THOMPSON RIVERS UNIVERSITY

# Engaging Communities in Collaboration through Online Communities of Inquiry

by

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ABSTRACT

This research examined the community of inquiry as a framework for collaborative, online community engagement with the goal of supporting collaborative participation of community members inhibited from attending face-to-face engagement opportunities. The community of inquiry framework was used to design a two-week, online, asynchronous community engagement experience for ten participants divided into two groups. Case study qualitative methods were used to explore the records of discussion to determine how the community of inquiry supported online community engagement as well as identify impediments to its development. The framework supported community engagement; however, participants did not complete the inquiry cycle. Potential inhibitors to the framework's development included participant motivation, lack of engagement between participants, response timing in asynchronous discussion, and the overall time available to complete the study. In response to these results, promising practices and a modified community of inquiry model were proposed for application in a community engagement setting.

Keywords: community of inquiry; community engagement; collaboration; makerspace; cognitive presence; social presence; facilitation; inquiry.

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# DEDICATION

I dedicate this thesis to my family who has offered compassionate support and encouragement throughout my journey. To my husband, John, and my children, Samuel and William, I thank you for understanding when I could not share my time as freely as I normally would. To my parents, I thank you for instilling in me a life-long love of learning and supporting me through all my academic journeys.

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## Chapter 1: Introduction

Community engagement and participation play a fundamental role in determining equitable and democratic solutions to complex issues (Afzalan et al., 2017; Centre for Addiction and Mental Health, 2015; Ramaley, 2016). Unfortunately, change efforts do not always include a representative mix of community stakeholders (Barnes & Schmitz, 2016). Equal access to community engagement is recognized as an ethical principle by the International Association for Public Participation (2017) and is included explicitly in community engagement frameworks (Ahmed & Palermo, 2010; Centre for Addiction and Mental Health, 2015; Community Places, 2014; Department of Infrastructure, 2017; Schmitz, 2017; U.S. Environmental Protection Agency, 2018; Vaughn, 2018). Despite the recognition of the importance of inclusion, barriers to meaningful community engagement such as "physical health and wellbeing, childcare and family care commitments, shyness or lack of social skills, lack of time, language barriers,…socio-economic circumstances" (Harden et al., 2015, pp. 86–88), access to transport and event timings (Harden et al., 2015) are still being reported.

Many barriers that prevent people from participating in face-to-face community engagement (Harden et al., 2015) would not inhibit participation if a mix of online and face-to-face public engagement methods were used (Department of Infrastructure, 2017). However, participatory guidance often does not include meaningful online community engagement where participants acquire an "enhance[d] understanding of public problems, and explore and generate potential solutions" (Bryson et al., 2013, p. 25). Within the community engagement context, collaboration is defined as a partnership where the public is involved in working with each other and the community organization to explore an issue including developing options and indicating the preferred option (Centre for Addiction and Mental Health, 2015; Community Places, 2014; International Association for Public Participation, 2018; U.S. Environmental Protection Agency, 2018). "As participants in good decision-making processes, all stakeholders must understand all sides of an issue, weigh the pros and cons, and make more thoughtful decisions" (U.S. Environmental Protection Agency, 2018, p. 4). However, the U.S. Environmental Protection Agency (2018) actively discourages the use of online tools for collaboration with the statement "consensus building requires that people meet face-to-face" (p. 34).

The Social Planning and Research Council of British Columbia (2013), Department of Infrastructure (2017), U.S. Environmental Protection Agency (2018), and Community Places (2014) provide some engagement activities and online tools such as social media groups, electronic democracy, online deliberative forums, The World Café, and PlaceSpeak; however, they do not suggest a framework to be used to ensure quality discourse within these. The tools recommended such as PlaceSpeak, Engagement Hub, Engagement HQ, Citizen Space, or Mind Mixer can be costly and without a model of discourse, they may not be necessary nor sufficient for community collaboration. Online discourse has been criticized for its lack of quality and collaborative consideration (Kersting, 2013); unfortunately, community engagement toolkits do not currently address this problem.

This problem might be solved using constructivist learning models which align well with collaborative community engagement as it requires learning about the issue from different perspectives and then collaboratively building a complete picture of the issue. Collaborative community engagement can be viewed as founded on the perspective that knowledge is socially constructed, the foundation of Dewey's educational philosophy as well as specific constructivist learning theory (Alomyan & Green, 2019; Garrison & Akyol, 2013; Gutek, 2015; Ruey, 2010; Schunk, 2012). There are numerous instructional strategies, principles, and models for online constructivist learning that might be applied in a community engagement setting to facilitate collaboration (Ruey, 2010). From a research review, Sun and Chen (2016) have outlined promising practices for online learning which include well designed and organized content, collaborative discussions between students and the teacher or facilitator, well prepared teachers or facilitators, and a sense of community. Alomyan and Green (2019) recommend course design elements of online constructivist courses including activities which guide the learner in sourcing content, facilitating interaction leading to knowledge construction and providing activities that result in a social presence. Sun and Chen (2016) also stress the interdependence of course elements, "cognitive presence and epistemic engagement can occur only when teaching and social presence are well developed, and the development of social presence is dependent on how well the teaching presence has been established" (p. 165). The community of inquiry framework was selected from the numerous options

as it has been well validated and contains elements recommended through independent studies.

Communities of inquiry have frequently been employed within education to allow a group to learn and discuss issues meaningfully (Kineshanko, 2016). It is a framework grounded in constructivist learning theory that consists of three overlapping elements: social presence, cognitive presence, and teaching presence (Garrison et al., 2000, 2010). These overlapping presences set the climate for positive learning, create a supporting discourse, and enable collaborative content selection (Garrison et al., 2000, 2010). It has been used successfully by many institutions in an educational context to design and analyze online courses (Chanprasitchai & Khlaisang, 2016; Cohen & Holstein, 2018; Garrison et al., 2010; Kineshanko, 2016; Mills et al., 2016; Nolan-Grant, 2019). Despite its success in an educational context (Kineshanko, 2016), the community of inquiry framework has not been promoted as a framework for collaborating within communities.

This research studied how the community of inquiry framework could be used to develop meaningful online community engagement with the goal of providing organizations completing public engagement a way to engage the public more meaningfully in an online collaborative process. This will in turn enable inclusion of community members previously inhibited from meaningful community engagement.

The research questions studied were:

Question 1: How did the community of inquiry framework facilitate collaborative community engagement in an online, asynchronous space?

Question 2: What were the impediments (if any) to the establishment of the community of inquiry model in a community engagement setting?

## Chapter 2: Review of the Literature

This section will explore the foundation of research related to the community of inquiry framework and makerspaces that the study has been built on. Specifically, it will outline the purpose, origins, components, and validation of the community of inquiry framework. Prior research using the framework will be explored as well as its practical implementation. The section includes a description of the community of inquiry theoretical foundation to demonstrate how it aligns with collaborative community engagement. Finally, literature relating to how makerspaces support user goals, training, and inclusion is investigated.

### Community of Inquiry Framework

#### *Purpose of the Community of Inquiry Framework*

The community of inquiry framework was developed by Garrison et al. (2000) as a model to guide online course design and course evaluation. They "constructed a comprehensive conceptual framework designed to capture the educational dynamic and guide the study of online learning effectiveness in higher education" (Garrison & Akyol, 2013, p. 13). This constructivist framework was designed to facilitate collaboration to complete deep social learning and discuss issues in an online setting (Garrison et al., 2000; Garrison, 2009, 2016; Garrison & Akyol, 2013; Garrison & Arbaugh, 2007; Vaughan et al., 2013).

#### *Origins of the Community of Inquiry Framework*

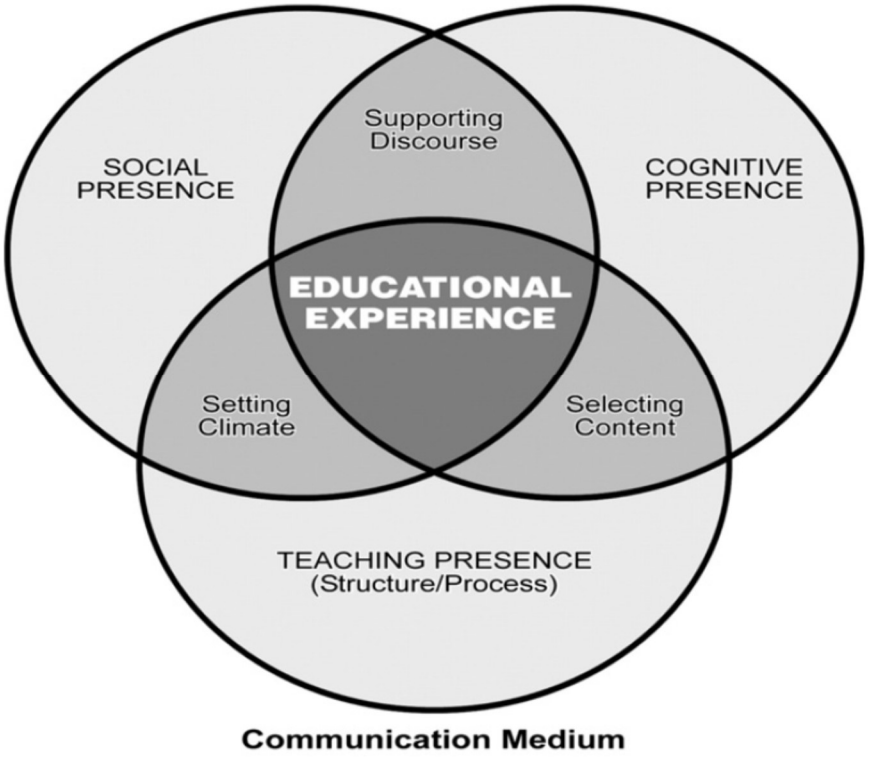
Grounded in social constructivist learning theory, Garrison et al. (2000) proposed the community of inquiry conceptual framework based on literature by Lipman, Resnick, Schrage, and Dewey describing inquiry learning, collaboration, and descriptions of communities of inquiry. Since this initial paper, many researchers have continued to build on, validate, detail, research, and explore the community of inquiry framework (Garrison et al., 2010). In fact, the term "community of inquiry" produces over 24 000 results in Google Scholar and Garrison et al.'s (2000) initial article has been cited in Google Scholar over 5700 times. Although developed twenty years ago, the framework still remains a significant method for design and assessment of online learning (Kineshanko, 2016).

### *Components of the Community of Inquiry Framework*

As discussed in the introduction and shown in Figure 1, the community of inquiry framework consists of three overlapping elements: social presence, cognitive presence, and teaching presence (Garrison et al., 2000, 2010). Importantly, these overlapping presences set the climate for positive learning, create a supporting discourse, and enable collaborative content selection (Garrison et al., 2000, 2010). Within each element are categories that function as components of the elements (Garrison & Arbaugh, 2007). Examples of each category in practice are shown as indicators (Garrison & Arbaugh, 2007). Table 1 further elaborates on each element of the community of inquiry framework.

**Figure 1**

*The Community of Inquiry Framework*




*Note.* Reprinted from "The first decade of the community of inquiry framework: A retrospective", by D. R. Garrison, T. Anderson, & W. Archer, 2010, *Internet and Higher Education,* 13, p. 6. Copyright 2010 by Internet and Higher Education. Reprinted with permission.

**Table 1**

*Elements, Categories, and Indicators in the Community of Inquiry Framework*

| Elements | Categories | Indicators (examples only) |
|---|---|---|
| Social Presence | Open Communication (Interactive Statements) | Risk-free expression; course discussions; expressing agreement |
| | Group Cohesion (Cohesive Statements) | Encourage collaboration; use of inclusive pronouns; refers to participants by name |
| | Affective Expression (Affective Statements) | Emoticons; expressing emotions; use of humor; self-disclosure |
| Cognitive Presence | Triggering Event | Sense of puzzlement |
| | Exploration | Information exchange |
| | Integration | Connecting ideas; developing solutions; explaining problems |
| | Resolution | Apply new ideas; describe applications of learning in real settings |
| Teaching Presence | Design & Organization | Setting curriculum & methods |
| | Facilitating Discourse | Sharing personal meaning; shaping constructive exchange |
| | Direct Instruction | Focusing discussion; feedback |

*Note.* Data for all elements and categories from Garrison and Arbaugh (2007), Heckman and Annabi (2005), and Rourke et al. (1999) and for examples from Garrison and Arbaugh (2007), Heckman and Annabi (2005), Heilporn and Lakhal (2020), Rourke et al. (1999), and Vaughan et al. (2013).

**Social Presence.** The social presence includes three categories, open communication, group cohesion, and affective expression (Garrison et al., 2000, 2010; Garrison & Arbaugh, 2007). These categories have also been referred to as interactive, cohesive, and affective statements (Heckman & Annabi, 2005; Rourke et al., 1999). Social presence is an integral part of the model as "the social relations of communication are entangled with the learning process (Xin & Feenberg, 2006, p. 3). In fact, Garrison (2016) linked these to "the ability of participants to identify with the group or course of study, communicate purposefully in a trusting environment, and develop personal and affective relationships progressively by way of projecting their individual personalities" (p. 7). Social presence encompasses strategies, language, and other expressive elements that bring course participants and instructors closer together emotionally, connecting them in an authentic way (Dunlap, Verma, et al., 2016). Although it might seem like specific activities should focus on developing this presence such as the ice breakers used in face-to-face

interaction, Garrison and Akyol (2013) specify that social presence "should be developed naturally and progressively through the purposeful and collaborative inquiry process" (p. 8).

**Cognitive Presence.** The cognitive presence element is based on reflective inquiry and critical thinking literature (Garrison & Akyol, 2013). The element uses a four-phased practical inquiry model which includes a triggering event to initiate different perspectives, exploration of related resources, integration of information, and resolution of the problem (Garrison et al., 2010; Huang et al., 2018; Sun & Chen, 2016). The process is focussed on collaborative knowledge building which includes reinforcing existing knowledge (Garrison & Akyol, 2013). Comparison of the change in cognitive presence from the triggering event to the resolution indicates students have gained a deeper conceptual understanding of the content (Dunlap, Verma, et al., 2016; Huang et al., 2018).

**Teaching Presence.** Teaching presence integrates the social and cognitive elements in the community of inquiry (Garrison, 2009). The three dimensions of teaching presence, design, facilitation, and direction, "provide the structure (design) and leadership (facilitation and direction) required for effective interaction and discourse" (Garrison & Akyol, 2013, p. 16). They have been identified as crucial to satisfaction, participation, quality responses, perceived learning, and sense of community (Garrison et al., 2010; Garrison & Akyol, 2013). Teaching presence involves "identifying relevant social knowledge, designing experiences that facilitate reflection and discourse, and diagnosing and assessing learning outcomes" (Garrison & Akyol, 2013, p. 14). Although these are responsibilities of the facilitator, the community of inquiry framework emphasizes that students can be empowered to perform activities relating to teaching presence and this occurs more frequently online than in face-to-face settings (Cleveland-Innes, 2020; Heckman & Annabi, 2005).

### *Validation of the Community of Inquiry Framework*

The framework has been validated using a standardized 34-item survey (Arbaugh et al., 2008). Arbaugh et al. (2008) validated the elements of the survey using 287 education and business graduate-level students across four institutions in the United States and Canada. This was later confirmed by several other studies (Heilporn & Lakhal, 2020).

The categories of the framework used in the survey were also found valid and reliable by Heilporn and Lakhal (2020) using factor analysis of 763 French-speaking university students from two institutions in Canada. Although some studies have suggested modifications to the framework, for example the addition of a fourth element such as an emotional presence (Cleveland-Innes, 2020), Kozan and Caskurlu (2018) completed a descriptive review of these studies and concluded that there is not yet sufficient research to support amendments.

### *Prior Research Using Community of Inquiry Framework*

Literature surrounding the use of community of inquiry framework in educational settings is substantial (Kineshanko, 2016) and it has been "adopted and adapted by hundreds of scholars working throughout the world" (Garrison et al., 2010, p. 5). Chanprasitchai and Khlaisang (2016) applied the community of inquiry framework to an Applied Thai Traditional Medicine online learning experience involving 39 students assuming avatar roles and entering different virtual spaces to treat patients. They found the framework supported teaching, social, and cognitive presences and enhanced students' problem-solving abilities (Chanprasitchai & Khlaisang, 2016). Similarly, Cohen and Holstein (2018) used the framework to analyze five highly successful Massive Open Online Courses (MOOCs). Using the framework and content analysis of 3503 online reviews, they determined that successful MOOCs had characteristics divided amongst the three elements (Cohen & Holstein, 2018); unfortunately, unsuccessful MOOCs were not analyzed as part of this study. Instead of using the community of inquiry framework as an assessment tool, Nolan-Grant (2019) used it as the basis for the course design when making changes to address lack of engagement in a postgraduate online module. Data including online posts, engagement with videos, and the summative assessments from 77 students in two cohorts (one before changes were made and one after) were compared (Nolan-Grant, 2019). Results showed increased student engagement, signaling that the framework can be used both to analyze courses and to create them (Nolan-Grant, 2019). In fact, Mills et al. (2016) used the framework for both the redesign and assessment of a post-graduate nursing and midwifery course. Following redesign and implementation, convenience sampling was used to survey 29 students and interview 10 students from the cohort of 59 students (Mills et al., 2016). High student satisfaction with the course design

and implementation were reported, although the community of inquiry survey and interviews did identify facilitation methods as a weakness in the course (Mills et al., 2016). Although this research is only a sampling of the ways that the community of inquiry framework has been applied in online learning, it demonstrates the benefit of using the framework for design and assessment. Despite these benefits, there is a gap in the literature that references using the framework outside of a learning context.

### *Designing a Community of Inquiry using the Community of Inquiry Framework*

As stated, there is a large body of research examining the use of the community of inquiry framework as an instructional design tool. Implementing the framework to design an online experience requires an understanding of the differences between online and face-to-face experiences (Garrison et al., 2000) as well as an examination of how the framework can be practically applied.

**Studies Comparing Online and Face-to-Face Results.** As collaborative community engagement methods are primarily focused on in-person interaction (Department of Infrastructure, 2017; Social Planning and Research Council of British Columbia, 2013), it is natural to wonder whether on-line collaboration can produce equally strong solutions as online and in-person interactions have different strengths and weaknesses (D. Garrison et al., 2010). In the learning context, learning is measured and graded through individual assessments or evaluation of the process or products of learners (Means et al., 2009). A meta-analysis examining the learning effects shown in 51 studies between 1996-2008 found that students in online courses performed better academically than those engaged in face-to-face learning (Means et al., 2009). A recent study comparing online, video synchronous, and in-class data from 1964 students in a college-level physics course similarly found that students completing the course online were more likely to receive higher grades; however, they also had a higher likelihood of not completing the course (Faulconer et al., 2018). Bowers and Kumar (2016) completed a comparative analysis of an undergraduate course run face-to-face with 29 students and the same course run online with 34 students. Although they stated that "studies examining student attrition in online courses and programs have consistently identified lack of connectedness and instructor presence as factors leading to student alienation and dropout from online courses" (Bowers & Kumar, 2016, p. 28), through the use of mixed methods surveys, their study

found that students had significantly higher perceptions of teaching and social presences in the online course (Bowers & Kumar, 2016). When viewed in combination with Nolan-Grant's (2019) research, this could indicate that course design could be a causal factor in completion rates rather than the mode of delivery; however, further research would need to be completed to determine if this was the case. Overall, the data indicates that students studying online are assessed higher than those studying in face-to-face settings.

**Studies Comparing Online and Face-to-Face Methods.** The interactions and learning processes in face-to-face and asynchronous online learning have also been studied and found to be different (Heckman & Annabi, 2003, 2005, 2006). Three studies by Heckman and Annabi (2003, 2005, 2006) examined eight case study transcripts using a content analytic framework derived from the community of inquiry model. In the study, 120 university seniors participated in one face-to-face and one week-long asynchronous online case study discussion (Heckman & Annabi, 2003, 2005, 2006). They found that in online asynchronous learning, "students carried a much greater share of the discourse" (Heckman & Annabi, 2006, p. 144) and students' communications were longer and more formal, but there were less of them. Both online and face-to-face discussion contained social processes, but "students played a bigger role in creating a social environment" (Heckman & Annabi, 2005, p. 10) in online discussion. There were less instances of teaching processes in the online environment and most of the instances were actually the students, not the teacher, which aligns with more student-to-student interaction (Heckman & Annabi, 2005). Wider participation has also been identified as a benefit of online methods (Xin & Feenberg, 2006). Cognitive processes in face-to-face discussion were more focused on lower-order exploration rather than analysis; however, in both face-to-face and online discussions, integration of ideas occurred (Heckman & Annabi, 2005). This highlights some benefits of online engagement which are "increased reflection time, more democratic participation, benefits attributable to writing" (Heckman & Annabi, 2005, p. 2), and "deep, time-consuming reasoning processes" (Aviv, 2000, p. 54) as well as showing that although processes were different, satisfactory results were obtained from both.

**Practical Implementation of Community of Inquiry Framework.** Although the community of inquiry is a descriptive rather than prescriptive framework (Dunlap,

Verma, et al., 2016), it provides an excellent instructional design foundation for creating a collaborative experience and allows the flexibility for application in different contexts. Seven principles for creating and sustaining a community of inquiry where social, teaching, and cognitive presences are established are presented by Vaughan et al. (2013) as:

1. Plan for the creation of open communication and trust.
2. Plan for critical reflection and discourse.
3. Establish community and cohesion.
4. Establish inquiry dynamics (purposeful inquiry).
5. Sustain respect and responsibility.
6. Sustain inquiry that moves to resolution.
7. Ensure assessment is congruent with intended processes and outcomes. (p. 17)

***Establishing Social Presence.*** To encourage productivity and collaboration, trust and group identity must first be established (Garrison, 2009; Vaughan et al., 2013) and "instructors should not over-emphasize socio-emotional or interpersonal identity at the outset" (p. 353). An initial activity that removes unknowns about others while at the same time focuses on course goals is a good way to begin (Garrison, 2009; Vaughan et al., 2013). Some example activities are an introductory letter or video clip, collaboratively setting expectations, a powerful learning experience discussion, or discussions with previous students (Vaughan et al., 2013). Small groups rather than whole class groups better allow for cohesion and open communication to develop (Garrison, 2009). Cleveland-Innes (2020) proposed that a facilitator could encourage social presence by discussing the value of social presence and collaboration in learning, the course climate or norms, and supporting participants who express feelings or interpretations. Additionally, the use of emotion icons (emoticons) should be encouraged as a way to convey non-verbal behaviour and cues, clarifying message intent especially for participants with weak English literacy (Dunlap, Bose, et al., 2016). Modelling open communication by recognizing contributions, addressing others by name, using inclusive pronouns, complimenting others, and responding to comments can help encourage social presence and group cohesion (Garrison & Akyol, 2013).

***Establishing Cognitive Presence.*** The community of inquiry's cognitive presence is

based on Dewey's practical inquiry cycle (Garrison, 2009). An issue must be presented, explored through discourse, reflected on, analyzed, and then concluded (Garrison, 2009). Of key importance from an instructional design perspective is how the issue is initially presented. It must be presented in a focused way that allows for interactive discussion rather than fragmented individual comments (Garrison, 2009). Referring back to key concepts, making questions explicit, representing information in multiple ways, providing links to application outside the course, providing opportunities to explore content outside the course, and using Socratic questions are all techniques that can help establish cognitive presence (Cleveland-Innes, 2020; Vaughan et al., 2013). Facilitation related to metacognition and specifically structured activities are also often required to ensure that discussion moves to integration and a conclusion (Garrison, 2009; Garrison & Akyol, 2013).

***Establishing Teaching Presence.*** Design and organization of materials are vital prior to the experience to ensure participants do not become confused or distracted (Garrison, 2009). Re-design and re-organization may also be required during the experience as collaborative-constructivist experiences are not always predictable and new paths or outcomes may need to be structured based on collaborative dialogue (Garrison, 2009; Vaughan et al., 2013). As the teaching presence is to support development of the cognitive and social presence, "content, cognition, and context" (Garrison & Akyol, 2013, p. 15) should all be viewed as important. Too much or too little facilitation and direct instruction from the facilitator can adversely effect discussion, so although the facilitator must give guidance when it is needed, participants should be empowered to also take responsibility and control of discussions (Cleveland-Innes, 2020; Garrison, 2009; Vaughan et al., 2013). Providing specific information, clarifying misconceptions, and summarizing discussion are also important roles, but should not always be completed by the facilitator such as when a student has certain subject matter expertise (Garrison, 2009). Strategies proposed by Vaughan et al. (2013) include modeling things such as timely response, sharing experiences and beliefs, and showing engagement by summarizing discussions.

### *Theoretical Foundations*

The theoretical foundation of the community of inquiry has been explored by Garrison and Akyol (2013), Cleveland-Innes (2020), and Garrison (2016). The community of inquiry consists of pedagogy that aligns with Dewey's educational philosophy which emphasized "themes of community, togetherness, collaboration, and sharing" (Gutek, 2015, p. 270) and was built on the concept that knowledge is socially constructed which was championed by both Dewey and Vygotsky (Garrison, 2016; Garrison & Akyol, 2013; Gutek, 2015). As with collaborative community engagement, it promotes interaction that is "open, flexible, explicit, and inquiry-based" (Cleveland-Innes, 2020, p. 85). Also in alignment with Dewey's idea of reflective thinking, the community of inquiry assumes that rigorously analyzing, conceptualizing, and assessing ideas through personal reflection and public discourse is key to this collaborative learning (Garrison, 2016). This allows people to "make connections or conceptualize the relationships between experience and ideas" (Garrison, 2016, p. 14). In *Thinking Collaboratively: Learning in a community of inquiry*, Garrison (2016) explores how the combination of individual cognitive dynamics and group dynamics can result in collaborative thinking and how critical and reflective thinking contributes to this. Fundamental to the community of inquiry is "a sense of shared purpose and mutual interdependence in achieving intended learning outcomes…predicated upon open but focused communication" (Garrison, 2016, p. 15). The social presence is important to creating the respectful climate that supports critical discourse and respectful collaboration (Garrison, 2016) which is also key to collaborative community engagement. Even within the definition of an educational community of inquiry, "a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding" (Vaughan et al., 2013, p. 98), the alignment to collaborative community engagement is clear.

## Makerspace

Makerspaces are "an unstructured fabrication lab outfitted with a variety of tools, software and materials appealing to a spectrum of interests" (Hynes & Hynes, 2018, p. 868). They can empower creation, experimentation, innovation, learning, and tinkering as well as change users' perspectives on success and failure (Otieno, 2020). Other names for

makerspaces are hacker space, fab lab, technical shop, tinkering studio, and invention studio (Forest et al., 2014; Hynes & Hynes, 2018; Otieno, 2020; Taylor et al., 2016). Within this study, participants will be exploring three main topics related to the university Makerspace: how the Makerspace supports users' goals, how to best provide training, and making the Makerspace welcoming to all users. Although Makerspaces are not the focus of the study, existing literature relating to these topics is explored as it is used to help design the Makerspace community of inquiry content and provide the facilitator with required background information.

### *How Makerspaces Support Goals*

Makerspaces can support learning and curriculum goals of institutions as well as personal or professional goals of individuals. These spaces leverage "the desire and need to make and create [that] comes from this inherent nature of humans as each person is born curious, eager to understand the world around them" (Otieno, 2020, p. 31).

Makerspaces have been used in University contexts to support learning and curriculum often using methods based on "learning by doing" or constructionism which is based on constructivist pedagogy (McGrath, 2016; Noel et al., 2016; Otieno, 2020). It asserts "that learners construct knowledge when they build, make, and share their artifacts with not only peers but the public as well" (Otieno, 2020, p. 32). Forest et al. (2014) describe how Georgia Institute of Technology has refocused their engineering curricula to be a more hands on making, designing, and prototyping experience through the use of a university makerspace. Their goal was to provide a space "for students to apply classroom theory to, or simply mess about with, design-build projects, tools, materials, and mentoring within a community of their own management, independent of curricular requirements, classroom projects, or hierarchical structure of coursework" (Forest et al., 2014, p. 2) to facilitate communities of practice and obtain the design and cognitive benefits of physical modelling. They were also encouraged by literature showing that hands-on opportunities early in engineering programs increased student retention (Forest et al., 2014). Otieno (2020) discusses how this hands-on experience allows the learner to define their own problem, determine potential solutions, and tinker to become "unstuck" as they iterate through different solutions. It also aligns with Noddings' (2005) curriculum of caring as it develops in students an appreciation of a quality product and the ability to repair

broken items (Otieno, 2020).

Makerspaces have also been used in community and University contexts to support personal and professional goals of users. As explained above, students can use makerspaces to help them prototype their coursework, improving their ideas and designs, but they can also use the space for personal art or engineering projects as well as entrepreneurial pursuits (Forest et al., 2014). Rapid prototyping and digital fabrications have allowed entrepreneurs to develop products viably on a small scale (Taylor et al., 2016). Makerspace community and tools have also empowered users to repair broken devices themselves and supported the design and development of custom assistive technology and devices (Steele et al., 2018; Taylor et al., 2016). Makerspaces can also support individuals in community engagement and activism as well as allowing for the development of career and personal skills like interacting with others, self confidence, leadership, and technical skills (Otieno, 2020; Taylor et al., 2016). The personal and professional goals supported by makerspaces include completion of a single project, soft skills development and launching a career or business.

### *User Training at Makerspaces*

The model for user training in makerspaces is intrinsically linked to how the makerspace is administrated. Access to and oversite of university makerspaces has been accomplished in either a bottom-up approach were students have the primary responsibility for daily operation, maintenance, and equipment training, or a top-down approach where these are managed by faculty and administration (Forest et al., 2014). In student run models, a core, trained group of students trade volunteer hours (supervising the space, maintaining equipment, and providing training) for unlimited access to the makerspace (Forest et al., 2014). The university Makerspace pilot is currently using a top-down approach where two administrators and one paid student control operation, access, maintenance, and training. In the initial pilot program, the university Makerspace was open from 1-4:30 pm Wednesdays and Fridays or upon request for groups and training was provided on an on-demand basis by staff.

Training for makerspace users has numerous goals including supporting user safety, developing user proficiency, and maintaining equipment in good working order. Spencer et al. (2016) discusses strategies for training in a student run makerspace such as testing

potential student volunteers using a checklist of skills. Potential volunteers must demonstrate proficiency and knowledge of safety protocols while completing the skills checklist to make specific basic objects (Spencer et al., 2016). After demonstrating proficiency on all equipment, they begin specialized training on one piece of equipment to become a master, capable of repairing, troubleshooting, and advising on replacement (Spencer et al., 2016). These volunteers then provide training for new users (Spencer et al., 2016). Forest et al. (2014) commented that with respect to safety, "The culture of ownership, personal awareness, and responsibility is absolutely vital to the success" (p. 13) and this is established through peer pressure, public awareness of violations, camaraderie, and a few very simple rules. This safety culture develops within a community of practice that involves more experienced individuals mentoring newcomers (Forest et al., 2014).

Training can occur on an on-demand basis where users are individually trained on equipment, a regularly scheduled basis (such as a weekly event specific to new users), specialized courses, or events for specific user groups (Forest et al., 2014; Spencer et al., 2016). Training videos and a website with instructions can also be used to supplement in-person training (Spencer et al., 2016). Dedicated public events where users complete a small, structured task are often used as outreach, but did not positively impact recruitment which happened primarily through word of mouth or through attendance on a more in-depth course (Taylor et al., 2016). In the Georgia Institute of Technology Innovation Studio, equipment is divided into six tool types and three difficulty levels (Spencer et al., 2016). Users are always trained on the lowest difficulty level of equipment in each category first and informally assessed by a trainer for proficiency before being trained on the intermediate and most difficult equipment (Spencer et al., 2016).

Otieno (2020) and McCue et al. (2019) discusses pedagogical practices for teaching and learning in a makerspace that should be considered when planning training. "Instructors in makerspaces put forth activities and learning goals that are user-centered and interesting to various learning needs" (Otieno, 2020, p. 49). When formal classes are conducted, some scaffolding and structure is required for students to initiate a project and "find their bearing in the sessions" (Otieno, 2020, p. 38) including an introduction,

information about the project or equipment, learning goals, and chunked steps (Love et al., 2020; McCue et al., 2019; Otieno, 2020). Using flipped-learning pedagogies can prepare students for hands on in-person sessions where they are actively making (McCue et al., 2019). Sometimes achievement of basic criteria in design and execution are required before students are "allowed freedom of design" (Otieno, 2020, p. 39). However, activities should be set up in a way to accommodate for a variety of learner ability levels and choice in projects, potentially using a variety of resources or techniques (McCue et al., 2019; Otieno, 2020). As part of the benefit of makerspaces is the ability to troubleshoot and tinker, instructors should involve students in troubleshooting when they have issues, guiding them through the process as a first step in becoming autonomous as well as helping them understand that iteration may be necessary to achieve their desired product (Otieno, 2020). Encouraging iteration is also supported by self-reflection, sharing, and feedback from peers and instructors (Otieno, 2020). Supportive feedback from instructors should allow for choice by phrasing such as, "Have you considered...?" or "How could you refine...?" (Otieno, 2020, p. 46).

### *Inclusion and Accommodation in Makerspaces*

Described as providing "a low barrier of entry to hands-on prototyping and fabrication experience" (Spencer et al., 2016, p. 1), inclusion and accommodation are important factors to consider in makerspaces as their purpose encompasses bringing together a diverse group of people and providing equal access to resources (Hynes & Hynes, 2018; Love et al., 2020; Noel et al., 2016; Steele et al., 2018; Taylor et al., 2016). Unfortunately, studies have shown that females, visible minorities, people with liberal arts backgrounds, and people with disabilities are not well represented in makerspaces (Hynes & Hynes, 2018; Noel et al., 2016; Spencer et al., 2016; Steele et al., 2018; Taylor et al., 2016). There are many barriers to using a makerspace including physical barriers for those with disabilities, psychological barriers such as anxiety or intimidation, pre-existing ideas regarding who makerspace users are, barriers to recruiting outside of the community that originally creates the makerspace as well as financial barriers for users (Noel et al., 2016; Steele et al., 2018; Taylor et al., 2016).

Literature outlines numerous strategies that can be used to encourage diversity in the makerspace including training, recruitment, and design. Otieno (2020) discusses the

importance of planning and conducting training in a way that is flexible to accommodate different abilities and levels of learners. Spencer et al. (2016) discusses how specifically targeted events such as ladies night can make it less intimidating to access the makerspace for the first time and how representative leadership can encourage continued participation. McGrath (2016) describes how design thinking was used to create generic user personas to assist with initial design of UC Berkeley's makerspace to allow them to reach specific "types" of students. Steele et al. (2018) outlines a process for improving the usability of a specific makerspace using a consultation process that included a tour to explain the purpose of the space, a design activity based on the human-centered design process to allow participants to use the space, and a brainstorming session to collaboratively identify opportunities and suggestions related to the makerspace. To make the space more accessible to users with disabilities, Steele et al. (2018) and Love et al. (2020) cited the following recommendations:

- wide entrances and aisles should be used with fixed locations for equipment to permit users with visual impairments to create a mental map over time,
- reduce tripping hazards from cords by either using ceiling mounted electrical outlets or outlets wired directly to workstations,
- using work benches with adjustable height,
- high-contrast, color coded signs, and instructions should be available in multiple forms (electronic, posted in paper copy, etc.),
- instructions should state how to ask for assistance, make suggestions or request adaptations to equipment,
- tools and materials should be well organized, labelled with high contrast text as well as tactile and braille options, and available from a seated position to ensure accessibility for wheelchair users,
- screen magnifiers and additional task lighting should be provided,
- place guards on blades and sharps,
- work with disabled users to develop appropriate training, supervision, and accommodation plans,
- providing quiet rooms close to the makerspace for those with hearing impairments or neurodevelopment disorders.

Hynes and Hynes (2018) studied the visual appeal of makerspaces to different disciplines and genders and provided some recommendations to enhance recruitment of females and non-engineering disciplines including open and accessible but tidy storage, high seating, and a clean space.

Funding is also an important part of inclusion as membership costs or material costs can be a barrier to low income individuals such as students (Noel et al., 2016). Makerspaces have a variety of funding designs. Some are completely free to use, some require a membership fee, and some require users to provide or purchase their own off-the-shelf consumables (except materials such as feedstock for 3D printers) (Forest et al., 2014; Taylor et al., 2016). Some makerspaces obtain funding by having members complete small jobs for local businesses (Taylor et al., 2016) or through grants connected to course work that requires use of the makerspace (Forest et al., 2014). Courses are normally offered as part of the membership fee, free of charge or for a small material fee (Forest et al., 2014). The initial pilot program for the university makerspace was free for staff and students to use and provided all consumable materials.

**Literature Summary**

Literature demonstrates the validity and reliability of the community of inquiry framework. There are many examples of the community of inquiry framework being used in educational settings to assess or design online learning; however, no examples can be found outside this context. There is substantial literature comparing online and face-to-face courses which support the supposition that well-designed online community engagement could produce strong collaboration. Guidance relating to the design of Communities of Inquiry provide practical suggestions as to how this may be accomplished. As collaboration is a required element for social constructivist learning, literature supports the premise that the community of inquiry framework could be appropriate to use in an online community engagement setting where robust models do not currently exist. Literature demonstrates that how specific makerspaces support user goals, conduct training, and promote inclusion is context-specific; therefore, exploring these issues in a specific context is worthwhile. The next section will describe how online community member engagement in the Makerspace community of inquiry was explored to determine if the community of inquiry framework is appropriate in this setting.

# Chapter 3: Methods

The previous two chapters outlined the necessity for the research, previous related research, and the research questions. This chapter details the research design including matters related to epistemology, participant information, data collection methods, and data analysis.

## Design and Matters Related to Epistemology

The goal of the research was to examine a method of collaborative, online community engagement to determine if it could be recommended to community organizations as a framework that collaboratively engages community members who were inhibited from participating in face-to-face engagement opportunities. Methods used permitted an examination of how the chosen framework functioned in a community engagement setting.

### *Justification of Method Selection*

As described at the end of the literature review, the aim of this study was to facilitate the investigation of how the community of inquiry framework functions in a community engagement setting. The specific research questions investigated were:

1. How did the community of inquiry framework facilitate collaborative community engagement in an online, asynchronous space?
2. What were the impediments (if any) to the establishment of the community of inquiry model in a community engagement setting?

As these research questions involved deep exploration of the facilitation process, online space design, and interaction during specific events, a qualitative instrumental case study approach was selected (Stake, 1995; Yazan, 2015). “Case studies are particularly useful in investigating complex, dynamic phenomena as situated in context” (Butler et al., 2014, p. 8) and quantitative methods would not have allowed for such an in-depth examination of how the framework functioned nor how the space impacted interactions. One of the defining features of case study research is that it focuses on deeply investigating a single issue within a bounded system, that is, it is particularistic (Creswell et al., 2007; Stake, 1995; Yazan, 2015). In this research, two cases were studied, each of which was bounded by time, the system in which interaction occurred, as well as the

specific group of participants. The case study was aimed at understanding how the community of inquiry functioned in a community engagement setting rather than developing an understanding of the participants themselves, so it was an instrumental case study rather than an intrinsic case study (Stake, 1995). In summary, the community of inquiry framework was used to design online asynchronous collaborative community engagement events and case study qualitative methods were used to explore them.

It was the discourse within the community of inquiry that was the focus of this research because it is within and through discourse that collaboration occurs, and solutions are documented. Although case study research normally involves multiple data sources to "capture the case under study in its complexity and entirety" (Yazan, 2015, p. 142), in this research, it was important to directly examine the discourse that occurs rather than participants' reflections as these might not have show an accurate or complete picture of how the framework actually functioned. As the research questions were both focused on how the framework functioned rather than participants' experience in the study, only the transcripts of the discourse within the community of inquiry and initial e-mails to participants were used. This is supported by Bhattacherjee (2012) which recommends collecting only data relevant to the research questions.

**Researcher Statement.** To support transparency, I am providing a summary of my experiences, assumptions, and biases as they relate to this research. I am currently a student in the master's in education program at Thompson Rivers University and have previously completed a Graduate Diploma in Technology-Enhanced Learning and Design, a Masters in Human Factors, and a Bachelors in Mathematics. Prior to beginning my master's in education, I served for twenty years in the Canadian Armed Forces as an Aerospace Engineering Officer. In this capacity, I completed a wide range of leadership and specialist roles where it was apparent to me how important it is to listen to, acknowledge, and incorporate the perspectives of those serving with me into leadership and technical decisions. The rich experiences and perspectives of those I served with supported stronger solutions, especially when the issue was complex. I strongly believe that it is essential to hear the voices and perspectives of community members when addressing community problems. Additionally, I took on instructional design and instructor roles at various times in my career, leading me to value strong instructional

design planning processes. When I learned about the community of inquiry model partway through my studies, the model really resonated with me. My own experiences with online learning while taking my graduate diploma through Royal Roads University and my Masters through Thompson Rivers University has reinforced my belief that deep collaborative learning can be completed through online asynchronous courses if a community of inquiry is developed. Although I analyzed the data in this study through a critical lens, my underlying goal was to support inclusion in community engagement by providing community organizations with additional information they could apply to engage community members in asynchronous, online collaboration.

### *Description of Study*

A great opportunity existed to leverage the strengths of the community of inquiry framework in a community engagement context at the university Makerspace where administrators were seeking user feedback and ideas on how to improve the space.

**University Makerspace.** A Makerspace pilot project operating for one year in a western-Canada university offers students and staff access to a virtual reality exploration room, educational programmable robots, 3D printers and scanners, basic electronics, a programmable sewing machine, and a vinyl cutter.

**Makerspace community of inquiry Questions.** After operating for two months, communities of inquiry were conducted with university makerspace users to explore three key questions and inform decisions about the makerspace. The questions explored were:

1. How does the content (workshops, instruction, etc.) and technologies available in the makerspace relate to user's personal or professional goals and what else do users need to support their goals?
2. How can the Makerspace best provide training for certain technologies to ensure safety of users and equipment while allowing flexibility and without restricting access?
3. How does the Makerspace ensure it is welcoming to all users regardless of their program, level of study, gender identity, nationality, role at the university, and economic background?

**Context.** When applying the community of inquiry model to community engagement

for the purpose of collaboration with diverse stakeholders, it was critical to generate collegial trust (Cosner, 2009) and a climate in which "members stay problem focused, listen to and understand one another, feel free to take risks, and be willing to compensate for one another" (Hill, 2013, p. 301). It was also important to ensure that the design of the makerspace community of inquiry required ending in a solution as involvement in the process and a strong solution are both important (Barnes & Schmitz, 2016).

The community in the context of this study included staff and students of the university. Thus, all the study participants can be assumed to have a high literacy rate (although some students might have been English as an additional language students) and some experience working in an online setting. As students and staff, all participants had easy access to a computer device such as a computer, ablet, or mobile phone. In a wider community context, literacy, experience with, and access to computer devices may be barriers that might inhibit implementation of these methods. The topic of the study was also one that people were interested in, but not emotionally upset about. This may differ from other community engagement topics where community members may have strong feelings and opinions about an issue. Despite these differences, there were many similarities with other community engagement work. Although a small draw prize was offered to thank participants for their time, the main benefit was the potential improvement of the Makerspace (an aspect of their community) which is the benefit of participation in community engagement initiatives. Some participants knew each other prior to the study, and some did not which is similar to community engagement work where some community members meet for the first time. The online tools used are open source, easy to use tools, and there are many similar tools available that community organizations could select or use.

**Data Collection Methods**

Prior to data collection, the university research ethics board granted study approval as shown in Appendix 6. The data collected was the electronic record of participant activity and discussion online about the Makerspace in the Mattermost forum, created, organized, and facilitated using the community of inquiry framework. The primary researcher, Lorri Weaver, facilitated conversations using facilitator guidelines from Heckman and Annabi (2005).

### *Participants*

The study included 10 online participants split into a group of six and a group of four based on participant availability. Participants consisted of staff and students who used the makerspace during its pilot program, faculty who expressed interest in using the space for their classes, staff with expertise in the makerspace tools, and staff with subject matter expertise about the issues or questions that the makerspace community of inquiry addressed. All participants were stakeholders who could contribute in some way to improving the makerspace. When students used the makerspace during the makerspace pilot program, they were asked if they wished to voluntarily provide their e-mail address so that they could be invited to participate in follow-up activities focused on improving and shaping the makerspace. These e-mails were used to recruit student participants using the recruitment e-mail shown at Appendix 3. As the Bachelor of Education Science, Technology, Engineering, and Mathematics (BEd STEM) class also used the space, the recruitment e-mail was also sent out to BEd STEM students through the program coordinator. Staff and faculty participants were also selectively recruited through the makerspace coordinators based on their subject matter expertise and previously expressed interest. Three recruitment e-mails were sent to all groups until 10 participants had volunteered. Research consent was obtained from participants by electronic survey as shown in Appendix 7.

### *Facilitation Team*

Schmitz (2017) suggests that within a community engagement context, it is important that the facilitation team relates to the target population with respect to experience with the issue, demographic relevance, geographic relevance, and a connection with them. The primary researcher, Lorri Weaver, has been a user of the university makerspace during the pilot program and was at the time of the study, a mature student at the university. Other members of the team included the Makerspace administrators, Erin and Franklin, who set-up, used, and facilitated the university Makerspace and were at the time of the study, staff at the university. Due to this diversity, the team was well positioned to relate to the target audience from a community engagement perspective.

### *Makerspace Community of Inquiry Design*

The community of inquiry model described at an implementation level by Cleveland-

Innes (2020) was used for the community of inquiry design shown at Appendix 4. Although the makerspace community of inquiry was designed to take only 1.75 hours of participants' time, it was structured in a way to facilitate the natural and progressive development of social presence (Garrison & Akyol, 2013).

Some of the decisions that have been known to influence group collaboration activities in online spaces include the type of technology or platform, the structure of the group, group members' past experience, task design, and the alignment of individual goals (Aviv, 2000; Heckman & Annabi, 2005). Aviv (2000) suggests "the basic structural components of effective cooperation are positive interdependence, group reflection, individual accountability, promotive interaction, and social skills" (p. 58). To foster positive interdependence, sharing information, setting group goals, assigning roles, and positively reinforcing group results during brief task reflection can be used (Aviv, 2000).

Prior studies (e.g. Cox & Cox, 2008; Sun & Chen, 2016) have indicated that "asynchronous, threaded discussions can be effective in creating a collaborative learning environment as well as interpersonal and group dynamics" (Sun & Chen, 2016, p. 169). Based on this research, I decided on the use of two asynchronous platforms, Mattermost and Etherpad prior to conducting the research. During the study, the decision was made to focus on the development of threaded discussion in Mattermost rather than introduce participants to a second software tool, so although available, Etherpad was not used in the study.

**Mattermost.** Mattermost is the platform that was used for the online discussion. Mattermost is an open source software tool that allows threaded group messaging and file sharing similar to Slack (Mattermost, 2020). Some features that make it a good choice for this project are the search capability (users can easily search discussions), ability for the facilitator to attract users attention to certain posts through the use of mentions or pins, channels to create discussion topics, and security features.

**Etherpad.** Etherpad is a text-based online editor that was available to be used for the development and refinement of specific collaborative solutions (for example to develop a list of the minimum training required for each piece of equipment) (The Etherpad Foundation, n.d.).

**Security Features.** Both Mattermost and Ethernet were set up through the university's open learning center. The data was hosted on BC Net Educloud Servers managed by the university. It was encrypted end-to-end and inaccessible from the open web or search engines. Log-in and passwords were created by each user of Mattermost. Etherpads could have been accessed through URL links that are obscure and not guessable.

### *Data Collection*

Data collection involved completing a scrolling screen capture of Mattermost discussions using chrome screen capture so that the participant and facilitator viewpoint could referenced. The .pdf of this screen capture was then downloaded and then edited in Adobe Acrobat for text recognition. Photos and emojis remained images within the document. The only video file posted to Mattermost was posted by the instructor and contained content information relating to trigger 3. No audio files were posted in Mattermost, but had they been, they would have been transcribed by hand into a text document.

## Data Analysis

Collected discussions were coded using codes generated from the community of inquiry model in NVivo 12. This analysis used a combination of inductive coding and deductive coding from Heckman and Annabi (2005), a coding structure that combines the community of inquiry framework with a content analysis approach. I chose to use Heckman and Annabi's (2005) framework to code the data because it is based on the community of inquiry framework, but they have excluded instructional design aspects from coding as they have assumed them as antecedent factors. As I used the community of inquiry framework in the instructional design and was viewing how it functions during data analysis, I did not want to include these design factors as part of the analysis. In keeping with the instrumental case study approach, the analysis was used to explore and make assertions around how the community of inquiry framework worked to facilitate collaborative community engagement and what were the impediments to its realization (Creswell et al., 2007; Stake, 1995). Using a robust deductive coding structure allowed for the data to be consolidated, reduced, and interpreted which is consistent with Merriam's analytical approach to case study research (Yazan, 2015).

### *Deductive Coding Structure*

The coding structure used was developed by Heckman and Annabi (2005). It focuses on four processes that act to generate the social, cognitive, and teaching presences in community of inquiry, which are social process, cognitive process, teaching process (modified to facilitating process to fit the community engagement context), and discourse process. This coding structure uses the community of inquiry framework (Garrison et al., 2000) and content analysis methods (Aviv, 2000) as a basis. Heckman and Annabi's (2005) coding structure consists of three levels of coding, the four structuring processes, sub-categories and specific indicators. The coding structure was modified prior to data analysis to fit a community engagement setting. Modifications to the coding structure made prior to the data analysis are shown in Appendix 2 and the complete modified coding structure is shown in Appendix 1.

### *Inductive Coding Structure*

Similar to Heckman and Annabi (2005), inductive methods were used to provide greater granularity and insight to the processes and discussion patterns. Specifically, during data analysis, manifest indicators were grouped and linked to latent variables (Heckman & Annabi, 2005). These latent variables have been added to the coding structure and are shown in blue in Appendix 1. Cases were also created for the day of the study, participants, and trigger questions.

**Additional Subcategories.** Several subcategories were added to the coding framework indicators as shown in blue in Appendix 1. It was thought during coding that these additional subcategories provided greater granularity and specificity to the coding; however, once the data was analyzed, it was apparent that they were not required as they did not provide the researcher with additional insight.

**Additional Discourse Indicator.** One additional discourse indicator was added to the coding framework to show a response to a participant by the facilitator. This additional indicator allowed the researcher to differentiate between when the facilitator was initiating a topic or discussion and when the facilitator was responding to a participant. This additional indicator provided some insight into the discussion patterns and facilitator responsiveness.

**Adding Modelling Social Processes Category.** During coding, it was apparent that

there was significant use of social processes. However, when using coding stripes to look for patterns, the contribution of the facilitator was not immediately apparent. The facilitator also used social processes deliberately to model these for participants which was seen to be part of the facilitator role. To add clarity to the coding and differentiate between social processes used as a part of the facilitator role, a "modelling social processes" category was added to the facilitator category.

**Coding Cases.** Three case classifications were created to allow data exploration using the NVivo 12 query tool. Cases were added to show the day of the study that a post was made (day 1 – day 13). Note that posts made prior to the first day of the study by the facilitator were coded as day 1. Each participant was also given a case to allow for individual participation patterns to be examined (participant 1 – participant 10). Finally, data was assigned a case based on the trigger question being initiated or responded to (trigger 1 facilitator – trigger 3 facilitator, trigger 1 response – trigger 3 response).

### Trustworthiness

Trustworthiness was enhanced in four ways: interrater comparison, rich description of data, transparency, and grounding in validated framework and coding structure.

- Interrater comparison: Members of the research team worked together to establish coding procedures by independently coding the same piece of discourse and comparing their results. This supports a "comprehensive and accurate description of the case" (Yazan, 2015, p. 147) while acknowledging that there are multiple valid perspectives of the data.
- Rich description of data: A thick or rich description of the data was provided through the use of graphs, charts, quotes, and description of the context. These were used to support identified trends as well as external validity (Korstjens & Moser, 2018; Yazan, 2015).
- Transparency: I have provided a researcher statement including my experiences, assumptions, and biases to enable readers to understand how these may have affected my interpretation of the data. Procedures, decisions, and data collection will be documented so that it can be used as an audit trail. This supports Creswell's (2007) validation and evaluation criteria.
- Grounding in validated framework and coding structure: The research builds on a

previously validated framework (Arbaugh et al., 2008; Heilporn & Lakhal, 2020) and uses an existing coding structure (Heckman & Annabi, 2003, 2005, 2006) as the basis for data analysis.

## Chapter 4: Findings and Discussion

This study is focused on determining how the community of inquiry framework facilitates community engagement in an online, asynchronous space as well as identifying impediments to the establishment of the community of inquiry model in a community engagement setting. To study this, ten members of the university community with an interest or experience in the pilot makerspace program were recruited and divided into two groups to use asynchronous communication in a community of inquiry to discuss three topics over the course of two weeks. The community of inquiry framework, specifically the concept of developing social, cognitive, and teaching presences, was used to design the participant experience in Mattermost, a chat tool. This framework was then used to analyze communication.

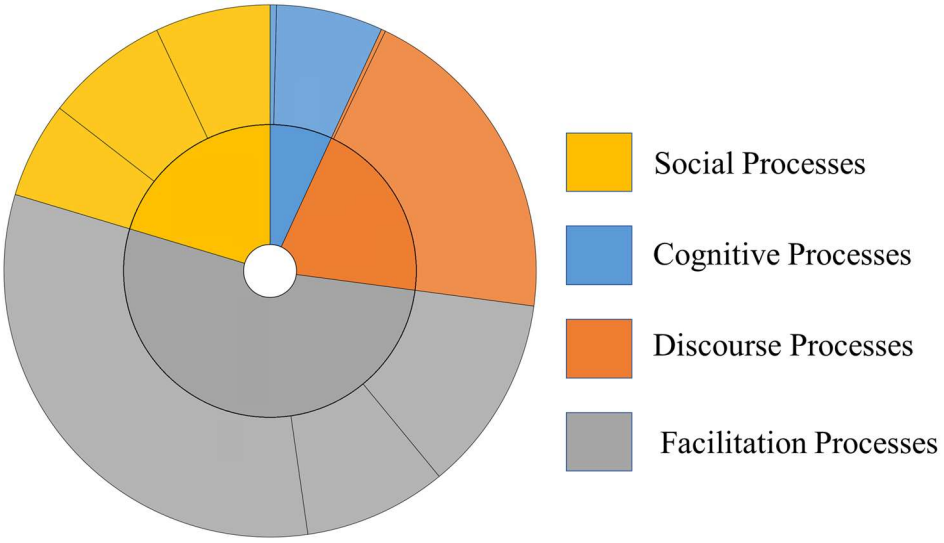
Using NVivo software, transcripts of the communication within the community of inquiry were coded using a combination of inductive coding and deductive coding from Heckman and Annabi (2005) shown in Appendix 1. In this chapter, we look at an overview of the findings and this is followed by an in-depth look at findings relating to each research question. Some of the data shared in this chapter includes number of words, instances of responses, and participant and facilitator quotes. This data supports observations relating to trends that occurred in the transcripts, but as this is a qualitative study, conclusions are based on observations rather than quantitative data.

### Overview of Findings

Figure 2 illustrates the coding themes within a hierarchy chart based on the number of instances codes were used. It shows that the three presences described in the community of inquiry model, social, cognitive, and teaching (shown as facilitation) presences, existed within the communication studied.

**Figure 2**

*Distribution of Processes Based on the Number of Instances Coded*

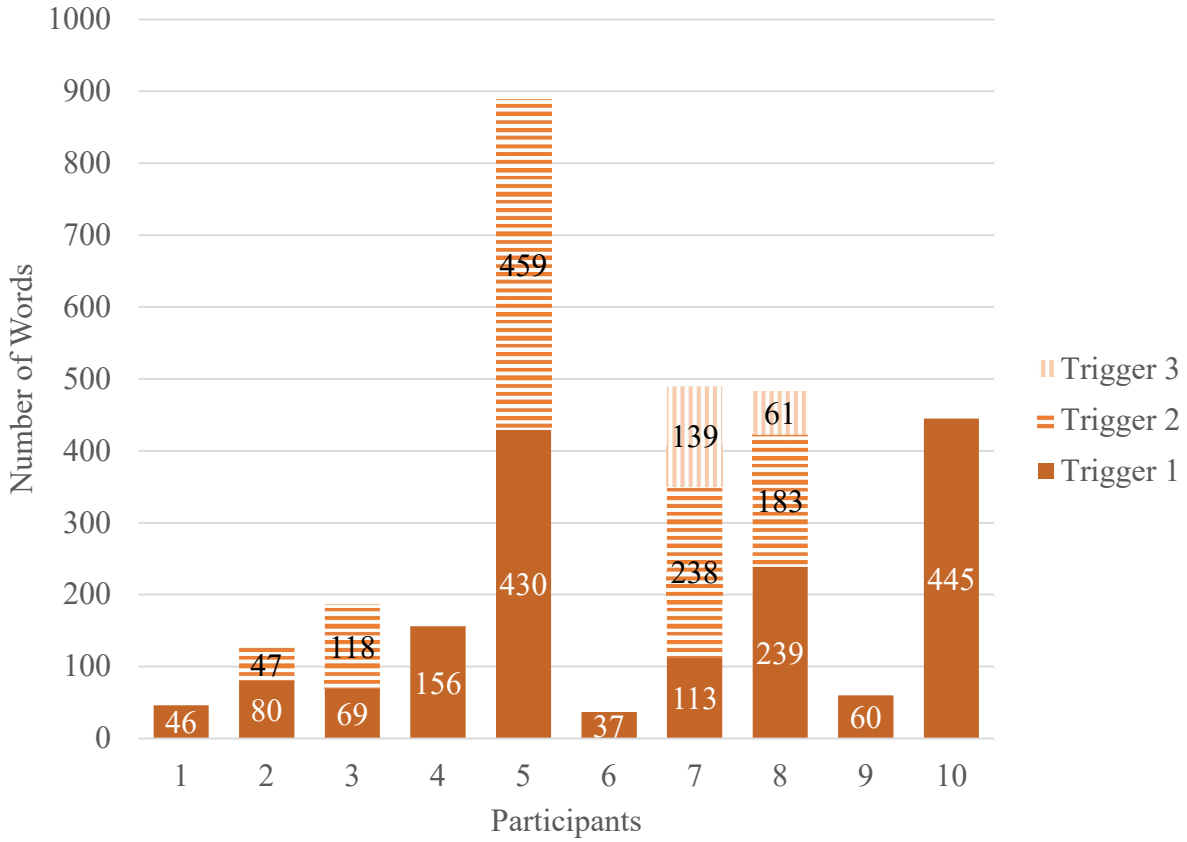



As demonstrated in Figure 2, instances of coding relating to facilitation processes showed strong facilitator presence throughout the study. This was particularly apparent after it was observed early in the first study group that participants did not post without prompts from the facilitator. Analysis of the coding demonstrated the development and maintenance of social presence within the community of inquiry lead by facilitator modelling. Specifically, the interactive response component of social presence was developed and maintained throughout the study. Participants also moved from providing rote factual responses to information exchange within the cognitive, exploration process, providing more detailed and lengthy responses as the study progressed. However, participants did not complete analysis and integration processes within the study and interactions between participants were limited. So, neither study group moved through the entire inquiry process to achieve solutions or resolutions collaboratively within the time allocated for the study.

As shown in Figure 3, several participants (participants 1, 6, and 9) only completed one introductory post. These participants could be considered dropouts from the study. However, the remaining participants posted at least twice with half of the participants responding to two trigger questions and two participants responding to all three trigger questions.

**Figure 3**

*Number of Words Coded for Each Participant Based on Trigger Questions*




The focused nature of the discussion can be seen in the word cloud shown in Figure 4 which shows the fifty most used words in participant responses. Discussion centered around using the space, the technology involved, and experiences, programs, or projects. Some examples of participant statements are detailed in Table 2. Generally, the trigger questions and facilitation were successful in keeping participants focused on topic.

**Figure 4**

*Fifty most frequently used words in participant responses*


*Note.* Stop words such as conjunctions, prepositions, and the university name were removed.

**Table 2**

*Examples of participant statements*

| |
|---|
| *Participant7:* I really like the ideas of seminars a 2 hour seminar to learn the basics of something might be doable for students. Incorporating indigenous/local/artists/crafts people/TRU students - domestic and international teaching what they know of creating to others. Also something on making small replacement parts for fixing things might be an idea.<br>*Participant8:* There probably could be several types of workshops or sessions. For someone like myself, there could be general interest options for a tour of the space and overview of the tools. This could be useful just to introduce the space to staff, faculty and students. More specific hands-on experience sessions with the technologies could increase confidence for users and be used to explore applications. For faculty who haven't used the technology, an experiential introduction at the Teaching Practices Colloquium would be really helpful. Help us to imagine the technologies in our courses.<br>*Participant10:* Hi it's Participant10 again, My whole focus for the summer is to learn animation using after effects and 3D modelling softwares like blender and Maya. Come fall!! I'll start all my 3D projects at maker space and work there. Until then, I feel this platform should be talked about more. I've already started talking about this with anyone I know. I would recommend all students to do the same. This is great place for creators to finish their dream art projects. |

*Note: Participant usernames and names have been replaced within the excerpt with their participant numbers.*

The remainder of the results section will be devoted to exploring in more detail how each of the three presences facilitated community engagement as well as some obstacles observed in the study that may have inhibited the establishment of the community of inquiry model within the community engagement setting.

**How the Community of Inquiry Framework Facilitates Community Engagement**

The community of inquiry model, consisting of social, cognitive, and teaching (facilitating) presences, was used to select the online space, create triggers to prompt new lines of discussion, and guide facilitator behaviour during the study. The overall goal of

the community engagement within this study was to have participants share and discuss ideas around three main topics which included things that the makerspace could do to support user goals, the dynamic between access and training, and making the space welcoming. The three triggers associated with these topics are shown in Appendix 4 and were designed to focus participants on these issues and move the participants from sharing that was more social to sharing that involved more cognitive processes. Facilitation responses and questions were also focused with cognitive and social development in mind. As shown in Table 3, this aspect of the design and facilitation was successful as the first trigger elicited a large amount of social processes from all categories where later trigger questions elicited more instances from interactive response, predominately continuing a thread. Trigger 2 also involved more information exchange as opposed to rote factual response. Due to time constraints, participants did not have equal amount of time to respond to trigger 3; therefore, the coding instances and word count data is not necessarily relevant to the progression observed amongst the participants.

**Table 3**

*Instances and words coded as social and cognitive processes in participant responses based on trigger questions*

| | | | Participant Responses by Trigger | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Trigger 1 | | Trigger 2 | | Trigger 3 | |
| | | | Instances | Words | Instances | Words | Instances | Words |
| Social Processes | Affective Response | | 22 | 547 | 1 | 17 | 2 | 24 |
| | Cohesive Response | | 32 | 60 | 0 | 0 | 0 | 0 |
| | Interactive Response | | 10 | 265 | 15 | 1017 | 2 | 145 |
| Cognitive Processes | Exploration | Rote factual response | 9 | 464 | 0 | 0 | 0 | 0 |
| | | Information exchange | 10 | 544 | 13 | 946 | 4 | 176 |
| | Analysis | | 0 | 0 | 0 | 0 | 0 | 0 |
| | Integration | | 0 | 0 | 0 | 0 | 0 | 0 |

### *The Role of Cognitive Processes*

As stated above, the goal of the community engagement was to collaboratively

develop solutions or responses to the trigger topics. So, to be completely successful, participants would engage in the whole inquiry process, exchanging information with each other; analyzing and clarifying the issue; and finally, connecting and evaluating ideas to produce conclusions and recommendations (Garrison et al., 2010; Heckman & Annabi, 2005; Huang et al., 2018; Sun & Chen, 2016). Completion of this process requires strong cognitive presence. Statements by participants that demonstrate cognitive presence were coded as cognitive process statements using deductive coding developed by Heckman and Annabi (2005). Although it was observed that participants did remain on-topic and shared their ideas, they did not move beyond this exploration phase within the study and the number of instances of cognitive processes decreased with later trigger questions as shown in Table 3.

Even though collaborative solutions were not achieved, the study does show progress in the inquiry process and development of cognitive processes. The decrease in the instances of cognitive processes can be attributed to participants who dropped out after one post and those that responded to only the first trigger question. It was also observed that the detail and depth of individual responses increased as the study progressed. As shown in Table 4, the average words per instance increased significantly between trigger 1 and trigger 2. Despite the increase in response word count and complexity, as shown in Figure 5, many of the trigger 2 responses did not occur until the last two days of the study, days 11 and 12. As the facilitator was trying to elicit responses to trigger 2 topic, trigger 3 was not presented to the whole group. Instead, trigger 3 was posed individually to those participants who responded to trigger 2. As trigger 3 was not fully explored due to time constraints, the data associated with it is not necessarily relevant to the progression observed amongst the participants. The increase in word count per response and the increase in response detail and depth show that greater exploration of topics occurred as the study progressed. So, although analysis and integration were not achieved within this study, cognitive processes did develop and these enabled community engagement at the “involve” or “consult” level where concerns and aspirations of community participants are listened to and potentially reflected in the solutions administrators develop (International Association for Public Participation, 2018).

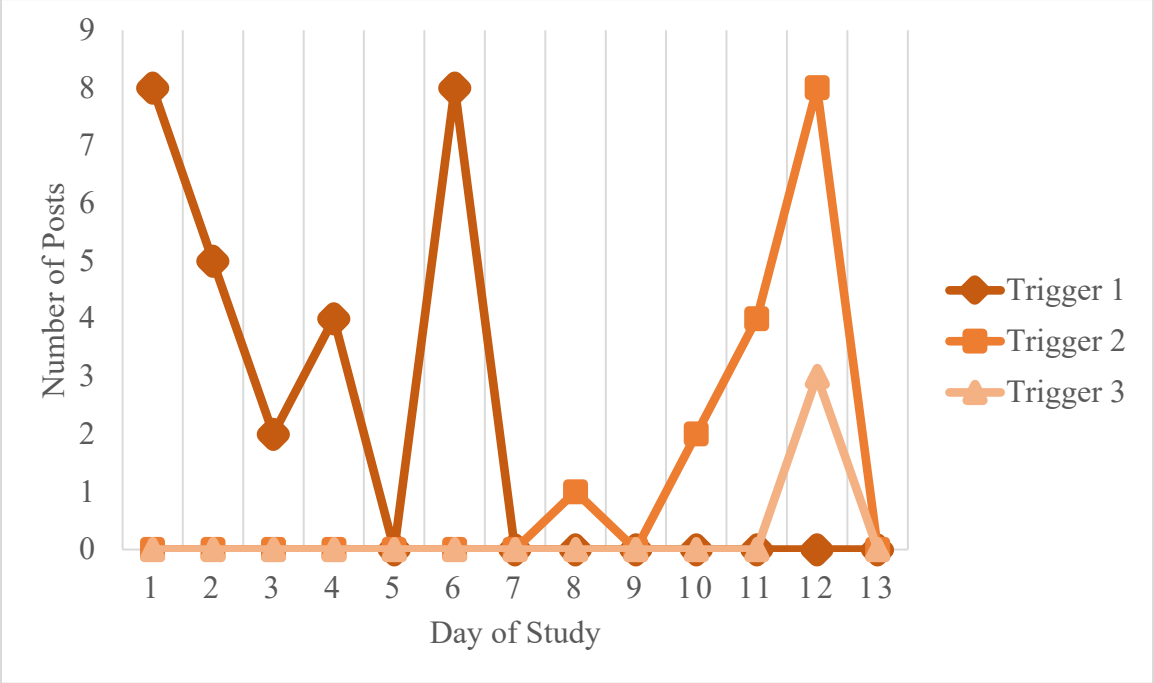
**Table 4**

*Average words per instance of cognitive processes based on triggers*

| | | | Trigger 1 | Trigger 2 | Trigger 3 |
|---|---|---|---|---|---|
| Cognitive Processes | Exploration | Rote factual response | 52 | 0 | 0 |
| | | Information exchange | 54 | 72 | 44 |
| | Analysis | | 0 | 0 | 0 |
| | Integration | | 0 | 0 | 0 |

**Figure 5**

*Number of participant posts by trigger on each day of the study*




### *The Role of Social Presence*

As stated above, the development of social presence was observed to align with the development of cognitive presence in that social presence shifted to primarily interactive as participants began to share ideas rather than just experiences and personal goals. As shown in Table 5, interactive response consisted of asking questions, complimenting other participants, continuing a thread, and expressing agreement. Although not coded as

social presence, observations of the content of individual responses showed most participants only responded with content that related directly to them, their experience, or their future aspirations as disclosed during trigger 1 discussions.

**Table 5**

*Instances of Social Processes based on Trigger*

| | | Participant Responses by Trigger | | |
|---|---|---|---|---|
| | | Trigger 1 | Trigger 2 | Trigger 3 |
| Affective Response | Emotional Expression | 5 | 1 | 2 |
| | Self-disclosure | 15 | 0 | 0 |
| | Use of humor | 3 | 0 | 0 |
| Cohesive Response | Addresses or refers to the group using inclusive pronouns | 5 | 0 | 0 |
| | Phatics, salutations | 16 | 0 | 0 |
| | Vocatives | 17 | 0 | 0 |
| Interactive Response | Asking questions | 2 | 3 | 1 |
| | Complimenting, expressing appreciation | 1 | 2 | 1 |
| | Continuing a thread | 8 | 13 | 2 |
| | Expressing agreement | 2 | 3 | 0 |
| | Quoting from others' messages | 0 | 0 | 0 |
| | Referring explicitly to others' messages | 0 | 0 | 0 |

Despite the observed alignment between the development of cognitive presence and the shift in social presence to predominantly interactive, at a participant level, social presence did not align with individual engagement. No trends were noted between participant's use of social processes and the number of instances a participant posted nor the number of words participants wrote. There were no trends observed that linked the instances or type of social process used by individual participants with participant dropout or participants who only responded to the first trigger question. Observations of participant heterogeneity with respect to participation intensity aligns with previous studies of online discussions (Chen & Poquet, 2020). Thus, although social presence developed within the study and it was observed that interactive social processes dominated as cognitive processes developed, it is unclear from this study, the role that

social processes played in facilitating community engagement.

### *The Role of Facilitator Presence*

As indicated in Figure 2, strong facilitator presence was coded in transcripts of the Mattermost discussion. Although literature suggested that too much facilitation can adversely effect discussion and it is desirable for participants to take on facilitation roles (Cleveland-Innes, 2020; Garrison, 2009; Vaughan et al., 2013), it was apparent early in the first study group that participants were not posting unless prompted by the facilitator. Based on these observations, the facilitator engaged more prominently through the remainder of the study to encourage and support participation and the development of social and cognitive presences. As participants did not take on facilitation roles during the study and only posted when prompted, the facilitator presence lead by the facilitator was necessary to prompt the community engagement that occurred.

Based on study of coding shown in Table 6 as well as the facilitator's own experience in teaching, it was observed that although strong facilitation was necessary, the facilitator role in this situation differed greatly from the teacher's role in a class. The focus of the facilitation was primarily on encouraging and acknowledging participants, drawing participants into the discussion, modelling social discourse, providing discussion strategy, asking questions, and providing some information about the makerspace itself. As the goal of the community engagement was to have participants discuss and collaborate rather than learn skills or knowledge, the facilitator was not guiding participants towards learning objectives, but instead was primarily encouraging positive participation through prompts and modelling. Within the study, I observed that the teaching or educating role in community engagement is minimal and the facilitation role takes precedence.

**Table 6**

*Instances and words coded as facilitation process based on trigger questions*

| | | Facilitation by Trigger | | | | | |
|---|---|---|---|---|---|---|---|
| | | Trigger 1 | | Trigger 2 | | Trigger 3 | |
| | | Instances | Words | Instances | Words | Instances | Words |
| Directions and Instructions | Ask questions | 23 | 664 | 17 | 492 | 2 | 59 |
| | Confirm understanding | 2 | 84 | 0 | 0 | 0 | 0 |
| | Diagnose misconceptions | 1 | 58 | 1 | 49 | 0 | 0 |
| | Discussion strategy | 3 | 75 | 5 | 147 | 0 | 0 |
| | Focus the discussion on specific issues | 4 | 90 | 3 | 91 | 3 | 89 |
| | Inject knowledge from diverse sources | 1 | 21 | 2 | 95 | 0 | 0 |
| | Present content | 2 | 30 | 9 | 237 | 0 | 0 |
| | Responding to technical concerns | 0 | 0 | 0 | 0 | 0 | 0 |
| | Summarize the discussion | 4 | 101 | 2 | 25 | 0 | 0 |
| Facilitating Discourse | Assessing the efficacy of the process | 0 | 0 | 0 | 0 | 0 | 0 |
| | Drawing in participants, prompting discussion | 8 | 145 | 7 | 292 | 4 | 76 |
| | Encouraging, acknowledging, or reinforcing participant contributions | 17 | 225 | 12 | 229 | 4 | 83 |
| | Identifying areas of agreement or disagreement | 0 | 0 | 0 | 0 | 0 | 0 |
| | Seeking to reach consensus or understanding | 0 | 0 | 0 | 0 | 0 | 0 |
| | Setting the climate for collaboration | 1 | 4 | 1 | 14 | 0 | 0 |
| Modelling Social Processes | Affective Response | 10 | 262 | 1 | 2 | 0 | 0 |
| | Cohesive Response | 43 | 68 | 26 | 71 | 6 | 14 |
| | Interactive Response | 30 | 1211 | 20 | 864 | 5 | 169 |

Although not included in the original coding structure, within the community of inquiry framework, literature asserts that part of the facilitator's role is to model open communication as this helps encourage social presence (Garrison & Akyol, 2013). During data analysis, modelling social processes was added as a category within facilitation with subcategories that mirrored the social processes category. As shown in Table 7, within the study, the facilitator modelled social processes and these processes were also used by participants. Social processes that were not used or rarely used by the facilitator were also not used or rarely used by the participants such as the use of humor and quoting from others' messages. Facilitator presence in the form of modelling social processes functioned to promote the establishment of a social presence.

**Table 7**

*Instances of Social Processes Modelled by the Facilitator and Used by the Participants*

| | Modelling Social Processes (Facilitator) | Social Processes (Participants) |
|---|---|---|
| **Affective Response** | **13** | **25** |
| Emotional Expression | 8 | 8 |
| Self-disclosure | 5 | 16 |
| Use of humor | 0 | 2 |
| **Cohesive Response** | **95** | **39** |
| Refers to the group using inclusive pronouns | 9 | 6 |
| Phatics, salutations | 44 | 19 |
| Vocatives | 75 | 21 |
| **Interactive Response** | **57** | **31** |
| Asking questions | 42 | 6 |
| Complimenting, expressing appreciation | 13 | 7 |
| Continuing a thread | 33 | 27 |
| Expressing agreement | 7 | 4 |
| Quoting from others' messages | 0 | 0 |
| Referring explicitly to others' messages | 4 | 0 |

*Note:* When coding instances of child categories overlap, parent categories only reflect one instance (e.g. if a statement is coded both as continuing a thread and as asking questions, interactive response reflects only one instance).

## Impediments to the Establishment of the Community of Inquiry Model in a Community Engagement Setting

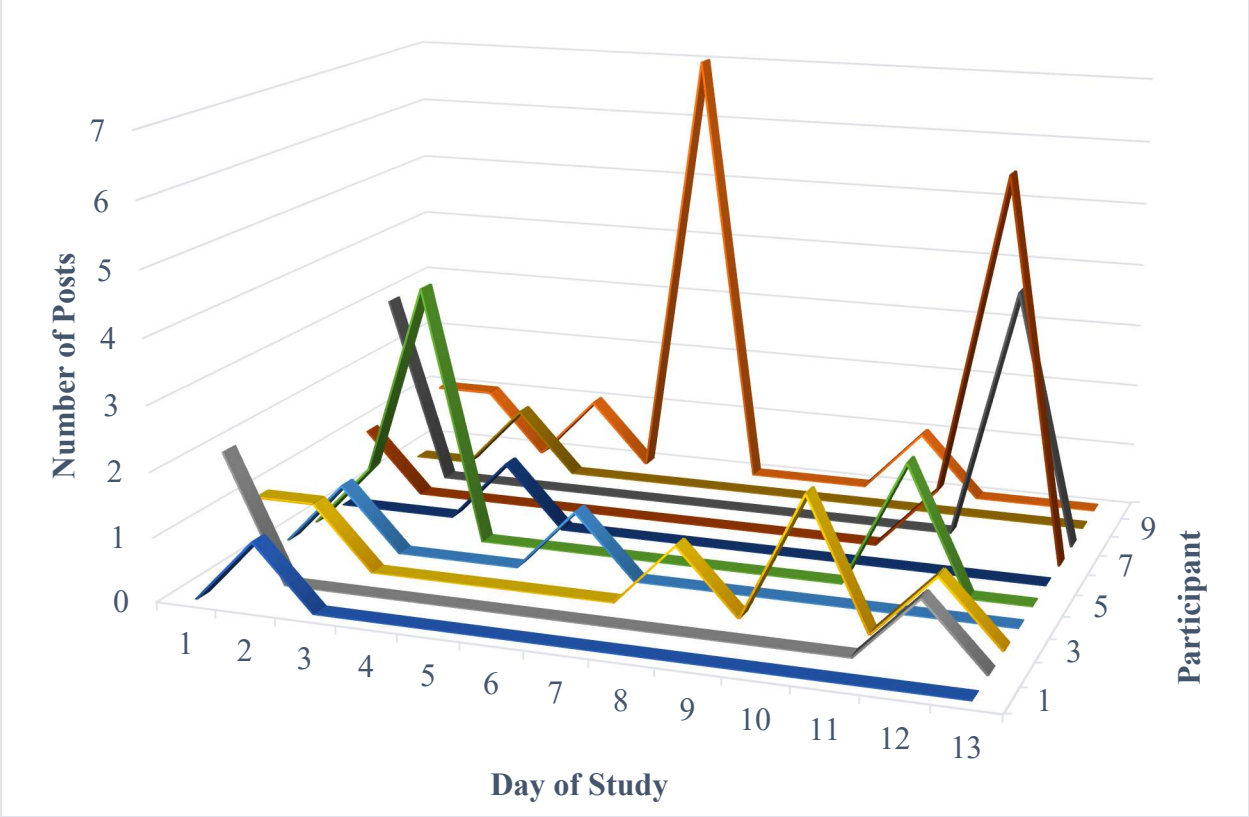
When analyzing the data, it was apparent that some factors may have inhibited the community of inquiry model from developing fully. Specifically, these factors may have played a role in curtailing the development of the cognitive presence, preventing the completion of the inquiry cycle. Among other things, completing the inquiry cycle requires active engagement from participants as well as some interaction between participants. Lower engagement levels observed in the number of participant posts and post frequency may have been influenced by participant motivation as well as the asynchronous nature of the discussions. Development of interaction between participants could have been influenced by the short duration of the study and the participants' willingness to engage authentically and meaningfully with each other. It is possible that participant motivation, participants' willingness to engage with each other, the asynchronous discussion, and the short duration of the study inhibited the establishment of the community of inquiry and the completion of the inquiry cycle.

### *Participant Motivation*

Engagement is directly related to motivation (Jiang & Albarracín, 2019). Participant motivation was not examined directly through surveys nor through any type of motivation assessment or scale; however, instances and frequency of participant posts were available. The number of days that participants posted along with the number of times they posted could be linked to their motivation to respond to questions posed by the facilitator as the facilitator responded to all participant utterances and almost always asked a follow-up question. The Mattermost system notified participants by email when they were tagged in a response. Although all participants logged in and posted an introduction post, as shown in Figure 6, three participants did not post after their first post. Additionally, even participants who were very engaged at specific times did not remain engaged consistently throughout the study with three additional participants posting on only two days of the study. Three participants posted on three days of the study and one participant spread posts out over five days.

**Figure 6**

*Number of posts by individual participants by day of the study*




Within the study, there were no extrinsic motivators (like grades provided in an academic setting) to prompt posting, so intrinsic motivation was relied on. It was observed that most participants responded more quickly to discussion and questions that related directly to their own interests or were specific to them. Except for one participant who expressed general knowledge about makerspaces, participants did not engage with more abstract topics until prompted with questions that tied to their personal interests or background. Lack of extrinsic motivators is an important difference between an educational and a community engagement setting and could be one of the factors that inhibited engagement.

### *Willingness to Engage with Other Participants*

By studying the content of individual responses, it was apparent that participants in the study engaged primarily with the facilitator and there were no instances where they

overtly disagreed with another participant. Throughout the study, participants primarily interacted with the facilitator even when the facilitator attempted to link their discussion or encourage collaborative discussion based on their interests or experiences as shown in Table 8. There were two instances where participants overtly agreed with another participant; however, the named participant did not respond to this and the instances did not develop into discussion. There were several cases where participants presented a different perspective to other participants; however, this was completed in a way that made it appear that they were agreeing or the perspective they presented was not linked in any way to the previous comment. Sherry (2014) views "disagreement as a productive mode of collaboration in which different perspectives are developed and revised in sociable tension with others" (p. 142). Xin and Feenberg (2006) emphasize that collaborative discourse necessitates participants interacting 'in pursuit of shared understanding and convergence" (p. 3). Thus, interaction with other participants is necessary to collaboration even if the interacting participants do not agree. As the goal of the community engagement involved collaboration, the lack of engagement between participants was significant.

**Table 8**

*Examples of the facilitator attempting to create interaction*

| |
|---|
| *Facilitator:* …Awesome! @Participant5 and @Participant1 what do you think the makerspace could do to help out a creator like Participant10 who is getting ready to "test" and market his work…?<br>Facilitator: … Hi Participant4, Participant1 and Participant10! You have some very interesting ideas relating to exploring the possibilities of the technology in the TRU Makerspace (as it relates to education, video games, books, robotics/coding, etc.) Could you three discuss how the TRU Makerspace could help users wanting to explore possibilities in this way? What are some things it could do to support teachers, researchers or those with individual innovative ideas wanting to explore possibilities? How could it support users initially as well as continue to enable them as they learn more and explore more? @Participant1 @Participant10 @Participant4 |

*Note: Participant usernames and names have been replaced within the excerpt with their participant numbers.*

### *Synchronous versus Asynchronous Discussion*

As shown in Figure 6, four participants posted four or more times on a single day. In three of these cases, this was attributable to a clustered discussion with the facilitator where the facilitator's response occurred within five minutes of a participant's post. This quick response prompted synchronous chat and greater engagement from participants. In the case of one participant, multiple posts occurred on the last day of the study as the participant reviewed and responded to multiple discussion threads. Although facilitator response within five minutes of a participant post did not guarantee a participant response, slower responses to posts by the facilitator resulted in delayed response from participants and generated less back and forth discussion. Although Heckman and Annabi (2005) found more lower order cognitive processes in synchronous, face-to-face discussion, analysis and review of the data did not indicate that asynchronous posts contained deeper cognitive processes. The lack of back and forth discussion that resulted from asynchronous communication was one of the factors that may have inhibited the

inquiry cycle.

### *Study Duration*

Another significant factor that may have inhibited the inquiry cycle was time. The study was only two weeks long and was supposed to take less than two hours of participants' time. As stated above, social and cognitive presence showed development through the study, however, analysis and integration of participant perspectives did not occur. It is possible that the study did not provide sufficient time for the social and cognitive processes to develop. Specifically, participants had not established a relationship with each other and the comfort level to question or analyze each other's ideas. This is necessary for the inquiry cycle as well as collaboration.

## Summary

In summary, the community of inquiry model supported community engagement within this study. While collaborative community engagement did not occur as participants did not engage in analysis or integration, cognitive processes were developing within the study and lower levels of community engagement were achieved. It appears that the development of cognitive processes was supported by the development of social processes although these processes do not appear linked to individual participant engagement. It is clear that facilitation presence differed from teaching presence, but was critical to the development and maintenance of social and cognitive presences.

Some of the factors that may have inhibited participants from completing analysis and integration, and thus the inquiry cycle, include: participant motivation, lack of engagement between participants, response timing in asynchronous discussion, and the overall time available to complete the study. This work suggests areas of focus for facilitators using the communities of inquiry framework to support online community engagement. In the next section, these ideas are explored.

# Chapter 5: Discussion and Recommendations

This study was focused on determining how the community of inquiry model facilitated online collaborative community engagement and if there were specific factors that inhibited the development of the community of inquiry model. The findings and discussion section detailed how the community of inquiry model supported the community engagement in this study through the development of the elements of the model. When examining this development, it was clear that in a community engagement setting, the facilitation presence differed from teaching presence. It was also apparent that although cognitive processes were developing, analysis and integration were not completed. Some potential inhibitions to the development of the community of inquiry that were examined include participant motivation, lack of engagement between participants, response timing in asynchronous discussion, and limited time available for the study.

In this section, I explore how the findings from this study can be applied to community engagement. These findings suggest that the community of inquiry model may require some adaptation when applied in a community engagement setting and that there are some recommendations for promising practice when facilitating online collaborative community engagement to mitigate factors that might inhibit the community of inquiry from forming. This section reviews the findings as they relate to the community of inquiry model being applied during online community engagement and presents recommended modifications to the model. Specifically, it addresses the differences observed between teaching presence in an educational setting and facilitator presence in a community engagement setting. Following this, some recommendations for the practice of online collaborative community engagement are discussed that further develop the study findings. Finally, the limitations of the study are explored and future work that could build on this study is suggested.

## Reviewing Findings in Relation to the Model

The community of inquiry model was created specifically to support online, constructivist learning (Garrison et al., 2000). Although the model's theoretical foundations and definition align well with community engagement as described in the literature review, the main goal of education is for students to acquire new knowledge,

skills, or attitudes (Ornstein & Hunkins, 2018) and the main goal of collaborative community engagement is "to partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution" (International Association for Public Participation, 2018, p. 1). Basically, education is focused on developing the students through experiences and engagement such as interactive lectures, discussions, and assignments such as projects or essays, but the product that they produce is often not used after the course as its purpose is to support learning and assessment (Boud & Soler, 2016; Xin & Feenberg, 2006). In community engagement, it is the discussion and resolutions that are captured that are of primary importance, rather than any changes that occur in participants' knowledge, skills, or attitudes as a result. Although learning occurs in a community engagement setting through the collaboration of community members, this is not the same as the formal course-based online learning for which the community of inquiry framework was developed. The learning that occurs during collaborative community engagement is beneficial and important to community engagement processes as it is often due to an increased understanding of the issue, new ideas that emerge, or increased empathy for stakeholders with other perspectives; however, it is not the primary goal of the process (International Association for Public Participation, 2018; Konsti-Laakso & Rantala, 2018). The difference can also be described by relating learning to acquisition and community engagement to participation (Goodyear et al., 2014). This difference in goals leads to different actions and focus by the facilitator and is the underlying reason behind observations within this study that the community of inquiry model may require modification when applied in a community engagement setting.

Certain changes in terminology were enacted within the coding framework prior to the study, as shown in Appendices 1 and 2, to reflect a facilitator presence rather than a teaching presence and participants rather than students. During coding and analysis, these terminology changes were found to be appropriate; however, some additional changes to the facilitator presence element within the model were deemed advisable when applying it in a community engagement setting. These recommended changes are discussed next.

### *Facilitator Presence: Modelling Social Presence*

As an outsider to the community, facilitator membership within the community is

conditionally and provisionally extended by members based on their perceptions of the facilitator's behavior (Hovmand, 2014). Therefore, unlike a course where the teacher has institutionally granted authority and membership to the class which students accept when they enroll, a facilitator in a community engagement setting does not hold the same power and membership privileges. This is because the "community" is not defined as the participants in the online experience, but more broadly based on the issue. This difference "requires a certain amount of self-awareness of one's own status and privilege, sensitivity to cultural diversity and how power and privilege operate within a community, and paying attention to distinctions that community members might draw between a definition of community imposed upon them and one that they can extend" (Hovmand, 2014, p. 8). For this reason, it is advisable for the facilitator to avoid showing preference or bias when discussing opinions or issues as indicating preference or bias may lead some community members to question the facilitator's inclusion in the group or stop engaging with the facilitator. During the study, in an instance where participants' perspectives differed, the facilitator expressed agreement with one of them with the intention of encouraging; however, as shown in Table 9, following this exchange, the participants did not respond further to this discussion thread.

**Table 9**

*Excerpt from group 1 discussion*

| |
|---|
| *Participant 5:* …There is a tendency for institutions attention to gravitate toward the capital purchase of equipment and not spend enough attention on a sustainable plan for staffing and programs… |
| *Facilitator:* …Great perspective *Participant 5*!... |
| *Participant 4:* I can't agree more with *@participant5* about mass purchase of the equipment and material for the makers lab, however I would suggest to provide guidelines brochures for each equipment that users can figure it out independently, also just as a suggestion, whenever the makers space has enough supply why not give schools an opportunity to borrow the material for specific class experiments… |
| *Facilitator: @participant4* What great ideas! I think it would be great if schools could also borrow the materials for class experiments. Do you think this should be done with a TRU maker or independently? Right now the makerspace has single items (i.e. three types of robots, but only one of each). Would use in an educational setting necessitate the purchase of class sets do you think? *@participant5* Right now the makerspace has only one of each type of machine. What are your thoughts on purchasing multiples to allow more than one student to work on a machine at once or to allow the machines to be used in a classroom setting? |
| *No further responses to this discussion thread by these participants. |

*Note: Participant usernames and names have been replaced within the excerpt with their participant numbers.*

Although the issues discussed within this community engagement were not emotionally tied or highly controversial, by engaging in interactive statements that expressed agreement and affective statements that disclosed the facilitator's opinion and perspective, the facilitator's neutrality may have been compromised in the eyes of participants. Operating from a neutral position also implies that the way the facilitator engages in social processes will be different from the way participants engage in them. However, it is still important for the facilitator to use social processes to develop positive rapport with the participants and to model social processes so that participants will also

use them as these processes promote positive interaction amongst the participants. As it is still recommended that the facilitator use social processes, but approach them slightly differently, it is recommended that a "Modelling Social Presence" category be added to the facilitator presence to highlight the importance of modelling processes as well as to allow the difference in how the facilitator engages in social processes.

### *Facilitator Presence: Facilitating Discourse and Directions & Instructions*

As discussed above, it is important for the facilitator to act as a neutral party and the goal of collaborative community engagement is not to educate participants (Hovmand, 2014; International Association for Public Participation, 2018). Therefore, it is recommended that indicators related to instruction found within the facilitating discourse and directions and instructions categories are removed or replaced with modified indicators more specific to community engagement. Although indicators within the model are only provided as examples rather than prescriptive components, it is important that these examples align with the facilitator's role in online community engagement and are sufficiently detailed as to support this role. Recommended changes to indicators related to instruction and found in the categories facilitating discourse and directions and instructions are detailed in Table 10. The remainder of this section will discuss the reasoning behind each recommended change.

**Table 10**

*Recommended modifications to indicators in the facilitating discourse and directions and instructions categories of the community of inquiry framework*

| Indicator: Definition | Change | New Indicatory: Definition |
|---|---|---|
| Present content: Facilitator presents materials and asks questions related to material. | Modify to focus on foundational, neutral facts. | **Present the issue & related research or facts: Facilitator presents the issue in a neutral way, providing basic facts or research to provide participants with common foundational knowledge.** |
| Asking questions: Facilitator asks questions on the material | Split into two more specific indicators. | **Ask questions to prompt additional discussion: Facilitator asks questions of participant to stimulate higher level discussion, deeper reflection, or consideration of alternate perspectives.**<br>**Ask questions to clarify a participant's perspective: Facilitator asks questions to clarify a participant's perspective that might be misinterpreted by other participants or is unclear.** |
| Confirm understanding through explanatory feedback | Remove | |
| Diagnose misconceptions | Remove | |
| Inject knowledge from diverse sources | Remove | |
| Assessing the efficacy of the process | Remove | |
| Drawing in participants, prompting discussion: Facilitator calls on participants to participate and includes everyone in the discussion | Add "redirecting questions" with definition. | Drawing in participants, prompting discussion, **redirecting questions**: Facilitator calls on participants to participate and includes everyone in the discussion, **redirecting non-technical or process related questions to other participants rather than answering.** |

**"Present content" changed to "Present the issue & related research or facts" and remove "Inject knowledge from diverse sources".** Although it may be relevant for the facilitator to share certain basic facts relating to community issues, it is important that the

information shared is presented in a neutral way. For this reason, the facilitator should closely examine external resources for bias. It may not be advisable to share resources prepared by other parties if they contain biased perspectives. Instead, it may be more beneficial for the facilitator to prepare a single fact-based reference using diverse resources that shows basic facts surrounding the issue. The goal of this resource is not to educate participants, but to provide a common knowledge foundation that participants can build discussion on (Xin & Feenberg, 2006). Creating this resource can be challenging and requires a good understanding of community perspectives so that the resource does not appear biased.

**"Ask questions" split into two specific indicators.** Although in a course, the teacher will ask questions to encourage deeper thinking related to learning objectives, in community engagement, the facilitator uses questions to prompt additional discussion or to clarify a participant's perspective. Prompting additional discussion is not aimed at eliciting specific responses, just more elaboration or deeper thinking by participants. These types of questions were used by the facilitator during the study as shown in Table 11.

**Table 11**

*Examples of asking questions*

| |
|---|
| **Example of asking questions to prompt additional discussion:**<br>*Facilitator:* … Keeping that in mind, what do you think would be the best way to train new users? Right now the Makerspace is doing one-on-one training by makerspace staff when someone comes into the space. Is this the best way to continue do you think or would it be better to run scheduled workshops or lessons for beginners? Or, should new users take some sort of training online to introduce them to safety and basic use for a specific machine prior to coming in? What do you think?<br>**Example of asking questions to clarify a participant's perspective:**<br>*Facilitator:* …When you talk about 3D modelling projects, do you mean modelling for use in virtual reality (i.e. designing VR environments), modelling things to print using the 3D printer or modelling to print and construct using the circuit machine (i.e. like cardboard 3D puzzles)? All of these sound really awesome to me, but I was just wondering what your specific interest was?... |

**"Confirm understanding through explanatory feedback" and "Diagnose misconceptions" removed.** An important difference between community engagement and teaching is that in community engagement, there are no incorrect responses, and the facilitator is not focused on having students learn specific information or processes. Because of this, confirm understanding through explanatory feedback and diagnose misconceptions were removed as they both focus on informing students of correct responses instead of listening to the perspectives of participants.

**Remove "Assessing the efficacy of the process."** Although it is important for participants to feel that their time is being well spent, it is also critical that participants feel that their voices and perspectives are being heard, acknowledged, considered, and when appropriate, incorporated into the final solution (Community Places, 2014; Department of Infrastructure, 2017; Involve, 2005; Social Planning and Research Council of British Columbia, 2013; U.S. Environmental Protection Agency, 2018). Although it may be necessary for the facilitator to ask questions to prompt additional discussion or clarify perspectives or to focus the discussion on specific issues to bring out additional perspectives or invite other participants into the discussion, deciding that the processes currently in use are not effective might lead to participants involved in these processes feeling as though their voices were being discounted. Within the study, there was one instance where the efficacy of a discussion might be questioned. Substantial discussion occurred with one participant around their personal projects. Although the facilitator tried gently and unsuccessfully to refocus this discussion on the trigger topic (how the makerspace could enable their goals rather than details about their personal projects), the participant wanted to share information about their personal projects. As the participant was encouraged by the facilitator to continue sharing, they disclosed a lot about their motivation to use the space. Although not a topic that was being deeply explored by the community engagement, the rich information provided a small window into the varied motivation that makers can have. If the facilitator had overtly questioned the efficacy of the discussion, the participant may not have shared this information. For this reason, facilitators may not wish to focus on efficacy as it might reduce the richness of personal stories being provided.

**Adding "redirecting questions."** During the study, some participants asked the

facilitator questions either to confirm if their ideas were acceptable or in some cases redirecting trigger questions to the facilitator to try to elicit the facilitator's opinion. As it is important for the facilitator to remain neutral, these questions were redirected to either another participant or the makerspace administrators. Additionally, the social dynamics of the group can also significantly impact participant participation and interaction and in some cases, participants may not feel comfortable responding to the questions of other participants (Duff, 2019; Harden et al., 2015). Redirecting questions can provide participants with a sense of agency as it shows that it is their voice that is important. Highlighting the importance of redirecting questions is the reason that this was added to one of the indicators.

### *Facilitator Presence: Design and Organization*

Indicators within the community of inquiry model for design and organization include setting curriculum and methods, indicators that apply to teaching rather than community engagement. Additionally, this category is not included within Heckman and Annabi's (2005) coding framework as it is considered an antecedent variable. However, design considerations are very important as elaborated in the recommendations for practice section which follows. So, in modifying the model for practitioners in the community engagement field to use it was felt that applicable indicators should be described. These indicators reflect the researcher's experience in designing and organizing the space for the study as well as some of the observations elaborated on in the results and recommendations for practice. For community engagement, it is important to design the online space, including selecting technological platforms based on their affordances and setting these up for participants. This is discussed further in recommendations for practice. Instead of a curriculum, within community engagement, participants go through an experience which includes some type of kick-off and trigger questions that occur over a set time period with a specific group. Synchronous events can also occur. Although some of these things can be altered by the facilitator as the engagement progresses, having a well thought out initial plan is important. Finally, as stated above, providing some neutral content that can act as a foundation for discussion is important and may require the facilitator to create this content. Design and organization is an important part of the facilitator's role in community engagement, but is approached differently in a

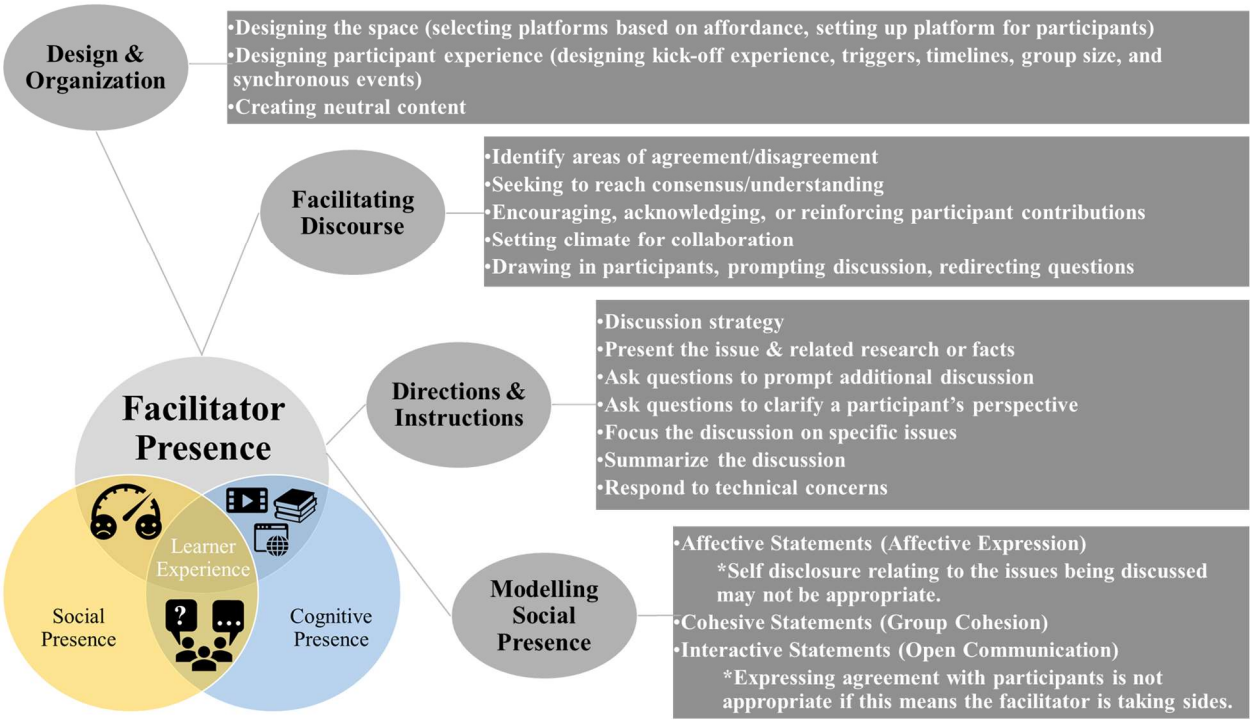
community engagement setting than in an education setting.

### *Proposed Community of Inquiry Framework for Community Engagement*

It is suggested that modifications to the community of inquiry framework, specifically to the facilitator presence element, could improve the framework's utility when applied in a community engagement setting. As discussed, these modifications include the addition of a modelling social presence category, modification of indicators in the facilitating discourse and directions and instructions categories that are related to instruction, and modification of indicators in the design and organization category to suit the community engagement context. The proposed framework is illustrated in Figure 7.

**Figure 7**

*Community of inquiry model modified for community engagement*




*Note.* Adapted with permission from *The first decade of the community of inquiry framework: A retrospective*, by Garrison, D. R., Anderson, T., & Archer, W., 2010, Copyright 2010 by Internet and Higher Education and "A content analytic comparison of learning processes in online and face-to-face case study discussions." by R. Heckman and H. Annabi, 2005, *Journal of Computer-Mediated Communication*, *10*(2), Appendix 1.

## Recommendations for Practice

Based on the data analysis and observations from this study, recommendations for practice have been generated. These recommendations reflect modifications proposed in Figure 7, specifically, they concern the design and organization of the community of inquiry and the facilitator's approach (embodied in indicators in the facilitating discourse, directions and instructions, and modelling social presence categories). This section discusses these recommendations along with related literature.

### *Design and Organization*

Recommendations for facilitators in terms of design and organization include considerations when choosing the technological platforms, reflection on inclusion of synchronous events, inclusion of deadlines, and consideration of the length of the engagement.

**Choice of Technology.** As discussed previously, design and organization of the community engagement space is an important job of the facilitator. The affordances and design of an online space shapes the way users interact with it and with each other which impacts the development of cognitive and social presence as well as the facilitator presence (Chen & Poquet, 2020; Heckman & Annabi, 2005). So, identifying what affordances are important and then using this to select the appropriate platform and determine how it will be used during the community engagement is an important part of design (Afzalan et al., 2017).

Within this study, two open-source platforms were selected and available for the facilitator to use, Mattermost, a chat tool, and Etherpad, a text-based wiki tool. The chat tool afforded text, images, or video posts to be shared in discussion threads. The text-based wiki tool afforded a single text-based model to develop and change over time. Although a wiki tool was available to the facilitator in this study, it was not used as eliciting participation in the discussion forum space was challenging and the facilitator suspected that adding an additional tool for participants to post in would not increase or enhance participation in the limited time available for the study. However, after examining the data from the study, it was apparent that participants did not analyze or integrate ideas, an important part of collaborative community engagement. As a chat tool, the discussion forum style communication in Mattermost did not easily afford an

integrated portrayal of developing ideas. Although participants may not have engaged with the wiki, literature suggests having a single model showing all of the participant's ideas and perspectives can help to structure and focus engagement and encourage analytical discussions leading to consensus (Hovmand, 2014; Konsti-Laakso & Rantala, 2018; Vaughan, 2008). Konsti-Laakso and Rantala (2018) discuss that such a model can be constructed by participants or by the facilitator based on participant response. So, in this short study in which participants' engagement is low, it may have been helpful for the facilitator to create and keep a central model or graphical representation up to date to reflect participant input. Some examples of these types of models include text-based wikis, causal loop diagrams, or stock and flow diagrams (Hovmand, 2014; Konsti-Laakso & Rantala, 2018; Vaughan, 2008). There are numerous methods that can be used to facilitate cocreation of models by participants including problem structuring methods and community-based system dynamics (Hovmand, 2014; Konsti-Laakso & Rantala, 2018). Due to the flexibility of the community of inquiry framework, these methods could be used within it. So, it is recommended that in designing collaborative community engagement, technology is selected that affords discussion as well as development of collective portrayals of participant ideas and perspectives.

Another factor which facilitators may wish to consider when selecting platforms is the use of open technology. Not only is this technology cost effective, but the principles that support the development and provision of open source code are the same foundational social justice principles that support community engagement practices (International Association for Public Participation, 2017; Sullivan, 2011). By using open source technology, the community engagement effort is supporting "cultural, political, and economic egalitarianism" (Sullivan, 2011, p. 232) which is often the foundation of collaborative community engagement, to give community members equal voice and influence on issues.

**Synchronous Events.** As discussed in the results, participants' interaction with each other was minimal and most discussions occurred between the facilitator and individual participants even when the facilitator attempted to draw other participants into the discussion. Although the goal of this research was to support asynchronous online collaboration, literature suggests that group performance, individual motivation, and

collaboration is improved when group members have the opportunity to meet synchronously or face-to-face (Michinov & Michinov, 2008; Vaughan et al., 2013). Group identity and social processes can also be strengthened by synchronous dialogue (Michinov et al., 2004). A synchronous event could occur via group video chat or text chat and could involve the whole group or small sub-groups (Goodyear et al., 2014; Michinov et al., 2004). Michinov and Michinov (2008) studied online collaborative tasks and suggested that midway through a course or group project may be the best time to have a synchronous or face-to-face event rather than as a kick-off event. However, although their study showed that this can positively affect participation and social interaction, it did not compare groups with differently timed synchronous events (Michinov & Michinov, 2008). Therefore, in designing the participant experience, facilitators may wish to consider synchronous events for time periods they feel will benefit from an increased participation and social presence.

**Timing and Scheduling.** As shown in Figures 5 and 6, numerous posts occurred within the last several days of the study. In group one, reminding participants that it was the second last day of the study may have prompted one participant to login and post two lengthy replies to questions from the facilitator. In group two, two participants logged in and posted replies to all the questions directed at them following a reminder that it was the last day of the study. This behavior is consistent with literature in behavioral economics that shows deadlines can promote action, especially when the deadline is aligned with general goals of the participant (Jiang & Albarracín, 2019). For this reason, it may be advisable to communicate deadlines to participants, for example, stating that topic 1 will be the focus of the group's discussion until a specific date when the focus will shift to a second topic. This type of communication was not employed within the study but may have been helpful in providing smaller deadlines (aside from the end of the study).

**Length of the Community Engagement.** Although many considerations will impact the length of time allocated to complete the community engagement such as deadlines related to the issue, available funding, etc., it is important when planning asynchronous collaborative events to remember that substantially more time must be allocated to allow for responsive dialogue to occur. Although during planning, two weeks seemed like a

substantial time period, as three topics were being covered, I felt that more time would have been beneficial to the development of collaborative processes.

### *Facilitator's Approach: Facilitating Discourse, Directions & Instructions, and Modelling Social Presence*

During community engagement, the facilitator must make choices relating to how they engage in facilitating discourse, providing directions and instruction, and modelling social presence. This engagement will vary for many reasons. One important issue is the level of motivation of participants. Another issue is the goal of the community of inquiry and the completion of the inquiry cycle.

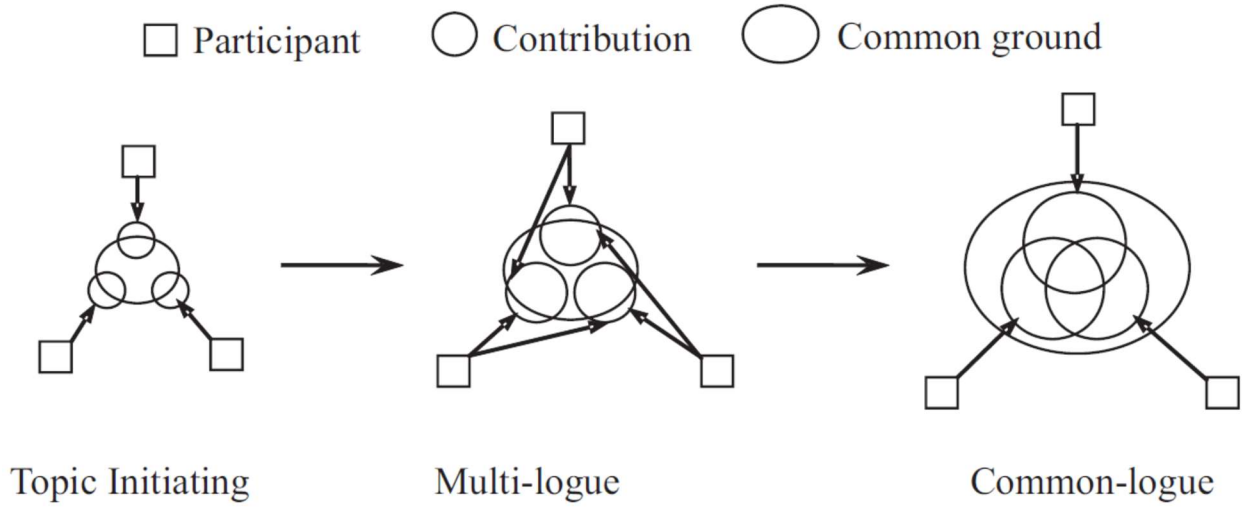
**Motivation of Participants.** Although in this study participant motivation appeared to be relatively low based on engagement, participant motivation in community engagement will vary depending on the issue and approach (Community Places, 2014). For example, Engeström (2009) presents the concept of "wildfire activities" which are communities or discussion groups that crop up repeatedly and revolve around an activity that sustains deep interest of participants. Examples are birding and skateboarding. In these groups where participants have a deep personal interest, there is no need for any external motivation and participants devote extensive time to the discussion group because of their personal interest. DeLuca (2018) discussed the same phenomenon in fandom communities where for no external reward, participants contribute their own writing and debate topics. Again, personal passion provides intrinsic motivation and leads to high time expenditure. Both fandom communities and wildfire activities can take place in "affinity spaces" which Gee (2005) has discussed in terms of certain characteristics including a common endeavour, no segregation based on skill or seniority, the ability for contributors to influence the endeavour they participate in, and encouraging collaborative knowledge building. This idea is extended by Green (2020) who talks about "affinity groups" in schools. When students identify themselves as belonging to a group, and when they are permitted to get together in that group to talk about their shared identity and interest, it is then that their discussion can develop into action. In wildfire activities, fandom communities, affinity groups, and affinity spaces, participants build on the work and ideas of others, exploring various topics with little facilitation or direction (DeLuca, 2018; Engeström, 2009; Gee, 2005; Green, 2020). A facilitator's approach to these

situations where participants are highly passionate may be more focused on mediation or prompting integration of ideas rather than prompting engagement as is the case when motivation is low. Therefore, facilitators may wish to study participant behavior and vary their approach based on their engagement. Although motivation to participate can be high when participants are passionate and such communities may require little facilitation to promote discourse, more facilitation may be necessary to promote the completion of the inquiry cycle and support collaborative community engagement.

**Completion of the Inquiry Cycle.** Participants within this study did not complete the inquiry cycle. Although this may be due to several reasons, literature was reviewed to determine recommended practices to help guide participants through the inquiry process. Xin and Feenberg (2006) describe the inquiry cycle as one in which "communication deepens through a series of attempts to explain, verify, repair, and confirm the subject of discussion" (p. 12) as shown in Figure 8. They suggest that the cycle should end by sharing a representation or artifact showing the new knowledge produced, further supporting the production of a central model or graphical representation as discussed (Xin & Feenberg, 2006). Xin and Feenberg (2006) and Vaughan et al. (2013) discuss that presenting an agenda showing clear expectations of how participants will engage in the inquiry process as well as the expected outcome of the process early in the experience is important. They recommend that participants "should be formally introduced to the inquiry process and be expected to monitor their contributions and activities" (Vaughan et al., 2013, p. 34). Although this approach may put too much responsibility on the participants for a community engagement effort, providing a general statement of the participant's expected actions during each stage of the inquiry cycle as it relates to the topic may help participants prepare for analysis and integration.

**Figure 8**

*The inquiry cycle shown as a discourse model*




*Note.* Reprinted from "Pedagogy in cyberspace: The dynamics of online discourse' by C. Xin and A. Feenberg, 2006, *Journal of Distance Education,* 21(2), 13. Open access journal, no permission required for reprinting.

**Limitations of the Study**

Although this study provided insight into how the community of inquiry can enable online collaborative community engagement, there were some limitations to the study. As it was important for us to directly examine discourse, we chose not to capture participant reflections through surveys such as the validated survey associated with the community of inquiry. As surveys were not used, some of the interpretations of the data are speculative such as discussions related to participant motivation. In addition, although this was a good community engagement opportunity, the pilot makerspace program was closed due to COVID-19 when recruitment efforts occurred and there was some difficulty recruiting participants which may indicate that participants were not eager for the opportunity to discuss these issues as is the case with community engagement initiatives where participants have strong opinions or where participants feel the outcome of the engagement will have a powerful affect on their lives. In addition to these limitations, the study was limited in time to two weeks to encourage participation and to ensure the study could be completed within the funding window the researcher had. The study also did not

provide comparison to in-person community engagement or synchronous community engagement due to COVID-19 and the difficulty recruiting sufficient participants.

**Future Work**

This study has demonstrated how the community of inquiry can support online collaborative community engagement, but it has also identified some impediments to the establishment of the community of inquiry. Through the study, a modified framework as well as recommendations for practice have been developed. The next step would be to test this framework. It would be useful to apply the modified community of inquiry framework and recommendations for practice in a longer study where community members are more emotionally invested in the issues being discussed to determine if in this situation participants complete the inquiry cycle. In a longer study, it would also be valuable to have some feedback from participants relating to their experience in the community of inquiry and their personal motivation, for example through surveys such as the community of inquiry survey validated by Arbaugh et al. (2008).

# Chapter 6: Conclusion

Through the study of two groups of participants engaged in a two-week discussion forum about the university makerspace designed using the community of inquiry framework, how the community of inquiry facilitated collaborative community engagement in this online, asynchronous space and the impediments to the establishment of the community of inquiry model were explored. Overall, the community of inquiry model supported community engagement as the facilitator and design aided the development of social and cognitive presences. Although cognitive presence did develop, participants did not engage in analysis or integration and thus community engagement was limited to the "involve" or "consult" level rather than the targeted "collaboration" level. It was also observed that facilitation in a community engagement setting differed significantly from teaching. Some factors within the study may have inhibited the development of the community of inquiry framework, specifically the completion of inquiry cycle. Potential inhibiting factors included participant motivation, lack of engagement between participants, response timing in asynchronous discussion, and the overall time available to complete the study. In response to the results and observations, a modified community of inquiry model was proposed for use in a community engagement setting. The modified model included terminology specific to the community engagement setting and changing the teaching presence to a facilitation presence to reflect the difference in the goals of education and the goals of community engagement. Additionally, promising practices were suggested for applying the community of inquiry framework in a community engagement setting that might better support completion of the community inquiry cycle. These included recommendations relating to choosing appropriate software, reflection on inclusion of synchronous events, inclusion of deadlines, consideration of the length of the engagement, and how a facilitator's approach might vary based on perceived participant motivation.

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**Appendix 1 – Data Coding Framework**

*Data coding framework showing first and second level categories with indicators and definitions adapted to fit a community engagement context. Inductive coding shown in blue.*

| Category Level 1 | Category Level 2 | Indicators | Definition |
|---|---|---|---|
| Social Process: Thematic Unit | Affective Response (Rourke et al.) | Emotional expression (Garrison et al.; Rourke et al.)<br>*Optional Subcategory: Emoji | Expression of emotion; includes repetitious punctuation, conspicuous capitalization, emoticons. |
| | | Use of humor (Rourke et al.) | The use of teasing, cajoling, irony, understatements, and sarcasm. |
| | | Self-disclosure (Rouke et al.) | Presents details of their life or expresses vulnerability. |
| | Cohesive Response (Rourke et al.) | Vocatives (Rouke et al.)<br>*Subcategories:<br>• Actual first name<br>• @name<br>• own name | Addressing or referring to participants by name. |
| | | Phatics, salutations (Rouke et al.) | Communication that serves a purely social function, greetings, closures. |
| | | Addresses or refers to the group using inclusive pronouns (Rouke et al.)<br>*Subcategories:<br>• @all<br>• “everyone” or “all” | Addresses the group as we, us, our, group. |
| | Interactive Response (Rourke et al.) | Continuing a thread (Rouke et al.)<br>*Subcategories:<br>• reply feature<br>• reply using @ | Uses reply features of software, rather than starting a new thread. |
| | | Quoting from others' messages (Rouke et al.) | Quotes others’ messages or responses. |

| Category Level 1 | Category Level 2 | Indicators | Definition |
|---|---|---|---|
| Social Process: Thematic Unit | Interactive Response (Rourke et al.) | Referring explicitly to others' messages (Rouke et al.) | Direct references to contents of others' posts. |
| | | Complimenting, expressing appreciation (Rouke et al.) | Complimenting others or content of others' messages. |
| | | Expressing agreement (Rouke et al.) | Expressing agreement with others or content of others' messages. |
| | | Asking questions (Rouke et al.) | Participants ask questions of other participants or the facilitator. |
| Cognitive Process: Thematic Unit | Exploration (Garrison et al.) | Rote factual response | States basic information from material or adds to previous comment. |
| | | Triggering event (Garrison et al.) | Start of the discussion or topic, sense of puzzlement, transition, and initiation into new line of thought. |
| | | Information exchange (Garrison et al.) | Basic information and brainstorming. Presentation of new ideas to group. |
| | Analysis | Analysis | Presents argument or applies framework to evaluate situation. |
| | | Simple clarification (Aviv) | Identifies previously stated ideas and reformulates the issue. |
| | | Deep clarification (Aviv) | Identifies hidden assumptions and needed information |
| | Integration (Garrison, et al.) | Connecting ideas (Garrison et al.) | Use of metaphors, analogies, and explicit similes and relationships. |
| | | Inference (Aviv) | Makes inferences linked to previously proposed ideas. |
| | | Judgment (Aviv) | Makes evaluation of others' ideas. |
| | | Resolution (Garrison et al.) | Applies new ideas, coming to conclusions and recommendations. |

| Category Level 1 | Category Level 2 | Indicators | Definition |
|---|---|---|---|
| Facilitating Process: Thematic Unit | Directions and Instructions (Anderson et al.) | Discussion strategy (Aviv) | Explicit discussion of what the participants and the facilitator do to proceed. Procedural rather than substantive. |
| | | Present content (Anderson et al.) | Facilitator presents materials and asks questions related to material. |
| | | Ask questions | Facilitator asks questions on the material. |
| | | Focus the discussion on specific issues (Anderson et al.) | Participant or facilitator focuses discussion by directing attention to particular concepts or information. |
| | | Summarize the discussion (Anderson et al.) | Participant or facilitator summarizes the discussion to develop and explicitly delineate the context. |
| | | Confirm understanding through explanatory feedback (Anderson et al.) | Participant or facilitator analyzes participants' comments and provides explanatory feedback to confirm understanding. |
| | | Diagnose misconceptions (Anderson et al.) | Participant or facilitator provides clarification and corrects participants' misconceptions. |
| | | Inject knowledge from diverse sources (Anderson et al.) | Participant or facilitator provides knowledge from difference sources (e.g., product manuals, articles, internet) and provides pointers to the sources. |
| | | Responding to technical concerns (Anderson et al.) | Facilitator or participant responds to technical questions. |

| Category Level 1 | Category Level 2 | Indicators | Definition |
|---|---|---|---|
| Facilitating Process: Thematic Unit | Facilitating Discourse (Anderson et al.) | Identifying areas of agreement/disagreement (Anderson et al.) | Facilitator or participant identifies areas of contradictions and agreements. |
| | | Seeking to reach consensus/understanding (Anderson et al.) | Participant and facilitator articulate consensus and shared understanding. |
| | | Encouraging, acknowledging, or reinforcing participant contributions (Anderson et al.) | Facilitator acknowledges and encourages participants and their contributions. |
| | | Assessing the efficacy of the process (Anderson et al.) | Facilitator moves the conversation along and ensures effective and efficient use of time. |
| | | Setting climate for collaboration (Anderson et al.) | Facilitator creates an environment that is not threatening and encourages sharing of ideas. |
| | | Drawing in participants, prompting discussion (Anderson et al.) | Facilitator calls on participants to participate and includes everyone in the discussion. |
| | Modelling Social Processes | Affective Response | *Subcategories and definitions mirror those of the social process category |
| | | Cohesive Response | |
| | | Interactive Response | |
| Discourse Process: Message/ Utterance Unit | Target/Speaker | Non-responsive (Aviv) | Statements that do not include a response (but are relevant). |
| | | Response to facilitator (Aviv) | Response to message/comment made by facilitator. |
| | | Response to participant (Aviv) | Response to message/comment made by another participant. |
| | | Response to participant by facilitator | Response to message/comment made by participant by the facilitator. |
| | | Participant | Utterance by participant. |

| Category Level 1 | Category Level 2 | Indicators | Definition |
|---|---|---|---|
| Discourse Process: Message/ Utterance Unit | Target/Speaker | Facilitator | Utterance by facilitator. |
| | Discourse Characteristics | Informal | Slang vocabulary, sentence fragments, insecure feelings or thoughts as opposed to complete sentences, complete thoughts |
| | | Passive voice (sentence) | Action performed upon the speaker or specified participant. |

*Note.* Adaptions made prior to data analysis are shown in Appendix 2. Additions of inductive coding are shown in blue. Adapted with permission from "A content analytic comparison of learning processes in online and face-to-face case study discussions." by R. Heckman and H. Annabi, 2005, *Journal of Computer-Mediated Communication*, *10*(2), Appendix 1.

## Appendix 2 – Modifications to the Coding Framework

*Modifications to the coding framework (Heckman & Annabi, 2005) to fit the community engagement context.*

| Category 1 | Category 2 | Indicator: Definition | Change | New Indicatory: Definition |
|---|---|---|---|---|
| **Social Process: Thematic Unit** | Affective Response | Self-disclosure: Presents details of life outside of class or expresses vulnerability. | delete "outside of class" add "their" | Self-disclosure: Presents details of **their** life or expresses vulnerability. |
| | Interactive Response | Asking questions: Students ask questions of other students or the moderator. | Students -> Participants, Moderator -> Facilitator | Asking questions: **Participants** ask questions of other **participants** or the **facilitator**. |
| **Cognitive Process: Thematic Unit** | Analysis | Simple clarification: Identifies previously stated hypotheses and reformulates the problem | Hypotheses -> Ideas, Problem -> Issue | Simple clarification: Identifies previously stated **ideas** and reformulates the **issue**. |
| **Teaching Process: Thematic Unit** | N/A | N/A | **Teaching** Process -> **Facilitating** Process | |
| **Facilitating Process: Thematic Unit** | Direct Instruction | N/A | **Direct Instruction** -> **Directions and Instructions** | |
| | Directions and Instructions | Discussion strategy: Explicit discussion of what the students and the teacher do | Students -> Participants, Teacher -> Facilitator | Discussion strategy: Explicit discussion of what the **participants** and the |

| Category 1 | Category 2 | Indicator: Definition | Change | New Indicatory: Definition |
|---|---|---|---|---|
| | | to proceed. Procedural rather than substantive. | | **facilitator** do to proceed. Procedural rather than substantive. |
| | | Present content: Instructor presents materials and asks questions related to material. | Instructor -> Facilitator | Present content: **Facilitator** presents materials and asks questions related to material. |
| | | Ask questions: Instructor asks questions on the material. | Instructor -> Facilitator | Ask questions: **Facilitator** asks questions on the material. |
| | | Focus the discussion on specific issues: Student or instructor focuses discussion by directing attention to particular concepts or information. | Student -> Participant, Instructor -> Facilitator | Focus the discussion on specific issues: **Participant** or **facilitator** focuses discussion by directing attention to particular concepts or information. |
| | | Summarize the discussion: Student or instructor summarizes the discussion to develop and explicitly delineate the context. | Student -> Participant, Instructor -> Facilitator | Summarize the discussion: **Participant** or **facilitator** summarizes the discussion to develop and explicitly delineate the context. |
| | | Confirm understanding through assessment and explanatory feedback: Student or instructor assesses students' comments and provides explanatory feedback to confirm understanding. | Delete “assessment and”, Student(s) -> Participant(s), Instructor -> Facilitator, Assesses -> Analyzes | Confirm understanding through explanatory feedback: **Participant** or **facilitator analyzes participants'** comments and provides explanatory feedback to confirm understanding. |
| | | Diagnose misconceptions: Student or instructor provides clarification and | Student(s) -> Participant(s), Instructor -> Facilitator | Diagnose misconceptions: **Participant** or **facilitator** provides clarification and |

| Category 1 | Category 2 | Indicator: Definition | Change | New Indicatory: Definition |
|---|---|---|---|---|
| | | corrects students' misconceptions. | | corrects **participants**' misconceptions. |
| | | Inject knowledge from diverse sources: Student or instructor provides knowledge from difference sources (e.g., textbooks, articles, internet) and provides pointers to the sources. | Student -> Participant, Instructor -> Facilitator, Textbooks -> Product manuals | Inject knowledge from diverse sources: **Participant** or **facilitator** provides knowledge from difference sources (e.g., **product manuals**, articles, internet) and provides pointers to the sources. |
| | | Responding to technical concerns: Instructor or student responds to technical questions. | Student -> Participant, Instructor -> Facilitator | Responding to technical concerns: **Facilitator** or **participant** responds to technical questions. |
| | Facilitating Discourse | Identifying areas of agreement/ disagreement: Instructor or student identifies areas of contradictions and agreements. | Student -> Participant, Instructor -> Facilitator | Identifying areas of agreement/ disagreement: **Facilitator** or **participant** identifies areas of contradictions and agreements. |
| | | Seeking to reach consensus/ understanding: Student or instructor articulate consensus and shared understanding. | Student -> Participant, Instructor -> Facilitator | Seeking to reach consensus/ understanding: **Participant** or **facilitator** articulate consensus and shared understanding. |
| | | Encouraging, acknowledging, or reinforcing student contributions: Instructor acknowledges and encourages students and their contributions. | Student -> Participant, Instructor -> Facilitator | Encouraging, acknowledging, or reinforcing **participant** contributions: **Facilitator** acknowledges and encourages **participant** and their contributions. |

| Category 1 | Category 2 | Indicator: Definition | Change | New Indicatory: Definition |
|---|---|---|---|---|
| | | Assessing the efficacy of the process: Instructor moves the conversation along and ensures effective and efficient use of time. | Instructor -> Facilitator | Assessing the efficacy of the process: **Facilitator** moves the conversation along and ensures effective and efficient use of time. |
| | | Setting the climate for learning: Instructor creates an environment that is not threatening and encourages sharing of ideas. | Learning -> Collaboration<br>Instructor -> Facilitator | Setting the climate for **collaboration**: **Facilitator** creates an environment that is not threatening and encourages sharing of ideas. |
| | | Drawing in participants, prompting discussion: Instructor calls on students to participate and includes everyone in the discussion. | Student -> Participant,<br>Instructor -> Facilitator | Drawing in participants, prompting discussion: **Facilitator** calls on **participants** to participate and includes everyone in the discussion. |
| **Discourse Process: Message/ Utterance Unit** | Target/Speaker | Response to tutor: Response to message/comment made by instructor. | Instructor -> Facilitator<br>Tutor -> Facilitator | Response to **facilitator**: Response to message/comment made by **facilitator**. |
| | | Response to learner: Response to message/comment made by another student/learner. | Student/Learner -> Participant | Response to **participant**: Response to message/comment made by another **participant**. |
| | | Student: Utterance by student. | Student -> Participant | **Participant**: Utterance by **participant**. |
| | | Teacher: Utterance by instructor. | Teacher -> Facilitator<br>Instructor -> Facilitator | **Facilitator**: Utterance by **facilitator**. |

**Appendix 3 – Recruitment E-mail**

Good Day!

We are reaching out to you because you indicated that you were interested in helping improve the Makerspace. We are running Makerspace Communities of Inquiry designed to improve the makerspace and contribute to research aimed at reducing barriers in community engagement. In addition to helping the university community and community engagement organizations, you will also be entered into a draw to win a (__gift card description__)!

To participate, you will be asked to sign up using the link below for an online session (pick that dates that work for you!) During the session, you will be learning more about the Makerspace, sharing ideas, listening to others and problem solving together. The researchers will be looking at your activity (such as group discussions and interactions) in the Makerspace community of inquiry to help us understand if the online environment helped you to work together as a team. The group solutions that are created will also be used to improve the Makerspace as well as contributing to research about the Makerspace. The Makerspace community of inquiry will take under two hours of your time (spread out over 2 weeks).

Please use this link to sign up for a session: (__link__)

Thank you in advance for participating! If you have any questions, please do not hesitate to contact me at weaverL18@tru.ca or 819-209-3429.

I look forward to working with you!

*Lorri Weaver*
MEd Student
weaverL18@tru.ca
819-209-3429

## Appendix 4 – Makerspace Community of Inquiry Design

Consistent with Heckman & Annabi (2005), online Communities of Inquiry will use facilitated discussion. Facilitated discussion will be broken up into six 15-20 min time blocks. The online participants would login approximately 1 time every 2 days to contribute or more frequently for smaller amounts of time. Initial questions that will be posed are given below. Examples of prompting questions and facilitation notes which may be used to encourage discussion are also given. Both groups will be sent a welcome e-mail shown in Appendix 3 approximately 3-5 days before the start of the session which will allow them to consider the first few questions.

| Main Idea | Time Block | Initial Question(s) | Examples of Prompting Questions and Facilitation Notes |
|---|---|---|---|
| Personal and professional use of the makerspace (content and technology) and how the makerspace can enable future goals. | 0:00-15:00 | To help your team get to know you, we would like to hear about how you used the makerspace (i.e. something you made, explored, learned or facilitated relating to the space).<br>We would also like to know about personal or professional goals that you have related to the makerspace (i.e. how do you see the Makerspace helping you in the future?)<br>**The responses are used in the next time block.* | • Individual introductions<br>• Facilitator will write summary notes or responses related to personal or professional goals that will be used in the next time block.<br>• Facilitator will prompt response if both questions are not answered.<br>• Facilitator will acknowledge similarities in the participant's responses (e.g. "That is such an interesting project Bill! Both you and Suzan have really explored the whole design process to make unique projects.") |
| | 15:00-30:00 | What improvements, services or changes at the Makerspace do you think would help others in the group accomplish their goals? | • Facilitator will prompt the group to look at common factors related to goals and goals individually (e.g. "Several of you mentioned that you want to use what you learn in your future employment. What things would help enable this?" or "Sarah said that she wants to develop a prototype for a puzzle toy to be 3D printed. What things could help support her in this?") |

| | | | |
|---|---|---|---|
| Training and access | 30:00-50:00 | A summary of current equipment in the makerspace, what is safety critical, and what is necessary to know to ensure the equipment is not broken will be provided by facilitator. Then these questions will be asked:<br>As users of the makerspace, do you think that there is anything else a first-time user must know before they use the equipment?<br>Can you share the links for some resources that you feel could help someone learning to use the equipment and software in the makerspace?<br>**The responses are used in the next time block.* | • Individuals will be given time to explore online resources (potentially ones that they themselves used) and post links they feel are valuable.<br>• Based on time, facilitator may also prompt group members to comment on the resources posted by others. |
| | 50:00-90:00 | Based on your explorations and experience, as a group, please explore what the minimum training that you think people require to safely use the equipment without damaging it?<br>How do you think this training should be completed?<br>How should we recognize training that people have received (i.e. badges, certificates, list of trained people)? | • Facilitator will prompt group discussion (e.g. "That is an interesting perspective Sally, Fred what do you think?")<br>• Based on time, the following additional questions may be explored:<br>  • How could the Makerspace support leadership within its users?<br>  • What roles could Makerspace users have?<br>  • How would these roles and associated responsibilities be assumed? |
| Accessibility and Diversity | 90:00-105:00 | What does the Makerspace need to look like to make sure that everyone can have a positive experience in the space? | • Facilitator will prompt participants to consider factors such as program or level of study, gender identity, nationality, role at the university, and economic status or background (e.g. "How should the makerspace be set up to ensure that all students and faculty, regardless of their economic status can use the space?") |

## Appendix 5 – Welcome E-mail for Online Makerspace community of inquiry Participants

***Please note that participants that sign up for the online Makerspace community of inquiry will complete an online consent form when they sign up. They will be sent a copy of the consent form electronically following their consent.

Good Day!

Thank you very much for volunteering to participate in the online Makerspace community of inquiry from (__start date__) – (__end date__). Your participation will help us improve the Makerspace and contribute to research aimed at reducing barriers in community engagement. To thank you for your time, you will also be entered into a draw to win a (__gift card description__).

You have already given your consent electronically when you signed up for this session, however, if you have any questions related to the study or the consent process, please do not hesitate to contact me at weaverL18@tru.ca or 819-209-3429.

Please follow the instructions below when logging in to the online space for the first time. After you have logged in, we would like you to check out who else will be part of the experience (look at introductions that have been posted) and then reply to introduce yourself by sharing how you used the makerspace (we would love to see a picture of one of your projects!) We would also like you to share any personal or professional goals that you have related to the makerspace (i.e. how do you see the makerspace helping you in the future). If you have not used the makerspace, please briefly share your area of expertise related to the makerspace.

We are going to be using a chat tool called Mattermost. You can join by clicking the link below and then creating an account name and password.
**NOTE: this link should only be clicked on a laptop or desktop machine. Using a phone or Tablet may cause errors.** (_____user sign up link_____)

Once the account is created, Mattermost works well on mobile devices, including apps if you want them. The tool itself is quite user friendly, but if you need any help, it has a good online reference (or you can ask me questions).
https://docs.mattermost.com/help/getting-started/welcome-to-mattermost.html#the-basics

If for some reason, you do not receive a confirmation email after registering, please select the "I forgot my password" link on the login screen and you should receive the e-mail.

If you have any questions, please do not hesitate to contact me at weaverL18@tru.ca or 819-209-3429. I look forward to meeting you online!
*Lorri Weaver*
MEd Student
weaverL18@tru.ca
819-209-3429

## Appendix 6 – Research Ethics Board Approval

**do-not-reply-TRU@researchservicesoffice.com** <do-not-reply-TRU@researchservicesoffice.com> Tue, Apr 21, 2020 at 2:01 PM
To: "Harrison Michelle (Faculty Supervisor)" <mharrison@tru.ca>, "May Erin (Co-Investigator)" <emay@tru.ca>, "Rees Carol(Faculty Supervisor)" <crees@tru.ca>, "Sayre Franklin(Co-Investigator)" <fsayre@tru.ca>, Lorraine Weaver <weaverl18@mytru.ca>
Cc: "truromeo@tru.ca" <truromeo@tru.ca>, "do-not-reply-TRU@researchservicesoffice.com" <do-not-reply-TRU@researchservicesoffice.com>


April 21, 2020

Mrs. Lorraine Weaver
Faculty of Education and Social Work\Education
Thompson Rivers University

File Number: 102368
Approval Date: April 21, 2020
Expiry Date: April 21, 2021

Dear Mrs. Lorraine Weaver,

The Research Ethics Board has reviewed your application titled 'Engaging Communities in Problem Solving through Online Communities of Inquiry (CoI): TRU Makerspace'. Your application has been approved. You may begin the proposed research. This REB approval, dated April 21, 2020, is valid for one year April 21, 2021.

Throughout the duration of this REB approval, all requests for modifications, renewals and serious adverse event reports are submitted via the Research Portal. To continue your proposed research beyond April 21, 2021, you must submit a Renewal Form before April 21, 2021. If your research ends before April 21, 2021, please submit a Final Report Form to close out REB approval monitoring efforts.

If you have any questions about the REB review & approval process, please contact the Research Ethics Office via 250.852.7122. If you encounter any issues when working in the Research Portal, please contact the Research Office at 250.371.5586.

Sincerely,
Joyce O'Mahony
Chair, Research Ethics Board

## Appendix 7 – Participant Consent

All participants completed the consent process using a survey through the university's SurveyMonkey application. They were provided with the following information relating to consent. They indicated their consent by selecting the appropriate checkboxes shown in the appendix as □.

Please review this information as part of the consent process for the study:

***Study Title***: **Engaging Communities in Problem Solving through Online Communities of Inquiry (CoI): TRU Makerspace**

***Researchers***:
Lorraine Weaver, Master of Education Student, 819-209-3429, weaverL18@tru.ca
Dr. Carol Rees, Associate Professor Faculty of Education and Social Work, 250-828-5004, Crees@tru.ca
Dr. Michelle Harrison, Senior Instructional Designer Open Learning, 250-852-7000, mharrison@tru.ca
Mr. Franklin Sayre, Librarian and Makerspace Administrator, 250-852-7127, fsayre@tru.ca
Ms. Erin May, Librarian and Makerspace Administrator, 250-377-6055, emay@tru.ca

***Background***:
You are being invited to participate in this study because you have used the TRU Makerspace (as a faculty or student) or have subject matter expertise related to the Makerspace (technology, training or set-up). During this study you will participate in an in-person or online focus group with the goal of contributing to the improvement of the TRU Makerspace. In addition to helping improve the Makerspace, the results of this study will be used in support of my thesis. You are encouraged to ask questions of the researchers (contact information above) if you feel anything needs to be made clearer. You will be given an electronic copy of this form for your records.

***Purpose***:
The purpose of this research is:

1. to explore interactions and inquiry in online and face to face settings; and,
2. to explore questions relating to the TRU Makerspace.

***Procedures:***
As part of this research, you will be part of a team of people working together to develop solutions to questions related to the TRU Makerspace. You will meet your team, the researchers and a member of TRU Makerspace in the online space. You will be asked to spend approximately 1.75 hours of your time spread out over the course of 2 weeks. Initially, you will create a user account and introduce yourself to your group. Then, you will spend about 1.5 hours (about 10-20 minutes at a time) learning more about the Makerspace, sharing ideas, listening to others and problem solving together. The researchers will be looking at your activity (such as group discussions and interactions) in

the online community to help us understand if the online environment helped you to work together as a team. The group solutions that are created will be considered to improve the TRU Makerspace as well as contributing to research about the TRU Makerspace. Transcripts and data from this research will be kept electronically on password protected computers and deleted after five years.

***Results:***
Results of this research will be published and presented as part of my thesis. They may also be published in academic journals or presented to interested parties. Quotations from the focus groups may be used within reports, published works or presentations of the results.

***Benefits:***
Being a part of this study will allow your voice and opinion to be heard and give you the opportunity to improve the TRU Makerspace. If the online framework we have used allows community teams to collaborate, it will give community organizations a way to work together with people online who have trouble coming to in-person events. It will give people who can not come to in-person events an opportunity to participate in the same way as other community members, giving them a stronger voice.

***Risks:***
We have not identified any risks to your participation in this study; however, if we learn anything during the research that may affect your willingness to continue being in the study, we will tell you right away.

***Renumeration:***
To thank you for your time, you will be given the option of participating in a draw for a gift card valued at $100.

***Voluntary Participation:***
You are under no obligation to participate in this study. The participation is completely voluntary. Even if you agree to be in the study, you can change your mind and withdraw at any time. If you withdraw, the data collected up to that point will be included in the study unless you request that the segments of your voice be removed from the transcript.

***Confidentiality & Anonymity:***
As you will be contributing ideas relating to the TRU Makerspace, you can choose to have your contribution recognized (i.e. your name will be published) or you can choose to remain anonymous (a pseudonym will be used for your name in all published work). If you choose to participate using a pseudonym, records will not show any link to your real name and information will be presented in the report in a way that your responses will not be able to be identified. Although your e-mail will be used to provide you with log-in information, your e-mail will not be retained in connection with your log-in after the online experience is complete.

Please select one to indicate your choice to the researchers:
□ I choose to have my contribution recognized (my name will be published)
□ I choose to participate anonymously (a pseudonym will be used for my name)

***Research Findings:*** Please indicate if you wish to receive an electronic copy of the summary of the findings from the study and have the chance to comment on them:
□ I would like to receive an electronic copy of the summary of the findings from the study so that I may have the chance to comment on them.
□ I do not wish to receive a copy of the summary of the findings.

We may use the data we get from this study in future research, but if we do this it will have to be approved by a Research Ethics Board.
Contact Information for Questions:
If you have any further questions regarding this study, please do not hesitate to contact:
Lorraine Weaver, Principle Investigator, Masters of Education Student, 819-209-3429, weaverL18@tru.ca
Dr. Carol Rees, Thesis Advisor, Associate Professor Faculty of Education and Social Work, 250-828-5004, Crees@tru.ca
Dr. Michelle Harrison, Thesis Advisor, Senior Instructional Designer Open Learning, 250-852-7000, mharrison@tru.ca
The plan for this study has been reviewed by a Research Ethics Board at the Thompson Rivers University. If you have questions about your rights or how research should be conducted, you can email TRU-REB@tru.ca or 250-828-5000. This office is independent of the researchers.

□ I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered. If I have additional questions, I have been told whom to contact. I agree to participate in the research study described above and will receive an electronic copy of this consent form after I confirm my consent. (Select Checkbox)