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Teaching and learning in *Second Life*: Using the Community of Inquiry (CoI) model to support online instruction with graduate students in instructional technology

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ABSTRACT

As virtual worlds become more widely utilized in education to deliver instruction, the need to measure learning in this environment will continue to grow. Building upon McKerlich and Anderson's (2008) exploratory study, the researchers of this study utilized the Community of Inquiry's (CoI) Multi-User Virtual Environment Education Evaluation Tool (MUVEEET), and the CoI Survey to measure observational and perceptual data in the multi-user virtual environment (MUVE), *Second Life* (*SL*), among instructional technology graduate students. Specifically examined in this study was the existence of the three CoI constructs — *cognitive presence*, *social presence*, and *teaching presence*. Results indicated that the CoI model served as a promising framework to measure all three constructs within MUVEs. Specifically, both the CoI survey and MUVEEET results indicated that the participants and coders experienced a developed community of inquiry during two *SL* classes.

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1. Introduction

As higher education administrators experience the pressure of tightening budgets and tuition competition across the nation (National Center for Public Policy and Higher Education, 2008), one way many higher education institutions are responding is through the implementation of distant courses within academic programs (Fischman & Young, 2008). Even those universities that have been reluctant to jump into distance education too quickly for fear that quality learning would be lessened in the process are cautiously testing the waters with online courses. This process has resulted in many faculty members attempting to develop innovative and effective ways to craft quality online college courses and programs. Learning Management Systems (LMS) such as BlackBoard and WebCT have dominated much of the higher education sector, and are also making their way to K-12 schools who wish to offer classes online (Project Tomorrow, 2008). Both BlackBoard and WebCT offer synchronous and asynchronous tools which allow students to communicate, to collaborate, and ultimately to create communities of inquiry (University of Massachusetts, 2009). Another sort of learning platform that has emerged in recent years, and that offers a three-dimensional, interactive learning experience is multi-user virtual environments, or MUVEs (Dede, 2003). Multi-user virtual environments are 3-D environments that support exploration, simulation, role-play, interaction and experimentation via avatars, or 3-D self-representations (Clarke, Dede, Ketelhut, & Nelson, 2006). *Second Life* (*SL*) (Linden Research, 2006) is one such MUVE that touts a user population of over eight million since its beginning in 2003. This virtual environment is created by its residents who have the ability to build objects within their world for such purposes including, but not limited to, entertainment, retail, academia, advertising, and marketing. An added bonus is that a thriving economy also exists within *SL* due to "Linden Dollar" currency that enables residents to purchase in-world items such as virtual islands, clothing, and furniture.

In an educational context, *SL* provides a space for constructivist learning, socialization, exploration, discovery, and creativity. The communicative, social nature of virtual learning allows students to demonstrate the skills and strategies they have acquired through utilization of social technology tools. This applied, situated learning environment has great potential — especially in online distance learning. Multi-user virtual environments are starkly different than computer management systems such as WebCT and BlackBoard. Multi-user virtual environments allow synchronous (real time) learning with visual, interactive components which are conducive to constructivist learning (Hornik, 2008). Physical presence (as avatars) in MUVEs also gives students and teachers a feeling of physically (albeit virtually) being there, otherwise known as telepresence (Andler, Casati, Guerry, & Pasquinelli, 2008).

Juxtaposing the above research is the interest from online educators on how to effectively and efficiently measure learning within online learning platforms. Garrison, Anderson, and Archer (2000) developed a formal Community of Inquiry (CoI) model designed to aid in identification of specific components that serve as a catalyst for a successful higher educational experience (Garrison et al., 2006, p. 87). The Community of Inquiry framework presupposes that through

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interaction of three elements: *social presence*, *cognitive presence*, and *teaching presence*, student learning occurs.

1.1. The COI model

Utilization of the CoI model in online learning is well-documented (Cleveland-Innes, Garrison, & Kinsel, 2007; Ling, 2007; Akyol & Garrison, 2008; Garrison, 2008; Shea & Bidjerano, 2009), thus it might as a reliable model from which to measure the existence of social presence, cognitive presence and teaching presence in a MUVE. Garrison et al. (2000) contended that the overlapping nature of social, cognitive and teaching presence creates a community of inquiry, rich in collaborative and cooperative learning. *Cognitive Presence* is the first construct of the CoI model and can be identified through an examination of online discourse (i.e., connection of ideas, sharing of related experiences, curiosity, and application of new ideas). *Social Presence* is the second construct and is also identifiable through an examination of online discourse among learners (i.e., emotions, expressions, collaborations, and group cohesion). *Teaching Presence*, the third construct, is essential to the CoI model and may have additional or differing — indicators (Garrison et al., 2004, p. 4) in a MUVE. The role of the instructor in a MUVE is more of a facilitator, coach, or mentor who guides student learning (Collins & Berge, 2008, p. 4). The Berge's (1995) four distinct functions of instructors are present within MUVEs: (a) pedagogical; (b) social; (c) managerial; and (d) technical. However, Collins and Berge (2008) observed the following changes for instructors when teaching in a MUVE.

1.2. Responsibilities of instructors in MUVEs

According to Collins and Berge (2008), a dramatic shift in pedagogy occurs when teaching in a MUVE and instructors would be well-informed to follow these guidelines:

(a) The responsibility of the instructor is to create an environment that facilitates the expansion of knowledge to students via *building* and *exploring* within MUVEs. Students' acquisition of information from virtual worlds should offer various kinds of stimuli and exposure to diverse environments within *SL*;
(b) Activities within virtual worlds should be adapted to the ability of the student and the objective of the curriculum within the class;
(c) Lessons and objectives that can be implemented within a virtual world in lieu of a classroom instruction is encouraged;
(d) Acquiring knowledge and skills through the use of MUVEs is an effective and powerful instrument for students who are digital natives.

1.3. Social responsibilities of instructors in MUVEs

The following social responsibilities are critical to pedagogy within MUVEs:

(a) Professionalism within the classroom as well as virtual worlds is vital to the success of the student and the activities that are implemented. Language used, physical appearance of one's avatar, and how the class is governed are crucial to the success of all participants;
(b) Instructors must take responsibility for creating a positive and nurturing environment in which all students feel acculturated to the environment;
(c) A cooperative learning environment is encouraged for the social and cognitive development of all participants within the virtual worlds;
(d) Instructors should anticipate *griefing* or improper or offensive written language from students while participating within virtual worlds. Instructors are encouraged to remind students privately that classroom etiquette is expected when participating in a virtual classroom.

1.4. Managerial responsibilities of instructors in MUVEs

Designing and managing a virtual learning space is quite different from managing a traditional classroom and is even vastly different from managing an online LMS classroom. Organization of the class environment within virtual worlds is imperative to the success of all students. Unlike Blackboard or an in-person classroom, the classroom environment of virtual worlds can be created to simulate any building, or outdoor environment (e.g. a mall, a coffee house, and a restaurant). The following guidelines regarding managing a virtual learning environment will significantly reduce spatial issues that may arise:

(a) Generally speaking, most MUVEs are not designed to store or upload documents such as articles submitted by students. The use of Internet or email communication is encouraged as a supplement to transfer students' individual or cooperative work;
(b) Instructors should encourage participation of all students when working in virtual environments, such as *SL*;
(c) The instructor's role is to act as facilitator and ensure that all students are given ample opportunity to participate and voice their opinion;
(d) Within virtual worlds, it is vital that the instructor create environments where all students are given opportunities to be responsible for leading the class discussion and facilitating others in a virtual world;
(e) The design and implementation of the classes within virtual worlds can be a time-consuming undertaking for the instructor. It is important for the instructor to anticipate this situation and prepare accordingly.

1.5. Technical responsibilities of instructors in MUVEs

Instructors should be prepared to handle technical difficulties when dealing with virtual worlds. Malfunctions should be anticipated and should be prepared with an alternate plan or agenda (i.e., Blackboard or a traditional classroom). To acknowledge and prepare for technical issues, instructors should be mindful of the following technical responsibilities:

(a) Instructors should be familiar with technical support within their university and their MUVEs in case technical difficulties occur;
(b) Instructors are advised to utilize graphic designers or scripters to assist in the building and design of the virtual classrooms;
(c) Attention to the speed, connection and how information is being processed while linked to the Internet is crucial to the success of teachers and students;
(d) Evaluations of students' work within virtual worlds should include grading techniques used within traditional classrooms, as well as feedback using virtual world capabilities.

Table 1 illustrates Berge's (1995) Instructors' Roles Model.

Table 1
Community of Inquiry indicators.

Elements	Categories	Indicators
Cognitive presence	Triggering event	Sense of puzzlement
	Exploration	Information exchange
	Integration	Connecting ideas
	Resolution	Applying new knowledge
Social presence	Emotional expression	Emotions
	Open communication	Risk-free expression
	Group cohesion	Encouraging collaboration
Teaching presence	Instructional management	Defining and initiating
	Building understanding	Discussion topics
	Direct instruction	Sharing personal meaning
		Focusing discussions

1.6. Second Life in online distance higher education

Research on the affordances of *SL* for hybrid and fully online courses has provided preliminary support for its effectiveness (Jarmon, Keating, & Toprac, 2008; Jarmon & Sanchez, 2008; Mayrath et al., 2007; Nicosia, 2008). With over 200 higher educational institutions with a presence in *SL*, there has been experimentation with delivering courses online via this medium. An active *SL* Educators listserv (SLED) serves as a catalyst for best practices in education and offers several resources for instructors interested in utilizing it in the classroom. Another listserv, Second Life Research listserv (SLRL) encourages discussions on current applications in *SL*, methodologies, measurement and assessment, as well as upcoming virtual conference venues. Use of the CoI model in designing and implementing MUVE learning, especially at the higher education level, will enhance its effectiveness and expand distance learning options for students and instructors alike.

1.7. Theoretical framework

The theoretical framework pertinent to this study is the CoI model (Garrison, Anderson, & Archer, 2000). This framework was used to examine the existence of the three specific components that make up a community of inquiry: (a) social presence; (b) cognitive presence; and (c) teaching presence. Prior research utilizing the CoI model has mostly involved asynchronous learning networks (ALNs) (Garrison, 2003; Heckman & Annabi, 2002; Ice, Curtis, Philips, & Wells, 2007; Rourke, Anderson, Garrison, & Archer, 1999; Wever, Schellens, Valcke, & Keer, 2006). In a MUVE, the instructor's avatar, or digital representation, is *representationally* present to offer instruction in real time. Grounded in Dewey's (1902) notions of practical inquiry, the CoI framework has served as a solid foundation in ALNs, blended learning and now MUVEs. Both ALN and MUVE instructors would be well-informed to incorporate social, cognitive and teaching presence into their synchronous and asynchronous online instruction. Table 1 below illustrates the three presences, categories of these presences, and examples of respective indicators. It is important to note that the indicators may differ depending on the educational platform used.

1.8. Purposes of the study

The purposes of this study were (a) to examine and observe the extent to which graduate level instructional technology students experienced social, cognitive and teaching presence in class activities held in *SL*, and (b) to examine the extent to which students perceived themselves to experience social, cognitive, and teaching presence within *SL*. Two research questions were addressed:

RQ1: To what extent do graduate level students enrolled in an instructional technology course experience social, cognitive, and teaching presence in activities taking place in the Multi-User Virtual Environment, *Second Life*?

RQ2: To what extent do graduate level students enrolled in an instructional technology course perceive themselves to experience social, cognitive, and teaching presence with the Multi-User Virtual Environment, *Second Life*?

2. Method

2.1. Sample, participants, and setting

Participants in this non-experimental quantitative study included 10 (8 females and 2 males) purposively selected graduate level students enrolled in a fully online instructional technology class at a rural university in southeast Texas during the summer 2009 session. The participants ranged in age from ages 23 to 34. Students enrolled in this particular instructional technology course are typically pre-service or in-service educators. The course covers the technical and instructional skills needed for integrating computers into the classroom as well as technology issues that impact instructional design. The specific setting for the learning activities in this study took place within various educational islands within *SL*.

2.2. Instruments

Both observational and perceptual data were gathered from two instruments derived from the CoI model — the *Multi-User Virtual Environment Education Evaluation Tool* (MUVEEET) (McKerlich & Anderson, 2008) and the *CoI Survey* (Arbaugh et al., 2008). Two outside coders not related to this study utilized the MUVEET as the primary instrument to observe the existence of cognitive, social and teaching presence leading to the learning of basic navigational skills within *SL*. This particular instrument utilizes Quantitative Content Analysis (QCA) which Crocker and Algina (1986), defined as a standard schedule and list of behaviors that can be used by an observer who codes behavior displayed by subjects in a naturalistic setting (p. 4). Per Rourke and Anderson's (2004, p.8) recommendations, the QCA protocol was utilized by the MUVEEET coders who: (a) identified the purpose of coding the data; (b) identified behaviors that represented each construct; (c) reviewed the categories and indicators; (d) held preliminary tryouts; and (e) developed guidelines for the administration, scoring, and interpretation of the coding scheme. The same categories as shown in Table 1 were examined as were the corresponding indicators. The researchers confirmed through preliminary tryouts that all of these elements could be applied to developing a community of inquiry in *SL* among the participants; therefore no alterations or additions were made. A "+" or a "−"was employed to note whether the indicator was found (+), or not found (−) within the learning activity, and then calculations of the numbers of (+) and (−) resulted in a low (1), medium (2), or high (3) scoring. The second instrument, the *Community of Inquiry Survey*, a 34item Likert scale, was use to measure student perceptions of the existence of specific indicators of the three presences immediately after the learning activities.

2.3. Procedure

This study was conducted over the period of one summer semester. Internal Review Board approval was established, and the researchers received informed consent from the instructional technology graduate students. Data were collected during and immediately following two separate two-hour *SL* class meetings. Prior to the first *SL* class meeting, students were asked to start a basic account in *SL* and create and avatar (digital representation of oneself). Once the students' avatars were created, they were then instructed to explore a *SL* orientation island to familiarize themselves with the environment and practice navigational skills.

2.4. Data collection

For the duration of both *SL* class meetings, two trained outside coders observed and recorded information using the MUVEEET instrument, noting specific indicators of social, cognitive and teaching presence.

2.5. First SL class meeting

Objectives for the first *SL* meeting included: (a) familiarization and enculturation of the *SL* learning environment; (b) becoming a community member by participating in a synchronous meeting in *SL*; (c) evaluating orientation stations for their ease of use, helpful exercises and free items; (d) collaborating in pairs to negotiate and complete a series of *SL* basic skill tutorials (i.e., walking, flying,

communicating); and (e) engaging in discussions on first thoughts regarding this learning platform based upon questions pre-developed by the instructor. For the first *SL* class meeting, the instructor provided instructions on how to "teleport" to the meeting location, Orientation Island. Immediately following the tutorials, the students were asked to complete the CoI Survey.

2.6. Second SL class meeting

Objectives for the second *SL* class meeting included: (a) familiarization and enculturation of the *SL* learning environment; (b) becoming a community member by participating in a synchronous meeting in *Second Life*; (c) introduction to the Community of Inquiry (CoI) framework and how teaching online and in MUVEs can effectively incorporate this model; and (d) in collaborative groups, participating in interactive activities that incorporate CoI.

Students were asked to meet at *Bearkat Island* in *SL*, an educational island designed by Sam Houston State University. The course instructor presented a PowerPoint on the CoI framework and engaged students in a discussion on possible ways educators could use the model to develop instruction for a MUVE. Application of the presentation/lecture included participation in stationed reading activities. The CoI Survey was distributed once again to the participants after they completed the required activities.

2.7. Data analysis

Participants' responses to the CoI Survey were analyzed through the use of descriptive statistics. Survey items were also analyzed for internal consistency through the use of Cronbach's coefficient alpha. No inferential statistics were calculated due to the small sample size.

The MUVEEET observations were analyzed slightly differently from that of McKerlich and Anderson's (2008) original MUVEEET analysis. For this study, the observers compared their Second Life observations and any duplicate observations were only counted as occurring once. The next step involved counting the number of occurrences in each category within each presence. As one of the primary purposes of this study was to document the existence of the CoI indicators within *SL*, the researchers also sought to measure the extent or degree to which the categories were observed during the two Second Life meetings. A category occurrence range was developed by the observers to rate each category as having a low, medium, or high occurrence within each corresponding presence. For cognitive presence, the occurrence ranges were: (1–12) Low; (13–24) Medium; and (25–35) High. For teaching presence, the occurrence ranges were: (1–10) Low; (11–20) Medium; (21–30) High. For social presence, the occurrence ranges were: (1–10) Low; (11–20) Medium; (21–30) High.

3. Results

3.1. CoI survey results

Delineated in Table 2 are the means and standard deviations for the CoI categories as reported by students during the *SL* meetings.

For all three CoI presences, nearly half (46.7%) of the participants supplied a response of Strongly Agree on the survey items. Students who selected Agree on the Likert-scale items made up 45.6% of responses. Students who answered Neutral made up 12.4% of responses. Readers should be aware that no participants selected either the Disagree or Strongly Disagree categories. Therefore, the variability of responses to all of the Likert-format items was restricted to a three-point range, instead of the maximum five-point range that was available. This is an interesting observation, and calls attention to the favorable responses.

Table 2
Descriptive statistics from the CoI model survey in Second Life.

Elements	Categories	*M*	SD
Cognitive presence	Triggering event	4.53	.52
	Exploration	4.34	.70
	Integration	4.33	.63
	Resolution	4.20	.58
Social presence	Emotional expression	4.37	.75
	Open communication	4.36	.75
	Group cohesion	4.20	.66
Teaching presence	Design and organization	4.40	.69
	Facilitation	4.52	.58
	Direct instruction	4.20	.59

$n = 10$, 5 point Likert-type scale 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

3.2. CoI MUVEEET results

The results from the CoI MUVEEET yielded promising results. For cognitive presence, the total number of observations of *triggering events*, *exploration*, *integration*, *resolution*, *integrated education tools*, *use of enhanced multimedia*, and *mediated assessment* was 21, which fell in the 13–24 range of medium. For the teaching presence, the total number of observations of *design and organization*, *facilitating discourse*, *direct instruction*, *logistical focus*, *side channel control*, and *teacher representation* was 14, which fell in the medium range. For social presence, the total number of observations of *affective expression*, *open communication*, *group cohesion*, *emotive expression*, *real life references*, and initiation of after-class activities was 14, which also fell within the medium range.

4. Discussion

The results above are encouraging and foundational to the continuance of research studies incorporating the CoI framework within explorations of the educational use of MUVEs such as *SL*. As McKerlich and Anderson discovered the applicability of the CoI model to learning in MUVEs in their 2008 study, so did the researchers in this study. This information bodes well for educators who are interested in using Second Life for online learning. One particular aspect of the MUVEEET the researchers discovered was its versatility. There are indeed many ways to utilize this instrument to analyze observations or behaviors within *SL*, therefore expanding the possibilities for varied research opportunities.

Following McKerlich and Anderson's lead on using the CoI model to study educational activity in MUVEs, this study supports the efficacy of assessing social, teaching and cognitive presences within a MUVE from the points of view of both participant perceptions and objective observations. With more college classes migrating to online status, instructors would be well-informed to support *SL* instruction by using the CoI framework's survey and/or the MUVEEET for assessment of CoI existence.

4.1. Limitations

The sample size included in this study was particularly small, therefore any reported statistical significance would necessitate a larger sample size. Another limitation to this study was the identified population — instructional technology graduate students. It can be suggested that students participating in a graduate level instructional technology course would already possess many technological skills. This knowledge level may inadvertently make the course easier for many students, thus attributing to high interest and engagement of activities — all yielding more favorable responses on the survey and perhaps more instances of social, cognitive, and teaching presence within *SL*.

4.2. Directions for future research

Taking steps toward conducting more research will continue to further discussions and possible interdisciplinary collaborations utilizing the CoI framework as a foundation for virtual online learning. Research involving other academic disciplines and student ranks could potentially strengthen the applicability of CoI, therefore opening synchronous online opportunities for undergraduate and graduate students alike. Higher educational institutions serve a diverse student population with regard to ethnicity, age and educational goals. Therefore, development of specific activities, lessons, and assessments in MUVEs which promote CoI, would also be beneficial to instructors teaching in *Second Life*. Engagement toward this goal will ultimately advance teaching and learning possibilities for higher education students and instructors and help institutions position themselves for academic success in the 21st century.

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