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Professional Learning on Twitter: A content analysis of professional learning conversations among self-organized groups of educators

Kelly-Ann K. Power
University of Windsor

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Professional Learning on Twitter: A content analysis of professional learning

conversations among self-organized groups of educators

by

Kelly-Ann Power

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2013

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conversations among self-organized groups of educators

by

Kelly-Ann Power

APPROVED BY:

_____
Dr. Jill Singleton-Jackson
Department of Psychology

_____
Dr. Cam Cobb
Faculty of Education

_____
Dr. Zuochen Zhang, Advisor
Faculty of Education

_____
Dr. R. D. Stanley, Chair of Defense
Faculty of Education

Defense Date: May 6, 2013

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ABSTRACT

This study explores the nature of professional learning conversations taking place in an online microblogging platform known as Twitter, through the lens of the Community of Inquiry (CoI) framework (Garrison, Anderson & Archer, 2000). The CoI framework offers an approach to further understand elements of cognitive presence, social presence, and teaching presence found in constructivist learning environments among educators.

A content analysis was conducted on three distinct particpant-driven educational Twitter chats demonstrating each chat to contain elements of cognitive presence, social presence, and teaching presence. This finding led to a deeper understanding about the use of questioning techniques and facilitation skills in order to allow for productive conversations online among educators.

The findings have important implications for professionals who are responsible for the design and organization of educators' professional learning programs. Implications for positive social change include increasing educators' effective use of social media to improve self-directed learning opportunities.

DEDICATION

This thesis is dedicated to my two beautiful children, Jesse and Julia. May this

work be an inspiration to both of them that learning never ceases. Together, we

have always tried to understand how <u>every</u> experience in life, no matter how

challenging, provides us with opportunities to learn incredible things about

ourselves and about others. May they always see the beauty and wonder in

learning, may they feel confident in asking many questions, and may they

continue to believe in their own abilities as life-long-learners.

Who are you not to be brilliant, gorgeous, talented, fabulous? You are a child of God.

Your playing small does not serve the world. There is nothing enlightened about

shrinking so that other people won't feel insecure around you. You are meant to shine,

as children do. You were born to make manifest the glory of God that is within you. It's

not just in some; it's in everyone. And as you let your own light shine, you unconsciously

give other people permission to do the same. As you are liberated from your own fear,

your presence automatically liberates others.

(Marianne Williamson, A Return To Love: Reflections on the Principles of A Course in Miracles)

ACKNOWLEDGEMENTS

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Chapter 1: Introduction

Educators have been engaging in professional learning conversations for years. Some educators reflect on their personal practice with colleagues in the privacy of their classrooms to share ways to best assess their students; others meet in small groups in the staff room with the school administrator to discuss school improvement plans; and others attend large group Board-directed professional learning opportunities to learn the latest government regulated curriculum or initiatives. In my role as a teacher consultant, experiences with traditional face-to-face models for teacher professional learning have offered a variety of rich site-based opportunities for teacher collaboration.

One of the drawbacks to face-to-face collaboration is that educators are limited to the interests and skills of the group in the same physical space. More specifically, if someone else on staff does not share the same professional learning focus or interest, resulting feelings of stress overload, stagnation, and burnout may lead the teacher to feel isolated (Gaikwad & Brantley, 1992). Social media presents educators with a venue to expand the scope of collaboration and even shift professional conversations into a variety of publicly shared online environments. Since the commercialization of Internet communication in the 1990's, many online education course designers have been using Computer Mediated Communications (CMC) as a method of teacher-student or student-student interactions (Buraphadeja & Dawson, 2008; Garrison, Anderson & Archer, 2001). This online forum has offered the potential to gain knowledge from and share experiences with other educators outside the confines of their school and board communities. While many professional learning

conversations have taken place orally, in a face-to-face environment, Sparks (2007) moves beyond the concept of talking about our thoughts, to exploring how the act of writing down ones' thoughts in a succinct fashion is a "way of freezing our thinking" so that we can slow down and think about our views in order to lead to "transformative learning" (p. 42). A structured CMC environment incorporates the idea of sharing thoughts and ideas in a written format, such as blogging. Blogging generally includes frequent personal updates of information to a website which will appear in reverse chronological order (Walker, 2003).

Moving beyond the formal learning environment of a structured CMC that may allow personal blogging, educators from various geographical locations are able to participate in informal, self-organized conversations within a self-selected online social medium such as Twitter, making their professional learning transparent to a wider public audience. Twitter has been traditionally understood to be a social media environment where participants share "what they are doing" through brief posts limited to 140 characters. Twitter (http://twitter.com) is a web-based tool that has been described as a "premier microblogging site" (Small, 2011, p. 872) as well as a social networking application bringing together multiple audiences into a single context (Marwick & boyd, 2010). Microblogging has been described as a form of blogging, but smaller (Small, 2011). McFedries (2007) described microblogging as a form of blogging that is restricted to 140 characters but is improved through social networking capabilities (para. 2). Ebner, Lienhardt, Rohs and Meyer (2010) described microblogging as a completely new form of communication that can support informal learning taking place in conversations among educators. In their study, findings suggested that microblogging allowed

for a constant information flow between users who were participating in posting thoughts and information pieces in a form of a collaborative thinking (Ebner et al., 2010).

Twitter is one such example of a microblogging platform where educators have self-organized into groups in order to hold conversations relevant to their experiences and self-directed learning. These conversations are more widely known as Twitter *chats*. Freiermuth (2011) described chatting as an actual "give and take of conversation" where those participating "carry on a live (synchronous) conversation through text - similar to normal conversation, only without verbalization" (p. 36). Freiermuth also contended that chatting synchronously online might be more similar to a verbal conversation than a time-delayed (asynchronous) online discussion, since it tends to be immediate in nature.

Twitter chats may take place in either a synchronous or an asynchronous nature, at a scheduled time throughout the week, where participants take part in a real-time exchange of tweets about a certain topic (Venable & Milligan, 2012). Conversations, or chats may also be archived on a public web environment, which provides opportunities for further learning. Educators who participated in the live event, as well as those people who did not participate, can retrieve transcripts of the chats. The nature and dynamics of Twitter chats will be further explained in Chapter 2 of this paper: Literature Review.

Twitter chats have evolved into a natural sharing of knowledge, resources and interaction that makes thinking and learning publicly visible. Ebner et al. (2010) contended that it is not the "transfer of information or status messages

that are crucial factors, but rather, the opportunity to be part of someone else's process by reading, commenting, discussing or simply enhancing it" that leads to being part of a "murmuring community" (p. 98). Collaborative spaces, such as the medium offered by Twitter, allows for educator conversations that reach a wider audience, and thereby benefit a larger community. There is a dynamic nature within these audiences given the context of continually evolving participants in the Twitter environment.

Seen by some as a social broadcast medium where participants may share what they are doing throughout the day, my literature review revealed that Twitter has not yet been studied from the perspective of understanding how this medium may be used to sustain professional conversations. Research studies exploring teacher learning conversations have traditionally focused on formal environments such as face-to-face focus groups (Edwards & Briers, 2001; Borko, 2004; Tan, Wong & Cheng, 2012), online course asynchronous discussion forums (Hou, Sung & Chang, 2009; Schellens, vanKeer, Valcke, DeWever, & Valcke, 2007; Schrire, 2006), or web-based environments created for a specific purpose (Hou, Chang & Sung, 2010; Wang, Woo & Zhao, 2009).

A search for peer-reviewed articles using ERIC, utilizing a Boolean search for the key words "twitter" AND "education" generated 103 articles, published between the years of 2007 and 2012. In my search of relevant literature, there were no known studies that focused on the content of educational conversations (chats) taking place on Twitter from a professional learning perspective. Upon further exploration, the majority of the 103 articles (42%) focused on general information about Twitter as a social medium. Another 31% of the articles

focused on the use of Twitter with students in formal learning environments such

as classrooms or online courses. The remaining articles dealt with general

information on how to use Twitter, as well as articles that focused on the usage of

this medium in the areas of healthcare, politics, and journalism. Only two articles

focused on using Twitter in an informal learning environment. The result of this

search demonstrated a gap in educational research regarding the value of using

Twitter as a medium for teacher professional learning opportunities. More

specifically, further research is warranted to examine the depth of intellectual

conversations or the nature of critical thinking taking place among educators

participating in conversations or chats on Twitter. The purpose of this research

was to help fill the gaps in the research literature with respect to the use of

Twitter for teacher professional learning conversations.

This research study used a qualitative case study approach to explore the

nature of professional conversations taking place on Twitter among self-

organized groups of educators in online educational chats. Since there have

been no documented research studies that have analyzed the nature of

educational Twitter chats, the findings from this study are exploratory in nature

and are not conclusive. This research is grounded in the theoretical constructs of

Garrison, Anderson and Archer's (2000) Community of Inquiry (CoI) model, with

specific foci placed on exploring the level of cognitive presence, social presence,

and teaching presence evident in different Twitter chats that have been archived

on the World Wide Web. Garrison et al. (2001) define cognitive presence as "the

extent to which learners are able to construct and confirm meaning through

sustained reflection and discourse in a critical Community of Inquiry" (p. 6).

Social presence is defined as "the ability of participants in the Community of Inquiry to project their personal characteristics into the community, thereby presenting themselves to the other participants as 'real people'" (p. 89). And lastly, teaching presence is defined as "the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Garrison & Anderson, 2003, p. 29). The CoI framework (Garrison et al., 2000) followed the teaching and learning theories consistent with John Dewey's work on the community of inquiry. Dewey (1933) believed that inquiry was a social activity that leads to the essence of an educational experience. A number of scholars including Henri (1992), Newman, Webb and Cochrane (1995) and Gunawardena, Lowe and Anderson (1997) have informed the research of Garrison's et al. (2000) CoI model with the main focus being critical thinking and cognitive skills used during online communications.

Various professional conversations taking place in the Twitter environment contain elements of collaboration eliciting critical thinking among the conversations. Many educators, who may not be aware of different uses of this social media environment, may also be unaware of the opportunities available for self-directed learning conversations that are offered. The analysis of the qualitative data gathered from this study provided interesting implications to inform the development of innovative professional learning opportunities in order to structure more complex, critical dialogue among educators.

This study also provided insight for constructing professional learning opportunities that could be explored in future research. Considering the new potentials of naturally occurring conversations in social media environments,

research that investigates how educators may benefit from these conversations in the context of cognitive and social development, may lead to new considerations and opportunities for those charged with teacher professional learning.

Key Terms

This research is based on the theoretical constructs of Garrison et al.'s (2000) Community of Inquiry (CoI) model. A *community of inquiry (CoI)* is "considered to be an educational group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding" (Garrison & Anderson, 2011, para. 1). The conversations analyzed in this study took place in an online social media environment, Twitter. Twitter will be further described in the review of literature related to this study.

Conversations taking place in this Twitter environment will be referred to as *Twitter chats* and will also be further explained in the review of literature. A convention known as a *hashtag (#)* is used throughout Twitter chats in order to label tweets that are related to a particular conversation as a means of identifying a group of tweets for organizational and group discussion purposes.

Conversations online can be either synchronous or asynchronous in nature. *Synchronous* chats occur as a live conversation, similar to normal conversation, with one contribution after another, and tend to be immediate in nature (Freiermuth, 2011). In other words, participants are present to the conversation at the same time, even if they are in two different locations,

requiring the synchronization of schedules in order to participate. *Asynchronous*

chats offer a time-delayed contribution where there may be increased time in

between contributions or posts (Freiermuth, 2011). Asynchronous activities may

not occur at the same time or place, allowing participants to contribute based on

their own unique schedules.

Research Purpose

The purpose of this multi-case study was to explore the nature of online

Twitter educational chats from a professional learning perspective. More

specifically, this study included a qualitative analysis of critical thinking and social

interactions emerging from three online educational Twitter chats to explore the

effectiveness of a public Computer-Mediated Communication (CMC) environment

such as Twitter, as a medium for holding teacher professional learning

conversations. According to Gerstein (2011), "Twitter's power, engagement, and

popularity lie in its endless networking opportunities. Its potential as a venue for

professional growth and development needs to be explored, discussed, and

ultimately used as such" (p. 273). Hakkinen, Arvaja, and Makitalo (2004)

challenged the use of environments like Twitter as "a way to achieve a type of

interaction that leads to educationally relevant higher-level discussion and

learning" (p. 164). Since there are more opportunities emerging that involve the

use of these online environments as a means of encouraging interaction in

various learning situations, additional studies have uncovered interaction patterns

between teachers participating in online discussions (Hou et al., 2009; Sing &

Khine, 2006), knowledge construction in asynchronous discussion groups

(Schellens, vanKeer, Valcke & DeWever, 2007; Schrire, 2006), as well as measured levels of critical reflection in online communication (Jeong & Lee, 2008; Yang, 2009). Namely, former researchers have assessed the level of depth in conversations taking place in a learning environment. Level of depth in this study refers to how deep conversations go in terms of critical thinking and providing opportunity for critical reflection based on the use of a coding system.

In this study, a deep conversation is defined as one in which there was a component of critical thinking present. Garrison et al. (2001) described critical thinking as "complex and (only indirectly) accessible" (p.8). Lipman (2003) contends that critical thinking is comprised of the following characteristics: "(1) facilitates judgement because it (2) relies on criteria, (3) is self-correcting, and (4) is sensitive to context" (p. 212). Additionally he describes "criteria – which may include standards, principles, factual evidence and procedures – are reliable kinds of reason (Buraphadeja & Dawson, 2008). Cognitive presence involves critical thinking being present in sustained discourse where participants are able to construct and confirm meaning as they collaborate through conversations (Garrison et al., 2001). Therefore, cognitive presence reflects higher-order thinking and knowledge construction that may also lead to critical reflection.

Higher order thinking essentially refers to thinking that takes place at a higher level of cognitive processing as demonstrated in a revision of Bloom's Taxonomy (Anderson & Krathwol, 2001). This revised Bloom's Taxonomy provides an organized approach to categorizing thinking skills into six levels ranging from the most basic to more complex levels of thinking: (1) Remembering, (2) Understanding, (3) Applying, (4) Analyzing, (5) Evaluating, and

(6) Creating. Higher order thinking involves the skills of analyzing, evaluating and creating where learning is analyzed, justified, critiqued and transferred beyond the simpler cognitive tasks of recognizing and recalling (Anderson & Krathwol, 2001). Given the shared premise that there is a higher level of cognitive presense (Garrison et al., 2000) or critical thinking (Anderson & Krathwol, 2001) when there is a justification of shared opinions, for the purpose of this study, Twitter comments were deemed to include a higher level of critical thinking when content in the tweets progressed beyond recall or statement of facts and moved into justification or evaluation.

This investigation examined how the use of Twitter has evolved over the years into a tool for collaboration and learning among educators. Insights into the dynamics of self-directed public conversations that engaged educators are provided. Research findings aim to benefit professionals who are responsible for the design and organization of educators' professional learning programs. On a practical level, this research has generated a summarized list of recommendations that could be considered and applied for hosting a Twitter chat focused on professional learning conversations.

Research Questions

As a consultant who has had the opportunity to participate in various face-to-face professional development learning opportunities, as well as in a variety of different conversations that have taken place on Twitter, the development of the research questions for this study emerged through my own curiosity. I was compelled by the different conversations taking place and felt that some

conversations were more apt to leave me with a strong sense of critical thinking

and critical reflection that challenged my thinking in certain areas of education.

Yet, it was difficult to identify exactly what the difference was between the chats,

and why I felt drawn to certain chats more than others. Why did some

conversations challenge my thinking more than others? Were they able to

influence my thinking into deeper critical thinking? And if so, what were the

elements in the conversation that influenced my curiosity?

The primary focus of this inquiry has been to examine the nature of

professional conversations among self-organized groups of educators on Twitter.

This overarching inquiry focused on the general nature and dynamics of

conversations (chats) that took place in this environment. Specific research

questions focused on the extent of which the elements of Garrison et al.'s (2000)

CoI model were present in educational Twitter chats, as well as the challenges

and possibilities of using Twitter for collaboration and learning among educators.

When considering Garrison et al.'s (2000) CoI framework, the three elements of

cognitive presence, social presence, and teaching presence were applied to the

Twitter environment by respectively considering the educationally-based

conversations that took place, the social groupings of educators by considering

the personal profiles of each, and the facilitation that was present during these

conversations, either formally or informally. This study sought to contribute to the

limited but growing pool of research on Twitter by focusing on the use of Twitter

by educators to participate in conversations around educationally related content.

The following four research questions guided this investigation:

1. To what extent were the elements of the Community of Inquiry model (Garrison et al., 2000) presented in educational Twitter chats, more specifically cognitive presence, social presence and teaching presence?

2. What were the similarities and differences among three educational chats taking place on Twitter?

3. What sorts of barriers affected educational Twitter chats and how could they be addressed?

4. As a medium, how could Twitter influence educator learning and collaboration?

Outline of Chapters

Chapter 2 includes a review of literature related to professional learning, communities of practice, collegial conversations, online professional learning, Garrison et al.'s (2000) CoI model, as well as Twitter as a social medium. Chapter 3 describes the methodological reasoning for choosing a qualitative case study approach as well as the outline of the directed content analysis applied to three sets of data retrieved from archived Twitter chats. Chapter 4 outlines an analysis of findings for each set of data, according to a coding template derived from Garrison et al.'s (2000) Community of Inquiry. Chapter 5 includes a discussion of understandings that emerged throughout this study as well as a summary of contributions and key findings of this research in order to offer suggestions for future investigation.

Chapter 2: Review of the Literature

Introduction

A review of academic literature focusing on key areas of interest has led to an emerging of themes related to educators involved in professional learning opportunities: professional learning as it relates to various learning theories, communities of practice (Lave & Wenger, 1998), collegial conversations, on-line professional learning, a model of CoI (Garrison et al., 2000), and Twitter as a social medium. This review of literature wove a common thread among these themes as they relate to educators engaging in professional learning conversations using Twitter as a medium, and thereby informed this investigation. An extensive review of the literature also revealed that very few qualitative studies have been published regarding the use of Twitter as a medium for holding professional learning conversations. In fact, there were no studies found indicating the level of critical thinking evident in educational conversations taking place in the Twitter environment. The lack of studies investigating the presence of critical thinking evident in conversations taking place in the Twitter environment led to the use of content analysis as a methodology that would aid in this inquiry. While the methodology section of this paper will further describe content analysis as the approach, the literature review will set the foundation for discoveries about professional learning, communities of practice, collegial conversations, on-line professional learning, Garrison's et al. (2000) community of inquiry model as well Twitter.

Professional Learning

Educators tend to be involved in a continuous cycle of learning throughout their careers in order to take into consideration new information about student learning and/or pedagogical approaches that may emerge on an on-going basis through educational research. Learning that involves knowledge and understanding of what it is they are teaching, who their learners are, and how best to teach various concepts. These learning experiences can be both formal and informal. Choi and Jacobs (2011) referenced Marsick and Watkins (1990) in their definition of formal learning to be "planned events or experiences that are designed to prepare individuals to attain a specific set of knowledge and skills" (p. 241). Examples of formal learning opportunities may include face-to-face university courses, specialized training workshops delivered by board or Ministry-trained experts, or professional development sessions within a school setting facilitated by board personnel. Informal learning, on the other hand, is not intentionally structured, where the individuals themselves "make sense of the experiences they encounter during their daily work" (Marsick & Watkins, 1990, p. 241) and control their own learning opportunities. Examples of informal learning opportunities may include self-directed study groups, book-talks, mentoring experiences, or conversations in online learning environments (Marsick & Watkins, 1990).

Regardless of the format of learning experiences, Guskey (2002) reported that teachers engage in professional development because they want to become better teachers. Not only do they want to learn more about *what* they are teaching, teachers also consider *how* they will teach it, and understand the

characteristics of *who* they are teaching and how those students learn best.

Shulman (1987) presented seven specific foundational characteristics that should

inform teacher training programs:

1. Subject matter content knowledge (specific knowledge of subject-content);

2. General pedagogical knowledge (classroom management and
   organization);

3. Curriculum knowledge (materials and programs);

4. Pedagogical content knowledge (blending of content and pedagogy);

5. Knowledge of learners (specific characteristics);

6. Knowledge of educational contexts (classroom, governance, school
   community);

7. Knowledge of education ends (purposes and values of education).
   (Shulman, 1987, p. 8)

Altogether, these categories frame the *what, how* and *who*, teachers must

consider on a daily basis in their classrooms and represent the core "knowledge

base for teachers" (Shulman, 1987, p.8). Pedagogical actions are referred to as

"ways of talking, showing, enacting, or otherwise representing ideas" as

demonstrated by teachers when teaching new content (Shulman, 1987, p. 7).

Shulman (2004) further defined the characteristics of an accomplished teacher as

a member of a community who is "ready, willing and able to teach and to learn

from his or her learning experience" (p. 2). In this community of learners, teacher

learning should include: a shared vision of student learning and understanding;

motivated teachers who participate in learning opportunities; knowledge and

understanding of content, pedagogy, and learners; practice that includes

intelligent and adaptive action; metacognitive reflection; and a community or group that influences their beliefs and practices.

Similarly, a review by Guskey (2003) of various lists that focused on characteristics of effective professional development revealed inconsistencies among how researchers defined the criteria for "effectiveness" therefore demonstrating professional development as being highly complex. According to Guskey, effective professional development included: (1) enhancement of teachers' content and pedagogical knowledge; (2) sufficient time and resources; (3) collaboration that is structured and purposeful; and (4) the promotion of collegiality and collaborative exchanges. Guskey further contended that teachers prefer professional development that will give them specific, concrete and practical ideas that they can apply in their classrooms. This contention is based upon his proposed "model of teacher change" (Guskey, 2002, p. 383) whereby professional pedagogical practice is impacted following initiative implementation in the classroom. Conversely, Darling-Hammond and Richardson (2009) discussed the importance of collaborative and collegial learning environments that help develop communities of practice beyond the walls of the classroom. This may include providing an environment for teachers whereby they can have discussions regarding student learning, that do not take place in the classroom.

Discrepancies among researchers exist regarding teachers' preference for professional learning. On one hand, Guskey's (2003) view indicates a view of teachers preferring prescriptive, more passive learning experiences. On the other hand, Marsick & Watkins (2001) view informal learning involves a self-directed approach where the learner controls the learning. The findings from their

study indicated the need for professional development to be structured to support "ongoing learning that is integrated with daily routines" rather than limited to "occasional, brief in-service sessions" (Marsick & Watkins, 2001, p. 26). In reviews on informal learning, learning has been linked to related concepts such as communities of practice (Wenger, 1998), social learning (Bandura, 1986) as well as critical reflection and transformative learning (Mezirow, 1997). These concepts will be further explained as they relate to this study.

In the review of literature, it became apparent that the word "community" was used in a variety of different ways. Grossman, Wineburg and Woolworth (2001) mentioned the prevalent use of the word community in education: "communities of learners", "discourse communities", "epistemic communities", "school community", "teacher community" and "community of practice" (p. 942). Regardless of the terminology used, the commonalities among research on professional learning is the notion of teachers moving away from individual, isolated learning by one teacher to a group of teachers learning together as a professional learning community who engage in collective inquiry that is based on actions, experimentation and collaborative learning teams (Darling-Hammond & Richardson, 2009; Dufour & Eaker, 1998; Guskey, 2003; Shulman, 2004). This notion is related to the work on communities of practice where "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger, McDermott & Snyder, 2002, p. 4). Wenger, McDermott and Snyder (2002) conceded that the value of a community of practice may take time to recognize. Conversations that take place as "informal discussions to solve a

problem or one-on-one exchanges of information about a tool or approach" may

contain insights that are shared on a certain day and time, but actions may not be

applied for a number of days or months.

     This concept relates to the continuous learning cycle that educators

encounter in their professional learning. Wenger, Trayner and deLaat (2011)

suggested that learning enabled by community involvement had the potential to

create value for its members according to a creating cycle with no apparent

hierarchy and was not meant to be linear. This cycle of value creation contains

the following types of value: immediate value, potential value, applied value,

realized value, and reframing value. Immediate value can be attained through

activities and interactions that may involve a useful conversation where a

question is asked and input is given immediately. There is also a level of potential

value to be realized as knowledge that might be revealed as a new idea later

assimilated or applied in their learning. Once applied, it becomes applied value in

the fact that there was an actual change in practice. When people change their

practice, and through reflection, they have a sense of realized value that may

lead to a reframing value that causes them to reframe future goals and modifies

their existing beliefs (Wenger, Trayner & deLaat, 2011).

     Donald Schon (1983) explained the cultivation of the capacity to reflect ***in***

action (while doing something) and reflect ***on*** action (after you have done it) in

order to engage in a process of continuous learning. Reflecting in action,

according to Schon is the act of "thinking about something while doing it" (p. 54)

whereby the reflection leads to a focus on the outcomes of the action and allow

the reflector to become a "researcher in the practice context" (p. 68).

The concept of communities of learners draws upon social constructivist principles where knowledge is constructed through social interactions. Social constructivist theories are based on the work of Vygotsky (1978), who maintained that learning results from social interaction where meaning is constructed through communication and interactions with others. Dewey (1959) believed that individual development is based on the social activity within a community involving the social activity of inquiry. He also held that through collaboration, learning would occur through the construction and confirmation of meaning (Dewey, 1959). Bruner (1986) viewed shared language as part of an active process where learners construct new ideas or concepts based on their current knowledge schemas. Therefore, social constructivism reminds us that learning can evolve from social activity and that meaning can be constructed through communication and collaboration with others.

Social constructivist learning also aligns theoretically with transformative learning. Mezirow (1997) introduced a theory of adult learning called transformative learning that is grounded in human communication. Cranton and King (2003) argued that three common themes that emerge in Mezirow's theory involve adults learning through experience, critical reflection and rational discourse in order to construct and deconstruct meaning, saying that "Good communication is based on authenticity. If we communicate through a persona, we create a barrier to communication and hence to effective teaching" (p. 33). Mezirow's theory of transformative learning proposed that we make meaning through our personal experiences. Taylor (2008) explained how individuals develop "habits of mind or frames of reference" (p. 5) based on these personal

experiences that result in the development of personal assumptions and beliefs leading to specific points of view. As social beings, we most likely discuss this process with others and engage in discourse where others' ideas and evidence may "help us consider our own views in a new light" (Cranton & King, 2003, p. 32). Cranton & King stressed the importance of individuation whereby we must be able to see ourselves as differentiated from others with an understanding of our own views as a prerequisite to learning. As we listen to differing views, it opens up the possibilities to engage in critical reflection, consider alternatives, and introduce new ways of thinking about our own teaching. Merriam (2004) further suggested "mature cognitive development is foundational to engaging in critical reflection and rational discourse necessary for transformational learning" (p. 61). According to Fullan (2002), "information only becomes knowledge through a social process" (p. 7). In other words, when we co-construct knowledge and thinking in a social context (versus being on our own), we increase the chances that our behaviours or thinking will transform, or change.

Collegial Conversations

Researchers studying collegial learning opportunities in professional learning communities, consistently mention one factor being related to the "collegial conversations" taking place. Dewey (1970) used the term *critical dialogue* to explain how teachers engage in collective inquiry using focused, ongoing professional *conversations* that stimulate innovation and further inquiry. Wood (2007) explained *collegial dialogue* that encompasses knowledge sharing among teachers. Lujan and Day (2010) mentioned *deep discussions* that allow

for teachers to engage in conflict and shared consensus. Fogarty and Pete

(2009) referred to *relevant dialogue* taking place in learning environments.

DuFour (2004) mentioned *collaborative conversations* as being a critical

component of a professional learning community. Darling-Hammond and

Richardson (2009) mentioned *continued, structured dialogue,* as a prerequisite

for the types of interactions that foster learning in a teacher inquiry cycle where

teachers participate in continuous dialogue to learn about, try out, and reflect on

new practices. They contend that "collective work in trusting environments

provides a basis for inquiry and reflection, allowing teachers to raise issues, take

risks, and address dilemmas in their own practice" (Darling-Hammond &

Richardson, 2009, p. 48). Lipton and Wellman (2007) used the terms *purposeful*

or *positive conversations* as being necessary in professional learning models.

The different uses in terms led to the need for further understanding of the terms

dialogue, discussion and conversation.

   Easton (2008) drew from the model of Garmston and Wellman (1999),

which was later adapted (Garmston & Wellman, 2009) to explain different ways of

talking and how conversations can become either a dialogue or a discussion in

nature. The outcome of a dialogue would be shared understanding, whereby the

outcome of a discussion would be a decision being made.

Ways of Talking

Deliberation

Dialogue

Monitoring
Self
Process
Whole

Outcome
Understanding

Seven Norms
Of
Collaboration

Discussion

Monitoring
Self
Process
Details

Outcome
Decision

Professional Community

(Garmston and Wellman, 2009)
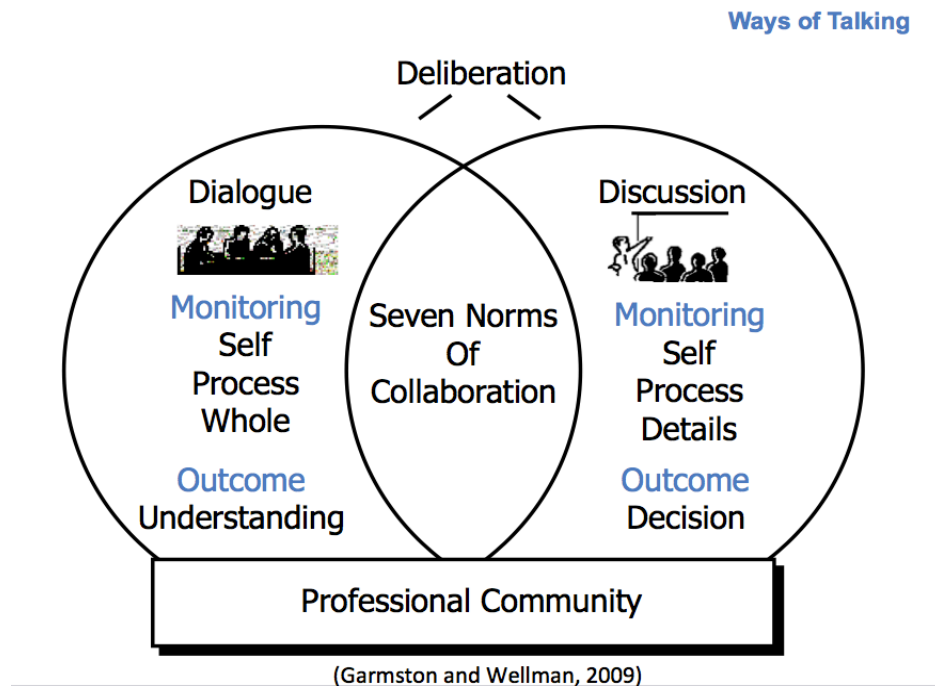
Figure 1: Ways of Talking (Garmston & Wellman, 2009. Used with permission.)

As a conversation begins, there comes a point in the conversation known

as the deliberation or choice point. At this time, Garmston and Wellman (1999)

found that the conversation may become dialogue-based in nature, where

members strive to develop collective meaning and shared understanding through

the contribution of multiple viewpoints and the clarification of each other's views.

If at the deliberation or choice point of the conversation, however a difference of

opinion ensues, whereby the conversation leads to more than one idea or

perspective or viewpoint, the conversation is deemed as a discussion, based on

Garmston and Wellman's model. In summary, the end goal of a discussion is a

decision being made whereas the end goal of genuine dialogue is shared

understanding and team learning. Easton (2008) maintained that "genuine

dialogue is what makes a professional learning community" (p. 140) by leading

participants in meaningful conversations where ideas are shared and issues that

have a shared importance are examined together.

Sparks (2007) built on Mezirow's theory of transformational learning in

stating that genuine dialogue that evokes strong emotions or creates cognitive

dissonance can lead to the exploration of one's own beliefs and ultimately a

change in personal assumptions and/or beliefs. In essence, the talk may bring

about a change in action. He contended that traditional methods of professional

development such as lectures, publications or training sessions, are usually

insufficient to affect practice unless they include genuine dialogue that encourage

challenges of personal assumptions and beliefs (Sparks, 2007). Sparks used the

term *dialogue-like conversations* to explain an exchange that can occur between

two or more people that is not limited to a particular setting with a trained

facilitator. These conversations may take place both formally, in a planned

professional learning setting, as well as informally, in a hallway between two

educators.

Cognitive dissonance may arise during discourse that goes beyond dialogue

and the sharing of ideas. Mezirow (as cited in Merriam and Caffarella, 1999)

stated that:

> Discourse involves an effort to set aside bias, prejudice, and personal
>
> concerns and to do our best to be open and objective in presenting
>
> and assessing reasons and reviewing the evidence of arguments for
>
> and against the problematic assertion to arrive at a consensus. (p.
>
> 322)

In this sense, discourse during dialogue provides similar function to Dewey's reflective thought concept. Fosnot (1996) suggested, "Dialogue within a community engenders further thinking" (p. 29) through the movement of thinking in one's private world to the sharing of thinking in a public world of collaboration. Validation from others publically, acts to further stimulate thinking critically about a problem. Garrison and Anderson (2003) supported this importance by stating that critical thinking is "an inclusive process of higher-order reflection and discourse" (p. 56).

The nature of conversations between teachers tends to vary in depth during teacher professional learning sessions. Nelson, Deuel, Slavit and Kennedy (2010) studied educator conversations taking place in collaborative inquiry groups. Their findings indicated that deeper conversations emerge when educators are willing to engage in conversations that move beyond "polite, congenial conversations" (Nelson et al., 2010, p. 175) where only stories are shared, to conversations that involve questions of an inquiry nature. They maintained that teachers tended to work hard at keeping the conversation superficial in order to avoid "fault lines" (Grossman et al., 2001, p. 963) which would expose differences in values among the participants. However, they identified key elements that emerged from the sharing of these differences as being the added value of discussions: asking and answering probing questions; recognizing conflict as a way to gain deeper understanding of the complexities of teaching and learning; being intentional about the nature of dialogue in a group; and accessing and using tools (e.g., prompts) to support a shift to deeper conversations (Nelson et al., 2010) with a higher level of critical thinking being

shared. As participants challenge each other's thinking and look for evidence to

support different points of view, this generated inquiry approach may lead to

additional exploration and professional learning. Grossman et al. (2001)

proposed a question when considering how to create structures that make

teacher collaboration meaningful by asking "[w]hat distinguishes a community of

teachers from a group of teachers sitting in a room?" (p. 987). They found that a

mature community of learners engages in both intellectual and social interaction.

Intellectually, they realized that "some people know things that others do not

know and that the collective's knowledge exceeds that of any individual"

(Grossman et al., 2001, p. 973). Engaging in the sharing and co-construction of

knowledge and perspective requires social conditions that invite a conversational

climate that affirms someone's perspective while at the same time challenging

them further with questions. One of the most commonly reported barriers to

collaborative professional learning opportunities among educators is *time*

(Darling-Hammond & Richardson, 2009; Lujan & Day, 2010; Nelson et al., 2010).

In my experience as a member of a teacher union, educator contractual

agreements maintain that professional development should be held within the

hours of the school day where teachers are provided with release time from their

classrooms. Given the latest research that teachers are among the most powerful

influences for improving student learning (Hattie, 2009), school boards are

cognizant of the number of days that a teacher is away from the students

participating in professional development sessions. The content of these

professional learning sessions may not necessarily be based on the interest of

teachers attending the sessions; rather these learning sessions should be based

on needs that have been identified through the analysis of student achievement data. Along with limits in ministry funding allocated to school boards for professional development, meeting the criteria for effective professional learning mentioned in this review seems to be more difficult to maintain.

One commonality among professional learning opportunities is the presence of a presenter or facilitator. A presenter might be someone with a certain amount of expertise in an area who can share new information with a group of learners, whereas a facilitator helps lead the group in a learning experience with a less active participatory role. Gibbs (2006) mentioned the benefit of all groups agreeing on "tacit norms" (p. 68) indicating the group behaviours that will allow for productive work together. One of these norms is that of "mutual respect" (p. 89) where participants will trust that their contributions will be valued and where feedback can be offered and interpreted as to encourage growth. Bens (2005) described a facilitator as "one who contributes structure and process to interactions, so groups are able to function effectively and make high-quality decisions" (p. 5). A facilitator of a learning experience may provide structure to a professional learning opportunity following a specific focus on both content and process. The content of a professional learning experience might consist of specific subject information, tasks, decisions, or goals related to a specific area. The process followed involves such things as methods and procedures used for the learning, developing group dynamics with specific rules and norms for an effective group climate. Bens referenced ten core practices of facilitators: staying neutral, listening actively, asking questions, paraphrasing,

synthesizing ideas, staying on track, giving and receiving feedback, testing

assumptions, collecting ideas, and providing summaries (p. 10).

While some educators are content with the facilitated professional learning

being offered through their boards and/or schools, others are now becoming less

traditional and turning toward self-directed approaches to engage in

conversations that may enhance their personal learning outside the hours of the

workday. For many, social online environments seem to offer the necessary

medium for collegial and collaborative conversations among educators that may

increase content knowledge and expand instructional strategies.

Online Professional Learning

With the evolution of Information and Communication Technology (ICT),

there are now a growing number of possible online environments that allow for

professional learning opportunities to take place. Clouder et al. (2011) described

an online environment as being "an ideal vehicle for interprofessional dialogue"

(p. 112) as it has the potential to bring together educators across a vast

geographical spread. When newcomers congregate in a new common space and

share mutual respect, participants may feel degrees of safety that can lead to a

willingness to share ideas to develop a common understanding. Huber (2010)

contended that an updated approach of using Web 2.0 tools is necessary in the

"learning life of teachers" in order to create structures for "sustained, complex,

and meaningful professional learning" (p. 42). She suggested that Web 2.0 tools

include such applications available on the Internet that allow users to interact,

share insights as well as content-related resources that lead to professional

learning.

Examples of more formal online learning structures might include wikis,

Nings, or blogs. A wiki is a database of pages that are maintained by a group of

participants who may interact together in order to access and edit content that is

of interest to the group (Huber, 2010). A Ning is more of a social networking

online platform where participants can join as a member with a unique login, in

order to take part in discussions related to a particular concept, access and share

resources with other members of the group, as well as participate in social

activities such as real-time chats with various members of the Ning (Huber,

2010). A blog is considered to be more of an individually created public sharing of

personal commentaries, resources such as links to materials, and to invite

responses from readers through a comment feature. Twitter, which will be

explained further in this paper, is an example of a "microblog" which allows for

concise bits of information being publicly shared between participants in an online

social environment (Huber, 2010). Lieberman and Mace (2010) discussed the

importance of teachers going public with their work in order to share professional

knowledge that can become "community property" (p. 80). When teachers share

their knowledge publicly, they not only open themselves up to reflection and

learning about their own practice, but they also "scale up" (p. 77) professional

learning by including contributions from others who help expand their existing

knowledge.

Building on Lave and Wenger's (1998) community of practice, one might

consider these applications as a way to provide a virtual community of practice,

which has been defined as a "network of individuals who share a domain of interest about which they communicate online" (Gannon-Leary & Fontainha, 2007, p. 1). Chiu, Hsu and Wang (2006) further defined virtual communities as "online social networks in which people with common interests, goals or practices interact to share information and knowledge, and engage in social interactions (p. 1880).

Researchers outlining various principles of successful online learning environments build on Wenger et al.'s (2002) concept of community by introducing features of effective online learning that supports the development of a community. Lave and Wenger (1991) say that "learning, thinking, and knowing are relations among people in activity in, with, and arising from the socially and culturally structured world" (p. 51). In the community-centered learning environment the paradigm shifts from the "individual as learner to learning as participation in the social world, and from the concept of cognitive process to the more encompassing view of social practice" (Lave & Wenger, 1991, p. 43). The specific features focus on trust, the sharing of information around a clear purpose of communicating meaning and knowledge through a shared participation and ownership of learning (Havelock, 2004; Wideman, 2010). Similar to the activities that occur in face-to-face communities of practice, participants are able to share resources and build on each other's knowledge through the Internet. Wideman (2010) supported an online environment as a way for teachers to emerge from their isolated classrooms to "collectively and critically reflect on their practices, and to develop a shared culture that supports risk-taking and experimentation with new ways of teaching" (p. 4). Ardichvili (2008) maintained that member

motivation is a critical factor in determining a virtual community's success whereby "trust was identified as one of the main enablers of knowledge sharing" (p. 551) in an online community of learners. Motivational factors that allow for active participation may include personal benefits, community building, and/or the sharing of similar values and norms.

Regardless of the forum type, Huber (2010) provided insight that supports the use of Web 2.0 tools as a venue for educators to tailor a sharing of resources, posting personal thoughts and responding to questions that provide opportunities for sustained professional conversations around teaching and learning. Considering Grossman et al.'s (2001) views on a teacher learning community, there must be more than a superficial social element of participation in conversations that goes deeper into an intellectual realm. This type of participation involves a type of "discussion brokering" (p. 979) where participants contribute to group discussions, but also engage in questioning and critiquing of thoughts that are being shared, for the main purpose of learning together (Grossman et al., 2001).

Wideman (2010) suggested that "the training of facilitators is an important consideration for effective online communities" (p. 22). Rovai (2007) designed a framework for facilitating online discussions that draws importance to both the design of an online discussion and the facilitation of such a conversation. According to Rovai, the design of an online discussion should generate motivation and opportunities for participants as well as describe the ground rules for such participation. Facilitators should develop a social presence that encourages interaction that maintains equity of communication among

participants, while avoiding becoming the center of attention themselves (Rovai,

2007). Facilitators should also focus on using "thought-encouraging questions"

(Golding, 2011, p. 357) in order to encourage critical thinking among a

community of inquiring learners. Collison and Shelton (2000) offered a spectrum

of questioning techniques in order to "help participants find new ways of viewing

and questioning their own thinking" (p. 142). The five categories of questioning

referred to are: (1) "So what?" questions; (2) Questions that clarify meaning; (3)

Questions that explore assumptions and sources; (4) Questions that identify

cause and effect; and (5) Questions that plan a course of action (Collison &

Shelton, 2000).

   Various studies have been conducted comparing online conversations to

those that take place in face-to-face settings (Chen, Chen & Tsai, 2009; Guiller,

Durndell & Ross, 2008; Newman et al., 1995; Tan & Tan, 2006). The findings

from these studies indicate both advantages and disadvantages for the

participants of both environments. While there may be a perception that face-to-

face conversations may be more productive since there is an added value of

human expressions such as body language, facial expressions, eye contact, tone

of voice as well as other non-verbal cues that help manage the understanding of

the conversation, in a study conducted by Najafi and Clarke (2008) an interview

with a certain participant stressed that not having face-to-face contact in an

online environment was a benefit since it allowed the focus to be on the words

being stated and that you weren't intimidated by any body language as you would

find in face-to-face conversation. While Najafi and Clarke's point may imply that

those engaged in face-to-face interactions may engage in intimidating body

language, one must acknowledge that written words may also be used to intimidate in certain contexts. Havelock's (2004) findings suggest that there are similarities in both online and face-to-face conversations that allow for a nature of personal interactions and the formation of relationships in both environments. These personal interactions and relationships support the features that are mentioned in Grossman et al.'s (2001) notion of educators coming together in teacher learning communities. However, in order to consider the depth of learning that may occur in online environments, and the nature of their conversations, many studies involving formal online learning environments (online courses, student discussion forums) have focused on the level of cognitive or metacognitive learning skills that may be developed in these environments.

Wickersham and Dooley (2006) explored the challenge of analyzing the quality of online discussions in virtual learning communities. Their main premise was that assessment of students' contributions in online communities should go beyond the number of posts a student makes since "more time and effort is spent on creating an illusion of participation on the part of the student by the number of one or two sentence postings" (p. 185). Their study focused on measuring the "thoughtful reflection and meaningful discussions" taking place within the virtual community" using Newman et al.'s (1995) critical thinking measure (Wickersham & Dooley, 2006, p. 186). In their content analysis comparing critical thinking in both online and face-to-face environments, Newman et al. uncovered that while a greater amount of brainstorming and new ideas emerged in a face-to-face conversation, the use of an online environment provided opportunities for a sharing of ideas that were more important, more justified and more linked as well-

thought out contributions. A content analysis study by Guiller et al. (2008)

supported the notion that an online environment provides a higher level of critical

thinking being shared based on the fact that participants may have more time to

think and reflect before responding leading to a higher quality of interactions.

Guiller et al. used a coding scheme based on the work of Kuhn, Amsel and

O'Loughlin's (1988) concept of critical thinking and Anderson, Howe, Soden,

Halliday and Low's (2001) adaptation of Kuhn's work. A total of 21 dialogue

categories were used for the coding. High levels of critical thinking were

demonstrated when students included a response containing "justification with

evidence" (Kuhn et al., 1988, p. 192). The majority of students in the study

confirmed through interviews that online discussions were preferred based on the

extra time it offered for reflection. Asynchronous discussions provide time for

participants to consult additional sources of information, refine their thought

processes based on new knowledge, and clarify their thinking and contributions

(Kuhn et al., 1988; Clouder et al., 2011).

In contrast to these studies, a conversation analysis using content analysis

of student discourse by Thomas (2002) indicated that online conversations

tended to contain discussions that branched endlessly and "did not promote the

coherent and interactive dialogue necessary for conversational modes of

learning" (p. 361) even though there was an indication of higher levels of

cognitive engagement and critical thinking. Tan and Tan (2006) suggested that

conversational analysis in an online environment involves multiple complexities

since the interaction through which knowledge is transmitted involves multiple

participants.

Given the competing thoughts around the question of effectiveness of text-based communication taking place in online environments, Garrison, Anderson and Archer (2010) believed that the "effect of lack of non-verbal cues in online communication was exaggerated and that the strengths of the text-based communication often more than compensated for a face-to-face or other model of synchronous presence" (p. 6). Given the fact that researchers have been applying their CoI model for over 10 years now, they further suggested that this "lean form of text-based communication" (p. 6) needs to be further studied with respect to online communities of inquiry (Garrison et al., 2010).

A variety of models have been referenced in order to measure the level of critical thinking in online environments. Henri's (1992) analytical framework and coding scheme consists of five dimensions that focus on social activity and cognitive processes: participative, social, interactive, cognitive and metacognitive dimensions. Newman et al. (1995) studied theoretical concepts of group learning, deep learning and critical thinking using a coding system based on ten categories: "relevance, importance, novelty, outside knowledge, ambiguities, linking ideas, justification, critical assessment, practical utility and width of understanding" (p. 14). Gunawardena et al. (1997) developed a coding scheme consisting of five phases in order to study the process of social construction of knowledge in computer conferences, which they ascertain was not specific enough in Henri's or Newman et al.'s model.

While a number of models for the analysis of critical thinking in online learning environments have been studied (Henri, 1992; Newman et al., 1995; Gunawardena et al., 1997), the CoI model provided by Garrison et al. (2000)

includes variations of Henri's (1992) critical thinking phases as well as Dewey's

problem solving processes (Weltzer-Ward, 2007). Garrison et al.'s (2000) model

provides a very useful framework that focuses on the three elements of a

community of learners that are developing in Twitter educational conversations:

cognitive presence, social presence, and teaching presence. This model is useful

when analyzing collaborative online learning structures, because it accurately

reflects the goal of professional learning opportunities: developing critical thinking

and critical reflection skills to improve teaching and learning.

Community of Inquiry

Garrison et al. (2000) introduced the Community of Inquiry (CoI)

framework as a model to study the nature and quality of critical discourse and

thinking in online learning, based on Dewey's (1959) view of education. Dewey

believed that the process of inquiry was at the heart of an educational experience

and involved an essential component of social activity taking place in a

community. Garrison et al. expanded on this view to support an educational

experience as a collaborative communication process where the achievement of

critical thinking can be reached through the written language shared via computer

conferences. The CoI model of Garrison et al. builds on social constructivist

principles by presenting a way of looking at the elements of learning involved in a

computer-based environment. The constructivist learning theory highlights the

social nature of knowledge construction by people, or groups of people, sharing

experiences through social interaction such as conversations (Piaget, 1973;

Vygotsky, 1978). Swan, Garrison and Richardson (2009) presented the CoI

model as a support for studying discourse and reflection in a collaborative

community of learners. They argued that without constructivist approaches and

community, opportunities for creating and confirming meaning and effective

critical thinking are reduced. Furthermore, Garrison et al. noted that building

community is particularly important in online learning environments because the

"construction of meaning may result from individual critical reflection but ideas are

generated and knowledge constructed through the collaborative and confirmatory

process of sustained dialogue with a critical community of learners" (p. 19).

The CoI framework (Garrison et al., 2000) depicts a model of a community

of inquiry that comprises three elements essential to an educational transaction –

cognitive presence, social presence, and teaching presence. This theoretical

model of online learning is outlined in Figure 2.
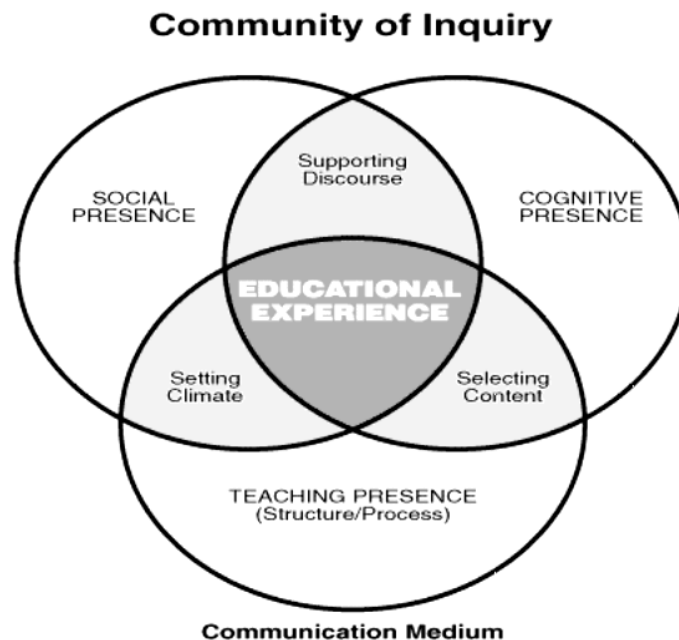
Figure 2: CoI Framework (Garrison et al., 2000, p. 88. Used with permission.)

There is an overlapping nature of these three elements with the unity of a collaborative constructivist learning experiences represented at the core, which is consistent with the legacy of Dewey (Swan et al., 2008). Cognitive presence is explained to be the "most basic to success in higher education" (Garrison et al., 2000, p. 89). Cognitive presence is a fundamental element when exploring critical thinking as it refers to the "extent to which members of a community are able to construct meaning through a sustained conversation" (Garrison et al., 2000, p. 89). The focus here is upon higher-order thinking processes following a collaborative process of inquiry involving four specific phases based on Dewey's (1933) reflective inquiry.

Garrison et al.'s (2000) practical inquiry process begins with a *triggering event* in the form of an issue or problem. As a result, one's thought process shifts to *exploration*, where members search for information and exchange knowledge that may help make sense of the situation. As ideas get shared, there is a move into the *integration* phase where participants connect ideas and search for insights that may lead to viable solutions. The final phase involves a *resolution* of the issue or problem through critical reflection and the application of these new ideas (Garrison et al., 2000). A review by Garrison and Arbaugh (2007) indicates that the element of cognitive presence is the most challenging to study.

One of Garrison et al.'s (2000) hypotheses centered around the fact that high levels of social presence were also necessary to develop higher-order thinking skills and collaborative work, and that cognitive presence by itself was not sufficient to sustain a community of inquiring learners. Social presence is defined as the ability of members of a community to "project their personal

characteristics into the community" (Garrison et al., 2000, p. 89), which indirectly

facilitates critical thinking and is therefore supportive of cognitive presence. If

members of a community feel that interactions with the group are enjoyable and

personally fulfilling, they tend to remain committed to the learning (Garrison et al.,

2000). Indicators of social presence include the following three categories: (1)

affective expression (personal emotional expressions), (2) open communication

(reciprocal and respectful communication), and (3) group cohesion (interactions

centred around dialogues) (Swan et al., 2009).

      According to a review of the CoI framework by Garrison and Arbaugh

(2007), the element of social presence has been studied the most when it comes

to studying educational settings. Garrison and Arbaugh's review also stated that

while social presence may lay the groundwork, teaching presence allows for the

creation of a learning environment where cognitive presence can be developed.

Teaching presence encompasses the design of the educational experience such

as selection of content, organization and presentation of the content and

facilitation of the educational experience (Garrison et al., 2000). Teaching

presence can be indicated by either a formal instructor or by the participants of a

community and may involve three categories: (1) instructional design and

management of content, (2) building understanding through facilitated discourse

and the guiding of discussions, and (3) direct instruction (e.g., present content,

question, guide, summarize, confirm understanding, provide feedback) (Swan et

al., 2009). A facilitator of an online conversation may act as a form of teaching

presence through keeping the discussion moving efficiently, drawing out inactive

participants, and continually monitoring the content and flow of conversations taking place.

Most referenced studies have focused on single presences instead of the framework as a whole. Even though many studies have used the CoI construct to study more formal online learning conversations (e.g., McLoughlin & Mynard, 2009; Oriogun & Cave, 2008; Schrire, 2006), this study focused on the exploration of self-organized groups of educators participating in conversations on Twitter, a public social networking site. Through this study it became apparent that all three elements mentioned in Garrison et al.'s (2000) CoI framework are evident in chats that are taking place on Twitter. Considering the new potentials of naturally occurring conversations in social media environments, investigating how educators may benefit from these conversations in the context of cognitive and social development may lead to new considerations and opportunities for those charged with the challenges of providing effective teacher professional learning.

Twitter – Background Information

Twitter has traditionally been viewed as a microblogging social broadcast medium with the general purpose of users being able to share information about what they are doing in a public online space as well as follow other users. Twitter users begin by creating an account on twitter.com using a unique username and password. This username can be the person's real name or an alias may be chosen. A unique user's profile is indicated by a username designated with the @ symbol (i.e., @kellypower). Users have the opportunity to display a photo of

choice, as well as information they would like others to know about themselves.

This brief user profile is limited to 160 characters, however many users include a

hyperlink to additional information such as a personal website. By default, an

account is publicly viewable; however, Twitter users can choose to make their

posts private, where only approved users can view them. Once an account is

created, users can begin "following" other users, which will lead to the viewing of

their tweets. Users can also be "followed" in return, which will allow others to see

their posts. A user's homepage will display the user's profile, the number of

people they are following, the number of others who are following them, as well

as a reverse chronological list of their aggregated posts. An example of a

homepage and profile is included in Figure 3.

Figure 3: Sample of Twitter homepage - Kelly Power
(www.twitter.com/kellypower, September 12, 2012)

Users participate in communicating with their followers by posting

information. Posts, also known as 'tweets', are limited to 140 characters, and may

contain text-based personal thoughts displayed as a public message, hyperlinks

to other resources on the web, or direct communication with other members.

Twitter users can choose to post a tweet in a number of different manners:

- Public tweets – appear in the public Twitter stream

- Reply tweets – also public but directed at another Twitter user
  through the use of the @ sign (i.e., @kellypower)

- Direct message tweets – private messages sent to other Twitter
  followers, not visible in the public tweet stream

- Retweets – forwarded messages, allowing the user to redirect a
  tweet from another user to his/her tweet stream (similar to a quote
  of someone else's message)

All posts will instantly appear on the user's homepage, as well as to

anyone who follows that person, with the newest messages appearing at the top

of the list. According to a study of Twitter as a social network by Java, Song,

Finin and Tseng (2007), the main types of user intentions are: daily chatter,

conversations, sharing information and reporting news. Generally, people are

using Twitter in three different ways: information sharing, information seeking and

friendship-wide relationships (Java et al., 2007).

Given Twitter's interactive nature, it can be viewed as an environment that

facilitates access to a population of geographically dispersed educators

consisting of a wide variety of expertise. Wright (2010) identified one of the

benefits of using Twitter as promoting and sharing one's own work, leading to a

sense of community being developed. Wright's participants reported feeling that

(a) their contributions were valued, (b) they were less isolated, and (c) they were

part of a mutually supportive community. Shirky (2008) referred to social network

users as operating in small groups as part of a community that are subdivided

into small but densely connected clusters of people having value. Cheng, Evans

and Singh (2009) also made reference to Twitter communities as "sets of Twitter

users that are tightly 'connected' in terms of following each other" (p. 28). Usually,

in social networking, the principle of homophily applies, "where people associate

with other groups of people who are mostly like themselves" (Yardi & Boyd, 2010,

p. 316). Grossman et al. (2001) maintained that teacher communities "work most

smoothly when teachers self-select into groups of like-minded colleagues" (p.

50). If we revisit Grossman et al.'s elements of an effective teacher community,

we review that a community allows for a sharing of resources for others' learning,

clarification of thoughts and the building of ideas through group discussions, and

a willingness to critique to further collective understanding. Aspden and Thorpe

(2009) supported Twitter as a medium to reinforce informal learning activities.

Therefore, rather than Twitter as a community itself, Twitter should be viewed as

a platform that will provide the opportunity for educators with shared interests to

come together as a community using informal communication techniques.

Wenger (2011) clarified in a tweet (see Figure 4) that Twitter should not be

viewed as a community of practice; rather Twitter is a platform for network

connections, where communities of practice may form.

Figure 4: Tweet by Etienne Wenger
(www.twitter.com/etiennewenger, April 11, 2011)

As a member of Twitter since 2010, I have observed that participants were using Twitter for a variety of different purposes. Twitter users have "appropriated this medium to reflect whatever use or style of communication they want" (Mischaud, 2007, p. 38). A content analysis study by Mischaud found that 58% of Twitter users went beyond a simple sharing of what they are doing by using the medium to send messages to other people known by the user, to publish one's personal viewpoints and thoughts, and to share news-like information with others (p. 23-25). He contended that participants have realized the flexible use of this medium and have adapted the technology to reflect a style of communication that "addresses the innate human desire to converse" (Mischaud, 2007, p. 38) with others. Twitter has provided a medium for a new form of collaboration and communication by allowing for informal learning conversations among educators following collaborative learning structures and transformational learning theories (Ebner et al., 2010; Grosseck & Holotescu, 2008; Honeycutt & Herring, 2009; Kassens-Noor, 2012). Wright (2010) found that collaborating on Twitter focused the participants' thinking to reflect purposefully on their experiences. In his study involving teachers' use of Twitter to share teaching practicum experiences, he found that "while 140 characters were initially difficult and limiting for explaining ideas, it honed participants' reflective thinking" (Wright, 2010, p. 259). At first,

participants tweeted mainly about what they were doing, but over time, the posts

became more deeply reflective after they had time to move beyond the *what*

posts to posts containing *why* and *how* they were teaching.

The notion that educators discuss topics of their own choosing that relate

directly to their experiences, provides opportunities for educators, who might feel

isolated in their schools, to explore the values and perspectives of other

educators, across the globe. The same elements of traditional learning theories

such as: informal learning through informal communication, supportive

collaboration involving suggestions and feedback to others, as well as self-

reflection on personal practices, seem to be accomplished through the thoughtful

actions of educators in using Twitter as a medium for professional learning

conversations.

While many educators are now using Twitter as a means of sharing

personal and professional resources through links to various blogs and websites,

some have gone further to participate in organized professional learning chats.

Twitter participants use a searchable and identifiable hashtag (#), followed by a

name or abbreviation, to label tweets related to a specific topic that can then be

followed by others. Shirky (2008) described the use of a hashtag (#) as a type of

"group formation" (p. 96). By using a hashtag, users are able to organize

messages related to a specific topic or context. The use of a hashtag allows

tweets to be searched and organized based on the tag used. One tweet by

Danny Maas (see Figure 5) contains five different hashtags that will draw

attention to different groups of users who may be interested in following the

discussion by searching for the following hashtags in Twitter: #ascd12, #lrnchat,

#edchat, #ecsd, and #edbookclub.

Danny Maas @dannymaas   24 Mar
Excited about my new book on differentiation & brain research!
ow.ly/i/wM45 #ascd12 #lrnchat #edchat #ecsd #edbookclub
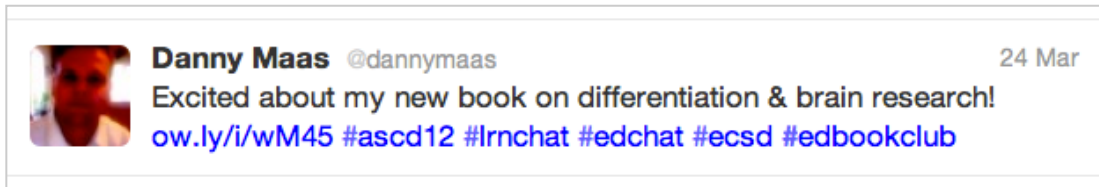
Figure 5: Tweet by Danny Maas (www.twitter.com/dannymaas)

This user determined that these five organically formed groups might be interested in his new book and by tweeting this, may lead to a further conversation about this book.

Twitter users may choose to use a Twitter chat tool in order to monitor conversations in a more organized fashion on their computer desktop or personal hand-held devices. Software applications such as Tweetdeck (www.tweetdeck.com) allow users to create and sort specific columns according to a search for specific hashtags (#), thereby filtering out only the tweets that apply to that specific group conversation. Other free applications available on the web, such as Tweetgrid (www.tweetgrid.com) or Tweetchat (www.tweetchat.com) also allow followers of a specific chat to filter only the messages pertaining to a specific chat they are interested in.

Another common use of a hashtag among educators is during a conference where participants use a pre-determined hashtag within the body of their tweets whenever they tweet something related to the conference (Reinhardt, Ebner, Beham & Costa, 2009). In this way, by searching for the community driven hashtag on Twitter, all the tweets related to the conference can be compiled and viewed, not only by participants in the conference, but also by Twitter users who

are not physically present. A search for #unplugd12 produced the stream of

tweets illustrated in Figure 6 which are of specific interest to the participants of an

educational gathering entitled UnPlug'd12 that took place in August, 2012.

Figure 6: Search results for #unplugd12 tweets
(www.twitter.com/ #!/search/%23unplugd12)

In an unplanned study that grew out of spontaneous participation in a conference

chat, a content analysis by Costa, Beham, Reinhardt and Sillaots (2008)

identified Twitter as an informal learning network that allowed for spontaneous

and immediate communication. While I have been afforded the opportunity to

participate in a variety of face-to-face conversations while attending professional

learning sessions, I have also experienced the use of Twitter as a medium which allowed for people from great distances to take part in the communications being tweeted at such sessions. In essence, Twitter allowed for participants to tweet and broadcast the information from the learning session out onto the web for others to participate in further discussions. This allowed for instantaneous interactive information sharing to a larger geographical population.

There are also a growing number of educationally related conversations taking place on Twitter that are organized using this hashtag (#) convention. Twitter chats allow opportunities for educators who may have similar interests to come together for conversation around related topics of interest. For example, #edbookclub is a convention used in order to keep track of tweets related to book study among a group of educators who chose to participate (see www.edbookclub.com). Another conversation identified using the convention #mathchat is a chat that takes place on Thursdays at 8:00pm EST and allows for anyone interested in the area of mathematics to discuss and share ideas related to various topics that are decided upon by the group prior to the chat. These chats are real-time events moderated by a facilitator, but are also archived publicly at http://mathschat.wikispaces.com/Archive+of+mathchat for others to access at a later date. Twitter chats that take place in the public timeline, are usually facilitated by a moderator, and are available to anyone interested in following along during the conversation through the use of the hashtag (#). A comprehensive list of popular educational chats can be found in Appendix B.

Groups of Twitter users can design and form a chat at anytime. The role of the moderator generally involves the announcement of the beginning question to

begin the conversation and to facilitate the chat session similar to a face-to-face

facilitation role. This may involve questions to clarify, or re-direct the focus of the

conversation. Most Twitter chats enlist the aid of a moderator to help guide and

facilitate conversations. Twitter chats usually allow for educators who are in

similar positions, to share best practices, debate common issues in an attempt to

collaborate and problem solve together.

Conversations taking place on Twitter can affect two different populations:

those participating in the chat by posting information, and those who are reading

the chat stream, but choosing not to participate in written form. Ebner et al.

(2010) described how this communication can foster "process-oriented learning

due to the fact that it can allow continuous and transparent communication" (p.

93) which supports a social constructivist approach to learning. The learning

process becomes transparent and as a result can benefit others who may be

following along. Learning can take place among the users participating in the

conversation; however, there is another population of users who may be

watching the conversation, but not actively participating. These "lurkers" are

defined by Preece, Nonnecke and Andrews (2004) as "someone who has never

posted in the community to which he/she belongs" and constitute 53.9% of online

learning communities (p. 208).

In the review of literature, there seemed to be competing views on the use

of Twitter as an environment for an effective conversation. Wideman (2010)

contended that chat environments may be less effective as a medium for deep,

reflective discussion seeing that there may be "disjointed conversations or

multiple parallel conversations that can be difficult to follow when chat groups

grow too large" (p. 22). In his study of the use of Twitter as a mode of reflecting on practicum experiences among teachers, Wright (2010) indicated that while limiting thoughts to 140 characters was initially difficult to explain ideas, it eventually honed participant's reflecting thinking. In a case study involving the use of Twitter as a means to capture self-reflections and observations over seven weeks of a teaching practicum, students were prompted with the following questions to respond to:

1. What am I learning now?;

2. What do my students say about their learning right now?;

3. What do I need to overcome or solve?;

4. Where am I learning right now?;

5. What am I going to do next?;

6. What is getting in the way right now?;

7. What am I thinking about right now? (Wright, 2010, p. 261)

Wright (2010) observed a developmental trajectory whereby study participants noticed tweet content evolved from predominantly factual content, (i.e. "*what* they did") to additionally reflective content (i.e. "*why* and *how* they did") as evidenced in the chronology of tweets captured and analyzed through focus group discussions. Findings suggested that Twitter was a valuable means to generating and developing self-reflection leading to effective teaching and learning. Grosseck and Holotescu (2008) supported Twitter as an effective tool for professional development through collaboration and opportunity for self-reflection.

Twitter conversations may engage group members in a variety of ways. Educators who may not have gathered otherwise, engage in opportunities for sharing different kinds of content (Grosseck & Holotescu, 2008), unique dialogue acts resulting in statements, questions and answers (Ritter, Cherry & Dolan, 2010) as well as debates that could be meaningful and deliberate (Yardi & Boyd, 2010) for professional learning. Research studies on the use of Twitter have generally focused on exploring the interactive nature of users participating in this medium (Cha, Haddadi, Benevenuto, & Gummadi, 2010). Honeycutt and Herring (2009) investigated that degree of conversationality and nature of collaboration among Twitter users through the use of the @ sign as a form of addressivity. They found that the use of the @ symbol, to address a certain participant, helped in relating one tweet to another making it possible to maintain more coherent exchanges among participants (Honeycutt & Herring, 2009). There seemed to be limited studies on the examination of content related messages in education conversations taking place (Ebner et al., 2010; Honeycutt & Herring, 2009). Gaps exist in the study of content within the tweets and therefore led to further exploration in this study.

Literature Related to Differing Methodologies

In a review of the literature related to differing methodologies used to analyze online learning environments, there were a variety of methods employed that incorporated quantitative analysis, qualitative analysis, as well as mixed methods analysis.

The initial discovery of a content analysis by Chew (2010) of the 2009 H1N1 outbreak and subsequent content taking place in the Twitter environment led to the decision to explore the use of a content analysis for my own study. Chew studied how the use of Twitter as a social medium could be used to track and "inform public health education and communication initiatives" (p. 3). Since a large number of tweets were analyzed (i.e., over 3 million tweets), Chew (2010) adopted a content analysis involving manual coding as well as automated computer coding. This inquiry of the use of Twitter in the health care environment aligned with my personal inquiry of how Twitter was being used in the educational environment as a medium for holding professional learning conversations.

Upon further review of content analysis studies, I came across reviews of various content analysis instruments and coding schemes that have been utilized in studying various asynchronous online learning environments that informed my methodology (DeWever, Schellen, Valcke & vanKeer, 2006; Weltzer-Ward, 2010). According to Weltzer-Ward (2010) the "field has been dominated by analysis focusing on describing the phases of levels of critical thinking and the evidence for socialization in online forums" (p. 70). As well, there has been a move towards "treating discussions as dialogue or conversation and for how well discussions are related to and supportive of learning outcomes" (Weltzer-Ward, 2010, p. 70). Among the instruments studied, the coding schemes used by Henri (1992), Gunawardena et al. (1997), and Newman et al. (1995) were most useful for informing my study as they aligned with my inquiry involving the types of conversations that were taking place in an online learning environment.

Henri's (1992) analytical framework referenced five dimensions of study:
(1) participative, (2) social, (3) interactive, (4) cognitive and (5) metacognitive.
Sing and Khine (2006) utilized Henri's framework in their mixed methods analysis
of online interactions and participation in discourse among teachers as
participants. Other mixed methods studies used Henri's framework to analyze
electronic discussion forums in traditional course settings through content
analysis, quantitative methods as well as qualitative interviews (Chen, Chen &
Tsai, 2009; Hara, Bonk & Angeli, 2000; Lee-Baldwin, 2005).

Gunawardena et al. (1997) presented a tool in order to study the process
of social construction of knowledge as it applies to five phases of knowledge
construction. The first phase involves "sharing and comparing of information,
which comprises observations, opinions, statements of agreement, examples,
clarifications, and identification of problems" (DeWever, Schellen, Valcke &
vanKeer, 2006, p. 15). The second phase explores the "discovery and exploration
of dissonance or inconsistency among ideas, concepts, or statements" (p. 15).
The third phase involves the "negotiation of meaning and/or co-construction of
knowledge" (p. 15) which continues with the fourth phase where "characterized
by testing and modification of proposed synthesis or co-construction" (p. 15).
Finally, the fifth phase refers to "statements of agreement and application of
newly-constructed meaning, and encompasses summarizing agreement,
applications of new knowledge, and metacognitive statements revealing new
knowledge construction" (p. 16). A number of studies utilized Gunawardena et
al.'s framework in order to measure the level of knowledge construction in
asynchronous groups interacting in an online learning environment (DeWever,

vanKeer, Schellens, & Valcke, 2007; Schellens, vanKeer, Valcke & DeWever

(2007); Wang et al., 2009).

Newman et al.'s (1995) coding scheme involved ten categories focused on

studying group learning with respect to critical thinking: (1) relevance, (2)

importance, (3) novelty, (4) outside knowledge, (5) ambiguities, (6) linking ideas,

(7) justification, (8) critical assessment, (9) practical utility, and (10) width of

understanding. A number of studies referenced Newman et al.'s framework in

order to investigate interactions and critical thinking in online environments

(Landis, Swain, Friehe & Coufal (2007), Perkins & Murphy, 2006; Wickersham &

Dooley, 2006).

Considering the coding scheme model parameters investigated in the

literature review, I found that Garrison et al.'s (2000) use of the Community of

Inquiry model captured the three elements that most applied to my inquiry:

cognitive presence, social presence, and teaching presence. The cognitive

presence coding scheme, in particular, contained four analytical elements, which

provided an exceptional fit for a twitter content analysis, given the nature of

limited character allocation in tweets. In addition to their own studies by Garrison

et al. (2000), others have used their framework to study collaborative knowledge

building (Schrire, 2006), telecollaboration (Redmond & Lock, 2006) and critical

thinking in online collaborative learning teams (Perkins & Murphy, 2006; Oriogun

& Cave, 2008). Xin's (2012) critique of the CoI framework describes online

interactions as more complex occurrences where "the analysis of the

communicative functions of online talks should be considered together with other

aspects of interest – who said what, how, why and when" (p. 10). Xin's main

argument is shared as,

> Online discussion must be understood as foremost a communication
>
> phenomenon. It consists of conversation exchanges in natural language.
>
> Online expression, like its face-to-face counterpart is multi-functional. We
>
> often combine instruction, knowledge construction, and social interaction in
>
> a single utterance. As demonstrated throughout the article, because of the
>
> multi-functionality of communication the three main aspects of CoI –
>
> cognitive presence, social presence and teaching presence are
>
> intertwined. (p. 9)

In a ten-year review of the use of Garrison et al.'s framework, the authors

themselves provide a personal perspective acknowledging the use of their

framework that was initially "designed for exploratory and descriptive studies"

(Garrison et al., 2010, p. 8) in studying the "growing phenomena of online and

blended learning" (p. 8). Their acknowledgement of the various strengths and

weaknesses of their framework presented by different research studies were

referenced as a "catalyst in initiating new lines of research and practice

employing the CoI framework" (p. 9).

An extensive review of the literature revealed that very few quantitative or

qualitative peer reviewed studies have been published regarding the use of

Twitter as a professional learning medium. Most, if not all studies, focused on the

use of a formal online learning environment, such as online discussion forums,

blogs, or CMC environments, as a focus for deeper exploration. Therefore, this

study supports additional research suggestions from Weltzer-Ward (2010) who

indicated a need for "further application of schemes outside of academic classroom contexts" (p. 70) by applying a content analysis in analyzing educational conversations taking place on Twitter.

Summary

A review of the literature on the use of computer-mediated communication from a professional learning context revealed educational research studies have traditionally focused on formal environments that were created for the purpose of studying online interactions and behaviours. A gap was evident in the available research concerning the nature of these educational related conversations being held in "real-time" and the possible benefits and challenges in using Twitter as a medium for professional learning conversations. This led to a question of personal inquiry and the basis for this study: How can this on-line professional learning environment be structured in order to meet the needs of the self-directed learners?

This study explored the nature of conversations taking place on Twitter based on the constructs of the CoI model (Garrison et al., 2000) to help fill the gaps in the literature. Examining the contents of three online public twitter conversations based on the three elements of cognitive presence, social presence, and teaching presence has led to a greater understanding of the general patterns of interaction and the nature of these conversations, more specifically, whether these conversations are able to get to a deep level of critical thinking.

Chapter 3: Methodology

This research involved a multi-case study approach in an effort to understand the nature of conversations occurring in a public online environment, Twitter. Johnson and Christensen (2008) suggested that studying multiple cases may result in a more effective investigation since one is able to compare similarities and differences between the cases studied. Therefore, in this research design each case was examined in total, and then compared in a "cross-case analysis" for similarities and differences (Johnson & Christensen, 2008, p. 409). This cross-case analysis, also referred to as comparative analysis, may enhance a study's generalizability as well as deepen understanding and explanation of the topic being studied, which in turn addresses issues of validity and reliability (Miles & Huberman, 1994).

Methods of Data Collection

The primary strategy of data collection involved accessing three public Twitter chat transcripts that had been archived on the World Wide Web. Archived transcripts of online conversations are searchable and publicly accessible on the Internet. Twitter chat transcripts for this qualitative research study were chosen from the following hashtags and websites:

- #edchat – http://edchat.pbworks.com/w/page/219908/FrontPage

- #mathchat - http://mathschat.wikispaces.com/Archive+of+mathchat

- #31daygame - http://31daygame.net/

This investigation focused on chats that contained a common focus on collaborative learning in the classroom, and involved a specific inquiry. The data

captured from each conversation included the participants of the public

conversation, the contents of tweets sent, and the date and time the tweets were

created. All data that were analyzed were tweets that were publicly broadcast on

Twitter and archived by the participants, therefore participant anonymity or

confidentiality was not necessary. However, in this study, precautionary

measures were applied to de-identify any data that may have been sensitive in

nature in order to eliminate potential risk to any individual. Since Twitter is a

public environment, a method to store data securely and privately did not apply

for this research. Transcripts of each Twitter chat were printed for coding

purposes, and were not published in this paper. Content analysis data were kept

on my personal computer for analysis purposes only and a summary of data will

be published in the research thesis report.

Participants

Since this study focused on the online chats among specific groups of

educators engaged in a specific social activity using a specific piece of

technology, this group was deliberately selected using "convenience sampling"

(Johnson & Christensen, 2008, p. 238) since the participants in the conversation

are the ones who were available at the time of the conversation and as they held

important information needed for this study. Johnson and Christensen

emphasized the importance of examining and describing the characteristics of a

convenience sample in order to accurately report on the findings in the study,

while at the same time maintaining a cautious stance about making

generalizations to larger populations.

The participants in this study were educators spanning various geographical locations who chose to participate in publicly held professional learning conversations on Twitter. These participants were aware that their conversations were held in a public forum and that these conversations have been archived on the World Wide Web for others to access for the purposes of additional sharing and learning. Participants had public profiles available online providing general information about their demographics. General information is provided on the demographics of the participants of each chat in the Data Analysis section of Chapter 3.

Situating the Researcher

As the sole researcher of this paper, I have been a teacher consultant for a District School Board for 10 years and have facilitated numerous face-to-face collaborative inquiry sessions with educators. This role involved leading groups of educators in professional conversations in order to analyze various sources of data in search of patterns and themes that resulted in improved teacher pedagogy and increased student learning. I have first-hand experience audiotaping and videotaping professional learning conversations and analyzing the content in search of underlying themes. This experience provided insight and understanding that enhanced my ability to critically analyze conversational data for the content of the proposed coding method. I have also been an active member of Twitter for the past three years. My previous experience and active participation with Twitter chats provided insight and technical understanding of

the interactive and social nature of this particular medium that proved helpful

when analyzing the data.

Data Coding and Analysis

The main methodological approach for this qualitative investigation

involved content analysis. Weber (1985) described content analysis as a

methodology that follows a set of procedures in order to organize large quantities

of text into much fewer content categories in order to "make inferences from text"

(p. 9) in an attempt to reveal a deeper understanding of the nature of the text,

beyond merely counting the words. I used "analytical constructs, or rules of

inference, to move from the text to the answers to the research question" (White

& Marsh, 2006, p. 27) following a specific coding procedure described in

subsequent paragraphs. This allowed the analysis of each tweet in a

conversation in an effort to make an inference about the nature of critical thinking

evident in the conversation.

A directed content analysis approach (Hsieh & Shannon, 2005) involves

the use of a theoretical framework in applying a coding scheme as a basis for

studying a particular phenomenon in textual data. This study was deductive in

nature. Elo and Kyngas (2007) describe deductive content analysis as being

useful if "the general aim is to test previous theory in a different situation or to

compare categories at different time periods" (p. 107). In this case, Garrison et

al.'s (2000) coding scheme was used as the theoretical framework in order to

focus on the research questions. Since this study was exploratory in nature, I was

also aware of an inductive approach (Elo & Kyngas, 2007) in the case that there

was an emergence of new themes or additional subcategories beyond the existing coding scheme that needed to be applied as an extension to the existing coding and theoretical construct.

Content analysis studies have taken both a quantitative and qualitative form in education related studies. Studies that have taken a quantitative approach include the analysis of the knowledge dimension shared in teachers' blogs, as well as the level of collaborative learning and knowledge construction evident in asynchronous discussion groups (Hou, Chang & Sung, 2010; Schellens & Valcke, 2005; Schellens, vanKeer, Valcke & DeWever, 2007). Examples of educational studies focusing on a qualitative form of analysis have included such studies as the constant comparative analysis of four different types of electronic communication mediums (Levin, 2001) as well as an exploratory case study of critical thinking in online discussions (Perkins & Murphy, 2006). Mixed method studies have also been conducted in analyzing interaction and cognition in asynchronous discussions (Schrire, 2006; Yang, Richardson, French & Lehman, 2011). While the studies reviewed involved mixed methodologies, this study was qualitative in nature.

In this multi-case study, a directed content analysis approach was applied to three sets of data retrieved from archived educationally related Twitter conversations. Each chat was analyzed thoroughly and independently of each other. Firstly, data were examined with a focus on each tweet in the conversation. Secondly, data were examined in a holistic manner, as major themes became evident in the conversations of each chat. A deductive content analysis approach was used following the coding template developed by Garrison et al. (2000,

2001). A comprehensive chart of the coding template used can be found in

Appendix B. Such a coding scheme allowed an assessment of the quality of

conversations considering the contexts of cognitive presence, social presence

and teaching presence while considering Shulman's (1987) foundational

knowledge categories. This coding template was chosen because it was

developed specifically for analyzing written texts taking place in computer

conferencing mediums.

Coding Procedure

Zhang and Wildemuth (2009, pp. 310-312) outlined a specific process for

conducting content analysis and suggested an eight-step process which was

followed in this study:

1. Prepare the data.

2. Define the unit of analysis.

3. Develop categories and a coding scheme.

4. Test the coding scheme on a sample of text.

5. Code all the text.

6. Assess the coding consistency.

7. Draw conclusions from the coded data.

8. Report methods and findings.

Following these steps, a more detailed procedure for this research is outlined

below.

In *preparing the data*, each conversation from three distinct Twitter chats

was downloaded and analyzed separately. Each conversation, which included a

compilation of tweets relevant to a Twitter chat, was analyzed separately in order

to remain focused on the nature of content in the individual chat. The *unit of*

analysis was identified to be each individual tweet in the conversation. A tweet

may have consisted of a phrase, an incomplete sentence, a complete sentence,

or more than one sentence that communicated a message that was limited to 140

characters.

The *coding scheme* used included the categories defined in Garrison et al.

(2000) and can be found in Appendix B of this paper. A *test of this coding*

scheme was carried out indicating specific coding rules that were applied in order

to ensure consistency throughout this study. For example, Garrison et al. (2001)

suggested that when a unit of analysis (in this case, a tweet) contains an

ambiguous categorization cue, the research must apply a code up or code down

strategy. If it was not clear what phase was reflected in a tweet, a code down

strategy was applied where the earlier phase was chosen. If a tweet clearly

contained more than one phase, a code up strategy was implemented, where the

later phase was chosen. Garrison et al. stated that this code up procedure is

"justified by noting that higher levels of critical thinking such as integration and

resolution borrow characteristics and process from previous phases" (p. 5).

These rules were applied by *coding all text* in this manner.

Each Twitter chat was considered to be a separate case study: #edchat,

#mathchat, and #31daygame. The *coding consistency* relied on myself as the

sole human coder since this study was exploratory in nature. In order to *draw*

conclusions from the coded data, the categorical data from each conversation

were presented in frequency distribution tables in the Analysis of Findings section

of this report. This allowed for themes or categories to be identified and the

nature of each conversation to be explored separately. Moreover, this approach

allowed the analysis of similarities and differences among the multiple cases in

this study. Personal thoughts and findings for each conversation analyzed were

also recorded as additional qualitative data. Also, in *reporting methods and*

findings, this paper includes a balance of descriptive and interpretive information

related to theories outlined in the literature review.

Validity and Reliability

This study relied on credibility in order to show that the textual evidence

was consistent with the interpretation (Weber, 1985). Research credibility was

enhanced by my prior experience as both a professional learning facilitator and

an active twitter participant in both face-to-face and virtual conversations.

Validity is defined as "the accuracy of the inferences, interpretations, or

actions made" based on a set of data (Johnson & Christensen, 2008, p. 150).

The validity of this study was enhanced by utilizing a specific coding scheme and

assessing decisions based on a standard (Hsieh & Shannon, 2005; Potter &

Levine-Donnerstein, 1999). At the time of this inquiry, the use of Garrison et al.'s

(2000) framework was referenced in 61 results of a search within the ERIC

database and was cited in 1219 studies in a Google Scholar. According to

Weltzer-Ward (2010), there has been a widespread acceptance and application

of the CoI model as a dominant content analysis coding scheme. Swan et al.

(2008) validated the CoI framework through analyzing student responses that led

to operationalized concepts consistent with the three elements of the framework:

cognitive presence, social presence and teaching presence. This led to a

conclusion that the CoI could be used to evaluate the existence of an online

community of inquiry. A number of studies have provided validation of the CoI

framework through various studies of computer conferences (Arbaugh et al.,

2008; Garrison & Arbaugh, 2007; Rourke & Kanuka, 2009; Shea & Bidjerno,

2009). Since this model has been used for over a decade, in studying a large

number of online interactions, it was assumed to be a valid and reliable tool for

this study. Garrison et al. (2010) claimed the CoI framework has been shown to

be "reasonably robust" in various studies and maintain its design for "exploratory

and descriptive studies" (p.8).

Reliability refers to the "consistency or stability" of a set of data (Johnson &

Christensen, 2008, p. 144). Potter and Levine-Donnerstein (1999) suggest coding

as stable when "coders make judgements about content, let some time go by,

then make judgements again about the same content. If their later judgements

match their earlier judgements, then their coding is stable" (p. 271).

Since this study involved the coding of data by one researcher, a

consistent approach to content analysis was applied. The interpretations were

made by one person and are reported in the Analysis of Findings section of this

report. The coding scheme used is included in Appendix B. There was a certain

level of subjectivity in deciding which code and category applied to each tweet.

This subjectivity was a factor in the reliability of this study. Potter and Levine-

Donnerstein (1999) consider "coding fatigue" (p. 271) as a threat to reliability

since a high level of concentration is necessary during the task of coding. The

use of a coding scheme, as represented in Appendix B, helped focus the coding task against a specific set of rules offering a schema for coding.

In order to address reliability at the onset of this study, my initial findings were shared with a colleague who is also active as a facilitator of professional learning sessions as well as a participant in the Twitter environment. If this study were to be replicated in the future, and there were human resources available, the use of additional coders would contribute a higher level of reliability by offering an element of "inter-rater reliability" (Rourke, Anderson, Garrison & Archer, 2001, p. 11).

Limitations of the Study

Though the findings of this study demonstrate a deeper understanding of the nature of online Twitter educational chats from a professional learning perspective, the conclusions of this study are limited by many factors. The following section outlines assumptions, delimitation and limitations related to this study.

Assumptions

The primary assumption of this study was that the participants in the online Twitter conversations analyzed were actual educators as indicated in their Twitter profiles. Since this research was conducted using archived conversations available to the public on the World Wide Web, it was also assumed that the Twitter chats pertained to a particular topic and were synchronous at one point in time.

Another assumption was that the participants were all self-directed learners who chose to take part in these online conversations. That is, their participation was not part of a formal learning activity directed from their superiors.

Delimitations

The Twitter chats chosen were based on educationally related themes that were similar in nature. Only Twitter chats related to education, involving educators as participants were chosen. All three Twitter chats, #edchat, #mathchat, and #31daygame were centered on the theme of cooperative learning strategies used in the classroom in relation to collaboration and group work.

The theoretical framework used for this study set a boundary for the findings to focus on cognitive presence, social presence, and teaching presence of each Twitter chat, according to the Community of Inquiry introduced by Garrison et al. (2000).

Limitations

Conversations taking place online were open to a number of interpretations since all archived communication involved the written word only. Garrison et al. (2010) reported that transcript analysis "does not reveal all the complex variables of context, personality, discipline and timing that make up a unique educational transaction" (p.8). For example, one limitation was the use of emoticons in participant's posts. Different participants may use and or interpret emoticons in varying ways. Therefore this study is limited by the interpretation of

how emoticons were used to share thoughts and ideas, and are not generalizable to different uses of emoticons in this environment.

One apparent limitation was that the convenience sample of participants only included educators who showed a preference for online communication in a public setting. As well, it is important to note that the demographic information people make available in their profiles is dependent upon their honest disclosure. These participants were already established members of the Twitter environment who seemed to embrace online activity and were apparently comfortable with their contributions being public and transparent. It is unknown how participants' perception of Twitter as a safe venue for public conversation influenced their contributions to the chats. Therefore findings from this investigation cannot be generalized to all educators or other online collaborative tools.

Another consideration related to the participants is the fact that we cannot be sure that the participants were who they said they were in the online profiles. For example, a math publisher might pose to be a certain identity in the Twitter environment and participate in these online chats to persuade the use of their resources as solutions to problems of practice.

This research produced results bound by the interactions and professional learning that took place in three virtual chats on Twitter, taking place at different times. Therefore, findings were neither generalizable to face-to-face professional learning sessions on these same topics, nor different times during months of the year.

Another limitation presented in this study, is that of differing time zones among the participants. The fact that participants were participating from different

geographical locations may or may not have been a factor in the inclusion or

exclusion of his or her interaction. The scheduled nature of educational Twitter

chats may also have affected participation based on scheduling conflicts among

participants. This study is limited to the topics, as well as the availability of

certain people on particular nights of the week, and times of the month.

Another limitation related to the concept of pseudo-community introduced

by Grossman et al. (2001). Since Twitter is a public online environment, there

may have been a tendency for a participant to "play community" by acting as if he

or she shared values and common beliefs as a congenial approach to maintain a

surface friendliness (Grossman et al. 2001, p. 955). This study was limited to the

assumption that the three Twitter chats that were analyzed contained valid

thoughts and ideas being shared.

Another limitation was in the interpretation of meaning in the coding of

archived transcripts. The participants' reasoning processes were sometimes not

immediately transparent in their written posts. As a result, there was a high

interpretive burden as a researcher analyzing and coding the data. Although

interpretation of tweets was necessary, the challenge of being subjective was a

factor. The use of the specific coding scheme helped limit this subjectivity.

Sharing of initial findings with a colleague confirmed the framework chosen as

well as developing trends and themes. Discussions and peer-debriefing about the

interpretation of data as it related to the coding system at the onset of this study

also helped limit the subjectivity as tweets were interpreted.

Despite the limitations, this study addressed gaps in the research literature

and made several significant contributions to both theory and practice for

professional learning conversations taking place in online environments. This work offered valuable insight into the application and use of Twitter as a medium for holding professional learning conversations.

Summary

Chapter three presented a multi-case study approach that was intended to understand the nature of conversations occurring in a public online environment, Twitter. A benefit to this approach is the ability to compare findings between the cases studied. This paper will now transition to chapter four to present the research findings of #edchat, #mathchat, and #31daygame in relation to Garrison et al.'s CoI framework (2000). Findings are first presented in relation to the individual Twitter chats, and then they are compared between the Twitter chats. The final part of this paper, chapter five, discusses the interpretations of these findings and the implications for practice.

Chapter 4: Results

Introduction

Chapter 4 of this research paper presents the findings of a content

analysis of the qualitative data collected. More specifically, this chapter presents

the results of a qualitative analysis of transcripts from three distinct Twitter chats.

A comparative analysis between these three Twitter chats is included.

The theoretical framework and research questions of this inquiry guide the

presentation of the results. The theoretical grounding of the paper is based on

Garrison et al.'s (2000) CoI, and the phases of interaction associated with that

model, as described in Chapter 2. The overall inquiry focused on the nature of

professional conversations among self-organized groups of educators on Twitter.

All data from each conversation were coded for the four categories of

cognitive presence, the three categories of social presence, and the three

categories of teaching presence. Tweet samples, analyzed by myself, were

included in these results in order to indicate the various categories of cognitive

presence, social presence, and teaching presence that were identified throughout

this analysis

Conventions Related to Twitter

To assist in the content analysis of these tweets, having a clear

understanding of the conventions used in Twitter was important. These

conventions included a predominance of short forms, *retweets,* and *non-related*

tweets.

Short forms

Since the length of a post in Twitter is limited to 140 characters, participants tend to provide short forms for certain words in order to preserve space for their thoughts. Examples of common short forms used are:

- IMO - in my opinion
- 2 - to
- 4 - for
- subj - subject
- stdnts - students
- w/ - with
- tchrs - teachers
- govt - government
- pics - pictures

Retweets

Another phenomenon of the Twitter environment is a *retweet*. A retweet is simply the direct reposting of another participant's tweet, similar to the practices of a direct quote or a forwarded email. According to boyd, Golder and Lotan (2010):

> While retweeting can simply be seen as the act of copying and
> rebroadcasting, the practice contributes to a conversational ecology
> in which conversations are composed of a public interplay of voices
> that give rise to an emotional sense of shared conversational context.

For this reason, some of the most visible Twitter participants retweet others and look to be retweeted. (p.1)

An example of a *simple retweet* is shown here:
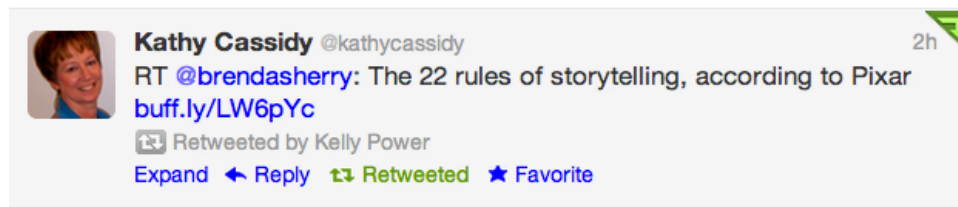
The original tweet was posted by @brendasherry: *The 22 rules of storytelling, according to Pixar (embedded link to web resource).* Another user, @kathycassidy retweeted the original post, without modification, as indicated by the "RT" at the beginning of the new tweet. There is an inferred understanding among Twitter users, that a retweet is an indication of agreement with a specific post. However, a simple retweet may also just be a user sharing this information with their population of followers without a judgment of agreement or disagreement. It may just be a simple sharing of the information in a neutral fashion.

Another behaviour of a retweet might include additional information shared along with the original posting. An example of a *retweet with more* is shown here:

In this case, the original tweet was posted by @brendasherry as a reflective question: *Do we admire people more for trying than for their successes?*

The second user, @kellypower retweeted the original post, as indicated by the RT, but also added additional information "This made me stop and think :)" indicating further reflection on the part of @kellypower, the one who retweeted.

Given the nature of a retweet, at times the retweeted post might appear to be neutral in nature, where it is unknown why the original tweet might have been retweeted. These retweets were identified as a *simple retweet*. It may have been with an inferred agreement, however it may have been just to re-share the information with another population of followers. There is no way to be sure of the nature of a simple retweet without interviewing the one who retweeted the original retweet. Interviews with participants were not part of this research study. Therefore, *simple retweets* were not included in the content analysis and subsequent coding for cognitive presence. The simple retweets were however counted and reported for each Twitter chat studied for informational purposes only.

However, it was noticed in the conversations analyzed, at times a participant might have posted a *retweet with more* information indicating evidence of further explicit thought or critical thinking. If a retweet contained further evidence of cognitive thought, beyond that of a *simple retweet*, these were counted and analyzed in this research study.

Non-related tweets

Another important phenomenon that became evident in the analysis of these Twitter chats was that of an unrelated tweet. At times throughout an

archived Twitter conversation, a posting included a tweet that was unrelated to

the scheduled conversation taking place. An example is as follows:

> C21U: RT @kevin_corbett: A Closer Look at Virtual Learning
> Models http://ow.ly/5YhY8 #onlinelearning #edchat

In this case, a participant, C21U, retweeted a post by @kevin_corbett regarding a

site for virtual learning models in order to share it with two specific communities

of followers, those following the hashtag #onlinelearning and those following the

hashtag #edchat. However, this specific tweet was not directly related to the chat

taking place during the scheduled time that #edchat was taking place. Therefore

these types of tweets were classified as *non-related*. The non-related tweets

were counted for each conversation, but were not included in the content

analysis.

Findings

There were three educational Twitter chats included in this exploratory

study. The archived transcripts were retrieved from each of the conversations.

Content analysis was applied to code and explore patterns of cognitive presence,

social presence, and teaching presence based on the indicators defined in the

CoI (Garrison et al., 2000) framework. The findings for each of the three

educational Twitter chats are reported here in terms of participant information as

well as detailed results for each category of cognitive presence, social presence,

and teaching presence organized into separate frequency distribution tables.

Specific information for each presence is further explained as it pertains to each

conversation.

#edchat - Findings of Participant Tweets

Using content analysis, the findings of a Twitter conversation called #edchat that took place in a synchronous, one hour timeframe revealed a total of 1366 tweets. The topic of this educational conversation was: What specific things can we do to make our schools more collaborative learning environments? The tweets captured included 329 individual profiles tweeting throughout the conversation. The demographics of the participant population involved mostly educators spanning from elementary and secondary panels, administrative and, support staff, as well as faculty from post-secondary institutions. Approximately 34 of the 329 profiles were not individuals participating in this conversation; rather, these participants were representatives from companies, organizations or developers that were using the #edchat hashtag to advertise certain events, topics, educational resources, or business related ventures and supports. The participants' geographical locations for #edchat, as listed on the Twitter profiles are shown in Table 1.

Table 1

Geographical location listed for #edchat participants

Country	Frequency (N)
Australia	14
Brazil	2
Canada	22
Iceland	1
Indonesia	1
New Zealand	3
Singapore	2
Sweden	1
United Arab Emirates	1
United Kingdom	7
United States of America	191
Venuzuela	1
Unknown location	83

Note. Total number of participants in #edchat: n=329

A variety of Twitter conventions were included in the #edchat. Of the 1366 tweets in total, 287 of the tweets (21%) were classified as simple retweets, as described above, and were therefore not included in the analysis for #edchat. Furthermore, 114 of the tweets were non-related tweets (8%); therefore, they were not included in this analysis. Eliminating simple retweets and non-related tweets from the #edchat transcript resulted in a total of 965 tweets that were then analyzed using content analysis. Table 2 provides detailed information for each category of each presence in the CoI framework, as well as additional information that were analyzed.

Table 2

#edchat - Overall findings

Community of Inquiry Presence	Frequency (N)	Percent (%)
Cognitive Presence		
Triggering Event	8	0.8%
Exploration	853	88.3%
Integration	31	3.2%
Resolution	0	0%
Social Presence		
Emotional Expression	91	9.4%
Open Communication	587	60.8%
Group Cohesion	237	24.6%
Teaching Presence		
Instructional Management	5	0.5%
Building Understanding	40	4.1%
Direct Instruction	8	0.8%
Additional information		
Facilitator Tweets	53	5.5%
Tweets containing questions	55	5.7%

Note. Total number of tweets analyzed in #edchat: n=965

#edchat - Cognitive Presence

Cognitive presence was analyzed in the transcripts by coding for the triggering event (CT), exploration (CE), integration (CI) and resolution (CR). As indicated in Table 1, 892 out of 965 (92.4%) tweets contained evidence of cognitive presence.

The triggering event (CT) was indicated in the following tweet:

Participant 184: Welcome to #edchat! What specific things can we do to make our schools more collaborative learning environments?

The triggering event as defined in Appendix B presented a question that focused

the discussion around a certain experience or topic.

As indicated in Table 2, throughout this conversation, the majority of the

tweets containing a cognitive presence (88.3%) were explorative in nature around

the triggering question: *What specific things can we do to make our schools more*

collaborative learning environments? These cognitive exploration type tweets

(CE) followed more of an information exchange or sharing of ideas representing

many different ideas being presented. As indicated in Appendix B - Description of

Content Analysis Coding Scheme, the exploration category may include many

different ideas or themes being presented with unsupported opinions. Here, these

tweets tended to be a general sharing of knowledge as an attempt to explore the

topic for discussion.

Upon further analysis of the #edchat data, it was evident that three main

themes emerged: (1) ideas related to the understanding of collaboration in

general; (2) ideas related specifically to the collaboration of students; and (3)

ideas related specifically to the collaboration of teachers. At one time during the

conversation, one participant asked for the definition of collaboration in order to

narrow the focus and understanding of the topic for discussion. A definition was

offered 127 tweets later by another participant; however, the conversation

continued with three distinct foci: (1) collaboration in general, (2) collaboration

among students, and (3) collaboration among teachers (see Figure 7).

Figure 7: Cognitive Presence - Exploration foci
(#edchat)
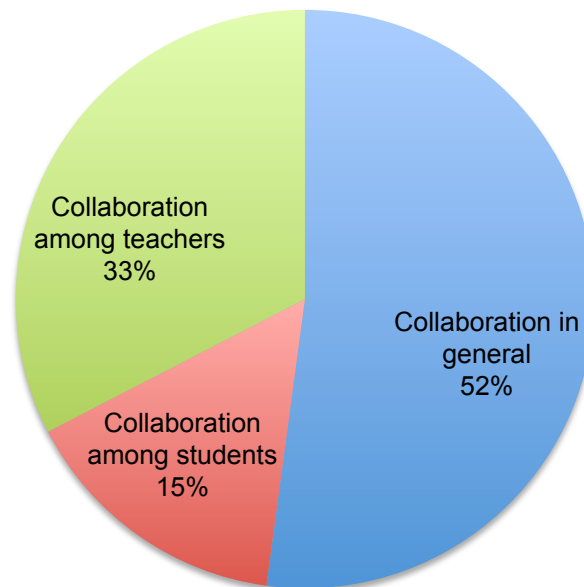
Among the tweets that explored the concept of collaboration in general, 52% of the tweets contained big ideas such as quotes about collaboration, and the importance of collaboration as a skill for all. An example of a tweet focusing on collaboration in general is as follows:

> Participant 98: #edchat I need our admin to get serious about everyone getting into the 21st century!

Thirty three percent of the exploration tweets explored the nature of collaboration among teachers focused on big ideas related to face-to-face learning, providing opportunities for teachers to meet throughout the school day, providing structure for meetings, and the importance of effective modeling by administration. An example of a tweet focusing on the collaboration of teachers is as follows:

> Participant 108: @participant186 The one thing admin could do to foster collab is to simply ask teachers, "What needs to happen in our school?" #edchat

The tweets that explored the collaboration for students, 15% of the exploration tweets, included such big ideas as setting norms for students to learn the skills of effective collaboration in group work, as well as defining roles of teamwork, peer observation, and student feedback. An example of a tweet focusing on the collaboration of students is as follows:

> Participant 64: Let students collaborate & work together to solve problems, construct meaning, & engage in meaningful discussions. #edchat

Although the majority of the tweets containing cognitive presence were exploration in nature according to the CoI framework, approximately 3% entered into a higher level of cognitive presence containing the integration of ideas (CI) as indicated in Table 2. It was noted that these tweets contained connected ideas or integration of further information related to the topic of discussion. As well, there was justification of thoughts or a gaining of understanding of the acquired information and knowledge as indicated in the coding template referenced in Appendix B. An example of a tweet containing further justification and integration is as follows:

> Participant 41: @participant225 What about viewing lessons on video, like athletes do. . . . . Allows you to breakdown and critique deeper #edchat

This particular tweet offers a suggestion for an idea to explore (i.e. viewing lessons on video) however; it offers a connected example (i.e., like athletes do)

as a real-life example with further justification about why it might work (i.e., allows you to breakdown and critique deeper).

Upon further analysis of the 31 tweets (3.2%) that contained an element of integration, there were a total of 19 participants who contributed tweets in this category. It was also noted that five of these tweets were part of a conversation between participants that continued for more than two tweets in succession, similar to that of an on-going dialogue between face-to-face collaborators.

There were no tweets that entered into the cognitive category of resolution (CR) during the archived #edchat.

#edchat - Social Presence

Social presence was analyzed in the transcripts by coding for emotional expression (SE), open communication (SO), and group cohesion (SG). As indicated in Table 2, 9.4% of the tweets contained emotional expressions (SE) of feelings as indicated in the coding template found in Appendix B. For example, emotions may have been inferred with the use of emoticons such as smiley faces [:)] as well as exclamation marks [!] in punctuation use.

In the archived #edchat conversation, 60.8% of the tweets indicated a form of open communication (SO) that involved direct communication to another participant either through the use of addressivity, using the @ symbol to reply directly to another participant, or through retweeting another participant's posting. In any instance of open communication, there was evidence of a mutual awareness and recognition of each other's contributions.

In the analysis of social presence of #edchat, group cohesion (SG) was noted in 24.6% of the conversational tweets which continued beyond the monologue sharing of ideas and entered into more of a dialogue between multiple participants. If an exchange of ideas continued beyond two posts (tweets), it was considered a dialogue and coded as group cohesion.

Upon analysis of the #edchat data, it was noted that 36.3% of the posts in the conversation contained only a social presence. That is, there was no evidence of cognitive presence related to the topic or teaching presence on the part of the facilitator. An example of a tweet containing only social presence is as follows:

> Participant 216: @participant208 #edchat thank you for the kind words :)

#edchat - Teaching Presence

Teaching presence was analyzed in the transcripts by coding for instructional management (TI), building understanding (TB) and direct instruction (TD). The analysis of teaching presence was limited to the tweets posted by the facilitator or moderator of each Twitter chat. In this conversation, there were two facilitators or moderators. Out of the 965 total posts in the archived conversation, 4.1% involved the building of understanding (TB), where the facilitator acknowledged the contributions of individual participants through productive knowledge construction or challenged and stimulated the process through focusing the discussion further. An example of a post involving the building of understanding is as follows:

> Participant 184: @participant304 so how will partnering with organizations build collaboration w/in a school? #edchat

This tweet demonstrates the building of understanding whereby the facilitator attempted to draw out further justification from a participant that posed an unsupported opinion about partnering with organizations in order to build collaboration. By asking the question "How", the facilitator is creating an opportunity for building knowledge around the area of partnering with organizations, by encouraging the participant to expand on their contribution.

Another type of tweet involving teaching presences involved direct instruction (TD) and occurred in 0.8% of the total posts. Direct instruction could involve the presentation of content, additional questions, guidance, feedback, or a summary in order to confirm understanding. An example of a direct instruction posts containing an additional question to explore is as follows:

> Participant 153: Does collaborative learning amongst staff have to happen at school? Could the physical environment be a factor? #edchat

This tweet provides two additional questions, beyond the one question offered as the focus of topic and triggering event.

The final type of teaching presence categorized was that of instructional management (TI) as contributed by the facilitator. Out of the total number of posts in the conversation, 0.5% of the posts contained elements of structural design methods or establishing parameters of the conversation. An example of this type of post is as follows:

> Participant 153: Welcome to #edchat friends. . . . . Tonight's topic: What specific things can we do to make our schools more collaborative learning environments?

This tweet is a sample of structural design method since it is specifically naming the topic for conversation during the scheduled #edchat. It is establishing the parameters for the focus on conversation.

#edchat - Findings of Facilitator Tweets

There were two facilitators contributing and facilitating during #edchat. The total number of tweets made by the two facilitators in this chat included 68 posts, or 7% of the total tweets in the conversation. These data included simple retweets as well as non-related tweets. A detailed analysis of the facilitator postings is offered in Table 3.

Table 3

#edchat - Facilitator tweets

Community of Inquiry Presence	Frequency (N)	Percent (%)
Cognitive Presence		
Triggering Event	5	7.3%
Exploration	40	58.8%
Integration	2	2.9%
Resolution	0	0%
Social Presence		
Emotional Expression	6	8.8%
Open Communication	53	77.9%
Group Cohesion	22	32.3%
Teaching Presence		
Instructional Management	3	4.4%
Building Understanding	47	69.1%
Direct Instruction	5	7.4%

Note. Total number of tweets analyzed in #edchat: n=68

In terms of cognitive presence, the majority of facilitator posts (58.8%) fell within the exploration category. The remainder of facilitator posts indicated either a triggering event (7.3%) or fell within the integration category (2.9%). There was no evidence of resolution in the posts from the facilitators. In terms of social presence, 8.8% of the facilitator posts contained emotional expression, 77.9% involved open communication and 32.3% were part of group cohesion. In terms of teaching presence, 4.4% of the facilitator posts were categorized as instructional management, 69.1% involved the building of understanding and 7.4% indicated direct instruction related to the conversation.

#edchat - Additional Information

Throughout the #edchat conversation, even though there were a total of 1366 tweets, most of the conversation did not follow a threaded discussion that is continuous in nature. With the large number of participants, the archived transcript contained a continuous stream of posts that were organized in an excel spreadsheet. Once the transcript was organized according to content and discussion topics, it was evident that there were 14 conversations that went beyond a two-tweet exchange, resulting in a social presence of group cohesion indicating a dialogue or discussion between multiple participants. These conversations ranged from between four to 51 tweets in the exchange. Upon further analysis, it was noted that four of these conversations contained posts that entered into the cognitive presence of integration.

Another important occurrence noted in #edchat was the number of questions asked throughout the conversation, either by the participants or the

facilitators. There were 55 tweets containing questions that may or may not have related to the topic of discussion.

Another important contribution noted during #edchat was that of sharing additional resources. Most additional resources and information was shared through the posting of additional website links referring participants to specific locations to access information. A list of additional links shared during #edchat can be found in Appendix C.

#mathchat - Findings of Participant Tweets

The findings for #mathchat include a content analysis of a Twitter conversation that took place in a synchronous, one hour timeframe which included a total of 186 tweets. The topic of this educational conversation was: Is group work or collaborative learning always possible in mathematics? The tweets captured included 28 individual profiles tweeting throughout the conversation. The demographics of the participant population involve mostly educators spanning from elementary and secondary panels, administration, support staff, as well as post-secondary institutions. Approximately 3 of the 28 profiles were not actual people participating in this conversation, but rather were companies, organizations or developers that were using the #mathchat hashtag to advertise certain events, topics, educational resources or business related ventures and supports. The participants' geographical locations for #mathchat, as listed on the Twitter profiles are shown in Table 4.

Table 4

Geographical location listed for #mathchat participants

Country	Frequency (N)
Australia	1
Canada	7
Japan	1
United Kingdom	1
United States of America	11
Unknown location	7

Note. Total number of participants in #mathchat: n=28

Of the 186 tweets in total, 14 of them were classified as simple retweets, as described above, and were therefore not included in the analysis for #mathchat. As well, there were 6 non-related tweets, as described above, that were captured in the conversation stream that were not included in this analysis. Therefore, the total number of tweets used for the content analysis of #mathchat was 166. Table 5 provides detailed information for each category of each presence in the CoI framework as well as additional information that was analyzed.

Table 5

#mathchat - Overall findings

Community of Inquiry Presence	Frequency (N)	Percent (%)
Cognitive Presence		
Triggering Event	4	2.4%
Exploration	137	82.5%
Integration	15	9.0%
Resolution	0	0%
Social Presence		
Emotional Expression	24	14.5%
Open Communication	99	59.6%
Group Cohesion	78	47.0%
Teaching Presence		
Instructional Management	4	2.4%
Building Understanding	19	11.4%
Direct Instruction	9	5.4%
Additional information		
Facilitator Tweets	36	21.7%
Tweets containing questions	27	14.5%

Note. Total number of tweets analyzed in #mathchat: n=166

#mathchat - Cognitive Presence

Cognitive presence was analyzed in the #mathchat transcripts by coding for the triggering event (CT), exploration (CE), integration (CI) and resolution (CR). As indicated in Table 5, 156 out of 166 (93.9%) tweets contained evidence of cognitive presence.

The triggering event (CT) was indicated in the following tweet:

Participant 3: Today's #mathchat topic is: Is groupwork or collaborative learning always possible in mathematics?

The triggering event as defined in Appendix B presents a question that will focus

the discussion around a certain experience or topic.

As indicated in Table 5, throughout this conversation, the majority of the

tweets containing a cognitive presence, 82.5% were exploration in nature (CE)

around the triggering question: *Is groupwork or collaborative learning always*

possible in mathematics? These cognitive exploration type tweets (CE)

consisted of an information exchange or sharing of ideas representing many

different ideas being presented. An example of a tweet containing an exploration

is as follows:

> Participant 4: Groupwork/collaborative learning can be a valuable
> experience, but sometimes in #math you need to work things out for
> yourself. #mathchat

This tweet indicates two unsupported opinions: (1) group work/collaborative

learning can be a valuable experience and (2) sometimes in #math you need to

work things out for yourself. It is unsupported in the fact that it does not offer

further justification for these ideas.

Upon further analysis of the #mathchat data, it was evident that three main

themes emerged in the archived conversation: (1) ideas related to individual work

versus group work, (2) the sharing of specific instructional strategies focusing on

how to attain collaboration among students, and (3) assessment. As indicated in

Appendix B - Description of Content Analysis Coding Scheme, the exploration

category included many different ideas or themes being presented with

unsupported opinions. These tweets tended to be a general sharing of knowledge

as an attempt to explore the topic for discussion.

One of the themes that emerged from this Twitter chat was around group work versus individual work on the part of the students. Although many opinions were shared by different participants, which may have eluded to a preference for one experience over another, the result of the discussion was not conclusive in nature. In other words, one instructional grouping strategy was not explicitly favoured as more appropriate than another. These tweets comprised a sharing of opinions in search of information or a discussion of ambiguities focused on the topic and was exploratory in nature.

Another theme emerging from this chat focused on specific strategies that could be used to help students collaborate during a math class. Strategies included: using a Google spreadsheet to collaborate on a graphing unit, specific web resources related to mathematics, as well as the use of math journals and math blogs to teach communication skills.

Another dominant theme that emerged from this conversation was that of assessment. Even though it was not directly asked in the triggering event, the conversation contained a number of tweets that referred to assessing students in group work versus individual work.

Although the majority of the tweets containing cognitive presence were exploration in nature according to the CoI framework, approximately 9% entered into a higher level of cognitive presence containing the integration of ideas (CI) as indicated in Table 5. It was noted that these tweets contained connected ideas or integration of further information related to the topic of discussion. As well, there was justification of thoughts or a gaining of understanding of the acquired information and knowledge as indicated in the coding template referenced in

Appendix B. An example of a tweet containing further integration of additional

information referring to another source is as follows:

> Participant 10: @participant16 #mathchat Do you use the Math
> Makes Sense textbook? The Explore questions are great esp for
> groups.

This tweet contains further investigation about the topic being discussed by

referring to an outside source (i.e., Math Makes Sense textbook) and specifically

referring to the types of questions that are used in the resources. This acts as an

integration of information from an outside source in an attempt to support the

existing conversation taking place.

Upon further analysis of the 15 tweets (9%) that contained an element of

integration, there were a total of nine participants who contributed tweets in this

category. It was also noted that 14 of the 15 tweets were part of a conversation

between participants that continued for more than two tweets in succession,

similar to that of an on-going dialogue between face-to-face collaborators.

There were no tweets that entered into the cognitive category of resolution

(CR) during the archived #mathchat.

#mathchat - Social Presence

Social presence was analyzed in the transcripts by coding for emotional

expression (SE), open communication (SO), and group cohesion (SG). As

indicated in Table 5, 14.5% of the tweets contained emotional expressions (SE)

of feelings as indicated in the coding template found in Appendix B. For example,

emotions may have been inferred with the use of emoticons such as smiley faces

[:)] as well as explanation marks [!] in punctuation use.

In the archived #mathchat conversation, 59.6% of the tweets indicated a form of open communication (SO) that involved direct communication to another participant either through the use of addressivity, using the @ symbol to reply directly to another participant, or through retweeting another participant's posting. In any instance of open communication, there was evidence of a mutual awareness and recognition of each other's contributions.

In the analysis of social presence of #mathchat, group cohesion (SG) was noted in 47% of the conversational tweets which continued beyond the monologue sharing of ideas and entered into more of a dialogue between multiple participants. If an exchange of ideas continued beyond two posts (tweets), it was considered a dialogue and coded as group cohesion.

Upon analysis of the #mathchat data, it was noted that 13.8% of the posts in the conversation contained only a social presence. That is, there was no evidence of cognitive presence related to the topic or teaching presence on the part of the facilitator. An example of a tweet containing only social presence is as follows:

> Participant 10: #mathchat is the best weekly edchat around!!
> Thanks everyone! I always learn so much here.

#mathchat - Teaching Presence

Teaching presence was analyzed in the transcripts by coding for instructional management (TI), building understanding (TB), and direct instruction (TD). The analysis of teaching presence was limited to the tweets posted by the facilitator or moderator of the chat. In this conversation, there was one facilitator

or moderator. Out of the 166 total posts in the archived conversation, 11.4%

involved the building of understanding (TB), where the facilitator acknowledged

the contributions of individual participants through productive knowledge

construction or challenged and stimulated the process through focusing the

discussion further. An example of a post involving the building of understanding is

as follows:

> Participant 3: @participant4 Do you feel there are any areas where groupwork is not possible, Ryan? ie. always has to be personal exploration #mathchat

This tweet demonstrates the use of an additional question, from one participant to

another, in an attempt to build further understanding around their comment made

regarding group work versus exploration. This participant seems to be asking for

further clarification, which in essence could lead to further reflection, as well as

further discussion as it is clarified.

Another type of tweet involving teaching presences involved direct

instruction (TD) and occurred in 5.4% of the total posts. Direct instruction could

involve the presentation of content, additional questions, guidance, feedback or a

summary in order to confirm understanding. An example of a direct instruction

post containing an additional question to explore is as follows:

> Participant 3: Two questions here I think: How often do we use groupwork in math and does maths sometimes require individual work? #mathchat

The final type of teaching presence categorized was that of instructional

management (TI) as contributed by the facilitator. Out of the total number of posts

in the conversation, 2.4% of the posts contained elements of structural design

methods or establishing parameters of the conversation. An example of this type

of post is as follows:

> Participant 3: @participant22 we started late, Sharon, so there's another 10 minutes or so! #mathchat

#mathchat - Findings of Facilitator Tweets

It is important to note that during #mathchat, there was one facilitator

contributing and facilitating this conversation. The total number of tweets made

by the facilitator in this chat included 36 posts, or 21.7% of the total tweets in the

conversation. This data also includes simple retweets as well as non-related

tweets. A detailed analysis of the facilitator postings is offered in Table 6.

Table 6

#mathchat - Facilitator tweets

Community of Inquiry Presence	Frequency (N)	Percent (%)
Cognitive Presence		
Triggering Event	4	11.1%
Exploration	23	63.9%
Integration	2	5.6%
Resolution	0	0%
Social Presence		
Emotional Expression	4	11.1%
Open Communication	21	58.3%
Group Cohesion	18	50.0%
Teaching Presence		
Instructional Management	4	11.1%
Building Understanding	19	52.8%
Direct Instruction	9	25.0%

Note. Total number of tweets analyzed in #mathchat: n=36

In terms of cognitive presence, 11.1% of the facilitator posts indicated a triggering event, 63.9% were in the exploration category, and 5.6% were in the integration category. There was no evidence of resolution in the posts from the facilitator. In terms of social presence, 11.1% of the facilitator posts contained emotional expression, 58.3% involved open communication and 50% were part of group cohesion. In terms of teaching presence, 11.1% of the facilitator posts were categorized as instructional management, 52.8% involved the building of understanding and 25% indicated direct instruction related to the conversation.

#mathchat - Additional Information

Throughout the #mathchat conversation, even though there was a total of 166 tweets, most of the conversation did not follow a threaded discussion that was continuous in nature. With the large number of participants, the archived transcript contained a continuous stream of posts that were organized in a Microsoft Excel™ spreadsheet. There were 12 conversations that went beyond a two-tweet exchange, resulting in a social presence of group cohesion indicating a dialogue or discussion between multiple participants. These conversations ranged from between three to 43 tweets in the exchange. Upon further analysis, it was noted that nine of these conversations contained posts that entered into the cognitive presence of integration.

Another important occurrence noted in #mathchat were the number of questions asked throughout the conversation, either by the participants or the facilitators. There were 27 tweets (14.5%) containing questions that were related

to the topic of discussion. Of these 27 posts containing questions, 12 of the questions (44.4%) were posed by the facilitator.

Another important contribution noted during #mathchat was that of sharing additional resources. Most additional resources and information were shared through the posting of additional website links referring participants to specific locations to access information. A list of additional links shared during #mathchat can be found in Appendix D.

#31daygame - Findings of Participant Tweets

The content analysis of the #31daygame Twitter conversation that took place over a one-month timeframe revealed a total of 1139 tweets. The topic of this educational conversation was: *Which of the two cooperative learning experiences is more effective? Justify your choice*. Each day of the month included two competing cooperative learning strategies according to a tournament style event as indicated in Appendix E.

The tweets captured included 73 individual profiles tweeting throughout the conversation. The demographics of the participant population involved mostly educators spanning from elementary and secondary panels, administration, support staff, as well as post-secondary institutions. The participants' geographical locations for #31daygame, as listed on the Twitter profiles are shown in Table 7.

Table 7

Geographical location listed for #31daygame participants

Country	Frequency (N)
Canada	24
Europe	1
Ireland	1
Scotland	1
United Kingdom	4
United States of America	19
Unknown location	23

Note. Total number of participants in #31daygame: n=73

Of the 1139 tweets in total, 99 of them were classified as simple retweets, and were therefore not included in the analysis for #31daygame. As well, there were 4 non-related tweets that were captured in the conversation stream that were not included in this analysis. Therefore, the total number of tweets used for the content analysis of #31daygame was 1036. Table 8 provides detailed information for each category of each presence in the CoI framework as well as additional information that was analyzed.

Table 8

#31daygame - Overall findings

Community of Inquiry Presence	Frequency (N)	Percent (%)
Cognitive Presence		
Triggering Event	84	8.1%
Exploration	342	33.0%
Integration	353	34.0%
Resolution	48	4.6%
Social Presence		
Emotional Expression	132	12.7%
Open Communication	447	43.1%
Group Cohesion	119	11.5%
Teaching Presence		
Instructional Management	77	7.4%
Building Understanding	60	5.8%
Direct Instruction	113	10.9%
Additional information		
Facilitator Tweets	156	15.0%
Tweets containing questions	139	13.4%

Note. Total number of tweets analyzed in #31daygame: n=1036

#31daygame - Cognitive Presence

Cognitive presence was analyzed in the #31daygame transcripts by coding for the triggering event (CT), exploration (CE), integration (CI), and resolution (CR). As indicated in Table 8, 838 out of 1036 (80.1%) tweets contained evidence of cognitive presence.

The triggering event (CT) was indicated each day of the event with the following example of a succession of two tweets:

> Participant 1: Day 1: Jigsaw moourl.com/cle01 or Graffiti moourl.com/cle02 Which would you say is a 'more effective' cooperative learning experience? #31daygame

> Participant 1: The challenge is to justify your preference. . . . . Vote via reply to @31daygame or use the tag #31daygame

The triggering event as defined in Appendix B presents a question that will focus the discussion around a certain experience or topic.

As indicated in Table 8, throughout this conversation, the majority of the tweets containing a cognitive presence, 67% were either 34% being exploration in nature (CE) or 33% being integration in nature (CI) around the triggering question: *Which of the two cooperative learning experiences is more effective? Justify your choice.* The cognitive exploration type tweets (CE) consisted of an information exchange or sharing of ideas representing many different ideas being presented, and comprised 33% of the tweets containing a cognitive presence. An example of a tweet containing a cognitive presence demonstrating exploration is as follows:

> Participant 10: Has anyone used either of these? I have heard of jigsaw but not graffiti, both seem good #31daygame

The cognitive integration type tweets (CI) consisted of further justification or sharing of related ideas, and comprised 34% of the tweets containing a cognitive presence. It was noted that these tweets contained connected ideas or integration of further information related to the topic of discussion. As well, there was justification of thoughts or a gaining of understanding of the acquired information and knowledge as indicated in the coding template (see Appendix B). An example of a tweet containing a cognitive presence demonstrating further integration is as follows:

> Participant 57: The jigsaw strategy is all about accountability to the group. . . . . It's my preference for calling on all participants to be leaders. #31daygame

This tweet offers an opinion (i.e., it's my preference) but then further offers support for the opinion (i.e., it allows accountability and calls upon participants to be leaders), which is indicative of integration.

The conversation throughout #31daygame also contained posts that indicated evidence of resolution (CR) providing a further cognitive presence of applications to the real world or the critical assessment of new ideas shared as indicated in the coding template found in Appendix B. Approximately 4.6% of all tweets analyzed contained evidence of resolution. An example of tweet containing resolution is as follows:

> Participant 6: Day 1: Jigsaw vs Graffit recap by @participant43 collating ideas so we don't lose this valuable dialogue http://j.mp/kHy9QV #31daygame

This tweet refers the participants to a list of collated ideas that further demonstrate the benefits of both cooperative learning strategies, jigsaw and graffiti. The list also offers further applications of each strategy in the real-world indicating integration of knowledge.

This specific example provided a summary of the choices made by the participants for the two competing strategies of the day along with the justifications and applications to the real world.

Upon further analysis of the #31daygame data, it was evident that one consistent theme remained throughout the chat, focusing on cooperative learning

strategies and why educators found one strategy more effective over another.

Each day offered additional challenges with two new strategies being presented;

however, the conversation remained focused on the topics of cooperative

learning.

Upon further analysis of the 353 tweets (34%) that contained an element

of integration (CI), there were a total of 34 participants who contributed tweets in

this category. Of the 48 tweets (4.6%) that contained resolution (CR), there were

a total of eight different participants who contributed tweets in this category.

#31daygame - Social Presence

Social presence was analyzed in the transcripts by coding for emotional

expression (SE), open communication (SO), and group cohesion (SG). As

indicated in Table 8, 12.7% of the tweets contained emotional expressions (SE)

of feelings (see Appendix B). For example, emotions may have been inferred with

the use of emoticons such as smiley faces [:)] as well as explanation marks [!] in

punctuation use.

In the archived #31daygame conversation, 43.1% of the tweets indicated a

form of open communication (SO) that involved direct communication to another

participant either through the use of addressivity, using the @ symbol to reply

directly to another participant, or through retweeting another participant's posting.

In any instance of open communication, there was evidence of a mutual

awareness and recognition of each other's contributions.

In the analysis of social presence of #31daygame, group cohesion (SG)

was noted in 11.5% of the conversational tweets, which continued beyond the

monologue sharing of one's own ideas, and entered into more of a dialogue between multiple participants. If an exchange of ideas continued beyond two posts (tweets), it was considered a dialogue and coded as group cohesion.

The #31daygame data revealed that 22.1% of the posts in the conversation contained only a social presence. That is, there was no evidence of cognitive presence related to the topic of teaching presence on the part of the facilitator. An example of a tweet containing only social presence is as follows:

> Participant 10: #31daygame a big thankyou to @participant43, @participant5 and @participant57 for all their work for this great game

#31daygame - Teaching Presence

Teaching presence was analyzed in the transcripts by coding for instructional management (TI), building understanding (TB), and direct instruction (TD). The analysis of teaching presence was limited to the tweets posted by the facilitator or moderator of this chat. In this conversation, there were two facilitators or moderators. Out of the 1036 total posts in the archived conversation, 5.8% involved the building of understanding (TB), where the facilitator acknowledged the contributions of individual participants through productive knowledge construction, or challenged and stimulated the process through focusing the discussion further. An example of a post involving the building of understanding is as follows:

> Participant 6: Can there be learning without dissonance? Learning & Influence a new post by @participant43 http://j.mp/lswaTK

This tweet offers an attempt to build further understanding through the reference to an additional article related to the topic of conversation. If participants choose to read the referenced article, this may offer additional topic-related information to focus the discussion further.

Another type of tweet involving teaching presences involved direct instruction (TD) and occurred in 10.9% of the total posts. Direct instruction could involve the presentation of content, additional questions, guidance, feedback or a summary in order to confirm understanding. An example of a direct instruction post containing an additional question to explore is as follows:

> Participant 1: Group Poster http://bit.ly/joUfqk or Placemat moourl.com/cle04 Which is a 'more effective' cooperative learning experience #31daygame

This tweet offers a direct question to focus the discussion asking for sharing of information around which of two cooperative learning strategies (i.e., Group Poster or Placemat) would be more effective.

The final type of teaching presence categorized was that of instructional management (TI) as contributed by the facilitator. Out of the total number of posts in the conversation, 7.4% of the posts contained elements of structural design methods or establishing parameters of the conversation. An example of this type of post is as follows:

> Participant 1: @participant13 You can follow @participant1 to see each day's challenge #31daygame

#31daygame - Findings of Facilitator Tweets

It is important to note that during #edchat, there were two facilitators contributing and facilitating this conversation. The total number of tweets made by the two facilitators in this chat included 156 posts, or 15% of the total tweets in the conversation. This data also includes simple retweets as well as non-related tweets. A detailed analysis of the facilitator postings is offered in Table 9.

Table 9

#31daygame - Facilitator tweets

Community of Inquiry Presence	Frequency (N)	Percent (%)
Cognitive Presence		
Triggering Event	76	48.7%
Exploration	19	12.1%
Integration	0	0%
Resolution	0	0%
Social Presence		
Emotional Expression	0	0%
Open Communication	5	3.2%
Group Cohesion	3	1.9%
Teaching Presence		
Instructional Management	48	30.1%
Building Understanding	21	13.5%
Direct Instruction	103	66.0%

Note. Total number of tweets analyzed in #31daygame: n=156

In terms of cognitive presence, 48.7% of the facilitator posts indicated a triggering event and 12.1% were in the exploration category. There was no evidence of integration or resolution in the posts from the facilitators. In terms of social presence, 0% of the facilitator posts contained emotional expression, 3.2%

involved open communication, and 1.9% were part of group cohesion. In terms of teaching presence, 30.1% of the facilitator posts were categorized as instructional management, 13.5% involved the building of understanding and 66% indicated direct instruction related to the conversation.

#31daygame - Additional Information

Throughout the #31daygame conversation, there were a total of 1036 tweets. Since the conversation was organized with two new competing strategies being presented each day, the conversation threads were consistent each day in more of a threaded fashion. The organization resulted in 31 different conversations that went beyond a two tweet exchange, resulting in a social presence of group cohesion indicating a dialogue or discussion between multiple participants. These conversations ranged from between 10 to 90 tweets in the exchange. All of these conversations contained posts that entered into the cognitive presence of integration and resolution.

Another important occurrence noted in #31daygame was the number of questions asked throughout the conversation, either by the participants or the facilitators. In addition to the 31 triggering questions each day, there were a total of 108 additional tweets containing questions related to the topic of discussion.

Another important contribution noted during #31daygame was that of sharing additional resources. Most additional resources and information were shared through the posting of additional website links referring participants to specific locations to access information. A list of additional links shared during #31daygame can be found in Appendix F.

Cross-case Analysis of Findings

The data in Table 10 present the cognitive presence across all three Twitter chats.

Table 10

Cognitive Presence across Chats

	#edchat (%)	#mathchat (%)	#31daygame (%)
Triggering Event	0.8%	2.4%	8.1%
Exploration	88.3%	82.5%	33.0%
Integration	3.2%	9.0%	34.0%
Resolution	0%	0%	4.6%

In terms of cognitive presence, exploration was the most predominant in both #edchat (88.3%) and #mathchat (82.5%). In contrast, integration was most predominant within #31daygame (34.0%) compared to that in #edchat (3.2%) and #mathchat (9.0%). Resolution was only evident in #31daygame (4.6%).

Focusing now on social presence, the data in Table 11 present the findings across all three Twitter chats.

Table 11

Social Presence across Chats

	#edchat (%)	#mathchat (%)	#31daygame (%)
Emotional Expression	9.4%	14.5%	12.7%
Open Communication	60.8%	59.6%	43.1%
Group Cohesion	24.6%	47.0%	11.5%

These social presence data revealed that emotional expression was most evident in #mathchat (14.5%) and #31daygame (12.7%) as compared to #edchat (9.4%). Open communication was predominant in #edchat (60.8%) and #mathchat (59.6%) above #31daygame (43.1%). Group cohesion was most evident in #mathchat (47.0%) as compared to #edchat (24.6%) and #31daygame (11.5%).

The data in Table 12 present the teaching presence across all three Twitter chats.

Table 12

Teaching Presence across Chats

	#edchat (%)	#mathchat (%)	#31daygame (%)
Instructional Management	0.5%	2.4%	7.4%
Building Understanding	4.1%	11.4%	5.8%
Direct Instruction	0.8%	5.4%	10.9%

These teaching presence data revealed that the #31daygame contained a higher occurrence of instructional management (7.4%) and direct instruction (10.9%) as compared to #mathchat (2.4% and 5.4% respectively) and #edchat (0.5% and 0.8% respectively). The percentage of tweets containing a teaching presence that focused on building understanding was higher in #mathchat (11.4%) compared to #31daygame (5.8%) and #edchat (4.1%).

Chapter Four presented the findings of the qualitative analysis of transcripts from three distinct Twitter chats. There was distinct evidence of cognitive presence, social presence and teaching presence in all three twitter chats. The percentages of each element varied between the chats, and the implication of those variations will be discussed in chapter five.

Chapter 5: Interpretation and Discussion

This qualitative content analysis provides an initial understanding of the collaborative structures of online educational conversations taking place on Twitter. This chapter begins with an overall interpretation of the nature and dynamics of educational conversations taking place in the Twitter environment as related to the literature review. Then, findings are organized in response to the specific research questions through the lens of Garrison et al.'s CoI framework (2000). This paper concludes with suggested guidelines for hosting a Twitter chat as well as implications for future research.

Nature of Twitter Conversations

Despite the limited understandings that exist suggesting Twitter as a social medium to post microblogs of "what you are doing" at a certain time and place, findings from this study support the notion of Twitter as providing a medium for promoting collaboration among educators in a community of inquiry.

Even though some researchers reported that an online medium did not promote coherent and interactive dialogue necessary for "conversational modes of learning" (Thomas, 2002, p. 351), the findings from this study indicate that there were elements of dialogue and discussion present in all three Twitter chats that led to a collaborative conversation presenting varying elements of critical thinking. Each conversation had elements of dialogue (sharing ideas), discussion (making decisions) and debate as it related to Garmston and Wellman's (2009) model of conversation. The synchronous nature of the scheduled one-hour #edchat led to the brainstorming and sharing of ideas around cooperative

learning in general, as well as additional cooperative learning strategies to

engage teachers and students. As well, the synchronous nature of the scheduled

one-hour #mathchat led to the brainstorming and sharing of cooperative learning

strategies more specifically focused in a mathematics classroom. Both #edchat

and #mathchat demonstrated more of a dialogue-like conversation, through the

facilitated use of a specific focus question for each chat. In contrast, #31daygame

was a chat that was held over a longer period of time, and tended to encourage

continued, deeper and wider ranging exchanges between participants that were

evident of a deeper cognitive presence or level of critical thinking. This specific

chat contained elements of synchronous discussion as well as asynchronous

discussion since it was held over a longer time frame of one month. The

additional time provided for participant sharing seemed to offer an opportunity for

posts to move beyond the sharing of ideas into a deliberation point where a

discussion was held and conclusions were drawn. These findings challenge the

myth that Twitter is merely a social venue for sharing occurrences throughout

one's day; instead, these findings indicated that Twitter has the potential to

provide a medium where meaningful structured professional learning can take

place.

Since there is a 140-character limit in posting a message in the Twitter

environment, there may be a belief that this microblogging chat environment

limits the potential for a coherent conversation. Freiermuth (2011) suggested that

multiple conversations might be occurring at the same time where "chatters can

follow what would seem at first glance to be a chaotic amalgamation of unrelated

strings of words" (p. 130). The findings of this study indicated that by applying the

CoI framework (Garrison et al., 2000) to analyze the content of these conversations, Twitter conversations can exhibit the same qualities of inquiry as a face-to-face or threaded online conversation evident in formally structured online learning environments. Participants seemed to tolerate the casual nature and shortforms used and generally accepted these conventions as common forms of communication in a microblogging environment. Whereas many people may believe that Twitter would not be a rigourous environment to hold professional learning conversations, these findings supported the fact that there were elements of cognitive presence, social presence, and teaching presence evident, indicating the educational exchange of learning. Refer to Table 2 for more specific results of elements of CoI evident in #edchat, Table 5 for more specific results of elements of CoI evident in #mathchat, and Table 8 for more specific results of elements of CoI evident in #31daygame.

To further interpret these findings, explanations are offered in more details below. Sets of data are interpreted for insights related to the following research questions:

1. To what extent were the elements of the Community of Inquiry model (Garrison et al., 2000) presented in educational Twitter chats, more specifically cognitive presence, social presence and teaching presence?

2. What were the similarities and differences among three educational chats taking place on Twitter?

3. What sorts of barriers affected educational Twitter chats and how could they be addressed?

4. As a medium, how could Twitter influence educator learning and

   collaboration?

Research Question 1

To what extent were the elements of the Community of Inquiry model

presented in educational Twitter chats, more specifically cognitive presence,

social presence, and teaching presence?

Garrison et al.'s (2000) CoI framework was applied in order to focus the

study around the areas of cognitive presence, social presence and teaching

presence. The results of this study demonstrated that the elements of the CoI

model are indeed reflected in transcripts of archived Twitter chats - that is, in

online communication behaviour of self-directed participants holding educational

conversations in the Twitter environment. There were clear elements of cognitive

presence, social presence and teaching presence evident in all three educational

Twitter chats that were studied. The occurrence of these three presences led to

an understanding that the CoI model is a useful conceptual framework for

investigating and describing interactive behaviours in Twitter chats.

When analyzing the results of cognitive presence, each conversation

allowed for the analysis of the four phases of the model: triggering event,

exploration, integration, and resolution, as represented in Table 4. Each of the

three conversations studied began with a triggering event in the form of a

question for participants to focus their collaboration. Triggers, in the CoI model,

were defined as events that resulted in recognition of an "issue, dilemma or

problem" (Garrison et al., 2000, p. 10). In an educational context, Garrison et al.

characterized triggers as being communicated directly by the teacher, but in the Twitter chats studied, a facilitator of the group chat most commonly presented triggering events. Participants may have also participated in sharing the trigger with other members of their Twitter environment, which aided in the inviting of more participants into the chat.

It was also evident that additional triggers presented by participants, sometimes competed with the focused group discussion. For example, during #mathchat, although the trigger event presented by the facilitator included the key concept of discussing effective cooperative learning strategies in math classrooms, one participant's triggering question led to an additional discussion concerning assessment and evaluation of group work. While this may have been an important concept for many of the participants to discuss, as indicated in the 157 tweets pertaining to this topic of discussion, the assessment and evaluation discussion did detract from the main triggering event posed by the facilitator. One might conclude that this interfered with the main goal or purpose of discussion for the Twitter chat, since the topic of assessment and evaluation deviated from the pre-determined focus of sharing mathematical cooperative learning strategies. Ultimately, topic divergence, while offering the potential of new conversations, relationships and professional ideas disseminated, it may also result in a lack of objective completion – a probable drawback in professional gathering of any nature.

Garrison et al. (2000) suggested that the next phase of exploration demonstrated that the participant perceived or grasped the problem or issue contained in the trigger. All three of the Twitter chats analyzed continued into

exploration, where participants shared many different ideas or opinions as well as questioned each other in the search for additional information, knowledge or clarifications related to the triggering question or event.

Each of the conversations also included indicators of integration where participants added onto existing ideas and also provided additional justification of thoughts leading to a more developed contribution. Garrison et al. (2000) stated that integration is difficult to detect in that it must be inferred from statements that suggest new ideas have been generated or interrelated in some way. Existing research also indicated that most online discussions never move beyond the exploration stage (Garrison & Arbaugh, 2007; Kanuka & Anderson, 1999). As indicated in the data presented in Table 4, integration existed in all three conversations analyzed, although with varying frequencies. Interestingly, #31daygame contained 34% posts with evidence of integration, which was considerably higher than #edchat (3.2%) and #mathchat (9.0%). This will be further discussed below when similarities and differences of each chat are presented.

Only one of the conversations (#31daygame) continued into the resolution phase where ideas were critically assessed or a referenced application into the real world was provided. Garrison et al. (2000) consider resolution to be a published, polished thought that is reflective and personal by providing an application or test of new understanding against existing knowledge and beliefs. #31daygame exhibited 4.6% of the tweets as containing indicators of resolution whereas both #edchat and #mathchat did not show elements of resolution (0%). This will be further discussed below when similarities and differences of each

chat are presented. These findings confirm that the use of constructs such as cognitive presence may be helpful in isolating evidence of critical thinking in online conversations, since as participants interact, they traverse the phases predicted in the CoI model.

With regard to social presence, all three twitter chats contained elements of emotional expression, open communication, and group cohesion as indicated in the CoI framework (Garrison et al, 2000), and represented in Table 5. As a facilitator of face-to-face professional learning opportunities among educators, I define an effective environment of inquiry as one in which a process is employed to create a community involving the development of social and cultural norms. This is normally attained in a face-to-face environment through activities where participants "get to know each other" socially at the onset and throughout the professional learning experience. This may involve activities where participants are able to share facial expressions and body language that would have certain effects on those around them. In the online Twitter environment, these emotional expressions are usually replaced by the use of emoticons to display certain emotions. For example, in all three Twitter chats, the use of a smiley face emoticon [:)] was used to convey a happy emotion. Additionally, participants used an exclamation mark [!] or capital letters (ALL CAPS) were also conventions used to display excitement or enthusiasm in all three chats in this study.

In a face-to-face environment, open communication is evident when participants directly name a person they may be speaking to or referring to throughout the communication. In the Twitter chats studied, open communication

occurred when participants directly responded to another participant through the

use of the @ sign, followed by that participant's Twitter name or through the use

of their direct personal name that was different from their Twitter name. Open

communication also involves the ability of participants to project themselves as

"real" people, using their given name as opposed to a nickname or an alias. In all

three chat environments, when Twitter users set up their Twitter profile pages,

many included additional personal information through the use of blogs and/or

pictures linking from additional accounts, which helped to build the human side of

the participants in an online environment. Conversely, there may also be

participants who were reluctant to put personal or identifiable information on their

Twitter profiles. If this was the case, one could still address the participant using

the @ symbol and their Twitter name, thereby including them in the conversation.

Another element of social presence, group cohesion, became evident in all

three Twitter chats with the use of the hashtag (#) for each chat. Even though

each individual chat analyzed (#edchat, #mathchat, and #31datgame), contained

a different cohesive group of participants, often an additional hashtag was

referred to in a tweet (e.g. #edcamp) in order to open the conversation up to

additional audiences who might have been interested in the social discussion.

Finally, with regard to teacher presence, all three twitter chats were led by

one or two facilitator(s) who applied the elements of instructional management,

building understanding, and direct instruction, as represented in Table 5.

Research literature indicated that teaching presence is a significant determinant

of a sense of community (Akyol & Garrison, 2008; Shea, Li & Pickett, 2006),

which is necessary in the establishment of cognitive presence and social

presence (Shea & Bidjerno, 2009). Xin (2012) contended "the need for facilitation is much more pronounced online than in the face-to-face environment where habits are well established and paralinguistic cues fulfill many communicative functions (p. 9). In this study, the facilitator of each chat acted to develop a more solid understanding of the issue presented through instructional management and direct instruction when the parameters around the chat were shared in order to set the curriculum design of the Twitter chat. This was usually handled with the introduction of the topic for discussion at the onset of the Twitter chat and then repeated throughout the chat for participants who were joining in late. The facilitator also offered a teaching presence by challenging and stimulating the process with facilitation skills and additional questioning techniques in order to offer clarification when ambiguities arose.

Research Question 2:

What were the similarities and differences among three educational chats taking place on Twitter?

In the three chats that were analyzed, there were five main areas of similarity that emerged: (1) conversational elements, (2) participant demographics, (3) elements of CoI, (4) question types, and (5) facilitation techniques. It was also noted that within each area of similarity, differences emerged that highlighted factors of importance to this study.

The first similarity among Twitter chats concerned the conversational elements presented as demonstrated by evidence of dialogue, discussion and debate. Even though each conversation contained all three conversational

elements, a key difference among each chat was based on how each conversation took place, either in a synchronous (live) or asynchronous (time-delayed) fashion. Since #edchat and #mathchat both took place within a one-hour timeframe, these two chats offered evidence of conversations that were synchronous in nature. Posts were generally in response to each other in a sequential fashion, however with the number of participants posting at the same time, related tweets were interrupted by additional tweets in the archived transcript. As a result, the conversation was broken up into many conversations taking place at once, making it difficult to keep track of each individual conversation.

The synchronous nature of #edchat and #mathchat displayed more of a dialogue based conversation. In #edchat, multiple viewpoints were shared focusing on the triggering event: *What specific things can we do to make our schools more collaborative learning environments?* Within this chat, there seemed to be three main areas of sharing, collaboration in general, collaboration among teachers and collaboration among students. In #mathchat, multiple viewpoints were shared focusing on the triggering event: *Is group work or collaborative learning always possible in mathematics?* Within this chat, it was found that three themes around the topic emerged: ideas related to individual work versus group work, the sharing of specific instructional strategies, and assessment. Garmston and Wellman (1999) suggested that a dialogue-based conversation is one where multiple viewpoints are contributed by participants as they work to clarify each other's views. The outcome of a dialogue-based conversation is that of enriched communal understanding around a certain

concept. All three chats, #edchat, #mathchat, and #31daygame contained

dialogic elements where communities were sharing their ideas in order to come

to an understanding around the topic of the respective chats.

Alternatively, while there were elements of synchronicity in #31daygame

as participants were able to post anytime throughout a day, this Twitter chat

offered more of an asynchronous nature (time-delayed) since it took place over a

longer time frame than one hour. This Twitter chat posted a new triggering event

(question) each day for a month, allowing participants the length of a day to offer

their posts based on each triggering event. In #31daygame, the conversation

entered into more of a discussion-based nature focusing on the triggering event

that offered a two-part question each day: *(1) Strategy1 versus Strategy2 -*

Which would you say is a "more effective' cooperative learning experience? and

(2) Justify your preference. The archived Twitter chat contained more tweets that

demonstrated a cognitive presence of integration and resolution as shown in the

comparison table, Table 4. The conversation stream also was more coherent in

nature since there was a focus each day, and only one theme was discussed at a

time. The archived transcript contained synchronous streams of conversation that

were focused on one theme, as well as asynchronous tweets added later on in

the day, however still focused on that one theme.

The length of the day offered additional time for further thinking and

reflection time to be built into their responses. Freiermuth (2011) suggested that

synchronous chats mimic more of a verbal conversation than asynchronous

chats. Clouder et al. (2011) suggested that asynchronous discussions provide an

advantage since participants are able to review text before posting a response to

the message. It seemed that the asynchronous nature of the #31daygame chat offered participants more of an opportunity to think and reflect on how to apply their thinking with a more justified response including examples of application. It is crucial to note that the 140 character limit does not represent the entirety of information presented as there are sometimes links to other documents that are routinely accessed by members. Thus, deep reflection is mediated by accessing this documents in a process that is interim to the usage of tweets.

A second similarity among all three Twitter chats was that of the demographics of participants. Upon analysis of the Twitter profiles for each chat, most participants were educators spanning many geographical areas from various elementary and secondary panels, as well as educators from a variety of post-secondary education institutions or board personnel. The difference arose in the number of participants for each chat as well as their individual contributions. Data suggested that there were 329 participants for #edchat, 28 participants for #mathchat, and 73 participants for #31daygame. Upon further analysis, the larger number of participants in #edchat seemed to affect the focus of the conversation, by creating a larger number of total tweets (1366) and 14 different conversations occurring at one time. In #mathchat, the number of participants were less (28) as well as the total number of tweets (186) in the archived conversation, however, the focus around one clear theme was affected as indicated by the number of different conversations (12) taking place throughout the hour. Among the total participants for #31daygame (73), there was a daily average of 13 participants for each chat that focused on one theme.

As a facilitator of face-to-face conversations, I have found that a smaller number of people contributing to a conversation allowed for a more focused discussion around a certain topic. The lower number of participants for each individual chat within #31daygame, may have been a contributing factor to the higher level of cognitive presence indicated in the data.

Thirdly, the elements of cognitive presence, social presence, and teaching presence were among the similarities found in each chat. However, the differences arose in the percentage of each element in the three chats, as indicated in the data in Tables 10, 11 and 12. As already mentioned, these differences may have been due to the nature of the conversation (asynchronous or synchronous) as well as a result of the number of participants in the Twitter chat. In terms of cognitive presence, Shea and Bidjerno (2009) indicated that when participants were specifically asked to justify their contributions, the conversation progressed to the integration and resolution phase of the CoI framework. These data suggested that the triggering event in #31daygame explicitly asked for justification of thinking, whereas the triggering event in both #edchat and #mathchat was more directive in the sharing of ideas and strategies. Shea and Bidjerno (2009) also suggested that online discussion proceed to integration and resolution when participants are offered explicit direction through a facilitator.

In this study, even though all participants had the opportunity to provide a teaching presence, only facilitator tweets were used to analyze this component for consistency. While the presence of a facilitator for each chat was a commonality, the actions of the facilitator seemed to differ from chat to chat.

There were two facilitators for #edchat, one facilitator for #mathchat and #31daygame respectively. The role of the facilitator differed greatly between the three chats. For example, in #edchat and #mathchat, the facilitator also participated in sharing ideas and whereas the facilitator in #31daygame limited his/her interaction to providing specific instructional direction and did not participate in the conversations. In #31daygame, the facilitator provided a summary of key themes that emerged throughout the discussion that seemed to organize all contributions and allow for further reflection.

Fourthly, in sharing similarities among chats, each Twitter chat contained a distinct triggering event in the form of a main opening question to lead the conversation. For #edchat, the triggering question was: *Is group work or collaborative learning always possible in mathematics?* For #mathchat, the triggering question was: *What specific things can we do to make our schools more collaborative learning environments?* Both of these questions were closed in nature meaning the question for #edchat theoretically could invite a yes or no answer, limiting the discussion options. Similarly, the question for #mathchat could lead to a list of specific strategies, however a higher level of thinking is not invited in the triggering event.

In contrast, for #31daygame, the triggering question for each day was composed of two separate posts providing more of an open question format. Freiermuth (2011) suggested that using open-ended questions could lead to further collaboration and consequently wider discussion thereby resulting in high quality task resolution. The triggering event in #31daygame was comprised of two posts: *(1) Strategy1 versus Strategy2 - Which would you say is a "more effective'*

cooperative learning experience? and *(2) Justify your preference.* There is

evidence that the questions or tasks "play an important role in the type of

cognitive activity evident in the discussions" (Arnold & Ducate, 2006, p. 42). In an

analysis of the questions used in the triggering event of each chat, the use of the

three words "justify your preference" in #31daygame provided the opportunity for

participants to enter into the integration and resolution phase more explicitly.

In addition to the question in the triggering event of each Twitter chat,

throughout each chat, either the participants or the facilitator of the conversation

posed additional questions that also acted as additional triggering events. As a

researcher, I did not anticipate the influence of additional questions throughout a

chat. However, since they occurred naturally, and seemed to influence each

Twitter chat, it prompted further exploration of the types of questions presented in

the conversations. Questions that were asked within the flow of the conversation

as an attempt to clarify posts, tended to energize the discussion with the

responses of related participant thoughts and opinions. However, some questions

acted as a new idea or triggering event that could take the conversation into an

entirely new direction that could be considered off-topic from the original

triggering event.

While different taxonomies of questioning exist (Anderson & Krathwol,

2001; Morgan & Saxton, 2006), these data suggest that there were four different

types of questions emerging from each Twitter chat. The first type of questions

were *clarifying questions* where one participant asked a direct question to

another participant based on something they had posted in an attempt to further

explore an understanding. An example of this type of question occurred during

#edchat when a facilitator posed this question: *Where and when does this demo usually occur?* Second types of question identified were *questions with an inferred opinion* where an inferred opinion was embedded inside the question statement. During #edchat, this type of question was indicated when a participant posed this question: *Wouldn't it be awesome if the actual physical school environment FORCED us all into collaboration? Tear down the walls…* Third types of question identified were *insightful questions connected to an existing idea*. This occurred when a participant posed an additional question to a statement that triggered deeper thinking into a concept. An example of this type of question was identified in #edchat when a participant posted: *We all seem to be on the same page - What do you see as roadblocks to collaboration?* A fourth and final category of question analyzed were considered to be *off-topic questions* since they led to another tangent beyond the main idea of the trigger event. An example of an off-topic question from #edchat was: *Hello my friend, are you ready for school?*

The data suggested that the nature of each conversation was affected by the questions being asked. Garrison and Arbaugh (2007) suggested that the types of questions used affect the depth of conversation, referring to cognitive presence or critical thinking. If the shared ideas throughout the conversation were not based on a collaborative solution around one main theme, the transcripts of online discourse did not reveal discourse that has moved to the resolution phase. One specific example of a disconnect in the conversation taking place in #edchat was the posting of a tweet that asked for the creation of an operational definition for *collaboration* early on in the chat. Approximately 157 tweets later in the

archived conversation, an attempt was made to support the need for an

operational definition. However, the conversation continued with a resolution to

this one question. As a result, the #edchat conversation lacked coherence around

one single theme for discussion. Sparks (2007) noted "questions are often an

indirect and less efficient method of stating assumptions and intentions, making

requests, and deepening understanding" (p. 90). He continued with the notion

that educators sometimes disguise their points of view by asking questions rather

than making declarative statements of personal assumptions, intentions and

requests. These data suggested that the use of questions often provided a barrier

to effective communication and deeper understanding. In #edchat, unanswered

questions seemed to be a dominant form of interaction, possibly due to the higher

number of participants in this specific chat. Unanswered questions may have

been on topic, off topic or social in nature.

The number of questions being asked also seemed to interfere with the

coherence of a conversation. Freiermuth (2011) suggested that in a chat

environment, the primary problem among participants was to decide which

question to answer. When participants spent time in #edchat answering another

question that was unrelated to the main topic or triggering event, it took time

away from constructing their own personal thoughts. Perhaps this is one of the

reasons why many questions remained unanswered throughout #edchat. Since a

facilitator introducing the main topic for the conversation led each chat, it may

have benefited the Twitter chat by remaining focused on one key theme, if the

number of additional questions were kept to a minimum and perhaps archived for

a future topic at a later date. Considering an optimal number of participants for a chat might limit the additional questions to a manageable number as well.

Finally, while a facilitator led each Twitter chat, the actions of the facilitators and techniques or skills used differed among the three chats. As mentioned above, #edchat was led by two facilitators both of whom also participated in the conversations by posting personal thoughts and ideas. In #mathchat, one facilitator led the chat, and also contributed personal thoughts, ideas and opinions. The chat, #mathchat, had the least number of participants (28). In both #edchat and #mathchat, the facilitator(s) did not limit his/her involvement to that of a teaching presence only. Comparatively, in #31daygame, there were two facilitators, and most of their involvement focused solely on instructional management and direct instruction, both elements of teaching presence.

A facilitator can enhance the collaborative interaction by providing a comfort zone for all participants to communicate their thoughts. Freiermuth (2011) suggested that a "well planned chat conversation provides true collaboration and wider participation" (p. 38). Research also indicated that while facilitators should generate a social presence online (Rovai, 2007), they should not dominate the discourse (Garrision & Arbaugh, 2007). It was suggested that the teaching presence offered by a facilitator "creates the environment where cognitive presence can be developed" (Garrison & Arbaugh, 2007, p. 163). Facilitators that tend to enhance the cognitive presence throughout a conversation raise questions, review and comment on certain observation shared, and keep the discussion moving efficiently by drawing out inactive

participants and limiting the dominating voices (Garrison & Arbaugh, 2007). Wideman (2010) suggested that the training of facilitators is of importance to consider in the creation of effective online communities. Facilitators should be prepared to encourage the exchange of insights from all participants, focus the discussion with engaging questions and ensuring the discourse is progressive based on a focused discussion (Wideman, 2010).

These data suggested differences in the actions of the facilitators in stimulating the discussion and the number of times the facilitators intervened in the discussion. In both #edchat and #mathchat, the facilitator did not only contribute as a formal teaching presence; he or she was also a participant who contributed ideas. Facilitator participation as both an instructor and learner provided a complexity where it was difficult to focus on one main theme therefore making it more ambiguous to navigate and understand the conversation taking place. Whereas, in #31daygame, the main facilitator offered a teaching presence, limiting their social interaction to be instructional in nature, related to the specific purpose of the chat. The facilitator of #31daygame also provided a summary of key ideas at the end of each day, further focusing the main idea for each topic. There seemed to be a consistent pattern established in the instructional management of #31daygame by the facilitator. These findings suggest a need for facilitators to have a clear facilitator presence that remains focused on teaching presence only: instructional management, building understanding and direct instruction (Garrison et al., 2000).

Research Question 3

What sorts of barriers affected educational Twitter chats and how could they be addressed?

These findings suggested that a number of barriers existed that affected the depth of inquiry among Twitter chats. Comparative analysis data suggested that group size affected each conversation. More specifically, if the group size was too large (e.g. #edchat), there was a greater potential for confusion, as there seemed to be a larger number of disjointed tweets resulting in a larger number of different conversations taking place throughout the chat. A larger number of participants led to fewer opportunities for personal contributions that were coherent among one main theme. At one point during #edchat, one participant tweeted: *Chat going so fast that when I try to RT someone the screen moves and I RT a tweet I haven't read yet! #edchat.* An additional barrier influenced by group size was the fact that there were an overwhelming number of tweets to analyze in the archived chats. There were more socially related tweets in #edchat and #mathchat that were not related to the main topic of discussion; therefore, excess tweets acted as *social noise* (Social noise, n.d.), "the general background noise found at concerts, nightclubs, restaurants and other events where groups of people gather" (Urban Dictionary, 2012), that distracted participants and thereby interrupted the focus of conversation. A possible consequence of participants having to cut through the *social noise* may be a decrease in the cognitive component of contributions as participants are distracted by additional conversations taking place, by not focusing on the pre-determined topic for discussion.

Another barrier noticed in all three Twitter chats was the use of the hashtag (#). If a participant forgot to include the hashtag (#) for the conversation in their post, that specific tweet was not captured in the archived chat. This led to a number of disjointed conversations where a response may have been provided to a participant with no record of the participant's original contribution. This problem could be addressed as part of the instruction management of the Twitter chat by reminding participants to use the hashtag related to the chat on a consistent basis. Another barrier noticed regarding the use of the hashtag was around the popularity of the chat. If the conversation is an established and popular chat, such as #edchat, it is open to someone posting information for that Twitter population even if they are not participating in the scheduled chat. They may simply post their un-related thoughts to #edchat as a contribution to a larger population of people on Twitter. Businesses or organizations may also post a tweet using this hashtag in order to market their products or resources as a way to reach a certain demographic of people. Consequently, a large number of non-related tweets occurred in #edchat. A way to address this issue would be in the use of a hashtag that is unique for each scheduled chat. For example, if the scheduled chat for #edchat took place on December 10, 2010, the hashtag for that conversation could have been #edchat121010 thereby limiting the tweets that would appear in the archived transcript to the main theme or topic for that discussion.

As indicated in the similarities and differences, at times the use of questions also acted as a barrier to holding a coherent conversation. If either the participants or the facilitator asked too many questions throughout the chat, a

number of additional tangents occurred that were unrelated to the main focus or

theme. This made it difficult for participants to understand the main topic of

discussion, as well as made it harder for the facilitator to limit the focus of

discussion. This barrier could be addressed with the facilitator guiding the focus

of the discussion with consistent reminders of the triggering event and by

directing the discussion to be focused on the main theme. Additional questions

that are offered throughout the discussion could be noted as future discussion

topics as one method of keeping the discussion focused for the scheduled chat.

An additional barrier noted throughout these chats was that of the

facilitator's actions and behaviours. This element was the most complex to

explore from my perspective. Firstly, since the Twitter chats involved mainly

educators as participants, each participant had the potential to act from a

teaching presence perspective. Twitter as a constructive learning environment

allows the promotion of collaboration where meaning can be negotiated and

knowledge can be co-constructed. This constructivist learning environment within

Twitter allows and encourages all participants to provide teaching presence to

other participants. However, the analysis of teaching presence was limited to

facilitator tweets only to limit the complexities and keep focused on the research

questions that guided this investigation. It was difficult to distinguish between

building understanding and *direct instruction* since both elements of teaching

presence focused on the questions being asked of the facilitator as indicated in

the CoI coding template (see Appendix B). In the area of *building understanding*,

questions were asked by the facilitator to challenge participant contributions. In

the area of *direct instruction* questions were asked by the facilitator to question

around the main theme. In the content analysis of these conversations, it was difficult to tell the difference between these types of questions; therefore it was difficult to maintain consistency in the coding of the different elements of teaching presence.

A final barrier was recognized in the behaviour of the facilitator. The facilitators' behaviour may complicate the nature of their presence if they are not limited to teaching presence only. It is important for the facilitator to manage the chat and keep it focused at the same time in order to limit distractions for participants. If the facilitator participates as a contributor while trying to guide the conversation, they might get caught up in individual conversations themselves and miss addressing important questions or refocusing participants that may be off topic.

Research Question 4

As a medium, how could Twitter influence educator learning and collaboration?

When considering these Twitter chats from a professional learning or professional development perspective, the use of the CoI framework (Garrison et al., 2000) allowed a focus for studying the various elements of an educational experience through the lens of cognitive presence, social presence and teaching presence. Constructivist learning theory views knowledge as constructed by people, or groups of people, in a shared context based on interpretation of experience and knowledge (Vygotsky, 1978). Each twitter conversation provided a social nature where knowledge was exchanged and meaning was constructed

as a result of the social interaction that took place through clarifying questions

and contributions throughout the online discussions. These conversations also

contained evidence of learning in social contexts as suggested by Piaget (1973)

to be largely a matter of cognitive development and social interaction. Piaget

found that cognitive changes occur when confrontational and contradictive

conversation takes place. Each Twitter chat contained conversation that allowed

an exchange of information as well as confrontational discussions where

participants may have disagreed with certain statements being shared.

Shulman (1987) suggested that the knowledge base for teacher

professional learning should include evidence of subject matter, pedagogy,

curriculum, learners, and educational contexts. Data from all three Twitter chats

suggested that these conversations contained elements of rigorous professional

learning as indicated by Shulman. The conversations that took place in #edchat,

#mathchat, and #31daygame dealt with the subject matter of cooperative learning

and also contained shared elements of specific pedagogical strategies used in

the classroom based on specific curriculum areas. All three conversations

focused on the learners in the classrooms and various educational contexts with

the sharing of specific examples of strategies that were applied in participants'

classrooms.

In my experiences as a leader of face-to-face professional learning

sessions, it was evident that teachers preferred sessions that provided practical

ideas that directly related to their daily role in the classrooms. Guskey (2002)

suggested "what attracts teachers to professional development is their belief that

it will expand their knowledge and skills, contribute to their growth, and enhance

their effectiveness" (p. 382). Since the data suggested that all three Twitter chats focused on the sharing of collaborative learning strategies that could be used in the classroom, this demonstrated that the conversations taking place might have provided an opportunity for educators to increase their effectiveness in the classrooms. However, within the parameters of this study, it was not possible to determine to what degree this was achieved, if at all. An enhancement to these Twitter chats would have been to have the educators return at a later date to discuss any applications that they had tried in the classroom to further lead to a deeper understanding of professional learning. Engaging in the initial Twitter chat may be helpful in sharing the knowledge and skills; however, perhaps allowing time to try the strategies and come back together at a pre-determined date and time would be an opportunity to continue the conversation with additional cognitive presence and critical thinking once application has been attempted in the classroom. There would be additional knowledge to share. This is supported by Guskey's (2002) research that suggested, "the crucial point is that it is not the professional development per se, but the experience of successful implementation that changes teachers' attitudes and beliefs" (p. 383). The Twitter chats analyzed did not offer this experience for educators. Given the nature of these Twitter chats, the collaboration was structured and purposeful, there was a promotion of collegial and collaborative exchanges and specific and practical ideas were shared: all elements of a successful professional learning model (Guskey, 2002).

When planning formal learning programs, planners should recognize the likelihood of informal learning that may occur in this social medium. Formal

learning opportunities could be provided during the day, with continued

opportunity for further dialogue in a Twitter chat to facilitate informal learning.

Choi and Jacobs (2011) suggested that both forms of learning, formal and

informal, need to be integrated to maximize the benefits of professional

development. The three Twitter chats analyzed were *formal* in the sense that they

were structured and planned by a facilitator (or two), however they could also be

classified as *informal* in the delivery since participation was voluntary by nature

and were not the result of board planning or implementation. Treacy, Kleiman

and Peterson (2002) shared the importance of having one or more carefully

planned face-to-face meeting in order to significantly strengthen the online

learning experience. Based on these research findings, it might be beneficial to:

(a) provide professional learning opportunities where educators are gathered in a

face-to-face formal experience, (b) share instructional guidelines for discussion,

and (c) continue the conversation online through the use of a Twitter chat to

discuss formally facilitated focused topics. Lieberman and Mace (2010) proposed

that when the teachers themselves propose the learning objects, their

professional development is enhanced, inverting the traditional top down models.

Therefore, it may also be beneficial to provide a choice of topics presented to

teachers, where they can contribute thoughts and experiences that are relevant

to them personally.

Implications for Practice

The examination of the elements of the CoI (Garrison et al., 2000), more

specifically, cognitive presence, social presence and teaching presence led to

key factors to consider in the planning and implementation of an effective

conversation (chat) in the Twitter environment. Figure 8 provides key reflection

questions to consider when planning learning opportunities focused around:

purpose, participants, facilitation, questions, and the Twitter chat. This figure is

followed by a set of guidelines that summarizes the main ideas found in this study

allowing for the planning and implementation of effective online conversations

that follow a CoI model, rich in cognitive presence, social presence and teaching

presence.

| **Purpose** | • What content will be the main focus?
• Will the conversation be dialogue or discussion based? |

| **Participants** | • Who is the main target audience?
• Will the number of participants be limited? |

| **Facilitation** | • How many facilitators are required?
• What role will the facilitator(s) hold?
• Will the facilitator participate in the conversation as well? |

| **Questions** | • What type of question will be used as a triggering event? (i.e., open or closed)
• Will additional questions be welcomed throughout the chat or archived for a later time? |

| **Twitter chat** | • What hashtag will be used to manage the conversation?
• When will the chat take place? |

Figure 8: Planning and implementing an effective Twitter chat

Guidelines for Twitter chats

Educational Twitter chats have become increasingly popular as educators move toward a self-directed learning model. While there are a small number of resources available supporting the use of Twitter as a tool to engage students in both synchronous and asynchronous online discussions (Venable & Milligan, 2012), the literature review demonstrated a gap in the use of Twitter for informal professional learning conversations among educators as in-service for teachers. The aim here is to highlight strategies and approaches culled from the reviewed literature and the content analysis of data, to assist in the development of both formal and informal opportunities for professional learning among educators. The following are recommendations for holding effective online conversations that follow a CoI model, rich in cognitive presence, social presence and teaching presence.

Consider the purpose. Establish a specific focus or purpose for the Twitter chat. Determine whether your conversation will be dialogue-based or discussion-based in nature. A dialogue-based chat will provide the opportunity for participants to brainstorm many ideas in order to build understanding in an area. A discussion-based chat, on the other hand, provides participants with an opportunity to share many perspectives or viewpoints, where differences of opinions may arise, with the end goal being that of a decision being made.

Define the role of the facilitator. Establish specific strategies that the facilitator can use for leading a collaborative online community. Facilitators should focus on creating a space for sharing and interaction, as well as keeping the conversation focused on the main purpose. This collaborative space is

enhanced when facilitators provide a strong teaching presence and adhering to
direct instruction related to the instructional management of the Twitter chat. If
facilitators are going to participate in the conversation by sharing their own ideas
and opinions, they should use a different Twitter account (and user name) to do
so. This maintains clarity among participants regarding the role of the facilitator:
to manage the online environment and purpose of the chat.

Define the norms and procedures for the chat. Structure the Twitter
chat by clearly outlining participation requirements. Remind participants to keep
posts related to the triggering event (opening question) by using the hashtag (#)
for posts that are on topic. If posts are not related to the specific topic (e.g. posts
that are purely social in nature), invite participants to refrain from including the
hashtag (#) in order to alleviate the social noise that distracts from the cognitive
presence of the conversation.

Use appropriate questions. Questions should be related to the purpose
of the Twitter chat. If the purpose of the chat is to gather quick information and
brainstorm ideas around a certain concept, a closed question would be beneficial
for this purpose (e.g. List specific ways you have engaged students in
cooperative learning experiences in your classroom). However, if the purpose of
the Twitter chat is for participants to share deeper thoughts and opinions around
a certain topic, then an open-ended question would more likely provide this
opportunity (e.g. Which is more effective: individual work or group work among
students? Justify your opinion with an example from your experiences). A variety
of theorists can be referenced to guide the generation of effective questions that

lend to higher-level thinking (Anderson & Krathwol, 2001; Morgan & Saxton, 2006).

Consider the timeframe. Chats that are held within a one-hour timeframe may be best for brainstorming and gathering a number of ideas centred on a certain topic. Chats that are held over a longer period of time, perhaps a day or a week, allow for a higher cognitive presence since a longer time period allows for participants more reflection time to be built into their responses. Additional time might also allow for a participant to search for additional resources that might allow for further knowledge construction. As a result, there is the increased potential for additional sharing of thoughts and applications that are specifically related to the conversation.

Keep the chat focused. If other questions or concerns arise that sway from the original triggering question or focus, park them for a later chat. Encourage the conversation to remain centred around one key idea in order to foster a conversation of threaded discussions that can be easily followed and built. This will allow an environment where knowledge can be shared and added to focusing on one key concept at a time while lessening other distracting topics.

Consider the number and type of participants. Decide on who would benefit most from the information of your specific Twitter chat. Do you want to address the general educator population? Do you want to address educators from a specific panel or a specific subject area? A larger number of participants may create an environment where the conversation threads are broken up by many different conversational tweets. Consider limiting the number of people to a reasonable number if it is being held in a shorter timeframe.

Share the CoI model. As with any authentic assessment model, If participants are aware of the elements of conversation that display deeper levels of critical thinking, such as that demonstrated in Garrison et al.'s CoI framework (2000), participants may strive to provide justification and connected ideas that will move the conversation into a deeper level of cognitive presence. Share the CoI model as part of the Twitter chat protocol in order to provide opportunities for participants to display further critical thinking and application of thoughts.

Encourage additional contributions. When participants can provide a picture, diagram, or photograph that is related to their thinking, it can further support their contributions and allow other participants to understand what they are thinking, while remaining in the 140 character limit of a tweet.

Encourage "retweets with more". If participants choose to retweet someone else's contributions, encourage them to justify why they retweeted the post with a few more words that offer additional personal insight on his/her part.

Provide a summary of important information from the chat. Throughout the Twitter chat, or at the end of a conversation, have facilitators provide a list of all links shared, key ideas summarized, as well as further questions to explore in the future. Take time to eliminate the non-related tweets as well as simple retweets in order to archive key messages for future reference.

Consider a F2F opportunity to support the community. Research has shown that providing face-to-face opportunities for groups to meet prior to holding an online conversation enhances the sense of community among participants (Treacy et al.,2002). If possible, have participants meet to begin the dialogue or

discussion that can then be continued using a specific Twitter hashtag for that group.

Provide a choice in chat topics. Educators could be encouraged to find a topic that interests them to take part in. Providing invitational tweets prior to the Twitter chat can promote the topic for conversation. This will invite participants who are interested in each topic as well as eliminate participants who are not interested in the topic of the day. Providing different choice topics for participants to choose from using different hashtag conventions for each Twitter chat in order to keep the ideas focused around one clear purpose would also benefit multiple interests.

Future research considerations

Since this research study was exploratory in nature, the data provided an initial understanding of factors that may influence the types of conversations taking place in this social environment. Further exploration in both of these areas may provide deeper understanding to enhance the findings of this study. Given the exploratory nature of this study, additional research is needed in several areas to address some of the study's limitations. This study replicated across additional Twitter chats could extend the research and include a larger study sample, beyond that of a convenience sample.

There are additional factors contributing to a professional learning opportunity that could also be explored. These findings increase the importance of investigating the various factors contributing to differences in this interactive environment, such as aspects of the group task (the triggering question), the

facilitator's actions, and the social presence among participants. Valuable insights may also be gained from interviews with participants in order to focus on actual application of learning, rather than the limited perceived learning evident in the cognitive presence analyzed in this study. Yin (2003) noted that interviewing participants is one of the most important sources of data in a case study. This may take the form of open-ended interviews, focused interviews, or a more structured and formal survey interview. Interviews with future participants of Twitter chats could focus on such areas as: the motivation of participants to participate in Twitter chats, individual levels of participation, their own perceived learning from the chat as well as how they have applied the learning into their current roles. Future research specifically focused on studying the participants of a Twitter chat may provide more specific information regarding: characteristics of the population, learning styles of participants, backgrounds of participants, preference for professional learning models, and interpretations of what they have learned from participating in the chat.

Additional questions that arose throughout this study are possible future studies that would enhance the results of this study:

- How would participant awareness of the CoI model influence the conversation, more specifically at the cognitive presence level?

- How do the types of questions asked by the facilitator influence the type of questions asked by the participants?

- How do the behaviours of the facilitator influence the Twitter chat?

- What is the impact of participation In Twitter chats on teacher practice in the classroom?

These findings highlight the importance of a further understanding of the relationship between the facilitator and the participants. Further exploration could include the influences involved from a facilitation perspective, on the outcome of a conversation.

Chapter 5 provided an overview of the results as they pertain to: nature of Twitter chats; similarities and differences among chats related to the CoI framework; barriers and/or limitations explored; and the resulting implications and recommendations for using Twitter as a medium for professional learning. Considerations for future research were also provided which may lead to a deeper understanding of further areas related to this study.

Conclusion

This paper presents the findings of an original exploratory study of three educational chats that took place on Twitter. As both an active Twitter participant and a facilitator of face-to-face professional learning conversations, I realized the importance of having a clear purpose and focus when we would come together for any formal or informal learning. We had to have goals and a structure for the day and this doesn't change for an online experience. Despite the increased use of Twitter by K-12 educators and leaders, a review of the literature identified gaps in the research of the value of Twitter as a possible vehicle for teacher professional learning. Therefore, even though this study was limited in its scope, findings help to close the gaps in this field of scholarly inquiry.

The value of Twitter as a model for professional learning is largely

unexplored, as indicated in the gaps discovered in the literature review. Some

believe that Twitter is merely a broadcast medium, while others contest

that Twitter can foster the combined knowledge creation of a group better

than face-to-face discussions because teachers facilitate sharing of ideas beyond

the classroom via an online platform that allows readily available access at

random times to continue such discussion (Kassens-Noor, 2012). Indeed, the

results of this study confirmed the cognitive, social, and teaching presence of the

elements of the CoI framework in Twitter chats. The findings of this

investigation also provide practical implications in that the three elements appear

to develop and progress in different ways in different Twitter chats.

In an age where staff development budgets are being cut, educational

leaders in K-12 school districts are tasked with finding creative ways to plan and

provide teacher professional learning to happen affordably and at scale. School

districts must provide ongoing and effective professional development to help

their staff learn to use educational technology in their classrooms. Much work is

being done at the school level to create powerful communities of practice face-to-

face. However, schools and boards would do well to consider the use of Twitter

as part of their staff development agenda to truly empower teachers to engage in

more on-going and self-directed professional learning. The technological

infrastructure currently existing in school environments (i.e., desktop computers,

smartphones, iPads, etc.) in conjunction with the cost-free Twitter environment

provides an evolution to online professional learning that is cost effective and

easily accessible. Additionally, the benefit of expanding professional contact

beyond the geographic confines of one's institution may build a larger network of

collaborative opportunities. Treacy et al. (2002) concluded that when "vibrant,

interactive communities of educators can be built online, [they] can have

significant effects on classroom teaching practice" (p. 42). Online professional

development, when carefully tailored to meet local needs, and when well

integrated with other ongoing technology and professional development plans

and initiatives, provides a powerful way for busy educators to meet this challenge

successfully.

Appendix A: Educational Chats on Twitter

The Twitter chats listed below were compiled from the following link:
http://www.tinyurl.com/twitterhashtaglist which shares a limited number of chats
taking place at the time of this research. A more comprehensive list of Twitter
chats can also be found at http://www.tinyurl.com/twitterchatschedule.

Hashtag	Chat Topic	Website/URL
#edchat	General Education	http://edchat.pbworks.com
#ntchat	New Teachers	http://twebevent.com/ntchat
#k12	K12 Education	http://twebevent.com/K12
#artsed	Art Education	http://twitter.com/artsed
#engchat	English Education	http://twitter.com/engchat
#mathchat	Math Education	http://mathschat.wikispaces.com/
#sschat	Social Studies Education	http://sschat.ning.com/
#musedchat	Music Education	http://musicedmajor.net/musedchat/
#scichat	Science Education	http://www.teachingscience20.com/scichat/
#historyteacher	History Education	http://www.activehistory.co.uk/historyteacher/
#physed	Physical Education	http://twitter.com/physed
#cpchat	Connected Principals	http://twitter.com/chat
#edadmin	School Administrators	http://tweetchat.com/room/edadmin
#kinderchat	Kindergarten Education	http://www.kinderchat123.net/
#gtchat	Gifted and Talented Education	http://www.ingeniosus.net/gtchat
#spedchat	Special Education	https://spedchat.wikispaces.com/

Appendix B - Description of Content Analysis Coding Scheme

Cognitive Presence

Categories & Coding	Indicators and Explanation of socio-cognitive processes
Triggering Event or Communication (CT)	**Indicators:** • recognizing the problem • sense of puzzlement **Socio-cognitive processes:** • presenting background information that culminates in a question • asking questions • messages that take discussion in a new direction • state of dissonance or feeling of unease resulting from an experience
Exploration (CE)	**Indicators:** • divergence – within the online community • divergence – within a single message • information exchange • suggestions for consideration • brainstorming • leaps to conclusions **Socio-cognitive processes:** • unsubstantiated contradiction of previous ideas • many different ideas/themes presented in one message • personal narrative/descriptions/facts (not used as evidence to support a conclusion) • author explicitly characterizes message as exploration ("Does this seem right?") • adds to established points but does not systematically defend/justify/develop addition • offers unsupported opinions • in search of information, knowledge and alternatives that might help make sense of the situation or problem • searching for clarification and attempting to orient one's attention • discussion of ambiguities
Integration (CI)	**Indicators:** • convergence – among group members / within a single message • connecting ideas, synthesis • creating solutions **Socio-cognitive processes:** • reference to previous message followed by substantiated agreement ("I agree because…") • building on, adding to other's ideas • justified, developed, defensible, yet tentative hypothesis • integrating information from various sources • explicit characterization of message as a solution by participant • look for insight • gaining some understanding of the acquired information & knowledge
Resolution (CR)	**Indicators:** • vicarious application to the real world • defending solutions **Socio-cognitive processes:** • critically assess, apply new idea

Description of Content Analysis Coding Scheme (cont'd)

Social Presence

Categories & Coding	Indicators and Explanation
Emotional Expression (SE)	- unconventional symbolic representations (emoticons) - expression of feelings - eg. humour, self-disclosure
Open Communication (SO)	- reciprocal and respectful communication - mutual awareness and recognition of each other's contributions - eg. replies, quoting others, direct comment to someone, appreciation, agreement, complements, encouragement
Group Cohesion (SG)	- activities that build and sustain a sense of group commitment - building cohesion and a sense of belonging - dialogues (as opposed to monologues) - eg. encouragement, help, support

Teaching Presence

Categories & Coding	Indicators and Explanation
Instructional Management (TI)	- structural - setting curriculum, design methods - establishing parameters - explicit & implicit
Building Understanding (TB)	- productive and valid knowledge construction - challenging and stimulating process - academic integrity - creating effective group - eg. draw in less active participants, acknowledge individual contributions, focus discussion, facilitate educational transaction
Direct Instruction (TD)	- assess the discourse and the efficacy of the educational process - present content - question - guide - summarize - confirm understanding - constructive explanatory feedback

Adapted from Garrison, Anderson and Archer, 2000.

Appendix C - Links shared during #edchat

Content / Name of Website	URL
Transforming Teaching in High-Tech, Collaborative Learning Environments with Critical Reflection	http://www.educause.edu/ero/article/transforming-teaching-high-tech-collaborative-learning-environments-critical-reflection
Visible Thinking	http://pzweb.harvard.edu/research/visthink.htm
Introducing teachers to teaching partners	http://muuua.com/
Blog - How to work with a No-Share Teacher	http://www.edutopia.org/blog/no-share-teacher-holden-clemens
Student blog - What if we got graded on collaboration	http://jamietsophacademy.blogspot.ca/2009/02/what-if-we-got-graded-on-collaboration.html
Student Support of Laptop Programs - resource	http://www.mbcurl.me/1B4
21st Century Curriculum and Assessment Framework	http://www.ncte.org/positions/statements/21stcentframework
Flipped Classrooms - Libby Lawrie	http://blog.lightspeedsystems.com/video/2011/08/04/flipped-classrooms-libby-lawrie/
Edcamp Impromptu - How to	http://www.andrewmarcinek.com/2011/05/edcamp-impromptu.html
TMB Panyee FC short film	http://www.youtube.com/watch?feature=player_embedded&v=jU4oA3kkAWU
Stop Meeting & Start Connecting & Sharing	http://www.edutopia.org/blog/stop-meeting-start-connecting
Importance of Collaborative Assessment in a 21st Century Classroom	http://www.edutopia.org/blog/collaborative-assessment-digital-classroom-social-media-tools
3 secrets to creating your desired collaborative environment)	http://leadershipsolutionsblog.com/leadership-solutions/3-secrets-to-creating-your-desired-collaborative-environment/
mini-lessons for literature circles - Harvey Daniels	http://www.amazon.com/Mini-Lessons-Literature-Circles-Harvey-Daniels/dp/0325007020
Comprehension & Collaboration, Harvey Daniels	http://www.amazon.com/Comprehension-and-Collaboration-ebook/dp/B003H83YE6/ref=sr_1_1?ie=UTF8&m=AG56TWVU5XWC2&s=digital-text&qid=1271363277&sr=1-1
Collaborative Learning: Group and Teams in the Classroom	http://community.learningobjects.com/Users/Nancy.Rubin/Objects_of_Interest/2011/05/Collaborative_Learning_Group_and

Content / Name of Website	URL
Constructivism and Project-Based Learning	http://community.learningobjects.com/Users/Nancy.Rubin/Objects_of_Interest/2010/01/Constructivism_and_Project_Based
Culture of Excellence & Ethics	http://excellenceandethics.com/assess/ceea.php
12 Most important thing to know about kids today	http://12most.com/2011/08/09/12-important-kids-today/
5 simple ways to use edmodo everyday	http://wsfcsintouch.blogspot.ca/2011/08/five-simple-ways-to-use-edmodo-everday.html
Culture of Excellence & Ethics - Professional Development	http://excellenceandethics.org/programs/training-toc.php
Wiki Scoring Checklist	http://digitallyspeaking.pbworks.com/f/Handout_WikiScoringChecklist.pdf

Appendix D - Links shared during #mathchat

Content / Name of Website	URL
Stock Market game	http://cybraryman.com/stocks.html
Cooperative Learning Page	http://www.cybraryman.com/cooperative.html
Rubrics for assessing blogs	https://sites.google.com/site/mathetlearningprojects/
Project Euler site	http://projecteuler.net
Community Math Center – Southbend, Indiana	http://riverbendmath.org
Mathchat discussion topics	https://docs.google.com/document/edit?id=1WA2Yk7Jf6IlpCjzGX7GVZa6spsKezoZud95hRJWx4-s&hl=en&authkey=CO7r4Fo&pli=1
How have Twitterchats helped with CPD Survey	https://spreadsheets.google.com/viewform?formkey=dF9VUW9iUWtuSS1UZWlVeFVMNlBFekE6MQ
Mathchat resources	http://mathschat.wikispaces.com/Resources

Appendix E - #31daygame Tournament Bracket

Day 1: Jigsaw vs Graffiti
Day 2: Group Poster vs Placemat
Day 3: Pass It On vs Gibberish
Day 4: Numbered Heads Together vs Scattergories
Day 5: Three Step Interview vs Questivities
Day 6: Tableau with a Twist vs Scamper
Day 7: Triad Summarizer vs Plus-Minus-Interesting
Day 8: WebQuest vs Wordle
Day 9: Found Poem vs Back-to-Back Drawing
Day 10: Somebody Wanted But so vs Possible Sentences
Day 11: Think, Pair, Share vs Paraphrase Passport
Day 12: Show not Tell vs Acrostic Poster
Day 13: I Like My Neighbour vs Improv Character Circle
Day 14: Concept attainment vs Graphic Organizer Game
Day 15: Snowball vs Give one Get one
Day 16: Zoom vs Beach Ball Questions
Day 17: Winner of Day 1 vs Winner of Day 2
Day 18: Winner of Day 3 vs Winner of Day 4
Day 19: Winner of Day 5 vs Winner of Day 6
Day 20: Winner of Day 7 vs Winner of Day 8
Day 21: Winner of Day 9 vs Winner of Day 10
Day 22: Winner of Day 11 vs Winner of Day 12
Day 23: Winner of Day 13 vs Winner of Day 14
Day 24: Winner of Day 15 vs Winner of Day 16
Day 25: Winner of Day 17 vs Winner of Day 18
Day 26: Winner of Day 19 vs Winner of Day 20
Day 27: Winner of Day 21 vs Winner of Day 22
Day 28: Winner of Day 23 vs Winner of Day 24
Day 29: Winner of Day 25 vs Winner of Day 26
Day 30: Winner of Day 27 vs Winner of Day 28
Day 31: Winner of Day 29 vs Winner of Day 30

The entire tournament bracket can be found at the following website:
http://31daygame.weebly.com/uploads/6/1/4/3/6143222/cooperative_learning_ex
periences_-_tournament_bracket_-_may_31.pdf

Appendix F - Links shared during #31daygame

Content / Name of Website	URL
Original blog about #31daygame	http://thecleversheep.blogspot.ca/2011/01/do-you-have-time-for-31-day-game.html
Jigsaw	http://olc.spsd.sk.ca/de/pd/instr/strats/jigsaw/
Graffiti	(link not available)
Day 1 - Jigsaw vs Graffiti - summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/cle_day1.html
Group Poster	http://teachcommunity.tribes.com/2008/11/multiple-intelligences-–-persuasive-writing/
Placemat	http://www.york.ca/NR/rdonlyres/zmzolykmk4s62xvnig6mx2stv3chp3jgeu2dbml5cbrcz27hu6lynlxz5ykz46eavxgwfjkxshsj4ocavma6bqzzgb/Place+Mat+K+to+Adult+08.pdf
Day 2 - Group Poster vs Placemat - summary of key ideas	http://31daygame.weebly.com/1/post/2011/5/day-2-place-mat-vs-group-poster.html
Pass-it-on	http://www.edu.gov.on.ca/eng/studentsuccess/thinkliteracy/files/Writing.pdf#page=103
Gibberish	http://www.childdrama.com/gibberish.html
Day 3 - Pass-it-on vs Gibberish summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-3-pass-it-on-vs-gibberish.html
Scattergories	http://www.onestopenglish.com/community/lesson-share/extras/vocabulary/vocabulary-grammar-scattergories/145355.article
Numbered Heads	http://www.eazhull.org.uk/nlc/numbered_heads.htm
Day 4 - Scattergories vs Numbered Heads summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-4-scattergories-vs-numbered-heads-together.html
Three-step Interview	http://www.eworkshop.on.ca/edu/pdf/Mod36_coop_3-step_interview.pdf
Questivities	http://www.carolyncoil.com/ezine32.htm
Day 5 - Three-step Interview vs Questivities summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-5-three-step-interview-vs-questivities.html
Tableau with a Twist	http://www.learner.org/libraries/makingmeaning/makingmeaning/support/lesson6.pdf
Scamper	http://www.illawarrasouthcoast.sreg.education.nsw.gov.au/BPS/Site/English/Scamper.html
Day 6 - Tableau with a Twist vs SCAMPER summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-6-scamper-vs-tableau-with-a-twist.html

Triad Summarizer	https://docs.google.com/viewer?a=v&q=cache:Brwi8 5ZevzcJ:www.uhseport.net/published/k/sh/kshaw/co llection/1/18/upload.c-kshaw- 1n18.doc+triad+summarizer&hl=en&gl=us&pid=bl&s rcid=ADGEESiEt8vkX1EZaSfWTTdLzQtdFBo75PvA uTHCafFtyHWCD_23Q3GJN_RR- XO_WOQT0VO_6NBZtBYcGBSDx00wGgPZZlpQQ DEVGR9uPxpbpFWCsGOWhk- 6duVfafSpH6cniuqm4hD7&sig=AHIEtbSS- up4w04BFd-AjR--2gix3imlvQ
Plus-Minus-Interesting	(link does not work)
Day 7 - Triad summarizer vs P-M-I summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-7-pmi-v-triad-summarizer.html
Webquest	(link does not work)
Wordle	http://www.ideastoinspire.co.uk/wordle.htm
Day 8- Webquest vs Wordle summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-8-webquest-vs-wordle.html
Found Poems	http://www.readwritethink.org/files/resources/lesson _images/lesson1034/found-poem-instructions.pdf
Back-to-Bck Drawing	http://www.teampedia.net/wiki/index.php?title=Back-2-Back_Drawing
Day 9 - Found Poems vs Back-to-Back Drawing summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-9-found-poem-vs-back-to-back-drawing.html
Somebody Wanted But So	http://spedlit.k12.hi.us/Strategies/SWBS.htm
Possible Sentences	http://its.guilford.k12.nc.us/act/strategies/possible_s entences.htm
Day 10 - Somebody Wanted But So vs Possible Sentences summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-10-swbs-vs-possible-sentences.html
Think-Pair-Share	http://www.lkdsb.net/program/elementary/intermedia te/di/files/22Strategies(Think%20Pair%20Share).pdf
Paraphrase Passport	http://albany2009.pbworks.com/f/Paraphrase+Passp ort+Protocol.pdf
Day 11 - Think-Pair-Share vs Paraphrase Passport summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-11-paraphrase-passport-vs-think-pair-share.html
Show-Not-Tell	https://www.georgiastandards.org/Frameworks/GS O%20Frameworks/6%20Unit%201%20Narrative%2 0Writing%20Memoir%20Show%20Not%20Tell%20T ask.pdf
Acrostic Poster	http://www.teach-nology.com/teachers/lesson_plans/language_arts/vo cab/912acrostic.html
Day 12 - Show-Not-Tell vs Acrostic Poster summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-12-show-not-tell-vs-acrostic-poster.html
I Like My Neighbour	http://teachcommunity.tribes.com/2008/06/i-like-my-neighbor/
Improv Character Circle	(link doesn't work)

Day 13 - I like my neighbour vs Improve character circle summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-13-i-like-my-neighbor-vs-improv-character-circle.html
Concept Attainment	http://olc.spsd.sk.ca/DE/PD/instr/strats/cattain/
Graphic Organizer Game	http://teachcommunity.tribes.com/2011/04/graphic-organizer-game/
Day 14 - Concept Attainment vs Graphic Organizer Game summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-14-concept-attainment-vs-graphic-organizer-game.html
Snowball	http://teachcommunity.tribes.com/2011/01/weekly-tribes-reflective-practice-snowball/
Give One Get One	http://www.usd416.org/pages/uploaded_files/Give_One_Get_One.pdf
Day 15 - Snowball vs Give-One-Get-One summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-15-snowball-vs-give-one-get-one.html
Zoom	http://wilderdom.com/games/descriptions/Zoom.html
Beach Ball Questions	http://www.residentassistant.com/games/icebreakers/beachball.htm
Day 16 - Zoom vs Beach Ball Questions summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-16-zoom-vs-beach-ball-questions.html
Day 17- Jigsaw vs Placemat summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-17-jigsaw-vs-place-mat.html
Day 18 - Pass it On vs Numbered Heads summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-18-numbered-heads-together-vs-pass-it-on.html
Day 19 - Three Step Interview vs Tableau with a Twist summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-19-three-step-interview-vs-tableau-with-a-twist.html
Day 20 - PMI vs Wordle summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-20-plus-minus-interesting-vs-wordle.html
Day 21 - B2B vs SWBS summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-21-somebody-wanted-but-so-vs-back-to-back-drawing.html
Day 22 - Paraphrase Passport vs Acrostic Poster summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-22-paraphrase-passport-vs-acrostic-poster.html
Day 23 - I Like My Neighbour vs Concept Attainment summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-23-concept-attainment-vs-i-like-my-neighbour.html
Day 24 - Snowball vs Beachball summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-24-snowball-vs-beachball-questions.html
Day 25 - Jigsaw vs Pass-it-on summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-25-jigsaw-vs-pass-it-on.html
Day 26 - Three Step Interview vs PMI summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-26-three-step-interview-vs-p-m-i.html
Day 27 - SWBS vs Paraphrase Passport summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-27-paraphrase-passport-vs-somebody-wanted-but-so.html
Day 28 - Concept Attainment vs Snowball summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-28-snowball-vs-concept-attainment.html
Day 29 - Jigsaw vs 3 Step Interview summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-29-jigsaw-vs-3-step-interview.html

Day 30 - Paraphrase Passport vs Snowball summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-30-snowball-vs-paraphrase-passport.html
Day 31 - Jigsaw vs Snowball summary of key ideas	http://31daygame.weebly.com/1/post/2011/05/day-31-jigsaw-vs-snowball.html
Complete tournament	http://31daygame.weebly.com/uploads/6/1/4/3/6143222/cooperative_learning_experiences_-_tournament_bracket_-_may_31.pdf
Week 1 reflection post	http://31daygame.weebly.com/1/post/2011/05/week-1-review-strategies-for-success-with-cooperative-learning-experiences.html
Round 1 reflections	http://31daygame.weebly.com/1/post/2011/05/round-one-reflections.html
Closing reflection	http://31daygame.weebly.com/1/post/2011/06/closing-thoughts-on-31-day-game-2.html
Poems about chemistry	http://allpoetry.com/tag/show/Chemistry
Link to Webquest	http://webquest.org/
thecleversheep - extended his thinking by sharing a photo of a diagram to illustrate his thoughts	http://www.flickr.com/photos/thecleversheep/5710286694/ http://www.flickr.com/photos/gforsythe/5705529111/
Ideas to Inspire	http://www.ideastoinspire.co.uk/ipodtouch.htm
Gigapan	http://gigapan.org
DOVE Brainstorming	http://webcache.googleusercontent.com/search?q=cache:6Ud7qjACeOAJ:www.nsrfharmony.org/empowering_youth/doc/brainstorming_tips.rtf+dove+brainstorming+rules&cd=5&hl=en&ct=clnk&gl=ca&client=safari&source=www.google.ca
I believe that we will win chant	http://youtu.be/7EmesKpGM4E
Survey was used	https://spreadsheets0.google.com/spreadsheet/viewform?hl=en_US&hl=en_US&formkey=dDk1N2E4dmFyUkZRUE1VV2lFemN3c3c6MQ#gid=0

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VITA AUCTORIS

NAME:	Kelly-Ann Power
PLACE OF BIRTH:	Sudbury, Ontario
YEAR OF BIRTH:	1967
EDUCATION	F.J. Brennan High School, Windsor
	1982-1986
	University of Windsor, Windsor, Ontario
	1986 – 1990 B.Sc.
	University of Windsor, Windsor, Ontario
	1991-1992 B. Ed.