole, 2017), web annotation (Zhu et al., 2020), online annotation (Nor et al., 2013), anchored discussion (Eryilmaz et al., 2014), and collaborative annotation (Adams & Wilson, 2020). In this study the term social annotation (SA) will be used.

This study will review research on the use of SA in education through the lens of the CoI framework, in order to analyze and evaluate its promise as an educational technology for online discussions of texts. Findings from a selection of 12 empirical studies will be synthesized to distill a list of best practices aligned with CoI principles. The best practices will be based on the strategies used in existing research and findings related to learning outcomes. This review can be a resource for writing educators interested in incorporating SA in their online teaching practice.

Research Questions

The research questions pursued are:

1. How can web-based SA tools contribute to social presence, cognitive presence, and teaching presence in an online writing course?
2. What best practices emerge from the literature for using SA tools in an online writing course?

Significance

Due to COVID-19 online education has taken on an unforeseen prominence; but prior to the pandemic, enrollment in online courses was growing steadily. Online courses must provide students with the same value as they would receive from a fully face-to-face course. Required courses, such as first-year writing, are particularly important because they serve as a foundation

for success in subsequent coursework. Technologies such as SA can open up possibilities for meaningful interaction that support collaborative construction of knowledge. The CoI framework provides a research-based tool for evaluating the pedagogical potential of emerging technologies. Applying the framework ensures that constructivist learning processes are foregrounded. This study offers a systematic review of SA in terms of the CoI framework.

Limitations

As SA is a relatively new area, a solid research base is still developing. Existing research focused specifically on SA and the CoI was not found for this secondary study. Newer research may have been conducted that was not available online and thus not included in the analysis of the literature. Ten articles, which discussed the results of 12 studies, were chosen for analysis because this number allowed for a thorough analysis of each article while accommodating time constraints. Several of the studies were small scale and/or relied on self-reported measures such as surveys. The findings may therefore not be generalizable.

A variety of annotation tools have been developed with differences in interface design. For example, annotations may appear in a separate panel alongside a text or as floating virtual post-it notes. This study did not take such differences into account. Interface and usability considerations might impact the success of a learning experience.

Definition of Terms

Online learning: “An online course is defined as one in which at least 80 percent of the course content is delivered online” (Allen & Seaman, 2014, p. 6).

E-Learning: “e-learning is the utilization of electronically mediated asynchronous and synchronous communication for the purpose of thinking and learning collaboratively” (Garrison, 2017, p. 2).

Blended/hybrid learning: “blended (or hybrid) instruction, has between 30 and 80 percent of the course content delivered online” (Allen & Seaman, 2014, p. 6).

HyFlex: “Hybrid-Flexible (HyFlex) course design enables a flexible participation policy for students, whereby students may choose to attend face-to-face synchronous class sessions in-person (typically in a traditional classroom) or complete course learning activities online without physically attending class. Some HyFlex courses allow for further choice in the online delivery mode, allowing both synchronous and asynchronous participation” (Beatty, 2019, p. 57).

Synchronous: “Synchronous e-learning encompasses same-time interaction independent of location” (Neal & Miller, 2005, The Definition of Distance Education section, para. 4).

Asynchronous: “asynchronous e-learning includes any situation where learners are dispersed in time and location” (Neal & Miller, 2005, The Definition of Distance Education section, para. 4).

Community of Inquiry (CoI): “An educational community of inquiry is a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding. The Community of Inquiry theoretical framework represents a process of creating a deep and meaningful (collaborative-constructivist) learning experience through the development of three interdependent elements – social, cognitive and teaching presence” (<https://coi.athabasca.ca/coi-model/>).

Annotation: “Annotating is a writing-to-learn strategy for use while reading or rereading” (Porter-O'Donnell, 2004, p. 82).

Social annotation (SA): “a genre of learning technology that enables the annotation of digital resources for information sharing, social interaction, and knowledge production” (Kalir et al., 2020, p. 2).

Summary

Academic writing is a foundational skill that supports success in higher education. Discussion around texts is a key feature of writing pedagogy. In courses taught online, whether due to COVID-19 or not, instructors must find ways to promote quality discussion and collaboration without the face-to-face communication of a traditional classroom. The CoI provides a conceptual framework for thinking through these aspects of online course design.

Instructors need digital tools with affordances able to facilitate learning activities informed by theory. SA is one tool to be considered in pursuit of constructivist goals. The following chapter will provide a review of literature related to constructivism/social constructivism, CoI, writing instruction, and SA.

Chapter 2: Literature Review

Introduction

The purpose of this study is to apply the CoI framework to develop an understanding of how SA can be used fruitfully in online writing instruction. The research questions ask 1) how web-based SA tools can contribute to social presence, cognitive presence, and teaching presence in an online writing course, and 2) what best practices emerge from the literature for using SA tools in an online writing course. The purpose of this chapter is to present a summary of the CoI framework, the social constructivist learning theory it evolved from, and related aspects of writing pedagogy. The methodology employed to locate relevant research for the literature review is explained first. Data from the academic articles is organized in a matrix. Salient themes are discussed. Then preliminary findings from existing research on SA and its use in writing instruction are introduced. Finally, the gap identified and the plan for the rest of the study are outlined.

Methodology

The research discussed in this chapter was found through Google Scholar and the academic databases accessible through the St. Cloud State University library (St. Cloud State University, 2021a). The search words and phrases used include variants of “community of inquiry,” “teaching first-year composition online,” “teaching writing online,” “social annotation,” and “collaborative annotation.” Additional research was identified in the bibliography on annotation maintained by the AnnotatED community (AnnotatED, n.d.). Books and articles containing foundational knowledge on instructional design, educational psychology, composition pedagogy, and other topics relevant to the study were also consulted.

Academic article sources discussed in this literature review are organized in a matrix in Table 1. The matrix indicates shared themes.

Table 1*Literature Matrix, Academic Articles*

Author/s	Year	Research themes and designs									
		Educational theory		Pedagogy		Annotation		If a study was conducted, data collection method			
		Constructivism /social constructivism	Community of Inquiry (CoI)	General Pedagogy	Language Arts Pedagogy	Annotation	Web-based Social Annotation	Survey (objective)	Interview or open-ended questioning	Written samples to be analyzed	Measure of learning outcomes
Adams & Wilson	2012	x	x	x	x		x			x	
Beach	2012				x		x				
Bruffee	1984				x						
Chan & Pow	2020			x			x	x	x		x
Ertmer & Newby	2013	x		x							
Garrison & Arbaugh	2007		x	x							
Garrison et al.	2000		x	x							
Hirtle	1996	x		x	x						
Kalir et al.	2020			x		x	x	x	x		
Marshall	1997					x				x	
Palincsar	1998	x		x							
O'Dell	2019				x		x	x			
Porter-O'Donnell	2004				x	x					
Razon et al.	2012b	x		x		x	x	x			x
Reid	2014			x	x	x	x	x			x

Theoretical Frameworks

Key points from the literature are summarized below, organized by constructivism/social constructivism and CoI. Social constructivism and CoI provide the theoretical framework for this study. They will be applied specifically to writing pedagogy, and more specifically to SA as a teaching strategy in the writing classroom.

Constructivism/Social Constructivism

Constructivist learning theory frames learning as a process of constructing knowledge (Driscoll, 2000). It has multiple origins in the work of scholars including Jean Piaget, Jerome Bruner, Lev Vygotsky, and John Dewey. In contrast to behaviorist and cognitive theories of learning, knowledge is not viewed as something external to the learner to be taken in or deposited. Rather, learners build mental structures to understand their experiences. These are revised as the learner has new experiences or as they test their understanding against that of others: “Humans create meaning as opposed to acquiring it” (Ertmer & Newby, 2013, p. 55). For constructivists, learning is a lifelong process. Cognitive flexibility, or epistemic fluency, should be fostered in learners so they will be empowered to evaluate their experiences, consider alternate viewpoints, and adapt in novel situations (Driscoll, 2000).

Social constructivism is the strand of constructivism that emphasizes the social nature of learning. Learners must discuss and compare their understandings with others and learn from one another. The label originated in John Dewey’s “social constructionism” (Hirtle, 1996). He spoke of how the psychological and social, internal and external, aspects of education cannot be separated, nor can one be subordinate to the other (Dewey, 1933).

Two social constructivist explanations for the process of learning are sociocognitive conflict theory and sociocultural theory (Palincsar, 1998). Sociocognitive conflict theory is

attributed to Jean Piaget (1985). Learners engaged in a problem-solving activity will adjust their understanding as they are influenced by more skilled peers and confronted with the inadequacy of their own thinking. This is related to Piaget's concept of disequilibrium, which applies to individual cognitive processes. Disequilibrium is provoked when a learner encounters a situation that cannot be explained with their current understanding. Learners always attempt to assimilate new knowledge into existing cognitive schemes. If the attempt fails, then the learner uses accommodation, restructuring present knowledge to a higher level of thinking. The conflict causes them to question their beliefs and makes them receptive to adopting new ones. Balance is then restored.

According to Vygotsky's sociocultural model (Hirtle, 1996; Palincsar, 1998; Vygotsky, 1978), learners develop by engaging in interaction with peers or mentors with a higher level of skill. Their development is made possible by language (Lantolf, 2000). "Outer" speech gradually becomes "inner" speech as learners internalize processes they are learning. For example, when involved in a task such as assembling a puzzle, an adult can model strategies for their process, talking out loud. Initially the child might be confused by the puzzle and rely on the adult's verbal instructions. Gradually the child will begin to take over, and use what Vygotsky called "private speech" for guidance, imitating the speech of the parent. Such speech tends to become sub vocal as the child masters a task or skill. It eventually is entirely in the mind of the child—it becomes "inner speech." The child has internalized and appropriated the cognitive strategy needed for the task. On a superficial level this may seem similar to a knowledge transmission model of education, but sociocultural researchers emphasize that this process of internalization is creative and transformative (Palincsar, 1998).

Some social constructivists include interaction with texts as well as other artefacts in their definition of collaborative knowledge construction, because “the learner is whole-heartedly engaged in trying to interpret the author’s perspective and compare to his own” (Smith & Ragan, 2005, p. 20). Annotation is one way to interact with an author through a written text. Anderson (2011) shares his experience of annotation: “it quickly began to feel, for me, like something more intense: a way to not just passively read but to fully enter a text, to collaborate with it, to mingle with an author on some kind of primary textual plane” (para. 2).

In a constructivist/social constructivist setting emphasis is placed on peer collaboration. The instructor is sometimes described as more of a facilitator than a central authority figure (Driscoll, 2000; Jonassen, 1994; Palincsar, 1998;). His or her work is still very important. Palincsar and Brown (as cited in Palincsar, 1998) looked at children participating in a reading intervention to improve comprehension. They engaged in reading discussions in small groups. The researcher notes the greater gains of children who engaged in the discussions with teachers skilled at giving feedback to build on their contributions compared to children working with teachers not as skilled at scaffolding. According to Damon (as cited in Palincsar, 1998), interaction with peers is ideal for development involving giving up a current understanding to adopt a new perspective, while interaction with instructors or coaches is best for acquiring skills or strategies. Additionally, an instructor may be necessary to orchestrate the former type of interaction. Factors such as insufficient verbal interaction (Forman & Kraker as cited in Palincsar, 1998) or social dominance among peers (Russell et al. as cited in Palincsar, 1998) can stifle learning even if the cognitive conflict that could provoke accommodation is being experienced.

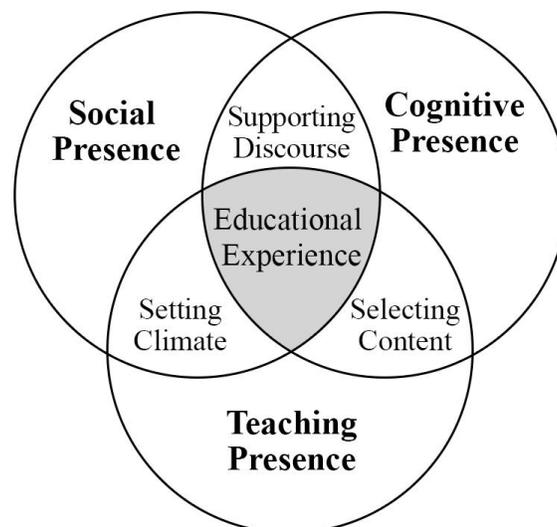
In the context of e-learning, technology can be used to implement constructivist learning conditions, including collaboration. Garrison (2017) elaborates on the communication possibilities of the Internet. He states, “E-learning diverges fundamentally from the autonomous industrialized form of traditional distance education where the educational approach was shaped by the available technology of the times. E-learning is first and foremost directed to providing an accessible and collaborative educational experience” (p. 3). Driscoll (2000) stresses that new technologies such as the Internet, microworlds, and databases have made it possible to incorporate constructivist learning principles where before it would have been unrealistic.

Community of Inquiry (CoI)

CoI is a theoretical framework based on constructivism and used to study online learning (Garrison & Arbaugh, 2007). The word community underscores the need to foster a sense of community in online classes. Community and learning are associated (Garrison & Arbaugh, 2007). The CoI framework is shown in a diagram of three intersecting circles (Garrison & Arbaugh, 2007). Each circle represents a type of presence: social, cognitive, and teaching. Please see Figure 1.

Figure 1

Community of Inquiry framework



Given that online learning takes place in a virtual space, it is helpful to explicitly consider the different kinds of presence necessary for quality education. The CoI framework was first introduced as a tool for evaluating asynchronous online classes, reflected in the original article title “Critical Inquiry in a Text-Based Environment: Computer Conferencing in Higher Education” (Garrison et al., 1999). It has since been used to study synchronous, blended/hybrid, and other delivery modes.

Garrison (2017) notes that the “e” in e-learning could just as well stand for extend or enhance as electronic. Ironically, in the CoI model, the excitement around the affordances of e-learning is connected to their potential to enact older forms of education more faithfully, and/or make possible learning conditions that were impractical in the past. With Internet-based technologies, learners can collaborate in a manner more reminiscent of Socratic questioning than modern lecture halls. The primary value of e-learning does not lie in faster access or continuous connection. Its true promise is in fostering meaningful collaboration: “e-learning is less about issues of technology . . . as it is about creating communities of learners engaged in collaborative inquiry” (Garrison, 2017, p. 89).

The first presence, social presence, refers to the sense of being a real human being, able to project oneself authentically into a virtual space (Garrison & Arbaugh, 2007). Garrison and Arbaugh identify three categories of social presence: open communication, group cohesion, and affective expression. Social presence helps establish a learning community. However, in a CoI, the overarching purpose must be learning. Individuals must identify first and foremost with the group and its academic goals, and social concerns should not interfere. Garrison (2017) warns that “pathological politeness” (p. 47) can stifle generative discussions. If students are fearful of disagreeing with one another or upsetting fragile social bonds, discussion will not move forward.

For teachers, Garrison suggest the hierarchy of priority should be facilitating: (a) the ability of participants to identify with and form a cohesive group around the academic goals, (b) a trusting environment in which participants can communicate freely, and last (c) the development of personal relationships. Personal relationships may be initiated at the beginning of a course with introductions and other icebreaker activities, but activities should always be organized to support the academic purpose. Teachers should strive for an environment that is both “inclusive and critical” (p. 37).

In an educational setting progress towards learning goals is expected. Cognitive presence is the ability to construct and negotiate meaning. Garrison and Arbaugh (2007) posit four stages of cognitive presence: triggering event, exploration, integration, and resolution. In exploration students delve into an issue through reflection and discourse, in integration they construct meaning, and in resolution they apply their new knowledge in the world. These stages are based on John Dewey’s (1933) practical inquiry model. Dewey spoke of reflective thinking, a habit of mind with practical value in deepening the meaning of our life. Reflective thinking, which Garrison (2017) equates with critical thinking, comes about through the interaction of private (reflection) and public (discourse) worlds. Students need one another to notice and challenge conclusions tainted by influences such as confirmation bias and ideological certainty. By articulating their views they develop and refine their understanding. As students progress through the first two phases of practical inquiry, they engage in creative, divergent thinking, considering many possibilities. In the later phases they turn to convergent thinking as they choose a contextually appropriate resolution of a problem. Stage 4 may also consist of reducing complexity by constructing a coherent understanding of a concept or situation. Teachers must look for evidence of understanding, point out misconceptions, provide encouragement, and

model inquiry. The educator is responsible for designing and facilitating authentic learning experiences in which students reach stage 4 of practical inquiry.

Metacognition should also be mentioned when discussing cognitive presence.

Metacognition is typically used to describe individual self-awareness and self-regulation of thinking processes. The CoI framework suggests a shared, distributed learning environment. In this context, the concept of shared metacognition is relevant (Garrison, 2017). Learners are responsible for themselves and for others. They monitor both their own and the group's progress, and implement management strategies to move both themselves and the group through the four phases of the inquiry process. A successful CoI depends on "participants taking responsibility to personally construct meaning and collaboratively confirm knowledge" (Garrison, 2017, p. 62).

Unfortunately, discussions in online courses often fail to progress to integration and resolution (Garrison & Arbaugh, 2007). This leads to the third type of presence. Teaching presence is key for moving dialog through the phases. The initial catalyst is typically a meaningful triggering event chosen by the teacher, such as a question or task. Subsequent guidance is needed in the form of clear expectations and helpful comments. Garrison and Arbaugh (2007) explain, "Direction and facilitation is required to establish cohesion and ensure that messages are developmental (i.e., more than 'serial monologues' or personal declaration)" (p. 163). Teaching skill is as important as ever in an online environment.

Three categories of teaching presence are instructional design and organization, facilitating discourse, and direct instruction (Garrison & Arbaugh, 2007). The first category includes the tasks such as writing a syllabus, uploading documents to a course site, recording lectures, etc. Facilitation consists of reviewing comments, asking questions, making observations, and intervening as necessary, for example to reach out to reticent students.

Teachers must find a balance between too little and too much intervention. Direct instruction involves sharing subject matter knowledge. Teachers correct misconceptions, suggest resources, make connections between ideas, and scaffold knowledge construction. Their feedback can enhance students' metacognitive awareness. Effective feedback must be accompanied by a sense of social presence. Students do not want automated feedback. Both facilitation and direct instruction require pedagogical expertise. Direct instruction requires content expertise as well.

Garrison and Arbaugh (2007) connect the three types of CoI presence: "Social presence lays the groundwork for higher level discourse; and the structure, organization, and leadership associated with teaching presence creates the environment where cognitive presence can be developed" (p. 163). Teaching presence is vital for moving learning towards worthwhile outcomes. One final observation is that this element is called teaching presence, not teacher presence. The teacher provides purpose, structure, and leadership, especially at the beginning of a course. Ideally, as a course progresses, students will begin to take ownership and teach and learn from one another as well the teacher (Garrison, 2017).

Social constructivism and social, cognitive, and teaching presence can be used to evaluate online writing instruction. Pedagogical approaches specific to writing mirror elements of these theoretical frameworks.

Writing Pedagogy

First-year and other writing courses are typically classified within rhetoric, a subdiscipline of English. Rhetoric occupies an academic space straddling English and technical/professional writing. In simplest terms, rhetoric is the use of language to influence others. The name reflects the intellectual influence of Greek philosophers such as Socrates, Plato, and Aristotle (Toye, 2013). The tradition of open-ended questioning as a teaching method

originates in Socratic dialog. Other scholars who explored language, and how it defines and circumscribes our identities and reality, have come to occupy prominent positions in the discipline. These include Kenneth Burke, Friedrich Nietzsche, and Michel Foucault. Social hierarchies are often codified, legitimized, and perpetuated through language, therefore rhetoric has a strong tradition of social justice, influenced by scholars such as Paulo Freire and CH Knoblauch. Discussion based on texts is a key pedagogical strategy in all cases.

Teaching through discussion is significantly different from a traditional approach of teacher-directed questions with set answers. Discussion promotes learning due to the requirement for students to use language to formulate and convey their ideas and then negotiate with the ideas of others (Nystrand, 1996). They must explicitly state and refine ideas that may exist in their mind in a vague and as yet undeveloped form. Building a community of learners comfortable discussing ideas with one another is good teaching practice in an English class (Bruffee, 1984).

Academic writing is sometimes framed in terms of a metaphor from Kenneth Burke, the “Burkean Parlor,” a space in which the “unending conversation” of humankind goes on. Here is Burke’s description (1941) of the parlor:

Imagine that you enter a parlor. You come late. When you arrive, others have long preceded you, and they are engaged in a heated discussion, a discussion too heated for them to pause and tell you exactly what it is about. In fact, the discussion had already begun long before any of them got there, so that no one present is qualified to retrace for you all the steps that had gone before. You listen for a while, until you decide that you have caught the tenor of the argument; then you put in your oar. Someone answers; you answer him; another comes to your defense; another aligns himself against you, to either the embarrassment or gratification of your opponent, depending upon the quality of your

ally's assistance. However, the discussion is interminable. The hour grows late, you must depart. And you do depart, with the discussion still vigorously in progress. (pp. 110-11)

Theories about the connection between conversation, thought, and writing inform the way writing is taught. Influential composition scholars and educators such as Kenneth Bruffee are classified as subscribing to a social constructionist philosophy of teaching writing. Bruffee (1984) explains thought as a mental process based on the experience of conversation with other people. This view is rooted in the work of scholars such as Lev Vygotsky (1978). Thought is seen essentially as internal conversation. When people write they continue this cycle by sharing their thoughts. "Writing is a technologically displaced form of conversation" (p. 641), which allows us to enter the Burkean parlor and respond to the work of people we may never physically meet. Bruffee proposes that in any discourse community, knowledge is built and negotiated through conversations, rather than being something external to the learner that must be taken in. Writing instructors have a responsibility to orchestrate experiences calling for meaningful collaboration, so students may enter the conversation: "Students are especially likely to be able to master that discourse collaboratively if their conversation is structured indirectly by the task or problem that a member of that new community (the teacher) has judiciously designed" (p. 644). Without such collaboration, students will not have the experience of articulating their ideas, listening to others, and coming to new understandings. Their writing may be stale and formulaic: "The way they talk with each other determines the way they will think and the way they will write" (p. 642).

Though other ideas exist regarding the teaching of writing, the recognition of the social nature of writing in the *Principles for the Postsecondary Teaching of Writing* established by the Conference on College Composition and Communication (CCCC) indicates a scholarly

consensus. Principle 3 recommends that “Instructors emphasize the collaborative and social aspects of written communication” (2015, Principles of Sound Writing Instruction section).

SA is an example of a teaching and learning practice for fostering conversation and collaboration around texts.

Annotation

Annotation is part of the history of physical books. In medieval times, marginal glosses were often transcribed along with the original text when a manuscript was copied (Wolfe & Neuwirth, 2001). In many old texts that changed hands, the margins contain conversations in which readers responded to one another’s annotations. When printing technology made books more widely available, annotation became more of a private activity, though annotation as a form of communication with other readers did not disappear entirely. In the 18th century it was common to give annotated books as gifts (Anderson, 2011). Authors such as Samuel Taylor Coleridge have even published their “marginalia” (Anderson, 2011). More recently, Marshall (1997) interviewed college students buying used books in a campus bookstore. She established students’ preference for books with detailed annotations from previous owners.

Annotation is often taught to promote critical reading. Porter-O'Donnell (2004) describes it as a “writing-to-learn strategy” (p. 82). Annotating texts forces students to slow down, which in turn produces active reading. Students are more aware of their thinking processes and notice ideas and connections they might not have otherwise. Their comprehension changes as they start reading to make meaning rather than merely to understand meaning at the surface-level. They also have a concrete record of their thinking process, which can be used to guide future writing activities (O'Dell, 2019; Porter-O'Donnell, 2004). Annotation, whether of a physical or digital

text, can be employed as an individual reading strategy. Deeper reading will then lead to more quality class discussions, but what if readers can start their conversations directly in the text?

SA adds a collaborative dimension to annotation. Readers can engage in annotation with other readers online. Howard (2012) writes, “Online, a book can be a gathering place, a shared space where readers record their reactions and conversations” (para. 3). Beach (2012) describes SA as one way of creating a “digital learning commons,” a shared space in which community members support one another and contribute to further “the common good” (p. 448). In a SA environment, users can create or join a group of peers with whom to annotate, or participate in annotation projects open to anybody. Bradley and Vetch (as cited in Johnson et al., 2010) contend that digital reading has suffered because of the lack of digital annotation tools, resulting in passive reading. As SA tools become more widely known and easy to use, this may change.

Annotation can be viewed as a bridge between reading and writing. Reading and writing are closely related. It is not possible to produce quality academic writing without strong critical reading skills. Some students need to be explicitly taught to read and reread challenging texts, and to engage with them by annotating, discussing, reflecting in writing, and employing other strategies. Godwin-Jones (2015) discusses the exciting web-based opportunities available to teachers today. On the web interactive reading results in a “continuing blurring of lines between reading and writing” (p. 16). He advocates the use of new social reading tools to involve students in this new approach to reading. In his study of the use of SA in second language teaching, Blyth (2014) noticed that students took advantage of the resources of the web, referencing other services such as Google Earth and Wikipedia in their annotations. SA tools allow readers to step out of a passive role and make their own contributions, using text and/or multimedia.

Annotation tools vary in the specifics of their features. The essential activity is selecting text with a mouse and typing a comment. The location of annotations on screen, and the options for annotation with text, media, emojis, and other symbols vary. Some tools create virtual layers on top of web pages or online documents. They may require the user to install an extension that adds annotation elements to their browser interface. A scholar could post an article online with a layer of personal annotations, a layer of annotations shared with colleagues, a layer for communication with an editor, a layer to communicate with the general public, etc. Tools such as Hypothes.is function in this manner. Document-oriented systems require uploading pdfs or other documents to a web account. These applications may require logging into an account on a site maintained by the annotation service provider. Tools such as Perusall function in this manner. Please see the Appendix for screenshots of Hypothes.is and Perusall.

As SA is relatively new, more research is needed to understand its benefits and effectiveness in different contexts. Digital tools are constantly being improved and updated, so there is also need for an awareness of changing affordances. Among the pedagogical goals relevant to writing instruction, much SA research has focused on reading comprehension. Many studies also report students' subjective reactions to using a tool, including satisfaction and motivation.

SA appears to improve students' reading comprehension as measured on tests. Reid (2014) conducted a study of 32 undergraduate students in three sections of a developmental English course. One section read a text and used a digital SA tool to comment collaboratively. The second section could read the comments but not respond or add their own. The last group simply read the text. Among the statistically significant findings: group 3 performed lower than the other two groups on a comprehension posttest. Razon et al. (2012b) analyzed data from 27

undergraduate students in three sections of an assessment class. Students in one section used a SA tool, Hylighter, to comment on four readings; students in the other two did not. The experimental group received prompts and instructions from the instructor to guide Hylighter use. Comprehension quizzes were given to all sections after reading. Questions related to the four articles were included on a summative exam. The experimental group performed higher on the quizzes and summative exam, though results were not statistically significant.

In self reports, students indicate that they find SA motivating and useful for learning. In Reid's (2014) study, Group 1 reported higher motivation while reading than group 3, and group 3 reported higher levels of mental effort than group 1 while reading. Both findings were statistically significant. In Razon et al. (2012b) a survey was given at the end, to assess motivation and attitude towards the readings. A survey about the tool was also distributed to the experimental group. The experimental group reported higher levels of motivation and positive affect, though not at a statistically significant level. The Hylighter survey results indicated the tool was very helpful to students for their learning. Kalir et al. (2020) studied survey responses from 33 students in three undergraduate courses that used a SA tool. Participants generally perceived SA to be useful for their learning. Gao (2013) studied the experience of 33 students in two sections of an undergraduate teacher training course. Participants had a moderately positive assessment of the tool's impact on their learning: 55 % said it was somewhat supportive and 33 % quite supportive. O'Dell (2019) surveyed 59 students in five sections of first-year writing to collect information on their experience of using digital media and a SA tool. 67% of participants stated digital annotation software was a useful tool for analyzing and writing and an additional 29% felt this was true sometimes.

Though reading comprehension is an important skill, constructivist learning generally involves higher-order outcomes. To apply the CoI framework, studies looking at SA in relation to learning outcomes involving critical thinking, construction of knowledge, inquiry, and metacognitive skill development should be considered. In the next phase of this study, research involving these more cognitively demanding skills is gathered and analyzed using the CoI framework. Particular attention is paid to ways a teacher can structure annotation activities to produce higher-order learning outcomes.

Summary

Social constructivist theory promotes an understanding of learning as a collaborative, creative endeavor. Writing instruction grounded in a social constructionist perspective incorporates discussion as a key knowledge construction strategy. Annotation is a longstanding practice in language arts instruction which helps the learner process, reflect on, analyze, and synthesize texts. Due to advances in computer technology, web-based SA is currently an option as well. SA combines the depth of processing produced by annotation with collaborative construction of knowledge. As with any technology, it is important to ground teaching decisions in educational goals and seek out affirmation in relevant theory. SA is a relatively new technology, and more research is needed to understand its impact on learning. In this secondary study the CoI framework, an established framework for evaluating online education, is applied to SA. The next chapter will explain the methodology for selecting and organizing existing research studies that shed light on SA and constructivist learning outcomes.

Chapter 3: Methodology

Introduction

The purpose of this secondary research study is to look at SA through the lens of the CoI framework in order to analyze and evaluate its potential as an educational tool for online discussions focused on texts. Existing studies were reviewed to gather relevant insights. The primary research question looks at how social, cognitive, and teaching presence manifest when SA is used in an online writing course. As a natural progression, best practices for implementing SA as an educational activity are also considered. The instructional strategies shown to be effective in the reviewed studies are compiled and summarized. Instructors of composition will be able to use the best practices to incorporate SA in their teaching.

This chapter provides an overview of the research methodology, including the selection of articles, the organization of the findings, and how the data was used to answer the research questions.

Institutional Review Board Exemption

This is a secondary research study consisting of a review of existing research on CoI, online writing pedagogy, and SA. No data was collected directly from human subjects and therefore Institutional Review Board approval was not required. Data discussed comes from existing research articles relevant to the topic in which identifying information of individuals has already been removed.

Methodology

Google Scholar and the academic databases available through the SCSU library, including JSTOR, ScienceDirect, ERIC, and SAGE Journals Online, were the primary sources of articles for this secondary research study (St. Cloud State University, 2021b). The SCSU library

also provides an Interlibrary Loan service. The library search tool yields results owned by SCSU, as well as additional resources available through Interlibrary Loan from other Minnesota libraries. The SCSU library also offers access to WorldCat, which provides Interlibrary Loan access to resources at libraries around the world (St. Cloud State University, 2021a). The search focused on higher-order learning outcomes, SA, and CoI. Search terms included combinations of variants of “community of inquiry,” “critical thinking,” “knowledge construction,” “metacognition,” and “social annotation.” Because CoI was employed as the primary theoretical framework, the list of publications on the Community of Inquiry website (Garrison et al., n.d.) was also consulted.

Articles were limited to those written in English and available online. Ten articles with accounts of 12 empirical studies were chosen. The research designs included a measure or evaluation of learning products or outcomes, as opposed to focusing purely on perception or attitude. The discussions included sufficient detail on indicators of social presence, cognitive presence, and/or teaching presence to enable the researcher to relate findings meaningfully to the CoI framework. Research conducted in higher education was chosen. Priority was given to articles about language arts instruction, but given the dearth of existing research, articles about the use of SA for higher-order learning outcomes in other fields were also considered. Article abstracts were reviewed to identify those relevant to this project and the reference lists of articles were reviewed for additional relevant references. Some of the empirical studies mentioned in Chapter 2 were used in this stage because they contain information relevant to achieving higher-order learning outcomes with SA.

Findings from the studies are organized in Table 2 in the next chapter. Information recorded includes author/s, year of publication, academic level and discipline, delivery mode,

sample size, SA activity or assignment, outcomes/s measured, SA technology used, and a summary of the key findings. Direct comparison of quantitative measures was not feasible, considering each study's use of different methods. A qualitative approach was applied, yielding a comprehensive view of the impact of SA on learning and revealing insights about the types of presence as conceptualized in the CoI framework.

Timeline

The exploration of topics and articles was initiated in the summer and early fall of 2020. This preliminary literature review process helped identify research questions. A research prospectus was submitted to the committee chair in September 2020. Drafts of the Introduction, Literature Review, and Methodology chapters were completed in October 2020. Revisions were made based on the committee chair's review. The preliminary culminating project meeting was held in November 2020. The last two chapters, Findings and Recommendations & Conclusion, were completed over January, February, and March of 2021. The final meeting and submission to the SCSU repository were completed in April and May of 2021.

Summary

This secondary research project gathers and synthesizes data from published research on CoI and SA. The concepts of social, cognitive, and teaching presence offered by the framework are used to analyze and interpret findings. A central purpose is to understand how SA can contribute to the three types of presence when used in an online writing course and how an instructor can facilitate the process. Based on findings, a list of best practices is derived for incorporating SA into educational activities. In the next chapter the findings of the study are shared.

Chapter 4: Findings

Introduction

The purpose of this study is to apply the CoI framework to analyze how SA can augment online writing instruction. Writing teachers can use this information to guide their teaching practice. Research question 1 asks, how can web-based SA tools contribute to social presence, cognitive presence, and teaching presence in an online writing course? Research question 2 asks, what best practices can be distilled from the literature for using SA tools in an online writing course? This chapter presents a discussion of the findings categorized in terms of cognitive presence, social presence, and teaching presence. Research question 1 is addressed in these sections. Then research question 2 is addressed by distilling a list of best practices for incorporating SA in writing instruction.

Analysis of Findings

In order to answer the research questions, the researcher selected and reviewed ten articles documenting 12 empirical studies of SA. Table 2 below summarizes the reviewed studies in terms of author/s, year of publication, academic level, discipline, delivery mode, sample size, SA activity or assignment, outcome/s measured, SA technology used, and key results.

Table 2*Summary of Empirical Studies*

Author/s and year	Academic level/ discipline/ delivery mode	Sample size	Activity/ assignment	Outcome/s measured or evaluated	SA technology used, any unique features	Key results summary
Adams & Wilson (2020)	master's/ digital literacy /asynchronous	15	annotate readings	type and quantity of annotations	Perusall	-Over the course of a semester, average number of interactions with text per reading went up by 30%, with peers by 40%.
Chan & Pow (2020)	undergraduate/ teacher education and sociology / not specified	377	collaborative inquiry-based learning project, annotate sources	annotation log files, project grade	WASP (self-developed)	-No correlation was found between students' perceptions of using the tool, their actual usage, and their learning outcomes as measured by marks on collaborative projects. -Students tended to use the tool early in their work, to collect and share research, but less to interpret and discuss the material with one another.
Eryilmaz (2014)	doctoral/ Learning and Pedagogical Theories/ blended	24	annotate readings and respond to classmates' annotations	percentage of comments on difficult concepts, nature of comments and comment sequences	Marginalia, font-size adjustment	-Both instructor and peer cuing of challenging concepts focused student attention. -Instructor cuing increased question, elaboration, and negotiation annotations.
Gao (2013)	undergraduate/ educational technology / not specified	33	annotate an article and respond to classmates' annotations	type and quantity of annotations	Diigo	-Students tended to contribute more than required 2 comments—mean was 4. -Notably for focus, 51% of comments were responses to a section, 47% responses to peers. -Notably for type, 47% of comments were self-reflection; none were disagreement. -Holistic understanding was not supported by SA.

Table 2 (Continued)

Author/s and year	Academic level/ discipline/ delivery mode	Sample size	Activity/ assignment	Outcome/s measured or evaluated	SA technology used, any unique features	Key results summary
Johnson et al. (2010) study 1	undergraduate/ English/ f2f	254	read, four different annotation conditions	questionnaire measured reading comprehension, critical thinking, metacognitive skills	Hylighter	-No support was found for SA, based on a control and 4 treatment conditions with varying designs. -In all 5 groups, critical thinking skills increased.
Johnson et al. (2010) study 2	undergraduate/ English/ f2f	267	read, four different annotation activities	questionnaire measured reading comprehension, critical thinking, metacognitive skills	Hylighter	-Students working collaboratively with an annotation tool performed better than those working alone in reading comprehension and metacognition.
Li et al. (2015)	university/ technology in education/ not specified	48	inquiry-based group report project, annotate sources	annotation quantity and quality, project score	Diigo	-Quantity of annotations at a basic cognitive level is correlated with higher level and metacognitive annotations, though fewer of these occurred, and with a higher project score. -Collaboration within groups accounted for most of the cognitive 2 and metacognitive activity score variation.
Plevinski et al. (2017)	doctoral/ overview of educational technology/ fully online	12	annotate course readings	annotation quantity and quality	Framebench	-SA supported knowledge construction, especially interpretation and elaboration.

Table 2 (Continued)

Author/s and year	Academic level/ discipline/ delivery mode	Sample size	Activity/ assignment	Outcome/s measured or evaluated	SA technology used, any unique features	Key results summary
Razon et al. (2012a)	Undergraduate education major students/ not integrated in a course	50	read and annotate article, comprehension quiz, summary	reading comprehension, similarity of summary to an expert summary	Hylighter	-There were no significant differences in reading comprehension scores between control and annotation treatment. -Annotation treatment group performed significantly better on content conceptualization.
Thoms & Poole (2017)	undergraduate/ L2 Spanish Literature/ f2f	15	annotate poems over 4 weeks	quality and quantity of annotations	Hylighter	-65% of student annotations were literary, 54% social, and 8% linguistic. -Students felt pressure to have original ideas, and were leery of “group think.” -Instructor felt annotations promoted a sense of community, drew out quiet students.
Wolfe (2008) study 1	undergraduate/ English/ not integrated in a course	7	read, articulate thoughts	nature of comments	printed	-Annotated paragraphs produced 50% more comments. -Paragraphs annotated with both pro/con produced significantly more comments than pro only. -Paragraphs annotated with both pro/con were significantly more likely to provoke reflection and stance- taking.
Wolfe (2008) study 2	undergraduate/ Intro Writing/ not specified	82	read and compose response essay	essay quality	printed	-Response essays by students with aligned annotations relied less on pure summary.

Garrison (2017) provides guidelines for applying the CoI theoretical framework to course design. He emphasizes that the role of the teacher remains as important as ever. If learning is to consist of purposeful inquiry, rather than random exploration, their expertise and direction are paramount. Below the findings are discussed in terms of cognitive presence, social presence, and teaching presence. In these three sections research question 1 is addressed. Cognitive presence is addressed first, as many of the findings fall within this circle. Teaching presence is reserved for last in order to reiterate and expand on observations that arise in the first two sections. In this manner, the ways in which teachers could apply the findings to their design, facilitation, and direct instruction will be highlighted. Table 3 provides an advance organizer of strategies that will be discussed.

Table 3

Preview of Strategies

Strategy	Mentioned in Studies
Train students on technology, use over extended time period, and provide ongoing technical support.	Razon et al., 2012a; Chan & Pow, 2020
Evaluate annotations based on quality.	Thoms & Poole, 2017
Assign discussion questions to address in annotations, and embed them or otherwise make sure students are aware of them.	Thoms & Poole, 2017; Gao, 2013
Use signaling to draw attention to key concepts.	Eryilmaz et al., 2014
Encourage peer scaffolding.	Eryilmaz et al., 2014; Thoms & Poole, 2017
Model annotation interactions.	Adams & Wilson, 2020
Seed readings with expert annotations.	Razon et al., 2012a; Wolfe, 2008; Johnson et al., 2010
Seed readings with annotations expressing conflicting views.	Wolfe, 2008

Table 3 (Continued)

Strategy	Mentioned in Studies
Integrate SA in group research, problem-based, or other learning projects.	Li et al., 2015; Johnson et al., 2010; Gao, 2013
Consider developing and teaching a coding scheme to categorize annotations.	Porter-O'Donnell, 2004; Garrison & Arbaugh, 2007; Garrison, 2017
Supplement annotation with holistic writing response assignments.	O'Dell, 2019; Gao, 2013
If excess comments clutter interface, consider how to handle.	Wolfe, 2008; Gao, 2013

Cognitive Presence

Cognitive presence, as conceptualized in the CoI, is modeled after John Dewey's (1933) practical inquiry model. Learners develop through complementary practices of solitary reflection and discourse with others. Members of the learning community support and challenge one another. Educators should strive to create learning experiences encouraging learners to construct and test rather than merely assimilate knowledge. A class activity can provide a trigger to initiate the four phases of practical inquiry: triggering event, exploration, integration, and resolution. A triggering event initiates a cycle of inquiry. SA can be a vehicle for staging a triggering event. Exploration, integration, and resolution can be fostered through the annotation activity structure and/or combination with other activities.

In exploration, learners share information and branch out to investigate interesting ideas. In integration, they connect ideas and begin to construct meaning. In resolution, they apply their knowledge to solve a problem or reduce complexity to make sense of a situation. Table 4 shows examples of annotations representing cognitive presence.

Table 4*Sample Annotations*

Cognitive Presence	Sample Annotations
<p>Exploration (Learners brainstorm, explore, and share information.)</p>	<p><i>“I love the idea of a survey for a book review! It is a quick and easy way to get immediate feedback about books and choose future materials catered to your students’ interests...” (Gao, 2013, p. 79).</i></p> <p><i>“For more information about nuclear disaster, please refer to the website’s pdf file” (Li et al., 2015, p. 7).</i></p> <p><i>“yes, the meaning in English is shroud. It is as if the heart were covered and already hardened due to so much suffering in the past” (Thoms & Poole, 2017, p. 147).</i></p>
<p>Integration (Learners connect ideas and construct meaning.)</p>	<p><i>“I would agree with you both just thinking of my own experiences when a teacher would review something and I would look around and there would only be like 3 students that were paying attention because everyone else knew what they were talking about” (Gao, 2013, p. 79).</i></p> <p><i>“I appreciate you bringing up the movement from novice to expert. My hunch is that somewhere along that journey, hands-on, practical experimentation becomes an important part of an expert’s development of foundational knowledge” (Eryilmaz et al., 2014, p. 310).</i></p> <p><i>“This paragraph rings a bell about student empowerment & motivation that comes when students can take control of their learning-actively” (Plevinski et al., 2017, p. 115).</i></p>
<p>Resolution (Learners apply knowledge by choosing a contextually appropriate solution or reducing complexity by constructing order.)</p>	<p><i>“According to the statistics provided, we can see that the development of north east area of Hong Kong can largely increase the housing supply, both in public and private housing, which can greatly reduce the existing pressure on accommodation” (Li et al., 2015, p. 7).</i></p> <p><i>“Got it. On an elementary level there are curriculum books for teaching creativity. See critical thinking skills for grades 1–2 published by Evan-Moor. I just checked online and they renamed their series critical and creative thinking skills. I think creativity can be taught” (Eryilmaz et al., 2014, p. 310).</i></p> <p><i>“I agree with all of the above, each student is at a different level in the classroom. Review can be helpful but only to some in the classroom, others zone out because they already know the material. This is a great idea to avoid this” (Gao, 2013, p. 79).</i></p>

Triggering Event and Exploration. An assignment to read and annotate a challenging text can serve as a triggering event. In the exploration phase learners brainstorm and consider possibilities. SA encourages readers to slow down and reflect as they read. They can record their reactions and compare them to those of other readers. The mechanics of the activity encourage readers to ground their discussion in specific references to the text. As one study participant said, “I had to really read the article to be able to make posts and comment on others’ posts” (Gao, 2013, p. 81).

Plevinski et al. (2017) were interested in the benefits of SA for discussing reading, given the cognitive load burden imposed in discussion forums by separating the text from the discussion interface. When learners have to move back and forth between screens containing source text and their responses, they use up some of their available cognitive resources on coordination. Plevinski et al. (2017) developed a taxonomy of knowledge construction activities, with which they coded annotations made by doctoral students in two different week-long discussion assignments during a term. The largest categories were elaboration (21%) and interpretation (21%). They considered these activities to contribute primarily to the “remember” and “understand” levels of Bloom’s Taxonomy. They hypothesize that the excessive reading load, four or five academic articles amounting to over 100 pages per week, may have contributed to this finding. Students had large quantities of complex material to read and could fulfill the annotation requirement by annotating anywhere in these readings. Possibly they did not have time or energy to progress to activities such as synthesis and evaluation. Additionally, the researchers suggest that though the anchored comment format helped students respond to specific passages, it may have hindered synthesis. The goal in the CoI framework is to progress

to integration and resolution phases, so a possibility would be to follow up with additional work such as composing a summary (O'Dell, 2019; Gao, 2013).

Exploration is a valuable phase in which learners discover and exchange information. Learning should not stop here. As learners begin to connect ideas they enter integration, and then as they apply them they achieve resolution. Resolution can consist of reducing complexity by constructing a coherent understanding of a concept or situation (Garrison, 2017). Most of the studies selected for this review include indicators of integration and resolution as well as exploration.

Integration and Resolution. In the integration phase, learners consolidate and construct knowledge. SA allows learners to collaboratively construct understanding of text, a feature of the integration stage. Thoms and Poole (2017) wanted to explore how SA could help advanced second language learners. In addition to helping with vocabulary and structural features, they realized annotation had potential for sharing background information and unpacking dense texts. They collected data in an advanced Spanish literature course using Hylighter over four weeks in the middle of a semester. Students were asked to annotate three to five poems each week with Hylighter, writing at least one annotation for each poem, and at least one response to a classmate. Students received guiding questions to answer through their annotations. They were aware their annotations would be graded based on quality. The researchers used a grounded theory approach to read through the annotations and identify categories. They coded all the comments using 13 categories. Three larger categories of linguistic, literary, and social were designated. The researchers also distributed a survey to students and conducted interviews with the instructor and four students who were active annotators.

Thoms and Poole (2017) coded 65% of the annotations as literary, 54% as social, and 8% as linguistic (comments could have more than one code). They attribute the low percentage of linguistic comments to the advanced level of the course and to the assignment guidelines, which encouraged understanding and interpreting the poems. Students engaged in close reading, interpreting the text and noting rhetorical devices.

Thoms and Poole (2017) used discussion questions to guide student annotations. Another way to guide students is by drawing attention to important passages. With complex reading, students may have difficulty identifying important concepts. If left to their own devices, they may focus on the wrong parts of a text. SA tools can be used to direct attention to key concepts. Eryilmaz et al. (2014) were interested in the ability of students to collaboratively understand new, difficult concepts and go beyond the instructional materials given to construct meanings not explicitly stated therein. They note that in online discussions, students will often take the path of least resistance and avoid difficult topics. To direct them in an annotation activity, “attention-guiding cues offer students an indirect way of focusing their social interaction on the processing of challenging concepts” (p. 305). For their study they designed a SA interface with an “importance bar” to change text size. A treatment group progressed through two stages. First, the instructor highlighted concepts by making the font size larger. In the next stage students took over responsibility for highlighting. The student version allowed for two font sizes. The largest size was intended to indicate student consensus about important topics. The researchers hypothesized that as students developed their knowledge base, teacher scaffolding would no longer be necessary and could even hinder learning.

In the Eryilmaz et al. (2014) study, 24 doctoral students were evenly divided into a control group and a treatment group. Over 12 weeks they participated in six online discussions of

two-week duration. The experimental group used the interface with instructor guidance, transitioning to peer guidance for the last discussion. Statistical analysis revealed that the treatment group produced both more annotations, and a larger percentage of annotations, on challenging topics at a significant level. Coding was used to identify the percentage of annotations which addressed challenging topics. Heat maps measuring cursor movement also indicated greater attention paid. The results also indicated partial support for the hypothesis that instructor guidance would lead to more quality collaborative knowledge construction around the concepts, as shown for example by more annotations demonstrating elaboration and negotiation. These positive outcomes persisted when they transitioned to peer-guided cuing, though the researchers caution that more research would need to be done to evaluate patterns over time.

The use of cuing is aligned with message design principles in instructional design. Mayer (2009) encourages designers of educational multimedia to follow the signaling principle, according to which learners' attention can be directed to essential material through strategies such as highlighting or underlining. Such treatment helps the learner pay attention and guides their cognitive processing as they mentally organize the information.

A study by Wolfe (2008) also sheds light on how SA can be orchestrated to draw students' attention and encourage them to engage with ideas. Wolfe was interested readers' use of annotations made by others. She notes that composing annotations and reading those of others may offer different benefits. Wolfe conducted a speak-aloud study with seven participants. They read an opinion piece seeded with both positive (agree) and negative (disagree) annotations. Some paragraphs with controversial statements were intentionally not annotated. Participants' spoken comments were coded using categories of comprehension, evaluation, and other.

According to Wolfe (2008), annotated paragraphs produced 50% more comments than non-annotated paragraphs, a statistically significant difference. Paragraphs annotated with both positive and negative annotations provoked more comments than those with only a positive annotation, at a significant level. Furthermore, participants made more effort to evaluate the text, in terms of percentage of comments. For paragraphs with no annotations, readers focused on comprehension, though the quantity of comments indicated that the paragraphs with “con” annotations still produced more comprehension comments. Wolfe suggests readers were working diligently to comprehend these paragraphs. In fact, a non-significant drop in comprehension comments on paragraphs with only “pro” annotations occurred, implying readers may gloss over paragraphs with “pro” annotations. Overall, pro/con annotations caused readers, especially novice readers, to reflect and formulate their own position. They made more than three times as many evaluative comments and more than five times as many original arguments for pro/con annotated paragraphs as for un-annotated paragraphs. In interviews, participants made observations such as “The ones that really helped me were when they’d disagreed with what was in the paragraph I like things that contrast. I think I can see them better when they contrast” (Wolfe, 2008, p. 154).

Wolfe (2008) conducted a second study with 82 first-year writing students divided in two conditions. One group read an opinion piece seeded with both positive (agree) and negative (disagree) annotations. The other group was given the same annotations combined loosely into an essay at the end of the reading. Both were assigned the homework of completing their own opinion response essay. Composition instructors who rated the essays found the first condition significantly less likely to produce “memory dump” essays consisting of pure summary. Wolfe (2008) concludes “readers have a different relationship with annotations than they do with the

primary text. Where novice readers adopted a generally passive reading style when reading the primary text, they were more proactive and questioning when reading the annotations” (p. 162).

In her studies students did not contribute their own annotations. These studies isolate the cognitive benefits of reading and thinking about annotations made by others. Annotations expressing differing views provided entry points into the complexities of the text.

Razon et al. (2012a) also had students read expert annotations, along with peer annotations. They recruited 50 undergraduate education major students to participate in a study evaluating use of Hylighter. They read an article, took a 3-question reading comprehension quiz, and composed a 350-word summary response essay. Participants in the treatment group annotated and read annotations by others and by the researcher. Total participation lasted about two hours. The researchers chose the essay as a valid representation of students’ mental models. They were interested in how novice mental models compared to those of experts. They used a text analysis tool called HIMATT to evaluate participants’ mental models based on their summaries. Razon et al. (2012a) found no significant differences in reading comprehension scores between the conditions. However, for the Hyglighter group, participants’ mental models were significantly more similar to expert mental models. The researchers believe this finding supports the usefulness of SA for developing higher-order complex thinking skills, particularly construction of concepts contained in reading: “When students collaborate with their peers and critique their work, the students are evaluating and comparing their own mental models with that of their peers, thus requiring more cognitive processing, which deepens their conceptualizations, and in turn allow them to modify their own mental models to be similar to that of the expert” (p. 72).

SA can be used to promote exploration, integration, and resolution as students compose and respond to annotations. Annotation can also be incorporated in group projects. When students work on a problem together they move towards resolution. A study by Li et al. (2015) sheds light on how collaboration on a group project interacts with level of thinking and learning outcomes. They explored the interaction between cognitive, metacognitive and social activity in learning with a SA tool by following 48 teacher education students through an inquiry learning project. Students were divided into groups of four to six, each of which chose a social issue, which was approved by the teacher as being complex and ill-structured. The project was divided into four stages, identified as Stage 1: initialization, Stage 2: exploration, Stage 3: consolidation, and Stage 4: celebration. In Stage 1 the teacher provided guidance in terms of topic selection, using the tool, setting a timeline, etc. In stage 2 students explored web sources and annotated. In Stage 3 they collated their sources and annotations and also constructed mind maps and developed arguments. Last they presented their reports.

Li et al. (2015) developed a coding scheme for rating annotations by level of cognitive (divided into cognitive 1 and cognitive 2) and metacognitive demand. Cognitive 1 activities consisted of processes such as agreeing and classifying. Cognitive 2 activities consisted of processes such as summarizing and synthesizing. The rating also incorporated an assessment of relevance and accuracy. For each student, an aggregate score for cognitive 1, cognitive 2, and metacognitive activity was also computed, along with a total score intended to capture their overall quality of participation. The level of collaboration in groups was quantified by considering the number of contributions, average number, and standard deviation. Most of the annotations were of type cognitive 1. Cognitive 1 activity was correlated with both cognitive 2 and metacognitive activity, and a higher project score. Analysis also indicated that the variation

in project score was most impacted by average number of posts per person. The level of collaboration within groups accounted for most of the cognitive and metacognitive activity score variation, which is in keeping with social constructivist theory of learning. By working together to solve an ill-structured problem, students co-constructed knowledge.

Johnson et al. (2010) discuss SA and group work in the context of trying to help underprepared students succeed in higher education. They recognize that poor reading comprehension, critical thinking, and metacognitive skills set these students up for failure. College students need more than basic passive reading skills. They must be able to read critically and apply metacognitive strategies. The researchers saw the potential benefit in integrating social networking practices with reading. They discuss the application of Social Annotation Model-Learning System (SAM-LS), a combination of team-based learning, computer-supported collaborative learning (CSCL), and annotation technology. Johnson et al. were curious about the impact of SAM-LS on lower-level, moderate-level and complex-level cognitive skills, or comprehension, critical-thinking, and meta-cognitive skills.

Johnson et al. (2010) conducted a study analyzing data from 267 students in ten sections of a first-year English course. The research was focused on the benefits of working in a group as opposed to alone. Students read five articles, then completed questionnaires assessing comprehension, critical thinking, and meta-cognitive skill. They also completed reading skills pre- and post-tests. Johnson et al. (2010) devised four instructional methods consisting of different combinations of completing SA activities alone and with other students in the same physical location. Participants composed annotations first, alone or in a small group, and then compared their annotations to those of an instructor, alone or in a small group. One of the four conditions involved completing both the activities alone. Each course section used the same

method for the length of the study. Students read, annotated, and compared, alone or in small groups. They then completed assessment instruments.

Johnson et al. (2010) discovered that students working together on either of two tasks showed better performance. Students who worked on either or both tasks together performed better than other groups in reading comprehension, especially on the more difficult readings. Students who worked together also performed better on the metacognition assessment. No significant differences for critical thinking were established. The researcher acknowledges this may have been due to the nature of the task or short duration of study. Further, they suggest critical thinking may emerge in groups with a sufficient level of trust, which in this case may not have developed. Additionally, part of the lesson they described involved chunking the text and identifying the thesis. Possibly this activity helped all the students perform better on the critical thinking assessment, regardless of their annotation condition.

In addition to being incorporated in small group work, SA can also help students acquire collaboration skills that extend beyond the course community. In the Burkean Parlor metaphor, academic discourse is compared to a conversation. Bloch (2007) talks about the use of blogs to involve students in academic writing as a social practice. He points out a benefit of blogging, which could also apply to SA. Second language learners struggle with incorporating sources. They tend to either rely heavily on inserted sections of sources copied or insufficiently paraphrased, or ignore the sources. They need to learn to integrate their voice with the sources. Bloch (2007) calls this “weaving.” According to Bloch, blogging with classmates about academic topics helped students develop this skill. Posting articles and responding to classmates’ posts helped students bridge the gap between academic discourse and the communication patterns they were already accustomed to. SA can operate in a similar manner, creating a context

in which students contribute to a conversation built around an academic text. They engage in the collaborative construction of knowledge. Wolfe (2008) noticed how novice reader participants in her speak-aloud study responded to paragraphs with both pro and con annotations by reflecting and weaving excerpts from both the primary text and the annotation into their spoken musings. The proximity of text and annotations appeared to make this process more fluid.

Problematic Findings. The mismatch of annotation with summary and synthesis has already been mentioned. SA seems to work especially well for close reading, while other communication and collaboration tools work for summary and synthesis. Gao (2013) studied the experience of 33 students in two sections of an undergraduate teacher training course using SA. Though participants found the tool helpful for learning, they voiced some concerns in their open-ended survey responses. The granular focus made it difficult to develop a holistic understanding of the texts. LMS discussion boards, in contrast, tend to encourage a summary approach (O'Dell, 2019). Students often compose discussion posts after completing a reading. Summary is an important skill, and O'Dell recommends that instructors have students engage in both types of writing: annotation and summary discussion post.

Research indicates some other trouble spots as well. The survey and interview data collected by Thoms and Poole (2017) revealed information about student experiences with the SA tool. Students felt pressured to come up with original comments. If another student had already expressed an insight they also had, it was stressful to come up with something else to appear engaged. Another comment was that the collective endeavor created a “group think” effect in some cases, where an initial inaccurate statement was never corrected or challenged and may have influenced other students or discouraged them from formulating a different interpretation. Wolfe (2008) also expressed concern about the quality of comments. With limited

screen space, an excess of comments may clutter up the interface and interfere with reading. Participants in Gao (2013) felt SA was helpful for learning. However, they mentioned in survey responses that the quantity of comments could be overwhelming to sift through. Instructor intervention might be appropriate in these cases.

In another study, Johnson et al. (2010) looked explicitly at several treatment conditions involving different combinations of annotating alone and with the benefit of others' annotations. They gathered data from 254 students in nine sections of a second-semester freshman English course. Students read five articles and then completed questionnaires assessing comprehension, critical thinking, and meta-cognitive skill. They also completed reading skills pre- and post-tests. The study incorporated five treatment conditions, including a control "no annotation" condition and four different instructional methods involving annotation. Students annotated and some then reviewed either peer or instructor annotations. All course sections rotated through all five approaches, in a different order, over a ten week period. In the treatments that involved students composing their own annotations, they were given general instructions to annotate to help themselves better understand the reading.

Johnson et al. (2010) found no significant effects supporting SA. An overall meaningful increase in critical thinking skill was detected, but no significant differences between the five approaches. The researchers note both the limited exposure to the treatment conditions and the limited time to become familiar with the SA tool. Learning effects might have developed with more time. Additionally, the annotation happened in a rigid order consisting of first writing annotations, then for some participants reviewing those of others. This is not an organic, back-and-forth process. Furthermore the process took place during a class period with time limits, not

over a longer period of self-paced study. Possibly these aspects of the study limited positive impacts.

The instrument developed by Johnson et al. included three reading comprehension questions, two critical thinking questions, and two metacognitive skill questions. Critical thinking questions were open-ended, and rated with three possible ratings. Metacognitive questions required students to explain their rationale for a conclusion or recount the steps they went through in formulating a response. Again, responses were rated with three possible ratings. It is possible the instruments did not adequately capture participants' cognitive processes. Other studies took a grounded theory or similar approach, coding the annotation data produced by participants. Assessment must be carefully designed to capture evidence of learning (Garrison, 2017).

In Thoms and Poole (2017), discussion questions worked well to scaffold annotation activity. In Gao (2013), on the other hand, many participants did not respond to the guiding questions provided by the instructor to scaffold annotation. She stresses that the questions must be emphasized and/or embedded effectively in the text to ensure students respond.

SA in group projects may also need to be structured carefully to ensure engagement. Chan and Pow (2020) looked at the use of a SA tool in six undergraduate teacher education and sociology course sections. Collaborative inquiry-based research projects were completed by 377 participants in small groups. They used SA to support their collaboration. A survey instrument was used to collect information on their experiences and perceptions of the annotation tool. Log file data was analyzed to quantify their actual use of the tool. No correlation emerged between students' perceptions of using the tool, their actual usage, and their learning outcomes as measured by marks on the collaborative assignments. Students tended to apply the tool early in

their work, to collect and share research, but less to interpret and discuss the material with one another. Chan and Pow (2020) suggest the SA use may not have been sufficiently structured and scaffolded. Training on the tool was provided to participants by the researchers in a 90-minute tutorial. Perhaps the instructors were not involved enough to ensure integration of the SA activity with the curriculum.

Metacognition. Metacognition involves self-awareness and self-regulation.

Metacognitive skill facilitates cognitive presence. In their study involving a collaborative project, In Li et al. (2015), annotations indicating metacognitive activity were few in number but related to other features. Lower level (cognitive 1) activity was correlated with both higher level (cognitive 2) and metacognitive activity, and a higher project score, suggesting “a kind of symbiotic or ecological relationship exists among the three types of activities” (p. 10).

Metacognitive activities did not have a statistically significant effect on project score, though the researchers note the small sample size may contribute to this finding. The level of collaboration within groups accounted for most of the cognitive 2 and metacognitive activity score variation, leading the researchers to conclude that “active participation and a distributive share of contribution among group members help promote high levels of cognitive and metacognitive activities” (p. 11). This finding supports social constructivist theory of learning. Collaboration resulted in increased metacognitive activity.

In one study, Johnson et al. (2010) found no significant effects supporting the benefit of SA for developing metacognitive skill. In a second study, focused on individual versus group annotation work, students working together on either of two annotation tasks showed better performance. Students who worked together performed better on the metacognition assessment.

They suggest that the process of discussion in a group required students to communicate more about their thinking, supporting metacognition.

Overall, the findings suggest mindfully designed SA learning activities have the potential to help students progress through the four stages of practical inquiry. Text annotation activities can serve as triggering events. Assignments to read and respond to text produce evidence of exploration, integration, and resolution. Students may need guidance to reach integration and resolution in SA activities. To encourage engagement at the stage 3 and 4 levels, annotation can be structured through pedagogical strategies such as highlighting important concepts and seeding annotations by experts. SA can also support the development of metacognitive skill. The process of articulating their views causes students to become aware of their thought processes.

Social Presence

Social presence should produce an environment of trust and collaboration (Garrison, 2017; Garrison & Arbaugh, 2007). Students' comfort level expressing their opinions and disagreeing or negotiating meaning with other students should be considered. Social presence includes open communication, group cohesion, and affective expression. Students' sense of the class as a cohesive community is important. Social presence can support cognitive presence (Joksimovic et al., 2015; Zhan & Mei, 2013; Liu et al., 2009).

Adams and Wilson (2020) investigated whether SA could be an alternative to discussion boards for facilitating community in an asynchronous online course. They proceeded from a constructivist orientation, recognizing the importance of interaction and community. They hypothesized that SA would foster more interaction by capturing students in active processing as opposed to post-reading summary composed in isolation and submitted to a discussion board. They collected data from 15 students in a semester-long asynchronous graduate course on

teaching literacy in the digital age. Students read one or two texts each week and annotated. The instructor participated and modeled annotation strategies. The researchers coded annotations as representing interaction with the text or a peer. Overall, by the end of the term, the average number of interactions with text per reading went up by 30% and with peers by 40%.

Approximately half of the annotations consisted of peer interaction. They interpret the increase to indicate community growth as students worked to make meaning together.

Thoms and Poole (2017) classified 65% of the annotations in their study of a Spanish literature course as literary, 54% as social, and 8% as linguistic (comments could have more than one code). Thoms and Poole define social instances somewhat broadly, including students' responses (agreement, disagreement, etc.) to one another's literary annotations. Interview data revealed information about the instructor's experiences with the SA tool. He felt SA established a sense of community. He saw expressions of support and solidarity in comments in a way that didn't happen in class. Additionally, quieter students who didn't talk in class opened up. Pedagogically, this perspective made him consider how to change his face-to-face teaching approaches so these quieter students would feel comfortable participating.

Though Li et al. (2014) initially intended to include social activities in their analysis of cognitive and metacognitive activity in annotations based on a collaborative project, 5 out of 10 student groups hardly displayed any social activity in their annotations. As a result they did not include social activities in their final analysis. Plevinski et al. (2017) determined that 2% of the annotations in their study involved social interactions. Students in Li et al. (2014) were working together on a project, so possibly their social activities were happening outside of the annotation environment. Li et al. also defined "social" quite narrowly to include appreciate, request, and encourage. Plevinski et al. (2017) defined social as "Comments directed at participants but not at

the task at hand” (p. 115). They specified other categories such as “Support” to accommodate annotations that could be considered indicative of social presence. Thoms and Poole (2017) included students’ responses to one another’s literary interpretations as social comments. Adams and Wilson (2020) do not provide examples or detail on their definition. Differences in definition may thus account for some of the variation in percentage of comments focused on social activity.

Razon et al. (2012a) included questionnaires to assess participants’ attitude and motivation towards learning. Treatment participants did not report higher positive feelings for learning, but the researchers attribute this to the short duration of their experience. They acknowledge that CSCL works best with groups of learners who have developed trust and community. They emphasize the importance of social processes in learning and suggest that social annotation can contribute to these processes with time. Johnson et al. (2010) also affirm the importance of community. On the other hand, survey responses collected by Gao (2013) indicate that the social nature of SA can be distracting. If a reading is not interesting, students may find the side conversations more enjoyable. However, Gao did not find any irrelevant annotations in the coded data.

SA can support the development of social presence, but it may depend on instructor guidance, activity design, the delivery format of the course, and the time students have known one another.

Teaching Presence

In the CoI model, social and teaching presence both support cognitive presence. Learning outcomes are impacted by teaching decisions, including activity structure and teacher participation in SA activities. According to Garrison (2017), the instructor is still key, even when students have taken on some responsibility for directing discourse. They must structure and

assess the learning experience. The teacher must find a balance between generative direction and excessive intervention. Below observations regarding SA and teaching presence are grouped by the pedagogical activities of design, facilitation, and direct instruction.

Design. Online teaching typically requires extensive planning upfront. In the CoI framework a course design should be a tentative and flexible rather than a rigid template (Garrison, 2017). Students will come to share in the teaching presence responsibilities, and their needs and input may dictate deviation from the plan.

Part of a teacher's responsibility is planning the "triggering events" to spark the inquiry process (Garrison, 2017). Teachers can plan SA as a core part of their syllabus. Other digital communication and collaboration tools exist, but SA seems to work especially well for reading discussion activities (Chan & Pow, 2020; Eryilmaz, 2014; Plevinski et al., 2017, Van der Pol et al., 2006). The anchoring of comments in the text reduces the cognitive load imposed by switching from the text to a forum. Students tend to produce more evidence of engaging deeply with the reading. However, to facilitate the development of holistic understanding, teachers should also plan for summaries or other activities that require students to synthesize their knowledge (O'Dell, 2019; Gao, 2013).

In a writing class, reflection on carefully chosen texts can be a starting point. SA activities can be designed as open-ended assignments with a requirement to contribute a given number of annotations and responses. SA tools encourage close reading, and capture the moment-by-moment experiences of readers as they engage with a text. To focus student attention on particular difficult concepts in the text, instructors can use visual cuing such as bold or highlight (Eryilmaz, 2014). Another strategy is to plant quality annotations that reflect conflicting opinions on key ideas (Wolfe, 2008). Students are drawn to the controversy and are

more likely to form their own opinions. They become involved in the text as an intellectual conversation.

Designing a collaborative project with an annotation component is another strategy (Li et al., 2015). SA promotes collaborative construction of knowledge. Topics should be ill-structured. Ill-structured problems allow students to develop their practical inquiry skills. As students progress through the first two phases of practical inquiry, they engage in creative, divergent thinking, considering and sharing possibilities. In the last two phases they turn to convergent thinking as their group chooses a contextually appropriate resolution to a problem.

Garrison (2017) suggests that less is more. It is vital to allow students sufficient time to process and reflect on material, rather than marching them through a pre-determined reading list. Plevinski et al. (2017) found that heavy reading assignments resulted in annotations representing the lower end of Bloom's Taxonomy. It is not always possible to reduce reading loads in introductory courses meant to provide students with a base of foundational knowledge in their field. If it is possible, however, and depending on the learning outcomes, quality may be more important than quantity.

Another element of design is assessment. If assessment rewards only information recall, students will focus on information recall, not higher-order learning outcomes (Garrison, 2017). This approach wastes the affordances of a collaborative, constructivist e-learning environment. In Johnson et al. (2010), the assessment instruments measured learning with a few focused questions. Though this type of measurement may be valuable for research, in a teaching and learning situation, it may be desirable to evaluate annotations or the projects they are part of based on the quality of thought. Garrison (2017) notes the possibility for collaborative

constructivist learning to consist of latent gains not readily apparent on conventional assessment instruments, but nonetheless significant.

Teachers can plan for social presence by building SA work into a schedule of assigned texts. Planning for some SA to be part of small group project work will allow collaborative relationships to develop and be reinforced through cooperative annotating. SA can be used in tandem with discussion boards, face-to-face interactions, and other class routines to support open communication, group cohesion, and affective expression. In their annotations students may express support for one another that is not evident in face-to-face class (Thoms & Poole, 2017). Taking part in conversations in the margins of texts will develop students' identities as participants in a scholarly conversation (Wolfe, 2008).

Facilitation. Teachers should manage and monitor students' depth of understanding. This involves facilitating and focusing discourse. Students can help moderate discussions too. To guide student attention to important concepts in the text, instructors can use visual cuing such as bold or highlight (Eryilmaz, 2014). SA also lets instructors see which parts of a text are attracting commentary. If an important part is not commented, the instructor will be alerted about students avoiding or overlooking it, and he/she can cover it in class (Thoms & Poole, 2017).

The teacher can acknowledge and encourage participation. Netiquette guidelines should be followed. It is always important that students can contact the teacher with any concerns that arise. If social interaction can be encouraged and cultivated over the course of the term, it can help sustain motivation (Garrison, 2017). The teacher can model contributing and building on others' contributions (Adams & Wilson, 2020). They can convey through their instructions and behavior their belief in the importance of a community of learners.

Teachers should be aware of both dominant and timid participants, and intervene tactfully to focus the former and draw out the latter. SA has shown promise as a way of providing a forum for quieter students to express themselves (Thoms & Poole, 2017). As Garrison (2017) points out, asynchronous online discussion activities provide an opportunity for introverted or less skilled learners to put together their responses without the pressure of real-time communication. They can carefully compose their contribution, taking time to consult any online resources they need.

Direct Instruction. Garrison (2017) considers technology an exogenous variable, not an integral part of the CoI framework. Nevertheless, teachers should plan for it. Well-designed technologies will have a transparent quality once students have learned to use them. Initial training and ongoing support should be planned so students feel confident engaging in SA and are not held back by technical complications. SA technology can provoke feelings of anxiety in new users (Razon et al., 2012a), so sufficient time must be set aside for learning it.

Both instructors and students can engage in direct instruction by correcting misunderstandings, proposing alternatives, and sharing background knowledge (Thoms & Poole, 2017). Many educators regard reading as a social and cultural activity, in keeping with the cognitive perspective on reading. Cultural background knowledge is key for understanding texts. This view aligns with Lev Vygotsky's sociocultural model (Vygotsky, 1978; Palincsar, 1998). Vygotsky proposed that learners develop by engaging in interaction with peers or mentors who possess a higher level of skill. The gap between what a learner can do on their own, and what they can do with some assistance, is the Zone of Proximal Development (ZPD) (Vygotsky, 1978). In a writing class, learners can help one another understand a text by sharing their interpretations and knowledge through their annotations.

Students new to annotation may need guidance to experience the benefits. Porter-O'Donnell (2004) furnishes a list of textual features she wants students to attend to, some of which have shorthand symbols. She specifies categories including making connections, asking questions, and analyzing an author's craft. She also shares models of annotated texts, preferably the same texts the students are reading. Scaffolding paves the way for students to employ annotation as an effective reading strategy. To encourage metacognitive awareness, Garrison (2017) recommends that teachers explain the practical inquiry model to students and ask them to identify their discussion contributions by stage. The studies reviewed here did not employ these strategies, but they could be a promising alternative.

Along with interpreting and responding to content, students can also use SA for language-focused purposes (Thoms & Poole, 2017). The CoI framework focuses primarily on higher-order outcomes, but literacy skills support these outcomes. SA can be used to review and fill gaps in basic knowledge. These uses build cognitive and teaching presence. Students can gloss vocabulary items, providing a definition and/or a media file. They can ask and answer questions about difficult structures and link to grammar resources. Second language learners can also translate difficult passages.

In addition to discussion around texts, SA could also be used for sharing and commenting on student writing. Students could post and comment on drafts of papers (Van der Pol, 2008). SA could also be used to share and comment on course documents such as the syllabus and assignments (Kalir, 2020). These practices encourage students to develop both cognitive and teaching presence.

Strategies Identified in the Literature

Research questions 2 asks, what best practices emerge from the literature for using SA tools in an online writing course? This question calls for a synthesis of research findings. The empirical research included in this study supports a variety of strategies for incorporating SA in writing instruction. Uses of SA that resulted in learning gains can be emulated. Problematic findings can be interpreted and used to define parameters. The findings elaborated in the preceding analysis section have been distilled to form a list of proposed best practices, summarized as a matrix in Table 3. Practices are categorized into cognitive and social presence rows. Miscellaneous other strategies are listed at the bottom. Teaching presence is represented in the columns for design, facilitation, and direct instruction.

Table 5*Strategies for Incorporating SA*

	Teaching Presence		
	Design	Facilitation	Direct Instruction
Cognitive Presence			
Triggering Event and Exploration			
Assign a given number of annotations/responses per reading or time period.	x		
Consider planning assignments that incorporate thoughtful questions/prompts or integrate annotation with team-based collaborative projects.	x		
Model annotation.		x	x
Plan annotation work over extended time period so students become accustomed to the practice and tool.	x		
Integration and Resolution			
Limit reading quantity to allow time for deeper processing.	x		
Draw attention to important or difficult concepts with size or highlighting.	x		x
Supplement annotation with summaries or other holistic writing assignments.	x		
Seed texts with annotations agreeing and disagreeing with ideas to encourage considering different views, stance-taking.	x		x
Structure annotation assignments with thoughtful questions/prompts and embed them or otherwise make sure students are aware of them.	x		x
Model annotation to expose students to annotation types and ways to agree and disagree, support one another.		x	x
Integrate annotation with team-based collaborative projects.	x		

Table 5 (Continued)

	Teaching Presence		
	Design	Facilitation	Direct Instruction
Monitor to avoid excess of comments that clutter interface; if this happens assign small groups or otherwise limit visibility of annotations.		x	
Ensure that assessment does not reward participation at only levels 1 and 2; grade annotations based on quality.	x		x
Metacognition			
Model and ask students to label or code their annotations according to type.		x	x
Integrate annotation with team-based collaborative projects.	x		
Social Presence			
Model supportive, collaborative annotation.		x	x
Monitor participation; encourage students who are not engaging.		x	
Integrate annotation with team-based collaborative projects.	x		
Assign small group annotation activities.	x		
Other			
Train students/teachers/assistants on annotation tool and provide ongoing technical support.		x	x
Invite students to annotate course documents such as syllabi and assignment sheets to gather feedback and address confusion.			x

Summary

SA has the potential to promote cognitive presence, social presence, and teaching presence in learning communities. SA encourages close reading and captures the moment-by-

moment experiences of readers as they engage with a text. Students can develop higher-order thinking skills, metacognitive skill, and a sense of community. Pedagogical strategies such as highlighting important concepts and seeding expert annotations can guide attention. The demands of articulating their views and comparing them to those of others cause students to become aware of their thought processes, a metacognitive development. SA can support the development of community as students collaborate and support one another. Teachers can plan and monitor SA activities to promote learning. The research reviewed and synthesized in this chapter supports and illuminates the use of SA to foster constructivist learning outcomes. The findings can be used to guide implementation of SA in writing instruction.

Chapter 5: Conclusion and Recommendations

Introduction

In the CoI theoretical framework, the educational experience is conceptualized as the intersection of three types of presence: social, cognitive, and teaching presence. The framework is based on basic assumptions about education as a “collaborative constructivist” endeavor in which learners construct meaning and confirm shared understanding, taking time for both private reflection and public discourse. A community of learners is considered an essential element of meaningful education. SA and other emergent technologies can be used to support constructivist learning outcomes. The role of the teacher, captured in the teaching presence circle, is vital. In the previous chapter, the ways in which teachers could incorporate SA in their design, facilitation, and direct instruction activities were discussed.

Recommendations for Application

Writing teachers can incorporate and scaffold SA in a variety of ways, including:

- Train students on SA technology, use over extended time period, and provide ongoing technical support. As student build confidence and familiarity with applications anxiety will decrease.
- Evaluate annotations based on quality rather than only quantity, if possible. Evaluation criteria impact student progression through the four phases of practical inquiry.
- Limit quantity of reading assigned if feasible. Quality engagement with the text is more likely to occur if students have ample time to process and interact through their annotations.

- Assign discussion questions to address in annotations and embed them or otherwise make sure students are aware of them. Such questions can spark intellectual conversation.
- Use signaling to draw attention to key concepts in text to be annotated. In accordance with instructional design principles, signaling directs learners' attention to key material.
- Encourage peer scaffolding. Peers can support, encourage, and teach one another.
- Model quality annotation. Teachers can pre-seed a text with annotations or participate in discussions to encourage and challenge students.
- Seed readings with expert annotations. These examples help students form accurate mental models of new material.
- Seed readings with annotations expressing conflicting views. Students are interested and surprised to see how scholars can disagree on controversial topics. They are more likely to respond by formulating their own positions.
- Integrate SA in group research or problem-based learning projects. Students benefit from working together.
- Consider developing and teaching a coding scheme to categorize annotations. If students must label their own annotations they explicitly reflect on the four stages of practical inquiry, or another model of cognitive development.
- Supplement annotation with holistic writing response assignments. Annotation works well for close reading and engagement with the text. Follow-up activities such as summary help students integrate and synthesize what they have learned.

- If excess comments clutter interface, consider how to handle the situation to reduce extraneous cognitive load. Students could be placed in smaller annotation groups.

SA is a relatively new technology. Existing applications will be developed and improved as technology advances. Further research will provide additional guidance for educators.

Recommendations for Further Research

The literature analyzed for this study provides a variety of valuable insights on the use of SA for discussing texts collaboratively. More research specifically in writing classes in undergraduate contexts would contribute to the existing body of knowledge. Studies examining metacognitive skill gains, particularly as conceptualized in the CoI framework, would be valuable. Shared metacognition means that learners are responsible for both themselves and for classmates. They monitor their own and the group's progress, and employ management strategies to progress individually and as a group through the four phases of inquiry. Skilled readers possess metacognitive awareness of how their mind is reacting to a reading and a toolbox of strategies to call upon when they run into difficulty (Liaw & English, 2017). Research on group metacognition dynamics while reading would be helpful.

In the studies reviewed here, students were not asked to code their own annotations in terms of cognitive level. Garrison (2017) recommends explaining the four phases of the practical inquiry model to students and ask them to label their own discussion contributions according to stage. Research employing such self-labeling in SA could shed light on skill development and metacognition.

Wolfe (2008) discovered that disagreement was a catalyst for reflection and growth. Johnson et al. (2010) say of team-based learning, "when a functional team joins intellectual power, they synergize one another's intelligence, and end up creating more than if they engaged

in the learning individually” (p. 1498). Conflict is a natural part of the process: “CSCL teams may become stronger as they work through conflicts that arise within the collaboration” (p. 1498). Plevinski et al. (2017) documented disagreement with fellow student as an annotation category, and found that only 3% of annotations included disagreement. None of the annotations collected by Gao (2013) consisted of disagreement. Research on fruitfully facilitating, building on, and moving through disagreement would add to the body of knowledge on SA.

Summary

The findings of this study demonstrate that SA can be used in writing classes for several purposes. The most obvious use is for understanding and unpacking texts. Students can enter a difficult reading together with their classmates. They can identify and discuss main ideas, claims, rhetorical moves, and supporting evidence. They can ask and answer questions. Shy students possibly intimidated by class discussions can take time to compose their thoughts and participate. Though LMS discussion boards allow students to share reactions to reading, they tend to encourage a summary approach. SA encourages close reading. Discussions can be conducted fully in the document, or the annotation experience can serve as support for projects or preparation for other activities.

The collaborative and reflective affordances of SA complement a CoI-informed course design. Critical thinking emerges in collaboration with others: “E-learning has become a tool of transformation and as higher education addressed passive information delivery methods, a new pedagogy began to emerge -- a pedagogy that is based on a changing sense of thinking and learning collaboratively guided by inquiry-based approaches” (Garrison, 2017, p. 88). SA turns a text into a virtual meeting space where students can construct meaning together.

In an effective learning community, the role of the teacher is key. Students need guidance and structure to effectively establish cognitive presence in SA activities. Teachers can design, facilitate, and instruct through strategies such as using prompts, modelling annotation, and highlighting key concepts. Discussions then become part of purposeful learning, not a random exchange of opinions. The findings discussed in this study can serve as a guide for writing teachers interested in incorporating SA in their online instruction.

Technology can be used to create tasks that were not possible without it. E-learning makes possible collaborative constructivist practices that were not feasible before. Blyth (2014) recommends that teachers embrace the affordances of digital tools, rather than simply using them as on-screen versions of print-based strategies. The possibilities for collaboration, inclusion of links and multimedia, and tagging take SA beyond what was possible with annotation on printed documents. SA allows us to redefine annotation in exciting new ways that can help writing students collaborate and support one another in becoming better writers and thinkers.

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Appendix

Screenshots of Perusall and Hypothes.is

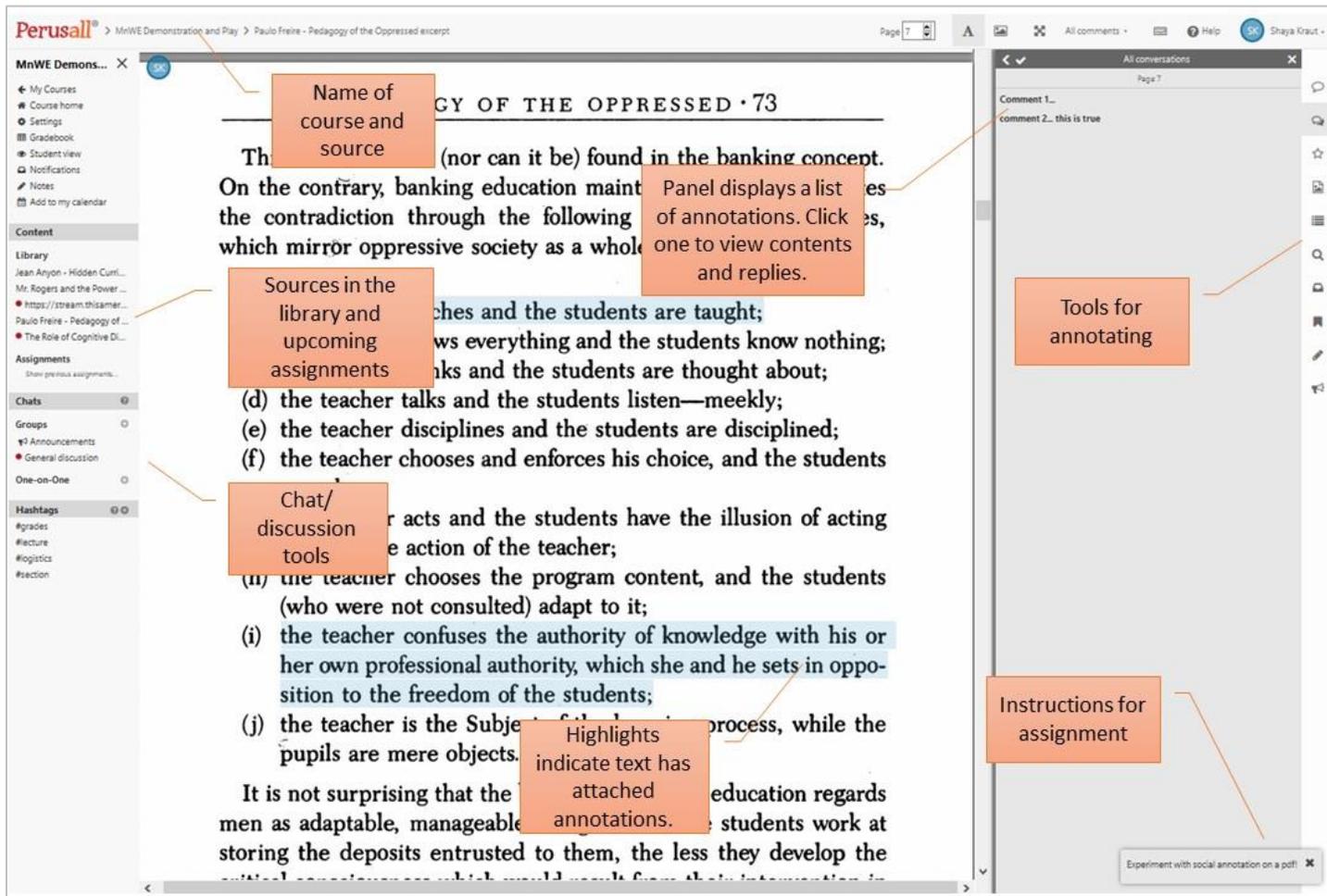


Figure A1. This screenshot shows a document uploaded to and opened in the web-based Perusall annotation application.

The screenshot displays the Hypothes.is interface on a web page from The Atlantic. The page title is "Is Google Making What the Internet is doing to our..." by Nicholas Carr, dated July/August 2008. The main image is an illustration of a police car labeled "INTERNET PATROL" with flashing red lights, stopped on a road. A person in a uniform is talking to another person. Below the image is a quote from Stanley Kubrick's *2001: A Space Odyssey*.

Annotations are visible on the page:

- A dropdown menu in the top right corner allows the user to choose whether annotations will be part of the public set or visible to a private group.
- Comments and replies display in a collapsible panel on the right side of the page.
- Highlights indicate text that has attached annotations.

The right-hand sidebar shows the Hypothes.is interface with the following annotations:

- Shaya** (44 secs ago): "Dave, stop. Stop, will you? Stop, Dave. Will you stop, Dave?"
- comment 1**: (Hidden)
- Shaya** (38 secs ago): "reply to comment 1"
- Shaya** (Just now): "Stanley Kubrick's 2001: A Space Odyssey."
- comment 1**: (Hidden)

Figure A2. This screenshot shows a web page and annotations created with the Hypothes.is extension activated in Chrome browser.