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DESIGN THINKING APPLIED: THE PROCESS OF CREATING A TECHNOLOGY-MEDIATED DEBRIEFING MODULE

BY

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Dedication

This thesis is dedicated to my beautiful family who have supported all my adventures in life and academia. Thank you to my Mother and Father who have always been my biggest support. From the beginning you taught me about priorities and values in life. You taught me to work hard, stay focused and dream big. I am truly grateful for your continuous love and support. You have always been there for me no matter what. Thank you also to my husband Bernhard for his patience as I balanced multiple life roles to see this degree through to the end. A very special thank you to my wonderful daughters for sharing me over the past few years. Although you have, and will always be my main priority in life, I am so grateful for your patience, understanding and support. I have enjoyed watching you from the base of the ski hill while working on my computer, but can't wait to join you once again in all our family adventures. Love you always.

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Abstract

This qualitative case study explored the effectiveness of using design thinking to create a technology-mediated debriefing module (mock up/story board) for practical nursing students. Participants (faculty, students, instructional designers and technologists) were guided by a facilitator through the 5 phases of design thinking. An analysis of focus group data, researcher notes and participant interviews revealed six themes: co-construction of knowledge, consensus building, student voice, sharing of unique subject matter expertise, the design thinking process guides and the Community of Inquiry. The collaborative, problem solving nature of the design team resulted in the creation of a professional community of learning. Within this community of learning all three presences of the Community of Inquiry model were evident (social, cognitive and teaching) creating an optimal learning environment for innovative inquiry, problem solving and design. The design thinking process provided a structured methodology which enabled sharing, learning and co-construction of new knowledge.

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Chapter I: Introduction

Introduction

Post-secondary educators in nursing are being challenged to create quality learning opportunities for students in today's fiscally restrained academic environment. Decreased clinical placements, increased class sizes, decreased faculty numbers and emerging technology are necessitating that novel teaching methods be considered. The time has come to question the efficiency and quality of some traditional delivery methods and explore alternatives. In the case of this study, an alternative method of delivery was sought for debriefing practical nursing students in a community college post simulation. The current debriefing process, as described further in this paper, is inconsistent and does not give sufficient time for reflection, faculty feedback or emotional processing. A new debriefing process is required to ensure a positive student learning experience post simulation. When implementing a change in educational delivery methods, the process by which we develop new learning opportunities is equally as important as the end product. Not only is a process important to ensure a robust instructional design utilizing pedagogical best practices, many theorists argue that the design process can be instrumental in influencing faculty fear, resistance or acceptance of new educational innovations (Bates & Sangra, 2011; Fullon, 2001; Groff, 2013; Kang, Choo, & Watters, 2015; Seale, 2010). The design process is the focus of this study.

The Research Problem

To understand the research problem explored in this study, it is first important for the reader to have an awareness of what simulation and debriefing entail in a nursing academic environment. Although the process of simulation and debriefing is not the

construct being explored in this study, it is relevant to the case which gives this research its context.

Understanding simulation. Simulations are being used in nursing education as an effective means to teach skills, clinical judgement, team work and problem solving. The use of simulations in nursing education has become more popular due to decreased clinical placement opportunities for students (Reimer, Harwood, Terblanche, Van Hofwegen, & Sawatzky, 2007; Waznonis, 2014). Simulations usually occur in a clinical lab and involve the use of standardized patients and/or mannequins (Cant & Cooper 2014; Moule, Wilford, Sales, & Lockyer, 2008; Runnacles, Thomas, Sevdalis, Kneebone, & Arora, 2014). Learning occurs during the simulation and continues as the learner moves into the post simulation phase called debriefing. Debriefing can be summarized as a discussion about the simulation experience and has been identified as the most important component of the learning experience for students in nursing (Cant & Cooper, 2014; Lavoie, Pepin, & Boyer, 2013; Levett-Jones & Lapkin, 2014; Runnacles et al., 2014). The literature identifies various methods for conducting a debrief including student self-debriefing, faculty debriefing, cognitive debriefing, technical knowledge debriefing, verbal debriefing, video assisted verbal debriefing, debriefing home study, group performance before and after simulation, standardized computer-based multimedia debriefing and nontechnical skills versus medical management debriefing (Dufrene & Young, 2014). Although numerous protocols for debriefing are utilized, no one method of debriefing has been identified as superior and great inconsistencies exist with its delivery resulting in varying costs and quality (Dufrene & Young, 2014; Runnacles et al., 2014; Welke et al., 2009). The next section of this paper will discuss the debriefing

process currently being used at the site of this study. It will highlight why an innovative new method is required.

Debriefing at the research study site. At the time of this study, high fidelity simulations occurred in the practical nursing college program at the study site on average twice per semester. The simulations are created with clear learning objectives and repeated each term. Students participate in simulation groups of 2-4 depending on class sizes. On average three simulations run simultaneously every 15 minutes for a period of 2-4 hours. Debriefing for all three groups occurs following the simulation and is facilitated by faculty. The debrief is limited in time to approximately 15 minutes. During debriefing, students discuss highlights and errors. Instructions for a follow up reflection activity are provided and students are encouraged to continue to debrief with each other, using the discussion forums in their learning management system. Several issues have been identified as challenges with the existing debriefing process including timing, student anxiety, summative nature and consistency. With respect to timing, current class sizes are very large which limits the time faculty have to spend with students during the debrief process (Canadian Association of University Teachers, 2012-2013). Students must often wait to participate in the debrief session and are usually given only 15 minutes with faculty. According to the literature, this time is insufficient, as most debriefings should be twice the length of the simulation (Lavoie & Pepin, 2013). Furthermore, the delay in time before the debrief is not ideal, as feedback to students should occur immediately post simulation, allowing sufficient time for discussion and reflection (Lavoie & Pepin, 2013). Still further, limited time impacts the faculty's ability to address student anxiety that may occur during simulation and debriefing. According to

Najjar, Lyman, and Miehl (2015), students can experience anxiety when participating in a simulation due to a fear of being watched and judged by their peers and faculty. The existing debrief process does not provide sufficient time for students to reflect on these emotions. During this time pressured process, students may misinterpret the experience as a summative evaluation because faculty are so involved (Welke et al., 2009). In addition, the debrief session is conducted by various faculty and therefore lacks consistency for all students. Faculty are not all equally skilled in leading debriefing sessions and various methods are used; this inconsistency can impact quality and the student learning experience. Evidently, the current debriefing process has many challenges. These challenges will be further discussed and validated in the literature review of this paper.

Purpose of the Study

The purpose of this qualitative case study was to evaluate the appropriateness of using the design thinking process (Brown, 2008) to create a technology-mediated debriefing module (TMDM) (mock up/story board) for practical nursing students at a community college. Design thinking is a human-centered, collaborative, iterative problem-solving technique associated with abductive reasoning which results in innovations. Design thinking was chosen as a process as it has been recently used to explore innovations within the education sector (IDEO, 2013). In addition, the lead researcher had completed a workshop on utilizing the design thinking process through Queen's University and had experience with the process as a facilitator. The design team for this project included nursing students, nursing faculty, simulation technologists and instructional designers. This purposeful sample is described further in the methodologies

section of this paper. The design thinking process involves five phases including empathy, defining the problem, ideation, prototyping and testing (The Institute of Design at Stanford, 2011). The expected outcome of this research is 1) an understanding of how design thinking can be used as an instructional design process 2) an understanding of how collaborative design may influence stakeholder engagement and acceptance of technological innovations 3) a mock-up/story board of a new technology mediated debriefing activity. Building and evaluating the TMDM was not within scope for this research project.

Theoretical Framework

This study used the Community of Inquiry (CoI) model developed by Garrison, Anderson and Archer (2000) as a theoretical framework to support the instructional design process of a TMDM. The instructional design process was structured further through the application of design thinking. Together the CoI and the design thinking process enabled collaborative learning. As illustrated by Figure 1, the CoI model suggests that true learning will occur when "there are sufficient levels of three component "presences" including the cognitive presence, social presence and teaching presence" (Anderson, 2008, p. 428). In addition, a fourth "presence", the emotional presence has recently been proposed by Cleveland-Innes and Campbell (2012). The CoI framework has been validated as an effective framework to construct online learning environments and will provide a strong theoretical framework during the design of a TMDM (Arbaugh et al., 2008).

Figure 1. Diagram of Community of Inquiry. From Garrison, D.R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, *2*(2-3), 87-1005. Reprinted with permission.

Research Question

The following is the central question that guided this study:

Is design thinking an effective approach within a pedagogical environment to create new learning tools such as a technology- mediated debriefing module?

The effectiveness of the design thinking method can be defined by the following sub-questions:

1. Does design thinking enable stakeholder's voices to be heard and represented in the final mock up/story boards of a TMDM?
2. Does design thinking facilitate collaboration and sharing of ideas across stakeholders?
3. Does design thinking engage stakeholders and contribute to a sense of fulfillment, acceptance, satisfaction and ownership over a technological innovation?
4. Is design thinking a time efficient instructional design process?
5. Does the Community of Inquiry, as a pedagogical model, assist in the design

thinking process?

The follow section of this paper will define important terms. Defining these terms will help readers understand the research and scope of the project.

Definition of Terms

Simulation: Simulations are learning activities that model real medical situations in order for students to practice their clinical skills, apply their knowledge and develop problem solving skills. Simulations usually occur in a clinical lab and involve the use of standardized patients and/or mannequins (Cant & Cooper, 2014; Moule et al., 2008; Runnacles et al., 2014).

Debriefing: An activity that occurs after the simulation experience and provides an opportunity to discuss and learn. Various methods of debriefing include self-debriefing, faculty debriefing, computerized debriefing and video assisted debriefing (Cant & Cooper, 2014).

High Fidelity: The highest level of believability, or degree to which a simulated experience approaches reality. Uses computerized patient simulators that are extremely realistic (Diekman, Gaba, & Rall, 2007)

Student (S1, S2): Practical nursing student at community college.

Faculty (F1, F2): Full-time employee in practical nursing program at community college.

Instructional designer (ID1, ID2): Employee in centre for teaching and learning at community college who supports faculty in design and building of online instructional material.

Simulation technologist (T1, T2): An individual who runs the simulation experience.

Sets up the mannequins and runs computerized patient simulators.

TMDM: A technology-mediated debriefing module.

CAE system: Simulation software system**.**

Design thinking: A human-centered, collaborative iterative problem-solving technique associated with abductive reasoning which results in innovations. It consists of five stages empathize, define, ideate, prototype, and test (Brown, 2008).

Mock-up/Storyboard: A visual drawing depicting a prototype of the final design product. Drawings are used to seek feedback and iterate features in design (Brandt, 2007).

Chapter II: Review of Literature

The following section of this paper will review the literature relevant to this research project. It will discuss important considerations impacting simulation and debriefing, instructional design, learning theory, the design team and the design thinking process.

Simulation and Debriefing Considerations

Student experience. The student experience is important to consider during simulation and debriefing activities. According to the literature, students identified common factors which are relevant to their experience during simulation and debriefing. These factors include the need for emotional processing, the impact of anxiety and fear, the influence of social connections, connections with the future, fidelity quality, the community of learning, reflecting and experiential learning (Najjar, Lyman, & Miehl, 2015). Simulations can be an emotional experience for students. Anxiety and fear are common reactions to the experience. Anxiety can be "so overwhelming that it inhibits cognitive processing" (Najjar et al., 2015, p. 8). Students often leave the simulation emotionally charged, needing to discuss their thoughts and feelings. Students described this type of emotional processing as wanting to "debrief about the experience of simulation itself and not necessarily the content within the scenario" (Najjar et al., p. 8). Consequently, timing of the debrief is important in order to optimize emotional processing. Debriefing should occur immediately after a simulation when emotions are high. Students learn best when they are motivated, actively engaged in deep reflection and ready to find meaning (Lavoie, Pepin, & Boyer, 2013; Mclean & Gibbs, 2010; Najjar et al., 2015).

It has long been believed that faculty-led debriefings help students' process

information emotionally and cognitively which leads to learning (Najjar et al., 2015). However, debriefing may also be viewed as equally anxiety provoking because of the presence of faculty who are responsible for students' academic grades (Welke et al., 2009). Utilizing a TMDM may decrease such anxiety enabling "more efficient cognitive processes to focus solely on learning" (Welke et al., 2009, p. 188).

Similarly, an important factor impacting the student learning experience is their social connections with peers (Najjar et al., 2015). Students report that simulations are an effective way to make connections with peers and learn how to work as a team. Learning to communicate with colleagues and provide feedback is an essential skill for any health profession. Students enjoy the sharing and learning process with their peers. The debrief provides an opportunity to critically think and discuss alternative approaches that may have added value to the simulation (Najjar et al., 2015).

Time. Due to the nature of the simulation/debrief combination, an extensive amount of time and staffing is required to implement them successfully (Childs & Sepples, 2006; Lavoie & Pepin, 2013). Usually simulations are first watched by educators, followed by the face-to-face debrief. The literature suggests that the debrief requires time for optimal learning and reflection to occur and on average is 2 to 3 times longer than a simulation (Lavoie & Pepin, 2013). Shorter debriefing of 10 or 20 minutes has been found to be insufficient for quality learning (Childs & Sepples, 2006; Neill & Wotton, 2011; Wotton, Davis, Button, & Kelton, 2010). Moreover, with today's larger class sizes and decreasing number of faculty, dedicating appropriate time for quality debriefing sessions has become increasingly more difficult (Dufrene & Young, 2014).

Quality and consistency. The literature reviewed numerous methods for conducting

a simulation debrief. Some of these include student self-debriefing, faculty debriefing, cognitive debriefing, technical knowledge debriefing, verbal debriefing, video assisted verbal debriefing, debriefing home study, group performance before and after simulation, standardized computer-based multimedia debriefing and nontechnical skills versus medical management debriefing (Dufrene & Young, 2014). The lack of consistency with the debrief process has been the subject of much discussion. According to Waznonis (2014), "the difference found among methods and evaluations for simulation debriefing have direct implications for practice. Nurse educator's and researchers should strive for consistency between the theory, design, use and evaluation of any debriefing method" (p. 465). The literature further identified that the method for the debrief did not make a difference for student learning (Boet et al., 2011; Chronister & Brown, 2012; Dufrene & Young, 20014; Morgan et al., 2009; Shinnick, Woo, Horwich, & Steadman, 2011; Welke et al., 2009). Dufene and Young (2014) concluded that a variety of debriefing methodologies have value and that no one method is superior to another. These findings are very relevant to this research project as they validate the potential for a TMDM. If there are no differences among the various methods of debriefing, educators have a responsibility to evaluate alternative methods to improve effectiveness and efficiency in today's fiscally restrained academic environment. Groff (2013) aptly observes

> We need to take to the drawing boards and design new environments, strategically, from the ground up. In this way technology is not used as a lever to produce changes, great or small. Rather, the learning environment is strategically designed to align the desired elements and ultimately produce the desired outcomes, and technology is often found as one of the enablers for that reality. (p. 9)

This quote highlights the potential of redesigning simulation debriefing practices to utilize technology as an enabler of learning outcomes. The key word in this quote is design. Learning innovations must utilize an appropriate design process to ensure that new technological solutions meet the needs of varied stakeholders, strategically support learning objectives and integrate pedagogical best practices.

Instructional Design and Learning Theory Considerations

Instructional design and pedagogical best practices are intricately connected. Schmid et al. (2014) argued that "technology and pedagogy are in a synergistic relationship that is difficult to disentangle" (p. 272). Good design must incorporate good learning principles. Technological solutions should aim to "better facilitate learning based on theory, so that they are powerful and replicable" (Bernard, Borokhovski, Schmid, Tamim, & Abrami, 2014, p. 117). The infamous 12th rule from Bates as cited in Foley (2003) has application to this discussion: "Technology is not the issue. How and what we want the learners to learn is the issue and technology is a tool" (Foley, 2003, p. 833). With this in mind, design teams should understand learning theories in order to validate and ensure their decisions are based on pedagogical best practices. Learning theories relevant to the design of a TMDM include cognitive theory, constructivist theory, activity theory and situated learning theory. The cognitive and constructivist theory are relevant to the design process as they identify learning as an active process that requires acquisition, organization, processing and retrieval of information (Keskin & Metcalf, 2011; Reeves & Reeves, 2008). Similarly, activity theory supports participation as it helps to engage learners, make meaning and activates cognition (Malik & Janjua, 2011; Schunk, 2012). Engagement in activity is further supported by situated learning theory (Makoe, 2012).

Situated learning theory proposes that meaningful learning occurs through engagement in authentic tasks in real world settings (Lave & Wenger, 1991; Winn, 1993).

Foster, Shurtz, and Pepper (2014) evaluated best practices in design of online instructional modules for health science settings. Their principle findings identified several factors to consider during the design phase, including currency, transferability, aesthetics and clear learning objectives. In order to keep online activities current, learning modules must be editable. It is important to factor this consideration into the design process at the very beginning to avoid great cost and future efforts (Foster et al., 2014). This is particularly relevant in medical learning activities as best practices may change. An editable format will also support the transferability of the learning module to other potential programs within the college.

Similarly, aesthetics and the user interface (UI) of an online learning activity are important to consider during the design phase (Foster et al., 2014; Rapanta & Cantoni, 2014). Aesthetic appeal, ease of navigation and functionality are important features to consider, for optimal learner engagement (Foster et al., 2014; Rapanta & Cantoni, 2014). Furthermore, good instructional design should consider accommodating multiple learning preferences (Dominici & Palumbo, 2013; Foster et al., 2014; Groff, 2013). A multimedia approach including visual, aural and spatial may help support various learning styles and engage learners in active learning, problem solving and deep reflective thinking (Groff, 2013; Reeves & Reeves, 2008; Stegeman & Zydney, 2010). Interactivity features imbedded into the design would also support student engagement and allow students to exert more control over their own learning (Foster et al., 2014; Groff, 2013; Schmid et al., 2014). Suggestions for interactive features include feedback from quizzes, activities

and control over how to navigate the learning experience (Foster et al., 2014).

Likewise, it is important to consider user experience (UX) during the design phase. UX can be defined as a practical and affective experience of the human-computer interactions. It is a "momentary, primarily evaluative feeling (good/bad) while interacting with a product or service" (Hassenzahl, 2008, p. 2). Good design should aim to have a positive influence on learners. Clear learning objectives and expectations of time commitment can contribute to a good UX. If students are not given clear guidelines, the learning experience may be seen as lacking value. Foster et al., (2014) observe that "Explicitly listing measurable objectives in learning modules enables students to know what knowledge and skills they will be expected to demonstrate" (p. 37). Furthermore, all features must add value and not distract from the core objectives of the learning (Dominici & Palumbo, 2013; Foster et al., 2014; Mclean & Gibbs, 2010).

Design Team Considerations

Professional development and collaboration. It has been suggested in the literature that collaborative teacher professional development can be a successful driver of enacting educational change (Borko, 2004; Cochran-Smith & Lytle, 2009). Teaching professionals working together in situated, inquiry-based learning opportunities have influenced changes in practice (Butler & Schnellert, 2012). According to Wenger (2011), teachers learn best when presented with an opportunity for social interaction and collaboration. Through sharing and learning with each other, teachers can co-construct knowledge together while working towards a common goal. Unfortunately, many schools "have been structured so that teachers work alone, rarely given time together to plan lessons, share instructional practices, assess students, design curriculum, or help

make administrative or managerial decisions" (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009, p. 11). Isolation can make teachers feel abandoned and alone, sometimes leaving them to solve very complex challenges independently. This negative experience can contribute to teacher burnout, emotional exhaustion and decreased job satisfaction (Gorozidis & Papaioannou, 2014). Engaging in collaborative learning opportunities can contribute to teachers and other educational team members' professional development. Pawan, Paulus, Yalin, and Chang (2003) state that "collaborative interactions are an essential element of any pedagogy which assumes that good learning is collaborative and that understanding comes through modeling, participation in and reaction to the behaviors and thoughts of others" (p. 119).

Community of learning. According to Hord and Hirsh (2008), the environment most supportive of enabling professional development opportunities, is the professional learning community. A learning community can be defined as a collaborative group of individuals who meet regularly to engage in learning. Participants in the group can have diverse backgrounds, as long as they share a common goal of collaborating to share knowledge, solve problems together and advocate for change (Louis & Kruse, 1995; Hord, 1997). Hargreaves (2003), highlighted that "a strong professional learning community brings together the knowledge, skills, and dispositions of teachers … to promote shared learning and improvements. A strong professional learning community is a social process for turning information into knowledge" (p. 170). The professional community of learning incorporates the constructivist approach, where knowledge is created in a shared environment, situated in authentic activities and contexts (Vygotsky, 1978). According to Huang (2002), as explained by Barwick (2016), "constructivist

theory brings to professional development a learner-centered environment requiring self-directed learners that are highly motivated, know what they want to learn, and are able to set their own objectives, find resources, and evaluate their learning" (p. 25). Hord (2009), identifies that "the professional learning community encourages constructivism by providing the setting and the working relationships demanded of constructivist learning" (p. 41). Furthermore Hord (2009), identifies six research-based qualities of a professional learning community:

- Shared beliefs, values and a vision of what the school should be;
- Shared and supportive leadership where power, authority, and decision-making are distributed across the community;
- Supportive structural conditions, such as time, place and resources;
- Supportive relational conditions that include respect and caring among the community, with trust as an imperative;
- Collective learning, intentionally determine, to address student needs and the increased effectiveness of the professionals;
- And peers sharing their practice to gain feedback, and thus individual and organizational improvement. (Hord, 2009, pp. 41- 42)

Community of Inquiry. A community of inquiry can be described as "a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding" (Garrison, 2011, p. 2). The model assumes that learning occurs within a community through the interaction of its three overlapping elements of social presence, teaching presence and cognitive presence (Garrison et al., 2000) (See Figure 1). The three overlapping circles represent the

relationships between the presences, and "learning occurs within the community through the interaction of [these] three core elements" (Garrison et al., 2000, p. 88). Indicators of the three component presences have been summarized in the Community of Inquiry coding template as seen below in Table 1 which is an exact replica of the Garrison, Cleveland-Innes, Koole and Kappelman (2006) coding table.

Table 1

Community of Inquiry Coding Template, Garrison et al. (2006), p. 5

Community of Inquiry Coding Template

Elements	Categories	Indicators (examples only)
Cognitive Presence	Triggering Event	Sense of puzzlement
	Exploration	Information exchange
	Integration	Connecting ideas
	Resolution	Apply new ideas
Social Presence	Affective	Expressing emotions
	Open Communication	Risk-free expression
	Group Cohesion	Encouraging collaboration
Teaching Presence	Design and organization	Setting curriculum and methods
	Facilitating discourse	Sharing personal meaning
	Direct Instruction	Focusing discussion

The first element of the model, cognitive presence, is deemed to be the most influential on success in higher education, and reflects "the extent to which the participants in any particular configuration of a Community of Inquiry are able to construct meaning through sustained communication" (Garrison et al., 2000, p. 89). The cognitive presence is a key theme in post-secondary learning as "it is a vital element in critical thinking, a process and outcome that is frequently presented as the ostensible goal of higher education" (Garrison et al., 2000, p. 89). According to the Community of Inquiry coding template, evidence of the cognitive presence can be observed when learners engage in exploration, integration and resolution. This is indicated through a

sense of puzzlement, exchange of information, connecting ideas and applying new ideas (Garrison et al., 2000, p. 4).

The second element of the model, social presence, is the ability of the participants to engage and interact as social beings sharing themselves as they learn together (Garrison et al., 2000). Participants "project their personal characteristics into the community, thereby presenting themselves to the other participants as "real people"(Garrison et al., 2000, p. 89). The social presence supports the cognitive process by engaging participants to critically think within a community of learners. The social presence can have a significant impact on successful learning "where it is important that participants find the interaction in the group enjoyable and personally fulfilling so that they…remain in the cohort of learners for the duration of the program" (Garrison et al., 2000, p. 89). According to the Community of Inquiry coding template, evidence of the social presence can be observed when there is group cohesion and participants express emotions, engage in risk-free expression, open communication and encourage collaboration.

The third element of the model, teaching presence, is the influence of teaching behaviours within a Community of Inquiry in the role of facilitator or designer (Garison et al., 2000). The function of facilitation "is a responsibility that may be shared among the teacher and some or all of the other participants or students. This sharing of the facilitation function is appropriate in higher education" (Garrison et al., 2000, p. 90). The second function is "the design of the educational experience. This includes the selection, organization, and primary presentation of course content, as well as the design and development of learning activities and assessment (Garrison et al., 2000, p. 90). According to the Community of Inquiry coding template, evidence of the teaching

presence can be observed when participants share personal meaning, focus on discussion, facilitate discourse and direct instruction.

Finally, Cleveland-Innes and Campbell (2012) emphasize the importance of a proposed fourth presence, the emotional presence. They describe it as "the outward expression of emotion, affect, and feeling by individuals and among individuals in a Community of Inquiry" (p. 8). According to Lipman (2003), the social and communal nature of the Community of Inquiry model, creates "a method for integrating emotive experience, mental acts, thinking skills, and informal fallacies into a concerted approach to the improvement of reasoning and judgment" (p. 18). This interplay of emotion within a social context can make it difficult to differentiate coding structures when analyzing transcripts. Cleveland-Innes and Campbell (2012), argue that "the emotive experience does exist in combination with social presence, but it also clusters together as a unique presence" (p. 8). As focus groups are transcribed and analyzed the "challenge of identifying, labeling, and discussing the subjective, emotional experience in text based evidence [may make it] difficult … to precisely define each emotive response" (Cleveland-Innes & Campbell, 2012, p. 7). Nevertheless, emotion is an important consideration in the learning community as it can distract learners if not managed appropriately. Conversely if emotion is properly addressed during the learning activity it can be a powerful "enabler in support of thinking, decision making, stimulation, and directing" (Cleveland-Innes & Campbell, 2012, p. 285).

Design Thinking Considerations

The following section will review design thinking and participatory design which are a focus of this case study. Both enabled a collaborative design process which were

essential to ensure all stakeholders' voices were heard. Stakeholder collaboration was essential to the design of the TMDM.

Design thinking. Engaging stakeholders is a central premise of the design thinking methodology (Brown, 2008). This iterative thinking process allows for the integration of viewpoints from all stakeholders when trying to define problems and identify solutions (Chance, 2010; Dorst, 2008). According to Brown (2008), the design thinking process is best described as a human-centered approach to innovation that involves "a system of spaces rather than a predefined series of orderly steps" (p. 4). The three larger spaces include inspiration, ideation and implementation. Design teams are navigated through the design thinking process with the end goal of creating new innovations.

> Inspiration for the circumstances (be they a problem, an opportunity or both) that motivate the search for solutions: ideation, for the process of generating, developing and testing ideas that may lead to solutions; and implementation for the charting of a path to market. Projects will loop back through these spaces – particularly the first two- more than once as ideas are refined and new directions taken. (Brown, 2008, p. 4).

Within these three larger spaces are modes including empathy, defining the problem, ideation, prototyping and testing (Brown, 2008). See Figure 2.

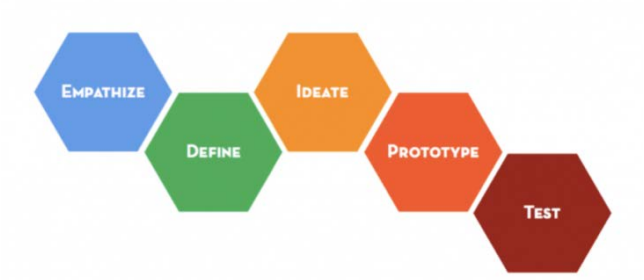

Figure 2. Design thinking process. Image from "Virtual crash course in design thinking," by Stanford University Institute of Design, 2015. Licensed under CC BY SA NC. https://creativecommons.org/licenses/by-nc-sa/3.0/

The Institute of Design at Stanford (2011) provides excellent resources to support innovators wishing to implement the design thinking process. They explain each stage in the process and provide suggestions for implementation. The "empathy" mode encourages designers to learn about their audience for whom they are designing. Essential to this stage is observing and engaging with users to discover what matters most. The "define" mode is characterized by the synthesis of findings and clarification of end goals including specific client needs. A point of view is created to help tell the story of the end user and define an "actionable problem statement" (Institute of Design at Stanford, 2011, p. 2). The "ideate" mode is when active brainstorming of solutions occurs. Wild ideas are encouraged and quantity over quality is important. Rules for brainstorming are shared with the group to prevent barriers. The "prototype" mode is where participants get "ideas and explorations out of [their] head and into the physical world" (p. 4). A physical representation of the idea is created in rough draft. Prototypes should encourage interaction and learning by doing. Failing quickly is embraced in this stage as "what you learn from those interactions can help drive deeper empathy, as well as shape successful solutions" (p. 4). Prototyping may use techniques including physical models and story boarding. The final "test" mode involves sharing ideas with users. Active feedback is requested on what works and what does not in order to refine the solution and improve it. This stage is action oriented, users should engage with the solution not just talk about it. Talk-aloud strategies are utilized to inform the design team of user's thoughts (The Institute of Design at Stanford, 2011).

Participatory design – student voice. The design of a TMDM will require careful consideration, planning and people. Participatory design and student voice are being

highlighted in the literature as growing design strategies (Kang et al., 2015; Seale, 2010). A participatory design strategy for the creation of a TMDM would aim to engage all stakeholders including students, faculty, technologists and instructional technologists. The active engagement of key stakeholders in the design process aims to "ensure that the end result meets the needs of all and is usable" (Kang et al., 2015, p. 831). A participatory design strategy ensures all voices are heard in a collaborative and iterative process. It requires "collective understanding, development and reflection of mutual learning" (Kang et al., 2015, p. 833). Including student voice work in the design process will ensure the TMDM is learner centered and avoids assumptions regarding the types of learning experiences students prefer (Mihans, Long, & Felten, 2008; Seale, 2010). Groff (2013), supports the inclusion of students into the visioning of new learning environments: "in this way, technology becomes not only a critical means for innovative learning opportunities, it becomes the vehicle by which learners, educators and all community stakeholders can partake in the evolution and transformation of the learning environment" (p. 21).

Participatory design – faculty/staff voice. Faculty fear and resistance to change may be a barrier to overcome when implementing the design of a TMDM. Enabling the faculty and staff voice during the design process may help to eliminate fears and create optimal buy-in. According to Bates and Sangra (2011), some faculty fear that technology and the automation of teaching will eliminate jobs. As discussed by the Canadian Association of University Teachers (2012-2013) there is already a decrease in faculty and an increase in average class size. This has occurred regardless of the introduction of technology-mediated instruction. Todays' teachers are under increasing

pressures to do more with less; while "no technology can replace a teacher, […] digital technologies can be powerful tools to help teachers do their jobs, in a more effective and personalized way" (Groff, 2013, p. 19). According to Fullon (2001), actively involving key stakeholders in the design and decision-making process will contribute to knowledge sharing and the creation of a collective identity, which can be a powerful force for positive change.

Summary

The simulation and debriefing experience is a cornerstone of nursing education. Traditional methods are time and staff intensive (Welke et al., 2009). The current state of post-secondary education has seen growing class sizes and reduced faculty numbers. As a result, the most effective and efficient way to deliver the simulation debrief requires consideration. The literature revealed a lack of measurable benefit for using faculty to debrief simulations versus "other post-experiential interventions" (Garden, Lefevre, Waddington, & Weller, 2015, p. 305). This important observation validates the need to explore the creation of a TMDM. In addition, the literature identified key challenges with debriefing which further support the creation of a TMDM including consistency, quality, student anxiety, learner control, communication skills, collaboration and critical thinking skills.

The design process used to create the TMDM necessitates much thought as an innovation of this extent could disrupt traditional simulation and debriefing methods. Finn and Horn (2013), describe a change resulting in a new system and new way of doing things as a disruptive innovation. Innovations of this magnitude if not properly designed, can be met with anger, fear and resistance to change (Bates & Sangra, 2011: Fullon,

2001; Groff, 2013; Kang, Choo, & Watters, 2015; Seale, 2010). There is a growing body of evidence however, that suggests teachers working together can drive change efforts, most notably regarding technology integration and adoption (Borko, 2004; Butler & Schnellert, 2012; Cochran-Smith & Lytle, 2009). The literature suggests that engaging teachers and arguably other key stakeholders, to help solve complex challenges together, can contribute to their professional development while creating a Community of Inquiry and a community of learning.

In addition, utilizing a process such as design thinking will allow for the integration of all viewpoints from these stakeholders when trying to innovate around complex challenges (Chance, 2010; Dorst, 2008). In this study, design thinking was chosen for its human-centered and participatory methodology (Brown, 2008). The design thinking process was used to engage the stakeholders (students, faculty, simulation technologists and instructional technologists) in an iterative thinking process, to innovate around the complex design challenge of creating a TMDM (Chance, 2010). The Community of Inquiry was utilized as the theoretical framework to guide this study. The next chapter will describe how the design thinking process was utilized in the methodology of this project.

Chapter III: Methodology

This chapter describes the research design, participants, data collection procedures, settings, sources of data, procedures for data collection and data analysis, the researcher, delimitations, limitations and ethics of the study. The purpose of this study was to explore the appropriateness of a design thinking process to create a TMDM. To accomplish this, a qualitative research design was chosen as it embraces the view that reality is constructed by individuals interacting in their social worlds (Merriam, 1998). When conducting a qualitative study, researcher's state questions not objectives or hypotheses. While using a central question is an effective strategy to obtain great breadth of opinions from the study participants, additional sub-questions facilitate more in-depth investigation. In qualitative research, "the intent is to explore the general, complex set of factors surrounding the central phenomenon and present the broad, varied perspectives or meaning that participants hold" (Creswell, 2014, p. 139).

Research Design

This study utilized a case study methodology. A case study "involves the study of an issue explored through one or more cases within a bounded system (i.e., a setting, a context)" (Creswell, 2007, p. 73). The issue explored in this project was the application of design thinking (Brown, 2008), to create a TMDM for a community college nursing program. The focus of the study was on the effectiveness of using design thinking as a process to create a TMDM. The actual development, delivery and evaluation of the instructional module were not included in the scope of this study.

Design and Data Collection

To help the reader visualize the design process, data collection and treatment, a

detailed description is provided below. The project was conducted in five phases which are summarized in Table 2.

Table 2

TMDM Methodology: The application of Brown, (2008) Design Thinking

	Empathize	Define	Ideate	Prototyping	Test	Data Collected	Data treatment
Phase 1 Pre-Survey & Design summary	• Summary of literature and design methodology shared • Survey to stakeholders					• Open-ended questions	• Findings from survey summarized
Phase 2 Design Team Focus Group#1	• Review findings from survey • Journey map through typical simulation • Talk aloud • Physically walk the path of student and technologist. Take pictures of the physical environment only to capture each stage in the current debrief process. (no human photos)	• Create a point of view based on user needs and insights • Embrace the mind of the user				• Talk aloud reinforced • Audio recordings • Drawings • Photos of white boards and flip charts for documentation purposes	• Audio recordings transcribed & analyzed thematically • Sketches analyses • Results shared with design team in phase 4

Phase 3 Design Team Focus Group#2			• Recap ideate stage from focus group #1 • Encourage additional thoughts to be presented • Brainstorm and produce as many creative ideas as possible • Encourage wild ideas • Divergent thinking followed by convergent thinking • Team members converge on ideas they think have most significance and brainstorm further	• Build a representation of the groups idea for a TMDM • Can use story boards	• 8 pre-selected design-testers review the mock up design and provide feedback to design team • Feedback will be incorporated into revisions to design prototype.	• Talk aloud reinforced • Audio recordings • Drawings • Photos	• Audio recordings transcribed & analyzed thematically • Sketches analyses • Results shared with design team in phase 4
Phase 4 Member checking					• Mock ups/storyboards cleaned up incorporating feedback • Final mock up shared with design team using Google document • Feedback collected via electronic communication • Revisions made to design based on feedback from design group by instructional designer and researcher	• All electronic communications, including text and images	
Phase 5 Post design interviews						• Formalized open ended questions • Audio recorded and transcribed	• Transcriptions analyzed and sent to interviewees for member checking • Data analyzed thematically

In phase one, the pre-project survey was given to participants (See Appendix F). This phase collected data from the participants including demographic information and personal opinions on the simulation experience at the college. Open-ended questions were used to capture opinions and results from the survey were summarized by the researcher and collated into a power point presentation. In addition, participants were sent a summary of the literature review on debriefing, a review of the design thinking process and expectations regarding participation, including rules for brainstorming, timing for design sessions and strategies for utilizing think-aloud protocol (See Appendix G). Seidel and Fixon (2013), highlight the importance of sharing expectations when implementing design thinking. Failure to explain the methodology may have resulted in frustration and abandonment of the process.

In phase two of the method, the first design focus group occurred. This focus group was four hours long and participants were guided through the empathize and define stage of the design thinking methodology. During the empathize stage a technique known as journey mapping was used to walk the participants through a typical student experience with simulation. This strategy is useful to evoke empathy and increase understanding of a complex situation (The Institute of Design at Stanford, 2011). The two instructional designers acted as the students during this activity which helped reinforce the adoption of a beginner's mindset, which is important during the empathize stage. The two student participants also acted as students. Both the faculty and technologists played their typical role as per a normal simulation. All participants were encouraged to use the think-aloud strategies to capture their inner thoughts and cognitive processes while they were audio recorded for future transcript analysis (Patton, 2002). During this phase, a summary of themes identified through survey one was presented to the group in the form of a power point presentation. This sharing of information from all stakeholders helped to

contribute to the empathize mode.

During the define stage, participants were asked to develop meaningful and actionable problem statements pertaining to the challenge of simulation debriefing. Participants were encouraged to frame their statements in the form of how might we (HMW) questions. Participants were divided into two groups and given flip chart paper and sticky notes to record their HMW statements. The group was given one example to help explain the process. Participants were encouraged to engage in divergent thinking and to document all ideas and think big. Divergent thinking activities focused on producing a large quantity of possible ideas that could evolve into solutions. The participants were cautioned not to converge but rather go for quantity of ideas. After time in their small groups, the larger group reconvened and shared their ideas. Once all ideas were read by the group members, each participant was asked to place a sticker beside their top three favourite ideas. Finally, participants were asked to share why they chose their HMW statements.

In phase three, the second design focus group occurred. This focus group was four hours long and participants were guided through the ideate, prototype and test stage of the design thinking methodology to create the TMDM. By breaking the focus groups into two days, participants had time to reflect on the first group and return with some clarity and fresh ideas. The second group began with a recap of the "define" stage from phase two. Participants were then navigated through the ideate stage. In the ideate stage participants were encouraged to move from identifying problems to collaboratively creating solutions together. They were given a short amount of time to do this pushing them to generate ideas quickly. They were asked to design with the user in mind considering the view of the student, technologist and faculty. In addition, participants were asked to use story boarding (writing things down in pictures) and journey

mapping to capture their design ideas. They were also reminded to engage in divergent thinking where no ideas were improbable. They were asked to write everything down and talk out loud so that they could share and build off each other's ideas.

The prototype stage was next. The participants were asked to create a mock-up or storey board of what the TMDM would look like. The goal of the prototype stage was to create anything that the users could interact with (Institute of Design at Stanford, 2011). Once the rough prototype was completed the group entered the "test" stage. In this stage, the pre-selected design-testers were invited to review the prototype and provide feedback. The design-testers were walked through a mock simulation using the prototype of the TMDM. Questions and feedback was encouraged and was audio recorded for transcription and analysis.

In phase four, member checking occurred. A summary of the themes and the mock up drawings were uploaded to a Google drive with private access only provided to the design participants for the purpose of member checking. Member checking involves the participants ensuring that the interpretations accurately represent them (Creswell, 2009; Lincoln & Guba, 1985). Participants were given the opportunity to confirm and validate their feedback concerning the design to ensure validity of results. Additional feedback to the design was also provided at that time and changes were made as requested.

In the final phase five, the researcher conducted individual interviews with each participant of the design team. Interview questions can be found in Appendix H. The purpose of the interviews was to explore opinions on the design thinking process and provide an opportunity for the researcher to clarify previous statements made during the data collection phases. Interviews were audio recorded and transcribed. Transcriptions were provided to interviewees for member checking validation.

Participants

Purposeful sampling was employed. The researcher selected individuals from the educational institution where the research was conducted as they could "purposefully inform an understanding of the research problem and central phenomenon in the study" (Creswell, 2007, p. 125). A critical case was used in which participants were provided with specific information about a simulation activity. In total, there were eight participants in the design group and eight participants in the design-tester group. This sample size ensured that 2 representatives from the various stakeholder groups would be present. Participants for the design group included students (S1, S2), nursing faculty (F1, F2), simulation technologists (T1, T2) and instructional designers (ID1, ID2). Participants in the tester group included 5 students (S3, S4, S5, S6, and S7), 1 instructional designer (ID3) and 2 faculty (F3, F4). All of the individuals participating in this study had experience with completing high fidelity simulations with the exception of the instructional designers. Participants in this study were volunteers with recruitment following expectations of the Ethics Review Board. All participants had reached the age of majority in their respective geographical areas at the time of the study. Although students were involved with this research project, the principal investigator was not in a teacher-evaluator position with the student participants. Students were not academically advantaged or disadvantaged for their participation in this study.

Demographic Data

Demographic data was only collected on the design participants. Most of the participants were employed at the college except for the 2 student nurses. The participants included 2 males and 6 females. Age ranges of participants was from 18-58 years. Positions held by the participants at the college included RN technologists in the simulation lab (2), practical nursing

faculty (2) and instructional design support with the centre for teaching and learning (2). Educational experience of the participants included high school only (1), college diploma (2), undergraduate degree (2) masters level (3). Experience practicing in current position ranged from 2 years to 15.

Data Collection Procedures and Data Treatment

Data for this research study was collected via the "four basic types of information: observations, interviews (focus groups, audio recordings), documents (photographs, notes, sketches) and audiovisual materials (photographs, email messages)" (Creswell, 2007, p. 129). According to Patton (2002), using a variety of data sources and collection methods helps illuminate the inquiry and strengthens the credibility of a study by reducing the vulnerability of only one method.

Survey. Prior to the design sessions participants were given a survey to complete with three parts namely (1) profile data (2) Likert scale survey questions and (3) open-ended questions (Appendix F). The profile section collected data which served to describe the participants including age, gender, employment position, and experience in simulation. Next a series of survey questions utilizing a Likert scale and open-ended questions were asked to obtain information on the participant's current thoughts on existing simulation and debriefing processes and experiences for students. Results were collected and summarized to present to the design group during the empathy stage of the design thinking process.

Think-aloud. Participants engaged in two design sessions which walked them through the design thinking process. During these sessions, a think-aloud protocol was used. The think-aloud protocol is a useful method to elicit inner thoughts and cognitive processes which is illuminate what a person is thinking as they perform a task (Patton, 2002). Utilizing this method

was purposeful to help researchers understand the thought processes of the participants as they worked through the design thinking process. The advantage of this approach was that it encouraged participants to produce verbal data which was audio recorded, transcribed and thematically analyzed (Patton, 2002).

Interviews. Semi-structured interviews were conducted with the participants following the completion of the design sessions. Interviews are a useful technique to see what someone is thinking and to gain insight into their perspective. They are a classic method in qualitative research and involve direct interaction with participants (Savenye & Robinson, 2004). Interviews were conducted face-to-face and were audio taped and transcribed. Transcriptions were analyzed manually and using NVIVO software (see data analysis). The text from these interviews offered evidence regarding the participants experience with the design thinking process (Patton, 2002). A summary of the interview transcription was sent to the participants for their review and approval. This process known as member checking helped triangulate the researcher's observations and interpretations (Creswell, 2009).

Data treatment. Types of data collected during all 5 phases of the design project included audio recordings, pictures, sketches and researchers notes. All audio recordings were transcribed. Data collection was in compliance with federal and provincial privacy legislation in accordance with the Ethics Review Board. All files were stored in encrypted files and kept in a locked location. All data will be destroyed one year from the date of successful thesis defense, in accordance with the requirements of Athabasca University's Research Ethics approval documents.

Data analysis. After the completion of data collection open coding was conducted. This stage involved a first pass through the data to identify themes and assign initial codes. Following

this stage, axial coding was completed where the researcher asked questions which helped further organize the initial codes, ideas and themes (Saldana, 2012). This process was done using sticky notes where each code was placed on a separate piece of paper then further organized into categories to reflect themes. The codes and themes were then sorted and categorized. Following this process, the researcher used NVIVO software to apply the codes to the data. During coding, the researcher remained open, stayed close the data, kept the codes simple and precise, constructed short codes, focused on actions, compared data with data and moved quickly through the data (Charmaz, 2014). The researcher repeated this process until saturation of themes and codes occurred.

Inter-coder reliability. To check for inter-coder reliability, an excerpt of the focus group transcript was sent to an external consultant who had no knowledge of the study. The consultant was informed that the analysis was to focus on the process of designing the TMDM and not the final product being created. Themes and codes were provided due to the complexity of the content, including coding descriptions. Coding by the external consultant was done using NVIVO software. An inter-rater reliability coding query was completed using NVIVO and a 98% coding agreement was identified.

Validity. Five of the seven strategies recommended by Creswell (2009) for validating findings and verifying for construct validity were incorporated in this study. They include (1) authenticating themes, (2) member checking, (3) rich, thick description of findings, (4) clarifying researcher's bias and (5) including negative or discrepant information. Authenticating themes was implemented by using open-ended questions during design sessions in an attempt to control for researcher bias. Member checking strategies included providing stakeholders with transcripts of audio recordings to review and a summary of key themes. A visual mock-up/storyboard of

the group's final TMDM design was provided to members (Appendix I). They were asked to review it to provide feedback on whether it captures the key themes they had identified during their design session. Lincoln and Guba (1985) describe member checking as the most valuable tool to establish credibility. It can help to reveal factual errors, reconcile discrepancies and stimulate recollection of new facts. Rich, thick description of findings are provided in the results and discussion section of this paper.

Researcher. The researcher performed multiple roles during this project including design thinking facilitator, data collector and data interpreter. At the beginning of each design session and before each interview, the researcher clarified any potential biases by discussing her various roles. The project was conducted in the researcher's place of employment which can raise concern with researcher bias. In addition, the researcher had previously taught the practical nursing lab course where the case study simulation usually occurs; therefore, a working relationship with stakeholders did exist. Furthermore, students involved in this study were part of the nursing program where the researcher taught, however at the time of the study no current teaching/student relationship existed. Creswell (2014) argues "when researchers collect data at their own workplace, the information may be convenient and easy to collect, but it may not be accurate information and may jeopardize the roles of the researchers and the participants" (p. 188). Given the researchers connection to the participants and location of study, self-reflexivity was a very important consideration for this project. Self-reflexivity "relates to the degree of influence that the researcher exerts, either intentionally or unintentionally, on the findings" (Jootun, McGhee, & Marland, 2009, p. 42). The principle investigator engaged in a continuous process of reflection during the project utilizing research diaries to keep track of potential "influences on [her] interpretation of the data and [its] relationship to the research topic and

participants" (Jootun et al., 2009, p. 43). This reflective practice encouraged the researcher to openly monitor how her values and preconceptions influenced findings and interpretations of the responses. Understanding the impact of these relationships was essential to ensure rigour in this qualitative research study (Houghton, Shaw, & Murphy, 2013; Jootun et al., 2009).

Delimitations. Factors that can be controlled by the researcher and aim to narrow the study are considered delimitations (Mauch & Park, 2013). This study aimed to design but not build a fully functional technology-mediated debriefing module. The outcome is a mock-up/story board of the design and an understanding of how design thinking (Brown, 2008) can be used to create learning modules, enabling stakeholder participation and collaborative design. Building and evaluating the TMDM was not within scope for this research project.

Limitations. Factors that could affect the study but are outside of the researchers control are considered limitations (Mauch & Park, 2013). This study was limited by the number of faculty, staff and students involved in simulations at the college. In addition, the results are specific to the case of applying the design thinking methods for a specific simulation activity. The results may not be directly transferable to other simulation activities within or outside of the organization. However, this research may contribute to and inform future technology design projects at the college. A further limitation is possible researcher bias due to the researcher's participation in the design session as a facilitator.

Ethics. Before this study commenced the ethics board of both the researcher's university (Athabasca University) and the location of the study (Mohawk College) granted permission to proceed. Consent forms outlining ethical requirements for conducting research within both institutions were provided to the participants. Forms included a letter of invitation to the research study identifying the purpose of the study, time commitment and associated risks

(Appendix B and C). Informed Consent forms were provided providing information on the purpose of the study, procedure, risks, benefits, compensation, freedom to withdraw, confidentiality, approval of research, IRB information, subject's responsibilities and permissions (Appendix D and E).

Chapter IV: Results

This chapter describes the results from a qualitative analysis of the data collected in this research study. The research study was carried out in 5 phases. Data collected from this research study included Likert scales, audio recordings, drawings and researcher's notes. All audio recordings were transcribed. Transcripts from both the focus groups and follow up interviews were analyzed to identify themes and codes. The process used was described previously in the data analysis section of this paper. Direct quotes from participants and the facilitator are used throughout the results section to illustrate and explain themes.

Pre-project Survey

Results of a pre-project survey identified that the quality of the current debriefing procedure at the location of this study had challenges (Figure 3).

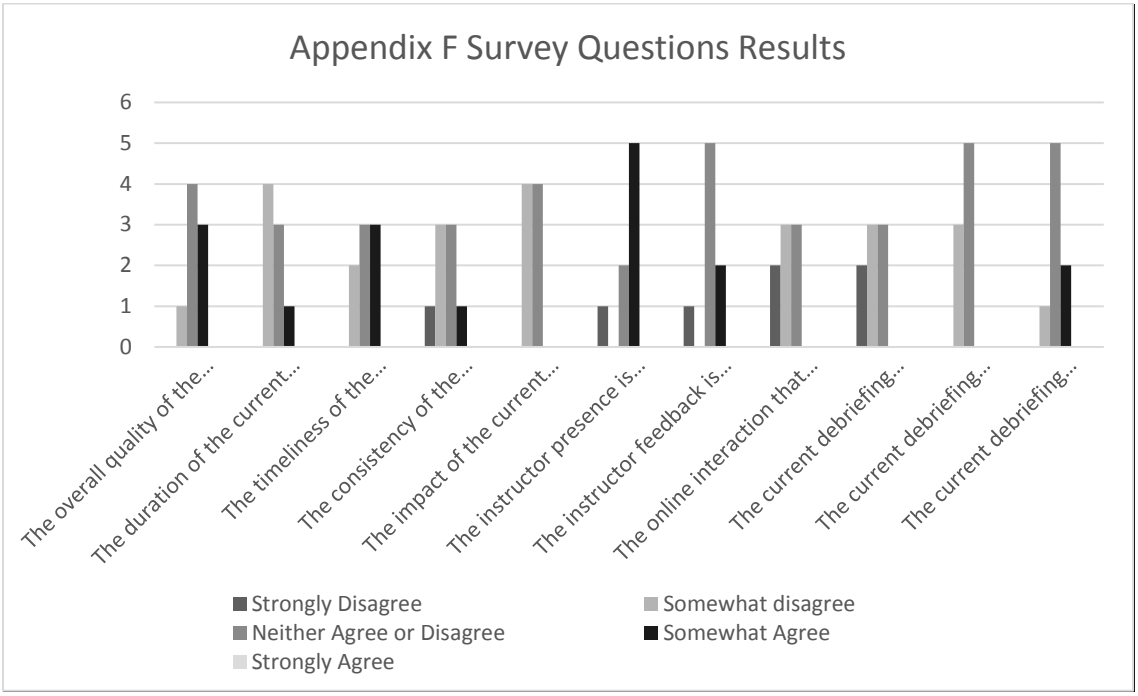

Figure 3. Appendix F survey questions results.

It was reported that the debriefing was inconsistent between groups and the online interaction between students was not adequate. The timing was reported to be rushed which may be

impacting the quality. Furthermore, due to the increased class sizes, the current method of debriefing had limited opportunities for instructor feedback and interactive discussions. Finally, the survey results revealed concerns regarding the consistency of the debrief experience and its ability to accommodate various learning styles. These results further support the need for an alternative debriefing process to be explored and created. The process used to create this new process is the focus of this study. In this case design thinking was utilized and evaluated.

Qualitative Data Analysis – Themes and Codes

Analysis of the transcripts from focus groups and follow up interviews revealed 6 overall themes and 19 codes related to the process of designing a TMDM. These themes and codes were chosen to discuss due to their high frequencies. Table 3 identifies the key themes, codes and their frequency according to Nvivo software.

Table 3

Themes and Codes

Themes	Codes	Frequency
1. Co-construction of knowledge	1. Use of examples	27
	2. Asking questions for clarification	68
	3. Linking ideas to create shared understanding	84
2. Consensus building	1. Building on ideas generates more ideas	43
	2. Recalling ideas makes connections to what is important	46
	3. Collaboration leads to consensus building	63
3. Student voice	1. Student voice can differ from faculty	10
	2. Student voice describes user experience	28

		3. Design team sees value in student opinion	33
		4. Student voice tells truth	66
4.	Design participants share unique subject matter expertise (SME)	1. Subject matter expertise adds value	42
5.	The design thinking process guides	1. Facilitator encourages participation	16
		2. Participant engagement	17
		3. Facilitator encourages headlining ideas	20
		4. Facilitator needs to monitor time	24
		5. Facilitator uses paraphrasing	33
6.	Community of Inquiry	1. Social presence	80
		2. Cognitive presence	196
		3. Teaching presence	214

Theme 1: Co-construction of Knowledge. During the design process the team engaged in activities which resulted in the co-construction of knowledge. Co-construction of knowledge was defined as the process by which knowledge is socially constructed when individuals are engaged and learn from each other (Vygotsky, 1978). Under this theme, the following codes were identified: use of examples, asking questions for clarification and linking ideas to create shared understanding. Examples for each code under this theme are provided below.

Use of examples. The design team frequently provided examples to share their experience with simulation and student learning. Through the process of sharing examples, a deeper level of understanding was achieved by the design team regarding key issues important to the simulation experience for participants. One student stated, “for example, in my first simulation I was like: “I don’t know what I’m doing” but was with one of my good friends so we were like, we can

both be confused together and try to take vital signs". This reference later contributed to the groups shared understanding of the importance of student anxiety during simulation and the need for team comradery. In addition, a student shared an example about what was meaningful to students.

> S1: But for example…if we bring it back to like what we did in Professional development (PD), like a case study. This person failed to document or hand hygiene and so you now realize how important it actually is and that, for some person out there who's been through school just like you and got registered and started working, they've had these issues and potentially had career repercussions or negligence or client safety issues... Like they had these issues that have happened in real life! So it moves from the simulation file… to things that can actually happen!

This example facilitated a lengthy discussion about the importance of meaning to optimize student engagement. The team co-constructed the understanding that student engagement is part of the current problem with their simulation process; students are motivated by different things therefore creating meaningful learning activities was a consideration for the final design of the TMDM.

Asking questions for clarification. Questioning was a method used by the design team to define and further understand key issues related to the simulation process. The following example demonstrates how the use of questioning lead to a shared understanding that students do not always feel safe to express their true feelings during the existing debriefing process.

> T1: Can I just ask, those feeling you just described, those situations, did you in the debriefing with the teacher bring them up? Or did you feel inhibited to do so?

The next example demonstrates how the use of questioning led participants to a shared understanding of the value of team comradery. Following this discussion, the team used this information to integrate the concept of doing simulations in clinical groups to create a sense of comradery and unity.

> T1: T2, you've taught clinical now for a while too and you debrief with clinical after. So, do you think there's parallels with what we are talking about?
>
> T2: Well, I think S1, you brought up that good point about it's such a different feeling in clinical. There's a comradery that does not exist in the lab setting. You're in there cleaning dirty briefs together. Like you're brothers in arms. And I think it's easier for them to reflect.

Linking ideas to create shared understanding. Through the design team discussions, participants linked many ideas which ultimately contributed to a shared understanding and co-construction of knowledge. One such incident was during the define stage of the process when the group participated in a discussion regarding their understanding of incentivizing students versus engaging students. Through a back and forth discussion the team eventually agreed on a common description.

> F1: My question was HMW make it more meaningful
> ID 2: HMW engage students?
> T1: HMW incentivize?
> F1: HMW encourage constructive criticism?
> T1: uhm, or support… either or
> S2: Isn't incentivize the same as engage?
> ID 2: well yes and no
> T1: I think it depends
> ID 2: engaging is you're more in it and incentivizing is making you want to do it
> T2: I'm more interested in getting people to just naturally want to do it, like without us. That would be the ideal if you could find a way to incentivize towards that.
> ID 2: HMW explain the importance or something?
> S2: yeah, something about why, what's the whole point of it
> Make it impactful?
> F1: … understand the impact? Importance or impact?
> ID 2: Impact is fine… or both

Furthermore, idea linking was frequently identified during the define stage when participants connected their ideas into similar patterns using sticky notes. During this phase, each participant used sticky notes to write down their individual ideas. They later shared their notes and

categorized the ideas making connections by linking them together. The following excerpt from the transcribed documents demonstrates this process in action.

> F2: This one is about students coming ill-prepared. Where is the one about the feedback?
> ID 1: That is kind of related to this one, but it could also be up here.
> S1: How about how might we remove the stigma of making mistakes in sim?
> T2: Yeah.

The co-construction of knowledge occurred during the design group as evident by the use of examples, asking questions for clarification, and linking ideas to create a shared understanding. The co-construction of knowledge helped the group come to a shared understanding of their goals and perceptions as they related to the creation of a TMDM.

Theme 2: Consensus Building. During the design process the team engaged in activities which resulted in consensus building. Consensus building was defined as the process of collaborating and sharing ideas within the group resulting in a decision (Voogt et al., 2011). Under this theme, the following codes were identified: building on ideas generates more ideas, recalling ideas makes connections to what is important and collaboration leads to consensus building. Examples for each code under this theme are provided below.

Building on ideas generates more ideas. Throughout the design thinking process participants would hear each other's ideas and this would trigger an additional thought of their own. One example was when the group was forming an idea about the importance of feeling safe to make mistakes.

> T1: This is a safe environment so if we can tackle the notion that screwing up is ok and the idea of if we can have a good philosophy on messing something up then learning something after, that's the key. That's not failure, that's actually a success
>
> F2: I didn't pick this one but just to add to that, I think that if we address this here, it's actually going to promote a culture of safety because what we want, well what we don't want, is our students and graduates to not report. We want that transparency and the level of comfort to be able to say that I made this mistake and I need to report it …

Group: nodding heads agreeing.

Another example was when the group built on each other's ideas to create consensus around the importance of alternate ways to evaluate students.

F1: We were saying that audio reflection came up, the idea of recording their thoughts to submit instead of written work.

T2: Oh cool idea

S2: can it be a video? Can it be a presentation? Can it be audio or?

F1: like I really like the idea of the photo booth. Would that be expensive?

ID 1: ha ha ha

Faculty 1: You can just put a camera

ID: if you're using a device, then it's got a mic and a camera in it already

S1: Or, just have a set computer that two people go to, like even just like a MacBook …

Group: nods and agrees

These two examples demonstrate how the group built on each other's ideas, stretched their thinking, and came up with more ideas. This sharing and building of ideas led to a consensus about the design.

Recalling ideas makes connections to what is important. Throughout the design process participants would recall ideas, making connections while narrowing in on what they perceived as important to the final design. The following example demonstrated how the group recalled the importance of team comradery which was later reflected in their final design.

S1: If the 2 people know each other before they go in you are in a lot better situation rather than like why don't you take the blood pressure? Then already know that they are supposed to be doing that. Why don't you take the 02 sats?

ID 2: That's exactly why when I was talking yesterday, in my head I was thinking of a tool that allows them to practice the simulations so that when they come in here they are actually getting a more real experience because that whole instinct mode kicks in…

> F2: what about what we were talking about yesterday about team comradery, what if your clinical group actually had a team pre-conference before and then 2 of you would pair up.

Recalling ideas from previous discussions during the design session was a useful strategy to make sure ideas were not forgotten. Through the discussions, the group was reminded about team comradery. Recalling this information led to a consensus about its importance and why it should be including into the final design.

Collaboration leads to consensus building. Collaboration can be defined as a process through which participants who see different aspects of a problem, explore their differences and seek a solution together (Gray, 1989). The following quote demonstrates how the participants engaged in collaboration resulting in a design decision to include questions.

> ID 1: Well I am not sure if it would actually give you answers… The idea is to get them asking questions.
>
> Facilitator: and can the tool record those questions?
>
> ID 1: So then when I get to the real scenario I am now walking in with questions…and earlier one of the comments was that "nobody ever asks questions".
>
> S2: So have a prompt after the video…do you have questions?
>
> Student 1: You don't even have to answer them so someone knows they have to look into it themselves because that encourages independent thinking rather than here are the answers.

The next example demonstrates how collaboration resulted in a consensus to include a transfer of accountability (TOA) video in the tool.

> F1: But we have to be careful we don't want to give away everything
>
> Tech 2: Because in real life you wouldn't see the patient before you go in to care for them
>
> T2: But at the same time though in real life, you have past experience …I know what to expect…So I can prepare for that mentally in my mind.
>
> F2: Just having that eyeball of the scenario

S1: Or even just having a video of a nurse like talking to you rather than having to read it.

Facilitator: Oh so the TOA is done by a visual of a nurse talking to you?

T2: I like that

Collaboration amongst group members provided an opportunity to share ideas and decide which key features should be included in the design. Consensus building occurred during the design group as evident by team collaboration, building off each other's ideas, recalling past ideas, and making connections. The final design decisions were a result of this sharing and collaboration.

Theme 3: Student Voice. Throughout the design process the student voice was a predominant theme that added value to the process. Student voice can be defined as the individual or collective voice projecting the student's views and interpretation of learning experiences within an educational setting (Seale, 2010). Under this theme four codes were identified including student voice describes user experience, student voice tells truth, design team sees value in student opinion and student voice can differ from faculty. Examples for each code under this theme are provided below.

Student voice describes user experience. During the design process the student voice provided opportunities for the design team to learn about the student experience during simulation and debriefing. The following two quotes describe how the students reported feeling incompetent during simulations.

S1: I think definitely first semester when we had basically no basis of knowledge everyone was like I don't know what I am doing

S1: We walked in and were like: "we don't know"...and that stuff comes with education. But it's like going up to a person in first semester and being like "what do you mean you don't know how to do a respiratory assessment? That should be instinctual"…but the person doesn't even

know what a respiratory assessment is. It's one of those things that once you've gone through it the first time, it seems easy but for someone who is still going through the process it is not at all.

Student voice tells truth. During the design process the students provided an honest perspective that described their personal experiences with simulation and debriefing. The following quote describes one student's opinion about why students may be focused on their marks.

> S1: I think one of the issues is a whole education-wide thing, but a lot of people are focused solely on marks rather than learning… a lot of it is about marks, if you want to bridge, then you need high marks if you want to do anything further you need high marks. So people are focused on marks and sometimes I think we forget that the purpose is learning.

In the next quote, the student discusses her perspective on what motivates students to attend nursing school.

> S1: As much as I hate to say this, I do think still one of the biggest issues, that there's always going to be a portion of the student population that just does not care. They're in the program not necessarily because they want to do nursing but because they have kids or because it pays better than their job or because it's 16 months. Or whatever. I'm not judging anyone's reasoning for getting into the program but there's people who won't necessarily be as integrated in it, because they don't care.

Design team sees value in student opinion. Throughout the design process the design team members would ask students for their opinion to better understand the situation and create a solution. In the following example a faculty member asked for clarification regarding the transfer of accountability procedure.

> Faculty 1: I was just going to say does that make a difference that it's given to you in advance?

> Student 2: ya it's not a real TOA because I have already researched it word for word for word what the script says.

In the next example a faculty member listened to the student's ideas and then asked for clarification.

> S1: you're done your simulation in 20 minutes, let's say…so you still have all that time, you're not even past your lab end time you can't be like…"well I am working"…well that's normally during class times, so then use that class time as a group so there is no issues with communication, there is no one saying "I can't, I didn't get your email" because you're just doing it then and there and so there is no issues with that . Everyone is there who is present and everyone is still fresh.
>
> F1: So then due it on the day? Reflect?
>
> S1: Yeah, like don't leave the school

Student voice can differ from faculty. There were times during the design process where a faculty member had a different opinion than a student. In the following example the student expressed her opinion and the faculty presented her understanding of the situation.

> F1: So one of the questions that came out was how many geriatric people die from falls? So [the students] had to go out and research.
>
> S2: But some people were confused by that question
>
> F1: But that is because they didn't come to the tutorial…sorry.

In the next example the faculty discusses the importance of using assertiveness skills that have been taught in a previous course. However, the student disagrees and states that it is not always realistic.

> Tester F1: If you are coming in here as a group and somebody is not showing up, it's your obligation to say and use your assertiveness from semester one PD to say to these people "you know what you are responsible as much as we are and you really need to be

> here and you need to do that peer evaluation with them because if they're not showing up to work, then who's covering for them again?
>
> S2: I don't think it's realistic. In the ideal world it would be like that, but not realistic. Taking different people from different situations and different things…like I have to go pickup my kid, this happened so you need to do this for me…well you're the only one without a job so why don't you do it blah blah blah…

The student voice was a predominant theme in the focus group analysis. The student voice added value by describing the user experience and telling the truth about the student experience. Although the student voice did not always concur with that of the faculty, their opinion was greatly valued.

Theme 4: Design Participants Share Unique Subject Matter Expertise (SME). During the design process, each member of the team was encouraged to share their ideas, experiences and opinions. A SME can be defined as the participant's unique background and respective expertise that contributed to the overall design. Under this theme one code was identified, subject matter expertise adds value. Examples for this code are provided below.

Subject matter expertise adds value. In the following example, a faculty member asks an instructional designer for their unique expert opinion.

> F1: I really like the idea of the photo booth. Would that be expensive ID1?
>
> ID 1: If you're using a device, then it's got a mic and a camera in it already

The next few quotes are examples of when the design participants shared their unique expertise which contributed to the design process by shaping and guiding design decisions. Each design participant had their own experiences and knowledge to share which was valued by the team as they learned from one another.

> F2: [Empathy is] a skill and it can be developed. There [are] actually tools that exist that can measure empathy. We've actually been doing some other research and we found that.

> ID1: There is something called the pedagogical agent in the psychology literature that would walk you through a process…so you could invent something like that in there.
>
> ID1: In a lot of educational research, it says if something doesn't add to learning, it detracts from learning. So, there is a fine balance between having it look sexy and fun and having it look distracting.
>
> F2: Also we need links to standards of practice and to BPGs (Best practice guidelines).
>
> ID1: Constructivism because with nursing and PBL being a thing, the idea that students are creating their own knowledge rather than consuming it, that should be in mind when developing the app.

Having various subject matter experts on the design team provided an opportunity for sharing their unique ideas. Each individuals experience was valued and their ideas contributed greatly to the overall design of the TMDM.

Theme 5: The Design Thinking Process Guides. The design thinking process utilizes a facilitator to help navigate through the five stages of empathize, define, ideate, prototype and test. The facilitator plays a critical role during the design thinking process by guiding participants and enforcing the rules. In addition, the facilitator monitored time and ensured participation by all group members. Under the theme of the design thinking process guides, five codes were identified including participant engagement, facilitator needs to monitor time, facilitator uses paraphrasing, facilitator encourages headlining ideas, facilitator encourages participation. Examples for each code under this theme are provided below.

Participant engagement. It was evident throughout the focus group that the participants were actively engaged in discussions. This engagement was seen by the rapid firing of ideas back and forth, excitement about the ideas and reference to supporting the process. The following quote

demonstrated a time where the participants were actively sharing ideas with each other demonstrating their attention and engagement with the design activity.

> Facilitator: So how could the student who is in the booth be useful during the debrief?
>
> ID2: Because they speak on behalf of the patient
>
> F2: They are the patients voice
>
> T1: Patient advocacy
>
> F2: I kept coughing and you weren't addressing my needs
>
> ID2: And that would help with the empathy

The next quote demonstrates how the participants started to embrace the design thinking process: "That's not our problem right now, if we build it, they will come. With enough money, anything is possible. We are not allowed to block ideas right now…I am channeling Christy". In addition, the participant's engagement in the activity and excitement for their ideas could be seen when they broke into song just before showing the tester participants their design: "I am so excited, I just can't hide it".

Facilitator needs to monitor time. The facilitator kept the group on task by helping them to focus and move through the process in a timely manner. The facilitator frequently stated things like "we don't want to go into solutions yet" or "let's end there and have a discussion about it" or "lets recap what she said and focus on….". The following quote demonstrates how the facilitator focused on time in order to keep on track with the design process. "Excellent, I want to now move through because of the time…ok we have to move on…I am sorry to push you".

Facilitator uses paraphrasing. The facilitator used paraphrasing to capture the design participant's thoughts and help highlight key points to the group. The following quote demonstrates when the facilitator used paraphrasing to capture the participants point about the

difference between clinical and simulation: “So what you’re saying is the stakes are higher in clinical…”. The next example demonstrates a time when the facilitator used paraphrasing to capture a participant’s idea about adding a peer review component to the final design of the TMDM. “…so you’re saying add a peer review component to the tool and enable personal reflection through the tool...”.

Facilitator uses headlining. Throughout the focus group the facilitator encouraged the use of a technique known as headlining. Headlining encourages participants to condense their idea to a simple and clear statement; like a headline of a story (Institute of Design at Stanford, 2011). The following two quotes demonstrate when the facilitator used the headlining technique.

> Facilitator: So let’s headline that, because that’s a really good point. So you said: are there key questions we can give students to help them with reflections or reflecting?

> Facilitator: Ok so what you’re saying then is, headline that, would be how might we change the questions

Facilitator encourages participation. The facilitator monitored the design group to ensure participation by all. This required observing the verbal and non-verbal communication of the group members. The following example demonstrates a time when the facilitator observed the non-verbal communication of a participant and encouraged their participation “[ID1], did you have any other thoughts?”. The next example demonstrates a time when the facilitator noted one of the design participants was cut off by another participant but wanted to make sure their ideas were heard “what were you about to say [T1]?”.

The design thinking process guides was a predominant theme in the focus group analysis. The facilitator kept the group on task while navigating the five phases of design thinking. The facilitator had to monitor time closely, paraphrase ideas, focus participants, and ensure that they

followed group rules. Overtime it was noted that the group began to self-monitor and reinforce rules, demonstrating their commitment to the process.

Theme 6: Community of Inquiry. The Community of Inquiry was a theme in this study influencing the design process. Following the CoI model, three codes were identified including social presence, teaching presence and cognitive presence. The emotional presence was document under the social presence due to limitation of coding structure validation at this time (Cleveland-Innes & Campbell, 2012). The coding template produced by Garrison et al. (2000) as seen in Table 1, was used to identify categories and indicators of these presences (p. 4).

Social presence. Learning together with peers created a sense of team and common purpose. The social presence was coded during times of emotional expression, open communication, group cohesion and collaboration (Garrison et al., 2000, p. 4). The social presence can be seen in action during the design session as participants engaged with each other to share ideas. People appeared to enjoy learning together as evident by laughter, open communication, expression, collaboration and group cohesion.

In addition, the design team saw value in the social presence as being part of the final TMDM. The following quote highlighted the importance of this design decision.

> Working with your peers and being accountable to a constant group like the clinical group as we decided, is more conducive to create an environment of feeling comfortable with one another and dependent on one another meaning you are part of a team that works together to solve a problem as they will be doing out in the real field.

Emotional presence. The emotional presence was evident throughout the design session when participants laughed, joked and sang. The emotional presence was clustered under the social presence and was coded accordingly. Coding of this presence occurred during times of

emotional expression (Garrison et al., 2000, p. 4). Emotional connections and having fun appeared to engage participants in the learning activity. One noticeable incident demonstrating this engagement was when several participants broke into song following a brain storming session "I'm so excited and I just can't hide it".

Another example demonstrating emotional presence was when the participants joked with each other as seen in the following quote.

> We are supposed to give each other constructive criticism and feedback …I never had difficulty really cause bro here tells be all the time that I don't have computer skills, which I know…I know I don't (laughter).

The design team also saw value in integrating the emotional presence into the final TMDM mock-up/story board. The emotional experience of a student following completion of a simulation was a consistent discussion point for the team. The group came to an understanding that immediately following simulation students were emotionally charged and ready to engage in meaningful learning. Strategies to capture emotional venting immediately following simulation were built into the final design. One faculty commented that "allowing students the space and time to reflect immediately post sim gives them the opportunity to react, vent and gives us an opportunity to be part of the post sim "hallway" conversations which are sometimes the most important".

Teaching presence. The teaching presence helps to guide, organize and support. The teaching presence was coded when the facilitator helped to direct instruction, build understanding, focus the discussion, define and initiate discussion (Garrison et al., 2000, p. 4). The teaching presence can be seen in action during the design session every time the facilitator interacted with the participants. An example of this influence was when the facilitator kept the

group on task “you want to aim for 2-3 pages, like lots of ideas, so push your ideas ok”. Another example was when the facilitator reinforced the design process, paraphrased and asked questions to help the participants build consensus “so what you’re talking about is a really important point. Cause I think if we could capture that a little bit more [for example] what you just explained, “I’m tired, I’m ready to be done, I just want to go home and have a nap” so if you could turn that into a HMW of something you would like to change [what would it be?]”.

The design team saw value in the teaching presence as being part of the final TMDM. One participant highlighted the importance of this design decision when they stated, “faculty will still be present virtually in order to support student learning, as the students clearly indicated that they really want a teaching presence”.

Cognitive presence. The cognitive process can be seen in action during the design session when participants were able to construct meaning through discussions. The cognitive presence was coded when the participants engaged in exploration, sharing information, connecting ideas, thinking about and linking new ideas and in inquiry (Garrison et al., 2000, p. 4). Participants were required to break down tasks when dissecting the simulation and debriefing experience. This resulted in reflection, critical thinking and idea generation on how to improve the simulation and debriefing experience. The following discussion between participants reflects the cognitive presence.

> Tech1: again there’s the questions that we can ask that will help them make sense of their experience, that’s what I was thinking.
>
> ID2: Students come in…with the notion that I have to be great to perform. I have to perform at my best to do well. How do we get rid of that notion that failing in a simulation is bad? it [should be] ok because it’s better to [fail] here

Tech1: how [can] we change the approach/focus?

S1: for students it's more impactful if they self-discover…what the answer was so that it's more impactful for them.

The design team likewise saw value in integrating the cognitive presence into the final TMDM. There was a consensus among the design participants that encouraging students to take ownership over the debriefing process would cognitively engage them in the activity. This was demonstrated when one participant stated, "I think this new module will make the students more responsible for working through the process rather than being spoon fed by faculty".

The Community of Inquiry was a highly noted theme in this study. The social presence, cognitive presence, and teaching presence all influenced the design thinking process. Following the completion of the focus groups interviews were set up with each participant. The post design interview consisted of semi-structured questions including ranking and open-ended questions. The transcripts from the audio recordings were coded and are represented in the qualitative data above. The results from the ranking scale questions are reported below.

Post-Design Interview Results

The first set of questions related to the participant's perception of their participation in the design process. All eight participants agreed or strongly agreed that they felt their voice was heard during the design sessions. Likewise, all eight participants agreed or strongly agreed that they felt their opinions were represented in the final design mock-up/story board. Finally, all eight participants strongly agreed that the collaboration among stakeholders was useful during the design process. When asked how likely the innovation will be implemented and how likely the participant will support the process of implementation, 4 participants responded they

probably will and 4 participants responded they definitely will. Figures 4 and 5 display the results of these questions.

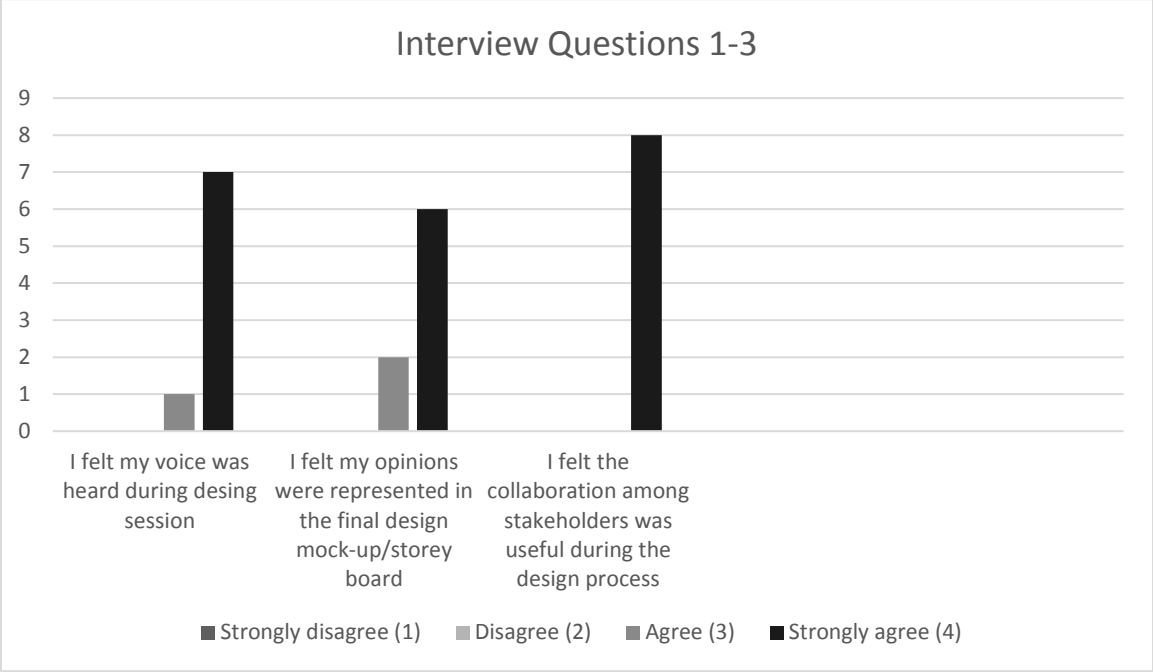

Figure 4. Interview questions.

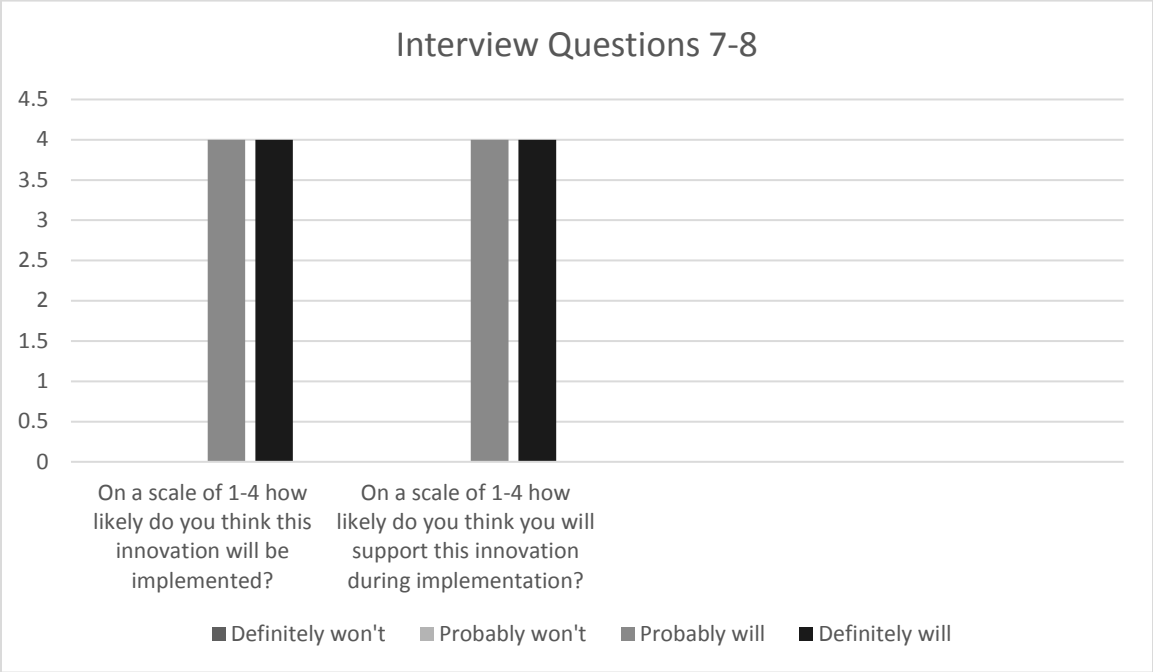

Figure 5. Interview questions.

Chapter V: Discussion

The purpose of this research study was to explore the effectiveness of design thinking within a pedagogical environment to create new learning tools such as a technology-mediated debriefing module. The effectiveness of the design thinking method can be defined by the following sub-questions:

1. Does design thinking enable stakeholder's voices to be heard and represented in the final mock up/story boards of a TMDM
2. Does design thinking facilitate collaboration and sharing of ideas across stakeholders?
3. Does design thinking engage stakeholders and contribute to a sense of fulfillment, acceptance, satisfaction and ownership over a technological innovation?
4. Is design thinking a time efficient instructional design process?
5. Does the Community of Inquiry, as a pedagogical model, assist in the design thinking process?

Regarding the first sub-question, the qualitative data results indicated that one of the greatest benefits of the design thinking process was its ability to facilitate the stakeholder's voices so that they could each contribute their subject matter expertise. At first some members of the group expressed uncertainty about how non-nurses could possibly contribute to solving the design dilemma. However, over time the group came to rely and value the subject matter expertise of each participant. Participants were noted to frequently ask for feedback and recommendations from each other, drawing on each other's expertise. For example, instructional technology questions were directed to the instructional designers and questions regarding the CAE system were directed towards the simulation technologists. One of the central premises of design thinking is engaging stakeholders in a collaborative manner where all viewpoints can be heard

(Brown, 2008). Valuing each other's unique expertise and contributions during collaborative problem solving, resulted in the co-construction of knowledge together; ultimately this process helped to create an innovative solution which included all participants' ideas. Vygotsky (1978) reported that group diversity with respect to subject matter knowledge and experience contributes positively to the learning process as individuals share and collaborate to socially construct knowledge. Likewise, Bruner (1985) agreed that diverse learning groups improve problem solving strategies because all learners provide varying interpretations of the given situation. Together they can integrate external knowledge with their own critical thinking skills to create greater connections for learning (Goghale, 1995). Through "communication and sharing of ideas, mutual learning occurs, which is a "win, win" situation [for all]"(Konings, Seidel, & Van Merrienboer, 2014, p. 2).

One of the most notable subject matter contributions was the student voice. The student voice provided a clear picture to the design group of what the learner experience was. This perspective was particularly valuable during the empathize stage of the design thinking process where understanding the learner experience was paramount. The design team turned to the students to ask clarifying questions to further understand the emotional, physical, cognitive and social components of the simulation and debriefing experience. The students openly shared the truth about their experiences. At times the faculty appeared surprised to hear the student's feedback, especially with respect to what really happens with assignments. For example, one student informed the design team that students actually do group reflections individually and then merge them into one paper, instead of sitting together to do the activity as expected by faculty. Nevertheless, this type of feedback resulted in a lot of "aha" moments for faculty which appeared to further motivate them to improve the debriefing process. Bovill, Cook-Sather, and Felton

(2011), reported similar findings stating, “when students work with academic staff to develop pedagogical approaches, [faculty] gain a different angle on, and a deeper understanding of learning” (p. 5). This deeper understanding can serve to re-invigorate and renew a faculty’s passion for creating positive learning experiences for student’s (Delpish et al., 2010; Bovill, 2009; Bovill et al., 2011). In addition, Rudduck (2007), discusses how a student’s interpretation of instructions determine their learning behaviour and ultimately the effectiveness of the academic activity. Therefore, if a student’s interpretation of the learning activity does not match the teacher’s intentions, then it is not likely to be an effective learning tool (Doyle, 1977; Konings et al., 2014). Including students as stakeholders on the design team in this study, ensured that the student voice influenced the final design of the TMDM. Further studies utilizing students on instructional design teams is worthy of exploration. Bovill et al. (2011), agree stating “academic staff should not only consult students but also explore ways for students to become full participants in the design of teaching approaches, courses and curricula” (p. 1).

Evidently the design team valued the student voice, however it was noted that at times the student’s opinions differed from faculty. Bovill and Bulley (2011) in their research discussed the role of students as designers and suggested that caution must be exercised to not give students full control over the instructional design process. They highlighted that although student’s participation in the design process is very valuable, the faculty and instructional designers must ultimately be the gatekeepers to the curriculum. This observation emphasized the importance of enabling all stakeholders’ voices to be heard during the design process. In this study, feedback from one participant was not valued higher over others in the group. Each participant was respected for their unique subject matter expertise and everyone learned from each other’s views. For example, during the design thinking process, faculty shared the pedagogical reasons for

specific learning activities which contributed to the students understanding of instructional design, academic accreditation requirements and learning expectations. Bovill and Bulley (2011) highlight how having students and faculty work together, creates a mutually beneficial learning environment where students can also be inspired, contributing to an "increased sense of engagement, motivation and enthusiasm" (p. 6). This research demonstrated that the design thinking process was effective at facilitating all the stakeholder's voices. In this case study, the design team participants worked well together which ultimately supported the design process. The contributions from all participants were represented in some form in the final mock up design of the TMDM. One challenge which may impact further application of the design thinking process, would be if personality conflicts existed between design participants. Future studies should aim at trialing the design thinking process in multiple different learning environments, to evaluate how personality differences can be mitigated.

The second sub-question explored the ability of the design thinking process to facilitate collaboration and sharing of ideas. A central premise of design thinking is collaboration. When working together "design thinkers …are open to the ideas and suggestions of their team members and … seek input and information from a variety of experts, including those outside the field of study for which the team is designing" (Coleman, 2016, p. 64). Results from this study revealed that collaboration was a key outcome and component of the design thinking process. Participants engaged in active discussions to share ideas back and forth; they would build on ideas and recall ideas making connections to what was important. These activities resulted in consensus building which ultimately helped to shape the final design of the TMDM. During the ideate stage participants engaged in active brainstorming, sharing wild ideas while building off each other's thoughts. According to Gray (1989), "collaboration is a process through which

parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their limited vision of what is possible" (p. 5). The design thinking process facilitates an ideal environment for collaboration. The application of rules for brainstorming, including go for quantity, headline ideas, stay on topic and defer judgement /no blocking, further support the collaborative design experience (Brown, 2008). This research study has demonstrated that design thinking effectively created a positive environment for collaboration where subject matter experts felt safe to share their ideas and learn from one another.

The third sub-question in this research study asked if design thinking engaged stakeholders to contribute to a sense of fulfillment, acceptance, satisfaction and ownership over a technological innovation. Results of this study revealed that participants enjoyed the design thinking process and that they were satisfied with the mock up design. Engagement in the design process was evident by the rapid firing of ideas back and forth, overall excitement about the ideas produced from the discussions and reference to upholding the design process and rules. Design participants also reported they would support the integration of the innovation as able. These positive results reflect much more than just the design participant's acceptance and satisfaction of the TMDM innovation; they suggest that including stakeholders in a change process can contribute to a sense of ownership and responsibility over new innovations. Resistance to change has been identified as one of the greatest barriers to innovation. Innovations from the top down are often met with anger, fear and reluctance (Keengwe, Onchwari, & Wachira, 2008; Butler & Schnellert, 2012). This project has revealed that engaging stakeholders in the change process from the beginning may be a useful strategy to excite participants about academic innovations, resulting in improved learning opportunities for students. Butler and Schnellert

(2012), advocate that there is great value in "multiple stakeholders [being] pulled together in loosely coordinated, goal-directed inquiry cycles focused on improving outcomes for students" (p. 1217). This process can facilitate communication and collaboration across a team while encouraging ownership over the innovation (Goksoy, 2013). Van Horn (2006), suggested that teachers who work collaboratively to solve problems are more likely to share resources, be innovative and make changes that they will follow through with to support students learning. Although this study highlighted how engaging the team in a design process can excite, motivate and inspire participants, it did not conclusively demonstrate a relationship between the design thinking process and long-term ownership over innovations. Further research is recommended to explore the application of design thinking within an academic environment to implement an innovation. Specifically, it would be worthy to explore if participating in the design thinking process motivates and encourages participants to implement and follow through with rolling out educational changes.

The fourth sub-question in this research study asked if design thinking is a time efficient instructional design process. The results suggest varying opinions. The time given for the design sessions were two, four-hour sessions over a period of two days. Researcher notes from the facilitator perspective indicated that it was difficult to keep the design group focused and on task to proceed through the phases of the design thinking process. At times the facilitator was required to cut off discussions to transition the group to the next phase. However, one of the fundamental principles of design thinking is to push your ideas, prototype, test and iterate as needed (Stanford University Institute of Design, 2015). Researcher notes indicated a tendency for participants to get stuck in the empathize, define and ideate stage while discussing all the issues with simulation and debriefing. There was some hesitance towards drawing and

committing to a first prototype. The facilitator played an active role to ensure the participants stayed on track. The follow up survey asked participants their opinions on the time given for the design process. It is interesting to note that although the consensus was that the time was rushed, most participants commented that additional time may not have resulted in a better solution but just more time wasted. Further studies are recommended to replicate the design thinking process within the academic environment to determine if it is time efficient.

Finally, the fifth sub-question in this research study explored how the community of inquiry (CoI) as a pedagogical model assisted the design thinking process. According to Garrison, Cleveland-Innes, and Shing Fung (2009), "The CoI framework identifies the core elements of a collaborative constructivist learning environment required to create and sustain a purposeful learning community" (p. 2). The foundation "of this framework is that higher-order learning is best supported in a community of learners engaged in critical reflection and discourse" (Garrison et al., 2009, p. 2). The design thinking process has similar philosophical underpinnings of collaboration and constructivism while engaging stakeholders in participatory design. When integrating the CoI model into the design thinking process in this project, it became evident that the design team could be considered a learning community. Voogt et al. (2011), discussed the value of professional learning communities such as teacher design teams for professional development. Teachers interacting with other teachers while re-designing curriculum was shown to not only improve the targeted curriculum, it also contributed to the professional development of all those involved (Voogt et al., 2011; Borko, 2004). In this study, the design team engaged in critical reflection, discourse and collaboration with the goal of constructing a new TMDM. After an analysis of the focus groups and interviews, it was apparent that the design thinking process created a learning community which embodied the four presences of the CoI model.

In this research project the social and emotional presences can be discussed together. The social presence highlights the importance of creating a learning environment where participants feel supported and safe to share their ideas. The emotional presence highlights the impact that emotions can have as a distracter, or enabler of thinking and learning (Garrison et al., 2009; Cleveland-Innes & Campbell, 2012). The design thinking process values the social and emotional presences of a learning community as evident by its rules of design. For example, one of the design thinking rules is that no idea is a bad idea and as a group it is expected that all participants defer judgement. This rule helped to create an environment where participants felt safe and supported to share all their ideas free from ridicule. In this study, the social and emotional presence were evident throughout the design focus groups as the participants joked, laughed, teased, snacked and told stories. This social bonding helped the group unite around a common purpose which was to create a TMDM. The participants appeared to be proud of the accomplishments they had achieved together and expressed great interest in continuing to work together as a group to achieve their goals.

The cognitive presence highlights the learner's ability to engage in critical thinking, reflection and discourse while constructing new knowledge and creating meaning (Garrison, Anderson & Archer, 2000). The design thinking process capitalizes on the cognitive process to facilitate brainstorming and the creation of new innovative ideas. One of the core facilitation techniques used during design thinking is to ask participants to think big, go for quantity of ideas and to build off each other's ideas. A central premise of the design thinking methodology is that stakeholders will listen and learn from each other. Listening to ideas informs the participants understanding and streamlines their thinking. This process makes participants think of more ideas and together the group builds and shapes ideas into new innovations. The cognitive

presence was evident throughout the design focus groups as participants asked questions of each other, valued each other's subject matter expertise and made connections between ideas. Talk aloud strategies were used to encourage participants to share all their ideas and thoughts, which further supported the cognitive presence. The learning that occurred during the design process was palpable as evident by the numerous "aha" moments documented in the focus groups. The participants walked away from the design activity with much more than just a new TMDM; Engaging in the design process contributed to new learning regarding the complexity of simulation debriefing from both the teaching and learning perspective.

The teaching presence highlights the influence of a facilitator to guide, instruct and create meaningful interactions within the community of learning (Anderson, Rourke, Garrison & Archer, 2001). In the design thinking process the facilitator can be equated to the teaching presence. In this research study, the facilitator kept the group on task while navigating the five stages of the design thinking process. In this role, the facilitator kept the group on time while encouraging full participation from all stakeholders. Part of the role of the facilitator was to encourage participants to clearly articulate their ideas and to make connections to what was important. This was done using paraphrasing, asking questions and encouraging participants to headline their key ideas and thoughts. The researcher's notes indicated that at times guiding the group proved to be challenging due to conflicting personalities and time restraints. However, it was also noted that without the role of a facilitator as a teaching presence, the design thinking process would not likely have been successful. Garrison et al. (2000), discussed how interactions between members of a community of learning must have parameters and focus on a clear direction. They suggested that the teaching presence plays a critical role to help guide and facilitate cognitive and social processes, with the intent of achieving meaningful learning

objectives. Furthermore, Garrison and Arbaugh (2007) report that the "teaching presence is a significant determinant of student satisfaction, perceived learning, and sense of community" (p. 163). The teaching presence in this study contributed to the participants satisfaction with the design experience by creating a positive learning environment and a sense of community.

An evaluation of the final TMDM design was not included as part of this study. However, it is worthy to mention the influence of the CoI on the final design, as it was a predominate theme noted in this study. Final design decisions reflecting the need for a social presence included the integration of clinical groups to facilitate team comradery and a sense of accountability and responsibility. Design decisions reflecting the cognitive presence included opportunities for self-directed learning and active participation. The TMDM will prompt students to reflect and answer questions utilizing the tool. Support resources, including RNAO best practice guidelines and instructional skills based videos, will be integrated into the design to support cognitive processing and learning in situ. The emotional presence was also discussed at great length during the design process. Anxiety experienced by students before, during and after the simulation was of great concern to the final design. It was decided that the TMDM would incorporate a preparatory video to assist with the transfer of accountability prior to the simulation as this may help decrease student anxiety and allow time for questions to the faculty. In addition, the tool was designed to enable an opportunity for students to immediately emotionally vent following the simulation. Finally, the teaching presence was reflected in the final TMDM. It became very clear during the design discussions that the teaching presence was an important consideration for the debriefing experience. This presence was incorporated into the final design by including a twitter feed linking directly to the faculty coordinating the course. Although the teacher may not be physically present, it was decided that twitter may be an interesting approach

to keep the lines of communication open at all times during the debriefing process. Twitter will enable responsive communication between the students and their teacher. In addition, if the students require the teacher to physically be present, they can request that the faculty travel to their location within the simulation center.

Putting it Together: A Proposed Relationship

The results of this research project have discussed the influence of the CoI on the design process and the final mock up design. Further exploration has highlighted a potential relationship between using the design thinking process (Brown, 2008) to create a professional community of learning (Hord & Hirsh, 2008) and a CoI (Garrison et al., 2000). Figure 6 helps to visually represent the purposed relationship between design thinking, professional learning communities and the CoI.

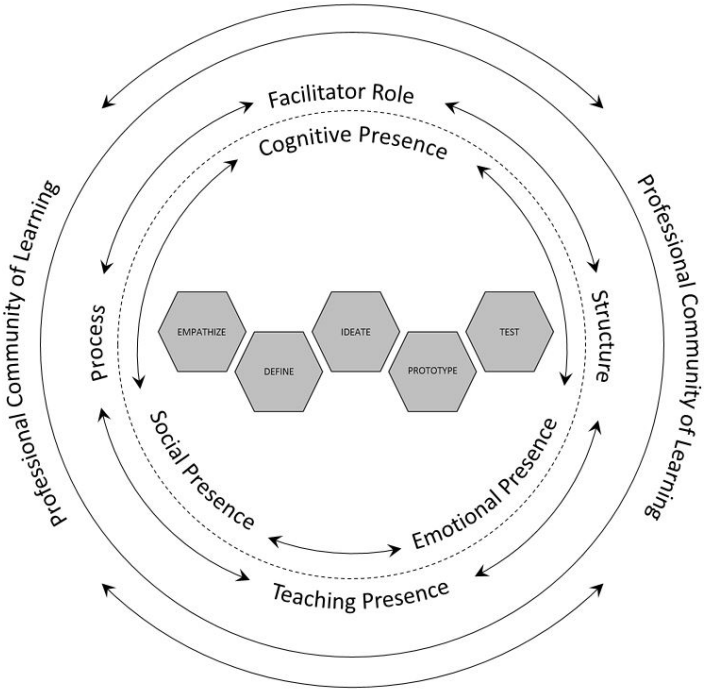

Figure 6. A proposed relationship between design thinking, professional learning communities and the Community of Inquiry

In this model, the outermost circle represents the professional community of learning which was established by the gathering of the design team to create the TMDM. Grounded in constructivist theory, the community of learning creates an environment for sharing beliefs, values and vision. There is a culture of respect, trust and community created within this circle where participants share their knowledge and engage in collective learning (Hord, 2009). The outside of the second circle (dash line), represents the facilitator role and the teaching presence. Vaughan and Garrison (2005) describe the teaching presence as "the unifying force that initiates and sustains the inquiry and learning process through design, facilitation and direct instructional responsibilities" (p. 3). This definition could easily be applied to the role of the facilitator when implementing the design thinking methodology. On the inside of the second circle is the cognitive presence, social presence and emotional presence. All three of these presences actively overlap and influence the design team participant's individual and collective capacities (Binkhorst, Handelzalts, Portman, & Van Joolingen, 2015). Placing these three presences in the model in close proximity to the teaching presence, still enables the necessary discourse and reflection required to create the Community of Inquiry. In the centre of the circle is the design thinking methodology which provides structure and a process for innovative inquiry, problem solving and design.

Chapter VI: Conclusion

This research project has explored the appropriateness of using design thinking (Brown, 2008) to create a technology-mediated debriefing module (mock up/story board) for practical nursing students at a community college. Design thinking was an effective means to create a TMDM, as it offered a human-centered, collaborative and iterative problem-solving approach which integrated key stakeholders into the design process. All stakeholders were valued for their unique subject matter expertise and contributions which created a professional community of learning. The community of learning created through the implementation of the design thinking process, embodied the four presences of the CoI model. The cognitive, teaching, social and emotional presences were all identified during the design sessions, creating an ideal learning environment for professional development and personal growth.

Throughout the design thinking process all stakeholders were valued for their unique subject matter expertise and contributions to the community of learning. Having participants with a variety of backgrounds created a positive environment for the co-construction of knowledge through the sharing and linking of ideas. One notable stakeholder contribution worthy of further discussion was that of the student voice. The student voice was valued highly by all participants as it told the truth about the students learning experience with simulation and debriefing. This feedback facilitated many "aha" moments for the design team which contributed greatly to their professional development as educators and ultimately to the final design.

Areas for further research following this study, include the influence of integrating students into professional learning communities and instructional design teams at the post-secondary level; evaluating their role on curriculum and instructional design. In addition following all team members to explore the long term influence of being part of a design team on the

implementation of innovations would be valuable. Finally, building the TMDM and evaluating its use with students, would be an ultimate research goal.

An innovation such as the TMDM may be considered disruptive as it is a completely new and revolutionary approach to simulation debriefing. If this type of innovation had been imposed by administrators, it may have been met with much resistance from faculty and staff. Incorporating faculty, students and key stakeholders into the design process was an effective strategy to create buy-in. The collaborative design experience contributed to a sense of excitement amongst the participants to see the innovation through into action. Studies have shown that engaging teachers in design and educational reform contributes not only to their sense of ownership, but also increases the likelihood that teachers will utilize the new innovations in their classrooms (Binkhorst et al., 2015; Penuel, Fisherman, Yamaguchi, & Gallagher, 2007). Through the utilization of design thinking, teachers, students and academic professionals have great opportunity to drive innovation from the bottom up. Together their efforts can be a powerful force for positive change within the education system.

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Athabasca University
RESEARCH CENTRE

Appendix A

CERTIFICATION OF ETHICAL APPROVAL - RENEWAL

The Athabasca University Research Ethics Board (AUREB) has reviewed and approved the research project noted below. The AUREB is constituted and operates in accordance with the current version of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS) and Athabasca University Policy and Procedures.

Ethics File No.: **22082**

Principal Investigator:
Ms. Christy Taberner, Graduate Student
Centre for Distance Education\Master of Education in Distance Education

Supervisor:
Dr. Agnieszka Palalas (Supervisor)
Dr. Martha Cleveland-Innes (Co-Supervisor)

Project Title:
Design Thinking Applied: The Creation of a Technology Mediated Debriefing Module

Effective Date: January 30, 2017 **Expiry Date**: January 30, 2018

Restrictions:

Any modification or amendment to the approved research must be submitted to the AUREB for approval.

Ethical approval is valid *for a period of one year*. An annual request for renewal must be submitted and approved by the above expiry date if a project is ongoing beyond one year.

A Project Completion (Final) Report must be submitted when the research is complete *(i.e. all participant contact and data collection is concluded, no follow-up with participants is anticipated and findings have been made available/provided to participants (if applicable))* or the research is terminated.

Approved by: **Date:** January 30, 2017

Sherri Melrose, Chair
Athabasca University Research Ethics Board

Athabasca University Research Ethics Board

University Research Services, Research Centre

1 University Drive, Athabasca AB Canada T9S 3A3

E-mail rebsec@athabascau.ca

Telephone: 780.675.6718

MOHAWK COLLEGE

Research Ethics Board
CERTIFICATE OF AMENDMENT APPROVAL

PRINCIPAL INVESTIGATOR	DEPARTMENT	NUMBER
Christy Taberner (M.Ed. student)	School of Nursing, Mohawk College	16-003

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:
Mohawk College

FACULTY ADVISOR (if student research):
Dr. Agnieszka Palalas, Athabasca University

SPONSORING AGENCIES:
ARIE Grant, Mohawk College

TITLE:
Design Thinking Applied: The Creation of a Technology Mediated Debriefing Module

ORIGINAL APPROVAL DATE:	AMENDMENT APPROVAL DATE:	COMPLETION REPORT/ RENEWAL DUE:
Jan 22, 2016	Jan 18 2017	Jan 18 2018

CERTIFICATION

The protocol describing the above-named project has been reviewed by the Mohawk College Research Ethics Board and the procedures were found to be acceptable on ethical grounds for research involving human subjects.

Approval of the Research Ethics Board by:
Donna Rawlin, RN, BScN, MSc(T), PhD(student)
Chair

This Certificate of Approval is valid for the term indicated provided there is no change in the experimental procedures.

Appendix B

Design Thinking Applied: The Creation of a Technology-Mediated Debriefing Module

Letter of Invitation to Design Team Participant

Colleagues and students:

My name is Christy Taberner and I am a graduate student at Athabasca University's Master of Distance Education Program. This letter is to invite you to participate in a study that I am conducting for my thesis. The following information is provided for you to decide whether you wish to participate in the present study.

The purpose of this study is to explore the appropriateness of using design thinking (Brown, 2008) to create a technology-mediated debriefing module (mock up/story board) for practical nursing students at a community college. There are no direct benefits to participants' in this study nor will any promise or guarantee of benefits encourage participation. The possible indirect benefit would be an increased understanding of how to apply the design thinking process and the experience of participating in a qualitative research study.

To participate you need to be either a:

- Faculty, instructional technologist, instructional designer, simulation technologist or student in the practical nursing program at Mohawk College.

The time commitment for this project is as follows:

1. Survey - Maximum of 60 minutes to complete an online survey (independent task)
2. Design session #1 – 3 hours with design group
3. Design session #2 – 3 hours with design group
4. Google document – member checking – 60 minutes (independent task)
5. Final one on one interview – 60 minutes (with researcher at a location convenient to you)

Overall your participation in this study will require a maximum of 9 hours over a period of 2 months.

Please be assured that your involvement in this research is completely voluntary. The data collected will include no identifying information and your name will not be presented on any document. You have the right to refuse to participate and to withdraw at any time during this research, without prejudice. There will be no consequences from deciding to withdraw your participation and no need to explain your withdrawal.

There are no known risks and/or discomforts associated with this study. This study has been reviewed by and received ethics clearance from the Athabasca Research Ethics Board and the Mohawk College Research Ethics Board. Should you have any comments or concerns regarding your treatment as a participant in this study, please contact the Office of Research Ethics at 1-800-788-9041 ext. 6718 or by email to rebsec@athabascau.ca

If you decide you are willing to take part in this study, please contact Christy Taberner either by email (XXX) or phone/text (XXX).

Thank you in advance for your consideration of this project.

Sincerely,

Christy Taberner

Faculty Health Sciences

Mohawk College

Christy Taberner (Primary Investigator): christy.taberner XXX

Dr. Agnieszka Palalas (Supervisor): XXX

Dr. Martha Cleveland-Innes (Supervisor): XXX

Departmental IRB representative telephone/email

Athabasca University: 1-800-788-9041 ext. 6718 or by email to rebsec@athabascau.ca

Mohawk College: 905-535-9140 ext. 20304 or by email to reb.coordinator@mohawkcollege.ca

Appendix C

Design Thinking Applied: The Creation of a Technology-Mediated Debriefing Module

Letter of Invitation to Tester

Colleagues and students:

My name is Christy Taberner and I am a graduate student at Athabasca University's Master of Distance Education Program. This letter is to invite you to participate in a study that I am conducting for my thesis. The following information is provided for you to decide whether you wish to participate in the present study.

The purpose of this study is to explore the appropriateness of using design thinking (Brown, 2008) to create a technology-mediated debriefing module (mock up/story board) for practical nursing students at a community college. There are no direct benefits to participants' in this study nor will any promise or guarantee of benefits encourage participation. The possible indirect benefit would be an increased understanding of how to apply the design thinking process and the experience of participating in a qualitative research study.

To participate you need to be either a:

- Faculty, instructional technologist, instructional designer, technologist or student in the practical nursing program at Mohawk college

The time commitment for this project is as follows:

- 30 minutes to review the mock up/story board design and provide feedback over a period of 1 day.

Please be assured that your involvement in this research is completely voluntary. The data collected will include no identifying information and your name will not be presented on any document. You have the right to refuse to participate and to withdraw at any time during this

research, without prejudice. There will be no consequences from deciding to withdraw your participation and no need to explain your withdrawal.

There are no known risks and/or discomforts associated with this study. This study has been reviewed by and received ethics clearance from the Athabasca Research Ethics Board and the Mohawk College Research Ethics Board. Should you have any comments or concerns regarding your treatment as a participant in this study, please contact the Office of Research Ethics at 1-800-788-9041 ext. 6718 or by email to rebsec@athabascau.ca

If you decide you are willing to take part in this study, please contact Christy Taberner either by email (XXX) or phone/text (XXX).

Thank you in advance for your consideration of this project.

Sincerely,

Christy Taberner

Faculty Health Sciences

Mohawk College

Christy Taberner (Primary Investigator): christy.taberner XXX

Dr. Agnieszka Palalas (Supervisor): XXX

Dr. Martha Cleveland-Innes (Supervisor): XXX

Departmental IRB representative telephone/email

Athabasca University: 1-800-788-9041 ext. 6718 or by email to rebsec@athabascau.ca

Mohawk College: 905-535-9140 ext. 20304 or by email to reb.coordinator@mohawkcollege.ca

Appendix D

Informed Consent for Design Participants

Title of Project: Design Thinking Applied: A Technology Mediated Debriefing Module

Primary Investigator: Christy Taberner XXX

Faculty advisors: Dr. Martha Cleveland Innes, Dr. Agnieszka Palalas

1. **Purpose:** The purpose of this study is to explore the appropriateness of using design thinking (Brown, 2008) to create a technology-mediated debriefing module (mock up/story board) for practical nursing students at a community college.
2. **Procedure:** The procedure for this research study will include a survey, participation in two design focus groups with a total of 8 participants, member checking through a Google document and a final interview with the researcher. Surveys will be summarized and shared with the design team during the empathize mode of the design thinking process. Design focus groups will be audio-recorded. Once recorded, the data will be transcribed and analyzed by the researcher. Additional artifacts may also be included in data collection such as drawings, photos of whiteboards, notes, sketches and prototypes. Following the focus groups a summary of the design sessions will be uploaded to a private google doc for review for accuracy and additional comments. Once feedback is received, transcriptions and conclusions will be adjusted accordingly. The final phase of the project will be a closing interview. The interviews will take place in a private location conducive to participants at a time that is convenient to you. Interviews will be audio recorded and transcribed. Before the initial survey stage of this research project, you will be provided with a copy of this informed consent and the researcher will retain the signed copy.

3. **Risks:** There are no anticipated risks to the participants in this study because the survey, design focus groups and interviews are not of a sensitive nature. You will have the right to stop participating at any time.
4. **Benefits:** There are no direct benefits to participants' in this study nor will any promise or guarantee of benefits encourage participation. The possible indirect benefit would be an increased understanding of how to apply the design thinking process.
5. **Extent of Anonymity and Confidentiality**

   All data collected during the researcher project will be kept confidential in a secured location. Audio recordings will be given to a transcriptionist who abides by the confidentiality code of conduct. Only the researcher's advisors associated with the project will have access to the data. Participant's names will not be used in any report, presentation or publication and identifying information will be changed to ensure anonymity. Pseudonyms will be used and no identifying characteristics will be revealed. Despite every effort to preserve anonymity it is important to acknowledge their still may be some risk.
6. **Compensation**

   Participants will not be compensated for participating in this study.
7. **Freedom to Withdraw**

   Participants are free to withdraw from this study at any time without penalty. You can do so through a written email or verbal conversation. You are encouraged to speak freely and share all ideas. You are also free to not answer any questions that you choose. There may be circumstances under which the investigator may determine that a participant should not continue to be involved in the study.

8. **Approval of Research**

   This research study has undergone ethics approval from Mohawk College and Athabasca University. The study has been approved, as required, by the institutional Review Board for Research Involving Human Subjects at Mohawk College and Athabasca University.

9. **IRB approval Expiration date:** TBD following ethics approval

10. **Subjects Responsibilities**

    I have read and understand the Informed Consent and conditions of this project. I voluntarily agree to participate in the research project. I have the following responsibilities:

    The time commitment for this project is as follows:

    1. Survey - Maximum of 60 minutes to complete an online survey (independent task)
    2. Design session #1 – 3 hours with design group
    3. Design session #2 – 3 hours with design group
    4. Google document – member checking – 60 minutes (independent task)
    5. Final one on one interview – 60 minutes (with researcher at a location convenient to you)

    Subjects Permission

    I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent

    _____ Date: _____

    Subject signature

Should I have any questions about this research or its conduct, I may contact:

Christy Taberner (Primary Investigator): christy.taberner XXX

Dr. Agnieszka Palalas (Supervisor): XXX

Dr. Martha Cleveland-Innes (Supervisor): XXX

Departmental IRB representative telephone/email

Athabasca University: 1-800-788-9041 ext. 6718 or by email to rebsec@athabascau.ca

Mohawk College: 905-540-4247 ext. 20304 or by email to reb.coordinator@mohawkcollege.ca

Subjects must be given a complete copy (or duplicate of original) of the signed Informed Consent.

Consent Form
Version date here once approved

Appendix E

Informed Consent for Tester Participants

Title of Project: Design Thinking Applied: A Technology Mediated Debriefing Module

Primary Investigator: Christy Taberner XXX

Faculty advisors: Dr. Martha Cleveland Innes, Dr. Agnieszka Palalas

Purpose: The purpose of this study is to explore the appropriateness of using design thinking (Brown, 2008) to create a technology-mediated debriefing module (mock up/story board) for practical nursing students at a community college.

Procedure: Your participation in this research study will be during the test phase. You will be asked to review a design of a technology mediated debriefing module. You are encouraged to speak freely and share your thoughts. Your feedback will be listened to by the design team and will be captured through an audio recording. In addition any drawings or prototypes created by you will be captured and included in the data collection for this project. All data will be thematically analyzed by the researcher. Before the initial survey stage of this research project, you will be provided with a copy of this informed consent and the researcher will retain the signed copy.

Risks: There are no anticipated risks to the participants in this study because participation in the review and testing stage of the design process is not a sensitive matter. You will have the right to stop participating at any time.

Benefits: There are no direct benefits to participants' in this study nor will any promise or guarantee of benefits encourage participation. The possible indirect benefit would be an increased understanding of how to apply the design thinking process.

Extent of Anonymity and Confidentiality

All data collected during the researcher project will be kept confidential in a secured location. Audio recordings will be given to a transcriptionist who abides by the confidentiality code of conduct. Only the researcher's advisors associated with the project will have access to the data. Participant's names will not be used in any report, presentation or publication and identifying information will be changed to ensure anonymity. Pseudonyms will be used and no identifying characteristics will be revealed. Despite every effort to preserve anonymity it is important to acknowledge their still may be some risk.

Compensation

Participants will not be compensated for participating in this study.

Freedom to Withdraw

Participants are free to withdraw from this study at any time without penalty. You can do so through a written email or verbal conversation. You are encouraged to speak freely and share all ideas. You are also free to not answer any questions that you choose. There may be circumstances under which the investigator may determine that a participant should not continue to be involved in the study.

Approval of Research

This research study has undergone ethics approval from Mohawk College and Athabasca University. The study has been approved, as required, by the institutional Review Board for Research Involving Human Subjects at Mohawk College and Athabasca University.

IRB Approval Expiration Date: TBA following ethics approval

Subjects Responsibilities

I have read and understand the Informed Consent and conditions of this project. I voluntarily agree to participate in the research project. I have the following

responsibilities:

The time commitment for this project is as follows:

- 30 minutes to review the mock up/story board design and provide feedback to occur over 1 day.

Subjects Permission

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent

_____ Date: _____

Subject signature

Should I have any questions about this research or its conduct, I may contact:

Christy Taberner (Primary Investigator): XXX

Dr. Agnieszka Palalas (Supervisor): XXX

Dr. Martha Cleveland-Innes (Supervisor): XXX

Departmental IRB representative telephone/email

Athabasca University: 1-800-788-9041 ext. 6718 or by email to rebsec@athabascau.ca

Mohawk College: 905-540-4247 ext. 20304 or by email to reb.coordinator@mohawkcollege.ca

Subjects must be given a complete copy (or duplicate of original) of the signed Informed Consent.

Consent Form
Version date here once approved

Appendix F

Title of Project: Design Thinking Applied: A Technology Mediated Debriefing Module

Pre-Project Survey Questions

Demographic Information:

Name:

Occupation:

Educational background (Degrees earned):

How many years have you been practicing in your current position?

Current role in Simulation at Mohawk College:

In your opinion please rank the current debriefing experience of students on a scale of 1 -5.

Please note #1 represents the lowest grade and #5represents the highest grade.

Select only one choice per line	1 Strongly Disagree	2 Somewhat Disagree	3 Neither Agree or Disagree	4 Somewhat Agree	5 Strongly Agree
1. The overall quality of the debrief experience for our students is adequate					

2. The duration of the current debrief process is adequate					
3. The timeliness of the current debrief process is adequate					
4. The consistency of the current debrief process between different groups of students is adequate					
5. The impact of the current debrief on students learning is adequate					
6. The instructor presence is adequate during the debrief process					
7. The instructor feedback is adequate during the debrief process					
8. The online interaction that occurs between students in the discussion forum in the current debrief process is adequate					
9. The current debriefing process accommodates various learning styles					

10. The current debriefing process contributes to life-long learning.					
11. The current debriefing process motivates students to explore content and learn new things					

12. What do you think we do best with simulations at Mohawk College?

13. What do you think we need to improve on most with simulations at Mohawk College?

14. In your opinion what are the top three problems with our current simulation and debriefing process. Please explain in detail.

Appendix G

Title of Project: Design Thinking Applied: A Technology Mediated Debriefing Module

Design Team Summary

Please read the following information prior to participating in the design focus groups.

We will be exploring the creation of a technology mediated debriefing module using a design thinking process.

Literature Summary:

- Debriefing has been identified as the most important component of the learning experience (Lavoie, Pepin & Boyer, 2013; Levett-Jones & Lapkin, 2014; Runnacles, Thomas, Sevdalis, Kneebone & Arora, 2014).
- The current state of post-secondary education has seen growing class sizes and reduced faculty. As a result the most effective and efficient way to deliver the simulation debrief requires consideration. Traditional methods are time and staff intensive (Welke et al., 2009).
- No one method of debriefing has been identified as superior and great inconsistencies exist with its delivery resulting in varying costs and quality (Dufrene & Young, 2014; Runnacles et al., 2014; Welke et al., 2009).
- Issues regarding debriefing that have been validated by the literature include timeliness, quality, consistency, student anxiety and cost of debriefing.
    - **Time.** Most debriefings should be twice the length of the simulation (Lavoie & Pepin, 2013). The timing of the debrief process is important as feedback to students should occur immediately post simulation, allowing sufficient time for discussion and reflection (Lavoie & Pepin, 2013).

- **Quality/Consistency**. There is a lack of consistency across the learning experience for students due to the variability of facilitators. Not all facilitators are equally skilled in leading debriefing sessions and various methods are used; this inconsistency can impact quality (Lavoie & Pepin, 2013).
- **Anxiety**. Students report high levels of anxiety from the simulation experience identifying fear of being watched and judged by peers/faculty as a primary concern (Najjar, Lyman & Miehl, 2015). The debrief provides time for students to reflect on these emotions; however students can misinterpret the experience as a summative evaluation when faculty are involved (Welke et al., 2009).
- **Cost.** Traditional methods of debriefing are time and staff intensive (Welke et al., 2009). The literature revealed a lack of measurable benefit for using faculty to debrief simulations versus "other post-experiential interventions" (Garden, Lefevre, Waddington, Weller, 2015, p.305). This important observation validates the need to explore the most cost efficient options for debriefing in today's fiscally restrained academic environment.

Design Thinking:

Design thinking is a human-centered, collaborative and iterative problem-solving technique associated with abductive reasoning which results in innovations. It consists of five stages empathize, define, ideate, prototype and test (Brown, 2008).

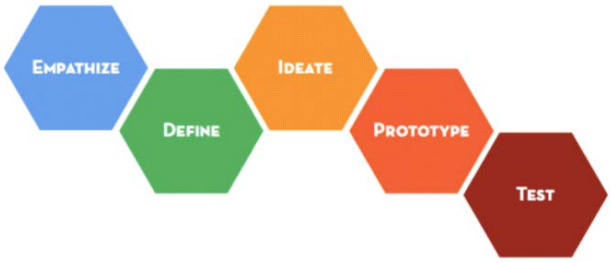


Figure 2. Design thinking process. Image from "Virtual crash course in design thinking," by Stanford University Institute of Design, 2015. Licensed under CC BY SA NC. https://creativecommons.org/licenses/by-nc-sa/3.0/

The facilitator will lead you through the five stages. Each stage will have specific rules and time expectations which will be defined at the start of each session.

1. **Empathize**: Participants will learn about their audience for whom they are designing. Essential to this stage is observing and engaging with users to discover what matters most.
2. **Define:** Participants will synthesize findings and clarify end goals including specific client needs. A point of view will be created to help tell the story of the end user.
3. **Ideate:** Participants will engage in active brainstorming of solutions. Wild ideas will be encouraged with the goal of creating a quantity of ideas over quality.
    - **Rules of Brainstorming:**
    - One conversation at a time
    - Go for quantity
    - Headline
    - Build on the ideas of others
    - Encourage wild ideas
    - Be visual
    - Stay on topic

- Defer judgement – no blocking!

4. **Prototype:** Take ideas and translate them in the physical world. Draw, map it out. Try lots of things don't be afraid to fail and start again.
5. **Test:** Take mock up drawings and show a user. "Testers" will consist of pre-selected faculty and students. Listen to their feedback and add to your design.

Think-aloud Instructions: During the design sessions you are encouraged to think aloud. The researcher will use what you are saying to try and follow your thought patterns during the design task. Remember this research is exploring the design process not the final product. According to Perez, Johnson and Emery (1995), thinking-aloud involves the following:

- Say everything that crosses your mind.
- Try not to overthink things just be honest and straightforward.
- Relax and let your thoughts speak.
- Free associate as much as you like.
- Don't worry if your ideas seem illogical.
- Wild ideas are encouraged.
- Note: The researcher may prompt you throughout the session to probe deeper into your thoughts.

Appendix H

Title of Project: Design Thinking Applied: A Technology Mediated Debriefing Module

Post Design Interview

Semi-structured interview with open-ended questions

Interview Questions

1. I felt my voice was heard during the design sessions

   1=Strongly disagree

   2=Disagree

   3=Agree

   4=Strongly agree

2. I felt my opinions were represented in the final design mock-up/storey board

   1=Strongly disagree

   2=Disagree

   3=Agree

   4=Strongly agree

3. I felt the collaboration among stakeholders was useful during the design process?

   1=Strongly disagree

   2=Disagree

   3=Agree

   4=Strongly agree

4. Can you comment on the time requirements for the design process? What are your thoughts?

5. Can you identify what you think the most valuable part of the design process was?

6. Are you satisfied with the final design mock-up/storey board?
7. On a scale of 1-4, how likely do you think this innovation will be implemented?

   1= definitely won't

   2=probably won't

   3=probably will

   4=definitely will
8. On a scale of 1 – 4 how likely do you think you will support this innovation during implementation?

   1= definitely won't

   2=probably won't

   3=probably will

   4=definitely will

Theory Related Questions:

1. How, do you think, the module will facilitate student's critical thinking skills?
2. How, do you think, the module will help support a learning environment for students to share, connect and feel valued by their fellow learners?
3. How, do you think, the module will enable feedback from teachers and ensure current best practices are reinforced?
4. How, do you think, the module addresses student's emotions that may be experienced post simulation?
5. How, if at all, does the module require acquisition, organization, processing and retrieval of information?
6. How, if at all, does the module support active learning by engaging students to make

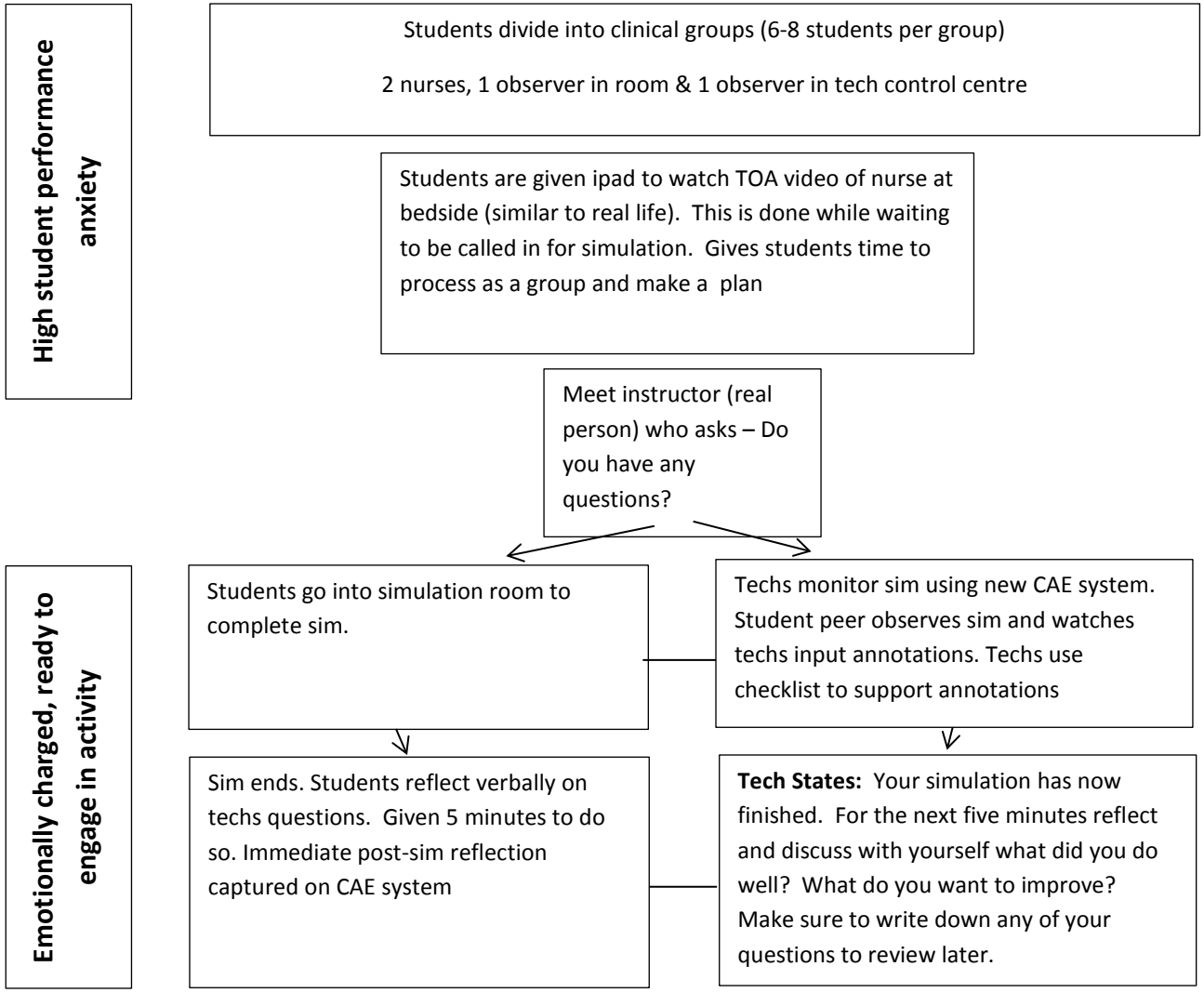
meaning and activate cognition?

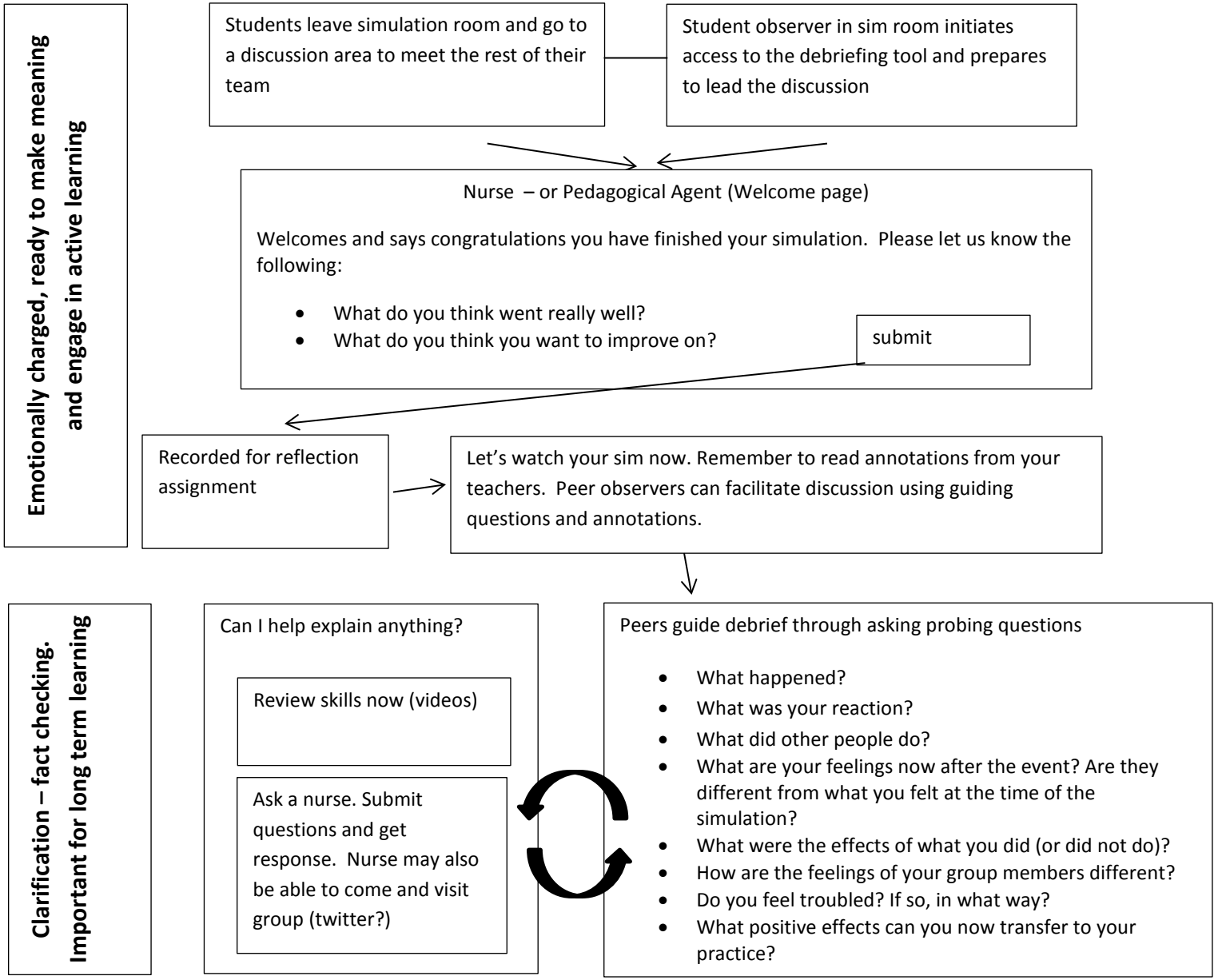
7. How, if at all, does the module support learning from a real world authentic task?
8. How, if at all, does the module support the process of reflecting, validating and learning among a peer group?

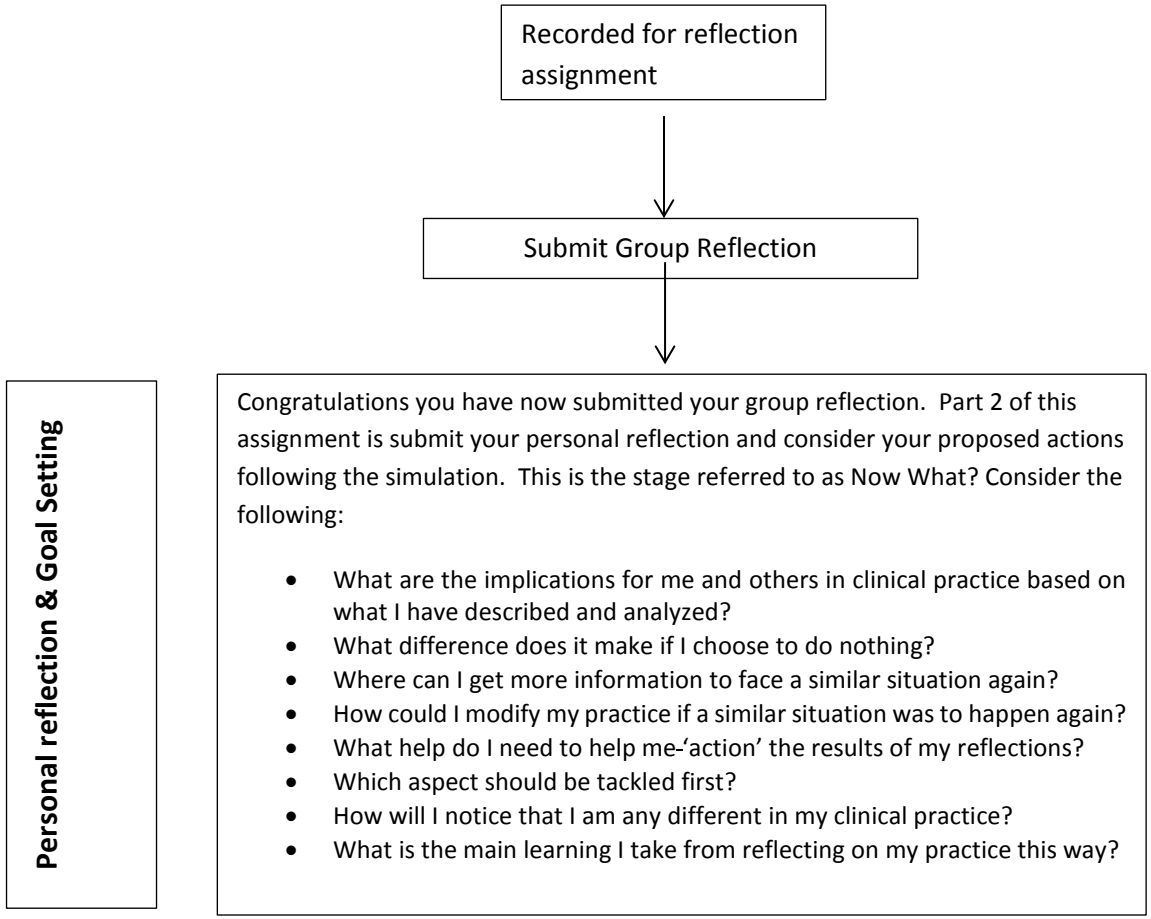
****Note: Additional interview questions may be added to reflect participant feedback as research unfolds during design process.**

Appendix I

Technology Mediated Debriefing Module – Mock up/ Story Board




Emotionally charged, ready to make meaning and engage in active learning
Students leave simulation room and go to a discussion area to meet the rest of their team
Student observer in sim room initiates access to the debriefing tool and prepares to lead the discussion
Nurse – or Pedagogical Agent (Welcome page)
Welcomes and says congratulations you have finished your simulation. Please let us know the following:
What do you think went really well?
What do you think you want to improve on?
submit
Recorded for reflection assignment
Let's watch your sim now. Remember to read annotations from your teachers. Peer observers can facilitate discussion using guiding questions and annotations.
Clarification – fact checking. Important for long term learning
Can I help explain anything?
Review skills now (videos)
Ask a nurse. Submit questions and get response. Nurse may also be able to come and visit group (twitter?)
Peers guide debrief through asking probing questions
What happened?
What was your reaction?
What did other people do?
What are your feelings now after the event? Are they different from what you felt at the time of the simulation?
What were the effects of what you did (or did not do)?
How are the feelings of your group members different?
Do you feel troubled? If so, in what way?
What positive effects can you now transfer to your practice?


Recorded for reflection assignment
Submit Group Reflection
Personal reflection & Goal Setting
Congratulations you have now submitted your group reflection. Part 2 of this assignment is submit your personal reflection and consider your proposed actions following the simulation. This is the stage referred to as Now What? Consider the following:
What are the implications for me and others in clinical practice based on what I have described and analyzed?
What difference does it make if I choose to do nothing?
Where can I get more information to face a similar situation again?
How could I modify my practice if a similar situation was to happen again?
What help do I need to help me-'action' the results of my reflections?
Which aspect should be tackled first?
How will I notice that I am any different in my clinical practice?
What is the main learning I take from reflecting on my practice this way?