DESIGN OF A 3D VIRTUAL LEARNING ENVIRONMENT FOR ACQUISITION OF CULTURAL COMPETENCE IN NURSE EDUCATION: EXPERIENCES OF NURSING AND OTHER HEALTH CARE STUDENTS, INSTRUCTORS, AND INSTRUCTIONAL DESIGNERS

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Abstract

This study investigates how a 3D virtual world or learning environment facilitates nursing and other health care students' acquisition of cultural competence. The study specifically explores the experience of students, instructors, and instructional designers in a 3D virtual learning environment designed specifically for this research. The research questions are: 1) What are the experiences of instructional designers and instructors in a simulated immersive learning environment of a 3D virtual world for the acquisition of cultural competence for students in nursing and other health related fields? 2) What are the experiences of students in a simulated immersive learning environment of a 3D virtual world for the acquisition of cultural competence? The design of the 3D world and analysis of data draw on a framework based on Deweyan and Confucian pragmatist theories of experience. The theoretical framework suggests that learning is best supported through affordances for continuity and interaction, which are essential when designing, integrating, and evaluating simulation and immersion in 3D virtual worlds. Design-based research (DBR) and user experience (UX) methodologies are employed to explore the experience of students, instructors, and other participants. A taxonomy of experience (ToE) established by Coxon (2007) guides qualitative data collection and analysis in this study. Users' data were distilled through nine steps to help experiences to be "seen" and to make abstract concepts comprehensible and visible. The findings include seven themes distilled from the data: 1) Simulation for 3D learning environments is best grounded in real-world contexts; 2) 3D learning environments should be shaped through holistic design; 3) 3D learning environments should include design for embodiment; 4) 3D learning environments should include design for interactivity; 5) 3D learning environments should include design for continuous experience; 6) 3D learning environments should take the complexity of the technical

interface into account; and 7) Design for the acquisition of cultural competence should take the users' experience and knowledge into account. Implications include: 1) Conceptualization of "designer as host" and hospitality through Chinese understandings of guest-host relations; 2) Consideration of virtual experience overlooked within Deweyan and Confucian pragmatism.

Lay Summary

This study has two major components. First, the researcher designed a 3D virtual learning environment to facilitate students' acquisition of cultural competence in nursing and other health care related fields. Second, the researcher explored the experience of students, instructors, and instructional designers in this 3D environment. Deweyan and Confucian pragmatist theories of experience inform the analysis of designers', instructors', and students' experiences. Design-Based Research (DBR) and user experience (UX) methodologies are employed. The taxonomy of experience (ToE) guides the data collection and analysis. The findings include seven themes addressing the design of 3D learning environments and acquisition of cultural competence.

Preface

This research project was originally conceptualized by the author, Jennifer Jing Zhao. The author is also solely responsible for writing this thesis, under guidance of the Supervisor and oversight of the committee. Ethics approval for this research was provided by the University of British Columbia Behavioral Research Ethics Board: certificate #H06-80670.

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Table of Contents

List of Tables

List of Figures

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Chapter 1: Introduction

1.1 Statement of the Problem

Lack of cultural competence of health care providers is a barrier to ethnic or racial populations receiving quality health care services (AHRQ, 2014). Nurses and other health care providers work within an increasingly multicultural and global society. Caring within a specific cultural context is an increasingly significant component in health care. To reflect healthcare in their philosophy of care and provide authentic care to patients, nurses and other health care providers have professional responsibilities to show sensitivity and respect for differences in beliefs and values of patients. Specifically, nurses and other health care providers have to demonstrate sensitivity for the care of an ethnic population, and cultural heritage is a significant factor affecting the perception of health, illness, and accepted treatment modalities of care service providers and patients (Elliott, 2001). In situations requiring cross-cultural health care, sensitivity to the patient's value system is of paramount importance because it may differ markedly from that of the caregiver (Donnelly, 2000).

Patients, families, and their health care providers can become frustrated because of an inability to communicate and understand the medical situation (Kim-Goodwin, 2003). In order to deliver successful health care programs and services, the cultural backgrounds of clients must be taken into account; nurses and other health care providers need to understand various cultural orientations and communicate effectively among various cultures (Bearskin, 2011). Becoming a culturally competent health care professional is an expectation in this multicultural society. To address this need, providing cultural competence training has been a widely used strategy to build capacity for nurses and other health care providers to work across cultural difference

(Bearskin, 2011). Cultural competence has been embedded into nursing standards from the College of Registered Nurses of British Columbia (CRNBC, 2011). Competency-based education (CBE) is a significant part of nurse and other health related education, where competence is described as the ability to do a particular activity to a prescribed standard (Hargraves, 2000). CBE has evolved from its original focus on task-based assessment to more cognitive approaches (Goudreau, Pepin, Dubois, Boyer, Larue, & Legault, 2009).

Traditionally, nursing and other health care related students are placed in a variety of clinical sites including clinics, community health care centers, hospitals and other institutions to consolidate the knowledge learned in classrooms. Because of patient safety and ethical reasons, evidence suggests exclusive traditional clinical placements are not always ideal for providing learning experiences (Heinrichs, Youngblood, Harter, & Dev, 2008). Currently, many nursing and medical schools have integrated mannequin-based simulation as part of the overall education process and curricula (Jeffries, 2005, 2006; Jeffries & Rogers, 2007). Simulation in labs can bridge the gap between theory and practice and enhance nurses' communication and critical thinking skills (Kuhrik, Kuhrik, Rimkus, Tecu, & Woodhouse, 2008; Lapkin, Levett-Jones, Bellchambers & Fernandez, 2010). Before nursing and other health related students are placed in real clinical sites, they apply knowledge and refine clinical skills using mannequins with different levels of fidelity in clinical skills labs. Lab simulation has been a widely proven technique in nurse and other health related education.

The demand for a variety of practice activities in simulated, safe, and supportive environments and engaging digital artifacts (image, text, and sound) (ITS) advanced learning technologies (ALTs) reinforced simulation in 3D virtual worlds. Virtual learning environments provide students with new opportunities to develop clinical experience. Simulation in 3D virtual

worlds saw rapid and substantive integration in college and university education, including nursing and other clinical disciplines (Gaba, 2004, 2006; Han, 2011a, 2011b, 2015, 2016, 2017; Wang, 2012). Effective design of simulation in immersive learning environments has the potential for students to connect knowledge learned in classrooms with real clinical settings. Therefore, the addition of 3D virtual worlds to physical clinical labs can not only release the high demand for lab staff and physical space, but also provides nursing students opportunities to develop their cultural competence in a simulated environment through novel ways of meaning-making. Hence, there is a need for the design of 3D virtual worlds for the acquisition of cultural competence and a need to document students' experiences in these learning environments.

Based on the review of research and trends, my goal was to create an effective 3D virtual learning environment to facilitate students' cultural competence acquisition. Design-Based Research (DBR) User Experience (UX) methodologies facilitate a documentation of experiences in the virtual world.

1.2 Research Questions

This study involves the design of a 3D virtual world or learning environment for nursing and other health related students' cultural competence acquisition. The purpose is to gain understanding of the experience of students, instructors, and instructional designers in this 3D virtual world in order to improve its design and assist other designers. Specifically, the research questions are:

1. What are the experiences of instructional designers and instructors in a simulated immersive learning environment of a 3D virtual world for the acquisition of cultural competence for students in nursing and other health related fields?

2. What are the experiences of students in a simulated immersive learning environment of a 3D virtual world for the acquisition of cultural competence?

1.3 Purpose of the Study

The purpose of this study is to gain understanding of the experience of students, instructors, and instructional designers in a 3D virtual world designed specifically for the acquisition of cultural competence. Building on the literature of simulation in immersive virtual learning environments for nursing and other related healthcare fields, I utilized the OpenSimulator 3D virtual world platform to build an immersive learning environment. Design-based research (DBR) methodology was adopted to test design, and further provide data to understand experiences in immersive virtual learning environments. Ultimately, the results and recommendations resulting from this study provide critical information that can be used in the design of educational environments for nursing and other health related fields.

1.4 Theoretical Framework

I draw on Deweyan and Confucian pragmatist theories of experience and relevant to inform the design and research (Ames, 2003; Kuo, 1985; Petrina, 2007; Petrina, 2010; Petrina, Feng & Kim, 2008; Petrina & Volk, 1995; Sun, 2008). This theoretical framework emphasizes affordances for continuity and interaction, which are essential when designing, integrating, and evaluating simulation and immersion in 3D virtual worlds. The framework is elaborated in Chapter 2.

1.5 Positionality

I grew up in China, did my graduate studies and have been working in Canada. With my inherited Chinese cultural background, I am exposed to Western culture as a cross-cultural learner myself. For my working experience, besides as an educational researcher, I also have advanced knowledge of the complexities of instructional design with more than ten years of experience as an Instructional Designer and eLearning Technologist, I have designed learning environments by simulating complex and naturalistic settings, utilized an eclectic collection of specific approaches to the whole process, from initial problem identification, intervention design and construction, implementation, and assessment to the production of reusable products. Therefore, in addition to the researcher role in this study, I also acted as a designer and cross-cultural learner with an integrated role. Throughout the multiple iterations of DBR iterative approach, I analyzed and re-analyzed the data allowing for multiple viewings.

1.6 Terminology

The section briefly defines a few select terms used in the research design. These terms are elaborated in Chapter 2. Relevant concepts, such as embodiment, interactivity, simulation, and virtual world are elaborated in Chapter 2. DBR and UX are elaborated in Chapter 3. The following two core concepts were defined for the purposes of the research:

Cultural Competence- Betancourt, Green, & Carillo (2002) define cultural competence as "the ability of [providers and] systems to provide care to patients with diverse values, beliefs and behaviors, including tailoring delivery to meet patients' social, cultural, and linguistic needs" (p. 5). More expansively, Campinha-Bacote (1999) defines cultural competence as "the process in which the healthcare provider continuously strives to achieve the ability to effectively work

within the cultural context of a client (individual, family or community)" (p. 203). In this definition, cultural competence has been defined as an ongoing process. These definitions guided the research design and are analyzed in Chapter 2.

Experience- Dewey (1917) defined experience as "a matter of *simultaneous* doings and sufferings" (p. 11). He noted that experience involves experimenting "in varying the course of events" and undergoing "trials and tests of ourselves." For Dewey, learning by or through experience is an active process demanding reflection. Wen (2009) notes that the Chinese word for experience is

> *jingyan* 经验, where original meaning of *jing* 经 means to 'go through' or 'pass'…. The common meaning of *yan* 验 is to 'examine, check, test.' In other words, *jingyan* means a particular road (*jing*) which one chooses or has been chosen to go through, so this road has been or will be examined. (p. 246)

This study was informed by Deweyan and Confucian pragmatist theories of experience and adopted more generally a definition common to UX studies: "An experience is an episode, a chunk of time that one went through— with sights and sounds, feelings and thoughts, motives and actions; they are closely knitted together, stored in memory, labeled, relived and communicated to others" (Hassenzahl, 2010, p. 8). Experience is elaborated in Chapter 2.

1.7 Significance of the Study

The present study explored and designed a variety of practice activities in simulated, safe, and supportive environments by engaging digital artifacts (image, text, and sound) (ITS) and advanced learning technologies (ALTs) to reinforce the simulation in 3D virtual worlds. It helps the candidates of nursing and other health care providers develop sensitivity and respect for

differences in beliefs and values of patients, and further prepares culturally competent health care professionals in the multicultural society.

For instructional designers, this study fostered new ways of design to enhance knowledge and skills acquisition, and attitude transformation, and thus prepared globally-competitive health professionals. Simulation in the 3D virtual world was developed to complement mannequin-based simulation and traditional clinical placements when they were not always ideal to provide learning experiences. The 3D virtual world provided the instructional designers in health care related disciplines with opportunities to develop learning environments through novel ways of meaning-making.

Also, this study provided a case and resources for other educational researchers who would be interested in doing advance work on similar topics. This study could help them to gain experiences and insights.

1.8 Limitations of the Study

Student data were collected from a convenience sample at a postsecondary institution in Metro Vancouver area. The sample is not intended to be representative of the study population. Caution was taken in claiming resonance with other regions and samples.

The study had a limited time frame for DBR iterations due to the scope. The results exam relatively short-term effects of the interventions. The long-term effects are unknown. For future research studies, ideally more DBR iterations will be conducted and continue throughout a longer time frame.

1.9 Dissertation Overview and its Structure

The dissertation is divided into five chapters. Chapter 1 provided an overview of the background, research questions, purpose of the study, a brief definition of core terms, and statement of limitations. Chapter 2 provides a review of literature for the theoretical framework and relevant concepts. Deweyan and Confucian theories of experience were integrated to guide this study and are reviewed. Characteristics of educational affordances of 3D virtual worlds, including simulation, embodiment, and interactivity, are reviewed and presented. These concepts are essential when designing, integrating, and evaluating simulation and immersion in 3D virtual worlds. Concepts of culture and cultural competence are reviewed and defined. Transcultural nursing and transcultural nursing models are reviewed.

Chapter 3 presents the methodological framework used in this study including DBR as the primary and UX as the secondary. Research design, considerations, instruments, and the use of the Taxonomy of Experience (ToE) to explore the experience of students, instructors, and other participants in 3D virtual worlds are introduced and described. Chapter 4 is organized by the seven iterations of DBR based on McKenney and Reeves' (2012) model. These results are presented and explored through iterations based on the research design and questions. The ToE and the analytic approach of SEEing are adopted as systematic processes to analyze the qualitative data. Seven themes are distilled from the most relevant elements of user experiences through data analysis. Chapter 5 concludes with a summary of the research findings and conclusions, along with implications and recommendations for future research.

Chapter 2: Literature Review

2.1 Introduction

In this chapter, I provide a review of literature relevant to central and core concepts in the theoretical framework for the study. First, I draw on Deweyan and Confucian theories of experience (Ames, 2003; Kuo, 1985; Petrina, 2007; Petrina, 2010; Petrina, Feng & Kim, 2008; Petrina & Volk, 1995; Sun, 2008). Dewey's theory of experience mainly articulated in *The School and Society* (Dewey, 1900), *The Child and the Curriculum* (Dewey, 1902), and *Experience and Education* (Dewey, 1938), together with commentaries by scholars and thinkers is explored. Second, I reconcile Dewey's theories of experience with Chinese theories. Third, I historicize Dewey and Confucian theories relative to simulated experience and immersive experience in 3D virtual worlds. Characteristics of 3D virtual worlds are discussed. The balance of the chapter provides a review of literature relevant to cultural competence and models that illustrate the scope of this construct.

2.2 Theoretical Framework

2.2.1 Dewey and the Philosophy of Experience

All genuine learning comes about through experience. (Dewey, 1938)

2.2.1.1 Background

Doing is not, automatically, learning. If hands-on activity or experience is to be meaningful, it has to be purposefully planned, reflective, and transformative. (Petrina, 2007)

People usually misinterpret Dewey's philosophy of experience and experiential learning as "learning by doing" or "trial and error" learning. Actually, the meaning of experience is

insufficiently understood. Dewey's philosophy of experience is complex and it involves more than simply actively doing. What is Dewey's idea of experience? In the following sections, I present what Dewey understood by experience to comprehend the basic concepts that Dewey uses to analyze experience and education.

Dewey clearly and concisely replied to common misunderstandings and misinterpretations of his idea of experience in the book *Experience and Education*. As a major contribution to educational philosophy, *Experience and Education* was first published in 1938, late in his career. Based on his experience with schools in his earlier days, Dewey established his first experimental school in the US called the University Elementary School in 1896, which is later more commonly known as the Laboratory School (Jackson, 1998; Simpson, 2001, 2006). The curriculum of the Laboratory School focused on the child along with the subject matter. Dewey tested his notion of integrating education with experience. Dewey's early work in the Laboratory School laid foundations for the formation of the philosophy of experience.

In *Experience and Education*, Dewey articulated the concepts, compared and reflected on the quality of experiences by analyzing and criticizing progressive and traditional education, the two extremes, and further developed his philosophy of experience, which called for a unifying new education. From Dewey's viewpoint, traditional education sets up the student to play a passive, receptive role during the educational process. Dewey's philosophy of education embraces the natural urges of the student. The traditional school "relied upon subjects or the cultural heritage for its content" and "imposed the knowledge, methods, and the rules of conduct of the mature person upon the young", without realizing "the knowledge and skill of the mature person has no directive value for the experience of the immature" (1938, p. 21). Consequently, it

"entailed rigid regimentation and a discipline that ignored the capacities and interests of child nature" (p. 10).

Opposite to narrowness and formalism of traditional education, progressive education advocates the democracy and freedom. Therefore, progressive education has better features of expression and cultivation of personality, free activity, and learning through doing.

Dewey articulated the "ultimate reason" for the popularity of progressive education is that "it seems more in accord with the democratic ideal to which our people is committed than do the procedures of the traditional school, since the latter have so much of the autocratic about them" (p. 33). Dewey noted emphasizing the freedom of the learner is very important, but what does freedom mean and what are the conditions under which it is capable of realization?

Progressive education philosophy "professes to be based on the idea of freedom; to proceed as if any form of direction and guidance by adults was an invasion of individual freedom" (p. 22). The progressive school's "inchoate curriculum, exalted the learner's impulse", and caused "excessive individualism and spontaneity, which is a deceptive index of freedom" (p. 10). Progressive education was actually "a matter of planless improvisation (which) make little or nothing of organized subject-matter of study." There is "no place and meaning of subject-matter and of organization within experience." There could not be an education result when "the materials of experience are not progressively organized" (p. 20).

In *Experience and Education*. Dewey (1938) clarifies the importance of the environment: "There are sources outside an individual which give rise to experience… No one would question that a child in a slum tenement has a different experience from that of a child in a cultured home" (p. 39). "Surroundings are conducive to having experiences that lead to Growth" (p. 39).

Further, Dewey theorizes experience in *Experience and Education* with two principles, continuity and interaction. These two principles to provide criteria to evaluate experience.

Dewey proposed a "new" education based on his cohesive theory of experience. The following section illustrates his ideas of experience and its educational potentialities.

2.2.1.2 The Criteria of Experience

To articulate and analyze the philosophy of experience in its educational function and force, Dewey used continuity and interaction as two principles. The interactive union and dynamic action of these two principles also provide criteria to measure the educative significance and value of an experience. In this section, I analyze and reflect on these two principles and take both together to see the whole picture to further understand why Dewey thinks that they are key criteria.

2.2.1.2.1 Continuity

Continuity describes the longitudinal dimension of experience. It's also called the "experiential continuum" according to Dewey (1938, p. 28). Continuity relates to the individual and incudes previous, present and future encounters. The person's prior experience has impact of present experience, and the present experience modifies the quality of subsequent experiences. Dewey clarifies: "the principle of continuity of experience means that every experience both takes up something from those which have gone before and modifies in some way the quality of those which come after" (p. 35). Present experience creates a scaffold for further learning and allows for further experiences and reflection. Continuity arouses curiosity and fosters growth,

which is not mere growth, but the growth that will "create conditions for further growth", which carries a person to a new and stronger place in the future (p. 36).

Dewey clearly said that not all experience was educative in terms of continuity; some experience was miseducative. “Genuine education comes about through experience does not mean that all experiences are genuinely or equally educative. Experience and education cannot be directly equated to each other” (p. 25). Educative experience is distinguished from miseducative experience based on whether the experience affects the quality of further experiences for better or worse. “Any experience is miseducative that has the effect of arresting or distorting the growth of further experience…The possibilities of having richer experience in the future are restricted” (p. 26).

Dewey’s principle of continuity indicates experience is an iterative process. He highlighted growth as one exemplification of continuity. He indicated “educative process can be identified with growth when that is understood in terms of the active participle” (p. 36). “Surroundings are conducive to having experiences that lead to Growth” (p. 40). He also emphasized that growth creates conditions for further growth.

2.2.1.2.2 Interaction

The principle of interaction describes the latitudinal dimension of experience, which refers to aspects of experience as they relate to the interactions between an individual and the environment. Environment is ‘‘whatever conditions interact with personal needs, desires, purposes, and capacities to create the experience” (p. 44). Interaction entails dynamic encounters between objective conditions and internal conditions. Any experience is interplay of these two

sets of conditions. Objective conditions and internal conditions interact dynamically and change, for instance in UX, both the user and the context of use.

Experience is true experience only when "objective conditions are subordinated to what goes on within the individuals having the experience" (Dewey, 1938, p. 41). In this specific situation, only the curriculum subordinated to the child can create true learning experiences. However, indiscriminately subordinating to the "immediate internal condition" in progressive education caused many experiences to be non-educative. Dewey gave a mother an example to further explain: "Education is a process of overcoming natural inclination and substituting in its place habits acquired under external pressure" (p. 17). Also, "every genuine experience has an active side which changes in some degree the objective conditions under which experiences are had" (p. 39). Therefore, neither completely student-driven, absolutely free, unstructured style of education nor overly structured, prescriptive approaches are congruent with Dewey's philosophy of experience.

These two principles of experience, interaction and continuity, are interrelated. Both principles must be taken together to "provide the measure of the educative significance and value of an experience" (p. 44).

2.2.2 Deweyan and Confucian Pragmatism

Dewey's philosophy of experience was influential outside America. For philosophical essence and educational insights, there are connections between Dewey's philosophy of experience and Chinese philosophies. Scholars have brought Confucius and Dewey together in philosophical engagements as the connecting point between east and west (Ames, 2003; Grange, 2004). Whitehead once said in reference to Dewey: "If you want to understand Confucius, read

John Dewey. And if you want to understand John Dewey, read Confucius" (quoted in Price, 1954, p. 145).

> Hu Shi, a famous Chinese innovative educator at the time of Dewey, commented:
>
> We can say that since the very beginning of the encounter between China and west cultures, no other foreign scholars influence the circle of thoughts in China as greatly as Professor John Dewey. We can also say that during a couple of decades in the near future, maybe no other foreign scholars in west world can give rise to more influence than Professor John Dewey. (quoted in Jiang, 2000, p. 277)

This following section explores and presents the relationship between Dewey's philosophy and Confucian philosophies to further understand the philosophy of experience.

2.2.2.1 Confucianism and Neo-Confucian Philosophies

Philosophy in China is rooted in Confucianism, Daoism, and Buddhism. Among them, Confucianism is the leading philosophy. Neo-Confucianism is the blend of these three influences (Zhang & Zhong, 2003). Confucius and his followers' traditions are deeply rooted in China and other East Asian nations.

Confucius, 551–479 BC, is the most well-known philosopher and educator in the history of China. Confucianism refers to Ru School of Chinese thought, and neo-Confucianism derives from his thought and works. His philosophy includes the fields of ethics and politics, emphasizes personal and governmental morality, social relationships, and education. Confucius lived during the 6th and 5th centuries BC. Laozi (Lao Tzu), the Father of Daoism (also called Taoism), introduced later, also lived at this time, perhaps a few decades senior to Confucius. Daoism was

quite different from Confucianism. Both are the two great indigenous philosophical traditions of China. Buddhism was introduced from India to China later in 64 AD.

Confucius left behind a rich collection of ideas and practices. The authoritative books of Confucianism are the Four Books (四书) including *The Analects*, *The Great Learning*, *The Book of Mencius*, and *The Doctrine of the Mean*, plus Five Classics (五经) including *The Book of Songs*, *The Book of History*, *The Book of Changes*, *The Book of Rites*, and *The Spring and Autumn Annals*. Along with the Dao teachings of Laozi and Zhuangzi, the teachings of Confucius have been extremely influential in shaping the cultural development of China (Bleeker & Widengren, 1971, p. 478).

Confucius's teaching philosophy is articulated in *The Analects*, which forms the foundation of the Chinese tradition of education and the ideal human.

> Confucius was a very influential teacher, and what is more important and unique, China's first private teacher…several tens of his students became famous thinkers and scholars... His ideas are best known through the Lun Yu or Confucian the *Analects*, a collection of his scattered sayings which was compiled by some of his disciples. (Fung, 1948, p. 39)

The Analects stress the importance of *ren*, which loosely translates as human-heartedness. The ideas of life fulfillment are through associating with others, including family life, community life, and national life.

Neo-Confucianism, developed since the eleventh and twelfth centuries, has reached new levels of vitality. Although the beginning of Neo-Confucianism may be traced back to Han Yu and Li Ao, its system of thought did not become clearly formed until the eleventh century, in the Song dynasty (Fung, 1948). There are various branches of Neo-Confucianism. According to Ames (2003) and Chan (1973), the great philosopher Zhu Xi (1130-1200) is one of the major

representatives of the systematic and theoretical wing of neo-Confucianism. Zhu's version of Confucian thought, known as Dao Xue (道学), the Learning of the Way, is about the teaching of principles. It served as the basis of civil service entrance examinations from the year 1313 until the beginning of the 20th century (Chan, 1973, p. 589).

The second phase of revival was completed by Wang Yangming (1472-1529) in the Ming dynasty. Wang's heart-and-mind's version of Confucian thought is known as Xin Xue (心学). The emphasis of Wang's program is on internal cultivation. Zhu Xi focuses more on intellectual learning even though he does not rule out introspection as a means to self-cultivation. The last Chinese Neo-Confucian movement is known as Han Xue (汉学) in the Qing Dynasty (清朝) (1644-1911). This movement introduced Evidential Research (考证学). It is against the speculative and personal moral philosophy of both Zhu and Wang and focus on philologically-centered historical scholarship. It has strong pragmatic concerns and promotes the analysis of particular historical events and cultural artifacts as a resource for finding answers to concrete problems of human beings. Neo-Confucianism was an attempt to create a more rational and secular form of Confucianism by rejecting superstitious and mystical elements of Daoism and Buddhism (Huang, 1999; Blocker & Starling, 2001).

2.2.2.2 Dewey's Visit to China

In addition to China, Dewey lectured and taught in schools and universities in Japan, Turkey, Russia, and Mexico (Campbell, 1992). Dewey was invited to lecture at University of Peking in China from April 30, 1919 to July 11, 1921. His connection with China began earlier when he was at Columbia as he had a group of Chinese students including Hu Shih, Jiang

Menglin, Zhang Bolin, and Tao Xingzhi, who played important roles in China's history and continued to influence Chinese intellectuals thereafter (Keenan, 1977; Zhang, 2014).

During Dewey's two-year visit in China, he visited 14 provinces and metropolises, including Beijing, Shanghai, Tianjin, Liaoning, Hebei, Shanxi, Shandong, Jiangsu, Zhejiang, Hunan, Hubei, Jiangxi, Fujian, and Guangdong (Zhang, 2014). While in China, he published 30 articles and gave over 120 lectures to a variety of institutions, of which less than a third have been recovered (Clopton, R.W. & Ou, 1973). The Chinese translations of these lectures were published in 5 books, including *John Dewey's Lectures in China* (October, 1919), *John Dewey's Five Series of Lectures* (August, 1920), *John Dewey's Three Series of Lectures* (February, 1921), *The Collection of Lectures from John Dewey and Bertand Russell* (September, 1921), and *John Dewey's Philosophy of Education* (October, 1921). Among them, Jo*hn Dewey's Five Series of Lectures* was reprinted for 14 times in two years (Zhang, 2014). In addition, he was deeply involved in the actions and study of Chinese society, culture, and politics. He published 16 papers in the *New Republic* (from July 16, 1919 to July 20, 1921), 6 papers in Asia (from November, 1919 to July, 1921), and 1 paper in the *Educational Review* (April, 1920). On May 12, 1919, he was invited to visit the former President Sun Yat-sen (Zhang, 2014).

2.2.2.3 Compatibilities and Similarities between Deweyan and Confucian Pragmatism

Before returning to Dewey, I examine similarities between the definitions of experience in Chinese and English. The Chinese word for experience is *jing yan* (经验). According to the *Dictionary of Modern Chinese* (Xiandai hanyu cidian 现代汉语词典 2016, the seventh edition), *jing yan* can be used as a noun and verb. When it is used as noun, it refers to knowledge or skill abstained through practice. Also, it can be used as a verb, meaning to prove efficacy (*yan*) by

personally going through (*jing*). In this way, *jing yan* is a concrete process with the continuity in context, and it is tangible and achievable. Similarly, according to Wen (2009), "*jing*" also means "go through" or "pass". The meaning of "*yan*" is to "examine, check, test. " *Jing yan* is a correlative expansion and a subjective-objective mutual movement.

In English, according to the definition of experience in the *Oxford English Dictionary* (*OED*), the origin of experience is from late Middle English: via Old French from Latin *experientia*, from *experiri,* 'to try'. The verb form of experience means "Encounter or undergo (an event or occurrence), feel (an emotion or sensation)." Steinaker and Bell (1979, p. 2) note that in *Webster's* (*Webster's New World Dictionary*, second college edition), experience is an actual "living through an event or events." Petrina (2018) emphasizes that the "living through" of an experience involves the total personality, and further suggests that an experience cannot be understood by fragmentation or isolation; it has identity, continuity, and interaction— a broad base involving all human senses and activities. Individuals think of experience as an integrated whole involving mind, physical being, and the sum of their previous experience.

Dewey (1934) defined experience as "the result, the sign, and the reward of that interaction of organism and environment which, when it is carried to the full, is a transformation of interaction into participation and communication" (p. 22). Here, Petrina (2018) summarizes, humans and nonhumans, young and old, alike have or learn from experiences. Experience is a way of making sense of what happened. These definitions of experience are clarified by Chinese scholar Wen (2012): "experience implies people partake of events personally, living through events via this participation (p. 441)." Both Chinese and the English words for experience stress interaction with the environment. Variations on Deweyan and Confucian definitions are common in UX studies: "An experience is an episode, a chunk of time that one went through— with

sights and sounds, feelings and thoughts, motives and actions; they are closely knitted together, stored in memory, labeled, relived and communicated to others" (Hassenzahl, 2010, p. 8).

The idea of learning through experience in Chinese philosophy is found in Confucius. "I hear and I forget, I see and I remember, I do and understand" (Confucius, 450 BCE). This is congruent with what Dewey states: "there is an intimate and necessary relation between the processes of actual experience and education" (1938, p. 20). In the following section, I identify the similarities between Dewey's ideas and Chinese thoughts about experience in a holistic view. Some topics are more generally philosophical than educational. However, they are significant in the theoretical framework for the research.

Holistic view

Philosophers including Hall and Ames, Tu, and Grange have reflected on and described the significant connections between Deweyan and Confucian pragmatic thinking. Both take holistic views of knowledge and human experience; they understand the world as an intrinsically relational one. The human and their surroundings are relational, interdependent with each other, and co-emergent. A learner and the learning environment are an organismic continuum, which cannot be dichotomized or fragmented (Zhang, 2014).

Dewey is clear that there is no person, entity, or thing that exists in isolation. He insisted on the unity between ideas and experience, knowing and acting, knower and known. Ideas need to be actualized by practical experience and guide their everyday activities (Campbell, 1995). Dewey has plenty of works that are titled binomial rather than singular, such as *Experience and Education (1938), The School and Society (1900), The Child and the Curriculum (1902),*

Democracy and Education (1916), Experience and Nature (1925), etc., which reflects his resolution of dualisms and beliefs in interconnectedness and inseparability.

Similarly, Confucians emphasize the environment of the learning experience. There is a famous traditional Chinese story titled "Mencius' Mother, Three Moves," which is about how she raised her son properly by moving homes three times. Mencius (372-289 BCE) is a Chinese philosopher who was one of the most famous Confucians after Confucius. This story illustrates the emphasis that Mencius' mother placed on her son's learning environment. Mencius lost his father early when he was still a young child and the family was very poor. However, Mencius' mother moved their home three times because of the educational impact of their living environment. First, they lived beside a cemetery. When Mencius played, he imitated mourners in funeral processions. His mother decided that environment was not right for her son to live; Then they moved to a place near a market, Mencius played imitating the peddlers' hawking and salesmen's bargaining. His mother decided to move again. The third time, she chose a house besides a school. Inspired by the scholars and students in the school, Mencius behaved in the same polite manner as the teachers and students and learned from them. When Mencius grew up, he became a great Confucian philosopher, second only to the founder Confucius.

As indicated, Wen (2009) explored "Confucian pragmatism," a counterpoint of American pragmatism. Wen shows the conceptual overlap between Deweyan and Confucian pragmatism. It is understood that Confucian pragmatism starts from the fullness of experience and contextualization. He argues that "wisdom is about knowing that mind is continuous with things/events" (p. 231). From a perspective of the wholeness of experience in Confucian pragmatism, "events are continual parts of a person "and "events come and go through the process a person experiences metaphysically" (p. 235). Confucian pragmatism emphasizes

experience as its field. “The mind views its context through the realization of the wholeness of experience and world” (Wen, 2009, p. 234).

2.2.2.4 Integrated Framework of the Philosophy of Experience for this Study

Based on the reflection on the connections, to help interpret the UX data, I integrated Deweyan and Confucian pragmatism. Although Dewey wrote in the late 19th and early 20th century and Chinese philosophies existed in ancient times, the contributions of their insights remain relevant.

2.3 Learning Experience in the Context of Virtual Worlds

2.3.1 Introduction

As we think about the changes in educational practices, naturally media and technology offer vast resources for new learning opportunities. Scholars from various disciplines have shown increasing interest in using well-designed digital interactions in 3D virtual worlds to support learning (Gee, 2003; Han, 2018; Prensky, 2001). Deweyan and Confucian philosophies of experience suggest that learning is best supported through affordances for continuity and interaction, which are essential when designing, integrating, and evaluating educational simulations in 3D virtual worlds. How can features of virtual worlds contribute to cultural properties and create holistic learning experience? These are key concerns for instructional designers, educators and researchers. A virtual world can be used to simulate and extend physical experience or provide new avenues to develop previously unattainable experiences. This has an impact on nurse and other heath related professionals’ education.

2.3.2 3D Virtual World Definitions and Characteristics

My research is conducted in a 3D virtual world. The virtual world is the design artefact and intervention. What is a 3D virtual world? Levy (1995) develops Deleuze's conception of "the virtual" in *Becoming Virtual: Reality in the Digital Age*. To examine the cultural and social impact of digital technologies, Levy tackles the concept of "the virtual," defining it alongside "the real," "the actual," and "the possible." "Virtual" is derived from the Medieval Latin *virtualis*, itself derived from *virtus*, meaning strength or power (p. 23). Levy further explained:

> The virtual, strictly defined, has little relationship to that which is false, illusory, or imaginary. The virtual is by no means the opposite of the real. On the contrary, it is a fecund and powerful mode of being, which expands the process of creation, [and] opens up the future…. In scholastic philosophy the virtual is that which has potential rather than actual existence. The virtual tends toward actualization, without undergoing any form of effective or formal concretization.…the virtual should not be compared with the real but the actual. (pp. 16, 24)

Then, what is a virtual world? According to Bell (2008), a virtual world is "a synchronous, persistent network of people, represented as avatars, facilitated by networked computer" (p. 3). Of course, networked computers nowadays also refer to mobile devices. Similarly, Aldridge describes virtual worlds as three-dimensional, multiplayer environments with a social context (2009). Both definitions emphasize the human and social aspects of this platform. In 3D virtual world environments, participants use avatars, the online graphical representations of themselves, to communicate and exchange data with each other through real-time voice chat or textual chat tools (Delwiche, 2006). Boellstorff's (2006) definition is that

virtual worlds are “places of human culture realized by computer programs through the internet” (p. 17). Virtual worlds are places and, therefore, constitute sites for cultural production.

According to Boellstorff et al. (2012), virtual worlds possess four characteristics. First, they are places and have a sense of worldness. They offer an object-rich environment that participants can traverse and with which they can interact. Second, virtual worlds are multi-user in nature; they exist as shared social environments with synchronous communication and interaction. Third, they are persistent: The environments continue to exist and develop even as participants log off (Bartle, 2004). Fourth, virtual worlds allow participants to embody themselves, usually as avatars, such that they can explore and participate in the virtual world (p. 7).

From these essential characteristics, virtual worlds resemble physical worlds so as human cultural contexts can be cultivated virtually. Virtual worlds produce new ways to express a human life (Boellstorff, 2008). With these unique characteristics, virtual worlds provide for human sociality; community is longer be restricted in relation to geographic location. The preference of students for more diverse, interactive experiences than traditional instructional methods further adds to the credibility of using virtual worlds and other advanced learning technologies (Mauro, 2009).

How do 3D virtual worlds provide an affordance for the interaction and continuity of learning experience? How do 3D virtual worlds contribute to the acquisition of cultural competence of nursing and other health care related students? These are key concerns for educational designers and educators using 3D virtual worlds.

2.4 Current Design Practices of Virtual Worlds

2.4.1 3D Virtual Worlds in Education

There is a growing body of educational attempts to use 3D virtual worlds, which is being considered as a potential medium to provide learners with new environments (Corder & U-Mackey, 2018; Dass, Dabbagh, & Clark, 2010; Davies, Arciaga, Dev, & Heinrichs, 2015; de Freitas & Veletsianos, 2010; Delwiche, 2006; Jarmon, Lim, & Carpenter, 2009; Peddle et al., 2019; Shaffer, Squire, Halverson, & Gee, 2005). Scholars from various disciplines have recently shown increasing interest in researching well-designed digital interactions in 3D virtual worlds to support learning.

Literature suggests 3D virtual worlds can offer more educational affordances compared to traditional educational technologies. Livingstone and Kemp (2006) claimed that 3D virtual learning environments are indicative of "the future of human interaction in a globally networked world" (p. v). Stoerger (2010) further stated that educators view immersive virtual environments as "powerful in that they enable students to learn through seeing, knowing, and doing within visually rich and mentally engaging spaces" (p. 3). As a media-rich platform, 3D virtual worlds offer the possibility of immersive experiences for learners through the realistic simulations that enhance deeper learning (Delwiche, 2006; de Freitas & Neumann, 2009; Gee, 2003). Practicing in simulations helps students build knowledge in a more experience-based way, which builds contextual layers to allow easier knowledge transfer to real learning situations.

3D Virtual worlds can be used for people to communicate and share interests from distributed locations with a graphical user interface to simulate real-time interactions and communications in real world. The use of avatars in virtual worlds overcomes the limitations of text-based platforms by creating virtual space with a sense of place. It gives educators and

learners the means to display real-time, nonverbal communication cues including gestures and emotional state indication.

Warren and Brixey (2008) pointed out that students were provided a sense of presence in the virtual world. The use of personal avatars contributed to the creation of a sense of telepresence, the sense of "being there", and copresence, a "sense of being together" (Schroeder, 2002, pp. 3-4; Wang, 2012). Loureiroa and Bettencourtb (2014) further confirmed in their recent study the implementation of learning contexts through Second Life (SL) 3D immersive worlds provided a physical presence feeling for students, which eliminated the sensation of isolation in a distance learning context because the presence of an avatars. These avatars emulate and simulate the actions and the emotions of their peer students.

Corder and Mackey (2018) explored the synergies between the affordances of 3D virtual worlds and intercultural competence development, and further conducted action research on the efficacies of using SL to develop cultural competence in an undergraduate cultural competence module at a New Zealand university. SL in this study offered a rich authentic experiential, explorative, and holistic environment for developing intercultural competence. Students experienced respective shifts in their cultural identities, values, and beliefs, which fundamentally influenced their behaviors during their intercultural encounters (Corder & U-Mackey, 2018).

Livingstone and Kemp (2008) and Hew and Cheung (2010) concluded that virtual worlds were utilized in several ways: role plays, simulations, group work and community building, constructive and experiential spaces. Through 3D virtual worlds, students learn new concepts and acquire new knowledge, engage meaningful learning activities and developed teamwork skills (Baker, Wentz, & Woods, 2009).

2.4.2 3D Virtual Worlds in Health Disciplines

Simulated educational environments have been widely used in a variety of disciplines. Health, nursing and other health related areas are where 3D virtual worlds have been most frequently used. They have long used virtual simulation as part of the repertoire of learning activities (Boulos & Toth-Cohen, 2009; Le, 2018; Peddle et al., 2019; Hew & Cheung, 2010). The following is a review of the applications of 3D virtual world in health-related disciplines.

One typical example is CliniSpace, which is created as a 3D Virtual Simulation Center (VSC) in an immersive clinical environment (http://www.clinispace.com/). CliniSpace center was founded by Parvati and Heinrichs at Stanford University with the objective to provide hands-off training for nurses and other allied healthcare professionals.

In 2015, Davies and his colleagues did a study utilizing interactive virtual patients in CliniSpace at the Charles R. Drew University of Medicine, an affiliate of the UCLA School of Medicine (Davies et al., 2015). Based on the clinical content in CliniSpace applicable to both medical and nursing students, and the ability to customize the interactive virtual patients and scenarios, Davies and his colleagues developed an Inter-Professional Education (IPE) program for the preclinical/undergraduate learners. Faculty facilitator, IT personnel, virtual standardized patient actors and other related participants were involved as well. During the study, the virtual simulation capacities in CliniSpace were able to replicate nearly all the essential aspects of traditional IPE mannequin/standardized patient-based simulations, which enable learners to more easily transfer knowledge to real clinical settings.

Davis et al. (2015) concluded that the immersive simulation in CliniSpace was an ideal educational modality to teach and train students and it overcame the limitations of the “temporal,

geographic, logistical, limited resources, difficulty in set-up of scenarios, and the need for students and facilitator to be physically present at the same location" (p. 145).

SL is another major 3D virtual world platform in medicine related areas. It is used in the Bachelor of Science in Nursing (BSN), accelerated BSN, and masters nursing programs (Skiba, 2009). Most nursing students have enjoyed the experience because SL offers access to experiences beyond what they usually gain through traditional clinical practice (Skiba, 2009). The University of North Carolina offered a virtual health clinic via SL (Baker et al., 2009). Virtual office components in-world increase interaction between professors and students. The University of Wisconsin Oshkosh College of Nursing developed a virtual learning center in SL virtual world to facilitate their online bachelor's degree programs. The center includes a student welcome center, offices, classrooms, a library and etc. synchronous sessions including classes, faculty/student office hours, and chats hosted in-world (Skiba, 2009). Similarly, Warren and Brixey introduced SL to teach graduate nursing students informatics at the University of Kansas. The interaction among student peers, between students and faculty were conducted in-world. Students and faculty meet in simulated real-world classroom. Synchronous PowerPoint presentations and asynchronous poster sessions were hosted in-world (Warren & Brixey, 2008).

Miller, an instructor at Tacoma Community College, has been using nursing educational simulations in SL and Opensim to train Registered Nurses (RN) since 2007. He has used robotic avatars that are scripted to simulate usual patient care scenarios in nursing practice. Also some medical equipment are designed and created including medicine, vitals, patient charts, etc. These simulated virtual environments expose students to various experiences in patient care (Skiba, 2009). Miller stated students were able to practice clinical skills with simulated patients before

and after high-fidelity mannequin simulations. Simulation videos are online at YouTube (Skiba, 2009).

Jong, Savin-Baden, Cunningham, and Verstegen, (2014) presented the REVIEW, which is a problem-based learning (PBL) project in SL immersive virtual world at Coventry University and St George's Medical School in the United Kingdom. The PREVIEW project tested a replacement of traditional paper PBL cases with virtual patients delivered through SL. Evaluation results indicated SL immersive virtual world could "provide a more authentic learning environment than classroom based PBL and therefore changes the dynamic of facilitation. An immersive 3D environment can provide greater realism, active decision-making and a suitable environment for collaboration amongst work-based learners meeting" (p. 283).

After a review of research on potential benefits of applications in 3D virtual worlds, three themes emerged, including simulation, embodiment, and interaction. Details are elaborated in the following section.

2.5 Educational Affordances of 3D Virtual Worlds

The concept of affordances originated in cognitive psychology and was further developed in the design literature (Norman, 1999). The following explains the affordances of 3D virtual worlds.

2.5.1 Simulation

Simulation, drawn from the Oxford English Dictionary (*OED)*, refers to conditions "created artificially in order to study or experience something that could exist in reality" ("Simulation," 2013, para.1). Simulation has long been used as training tools in health education.

It complements current teaching methods for clinical trainings, especially in nursing, midwifery, and other health related disciplines (Aldrich, 2009; Dalgarno & Lee 2010; Davies et al., 2015; Murray et al., 2008; Savin-Baden, 2010).

With the ability to mimic reality, scenario-based simulation provides students with experiences similar to real life (Belei et al., 2009; Corder & U-Mackey, 2018). Evidence suggests simulation in clinical education can assist nursing and other health related students to make the transition of knowledge learned from textbook to actual patient care and clinical environments (Campbell & Daley, 2009; Jeffries, 2006). Students can practice clinical skills in scripted scenarios including clinical decision making, critical thinking, and team building. Simulated environments are especially valuable for the practice in scenarios that are difficult, costly, or risky (Taekman & Shelley, 2010). Comparing to traditional online learning, which has limited training functions due to its unrealistic settings, simulation in 3D virtual world adds a visual component that "redefines the landscape of online interaction away from the text and towards a more complex visual medium" (Jeffries, 2006; Thomas & Brown, 2009, p. 38).

In simulation, level of fidelity is the key criteria to measure similarity. Fidelity is defined as "the degree of similarity between the training situation and the operational situation which is simulated" (Sauvé, Renaud, & Kaufman, 2010, p. 4). For deploying simulation in virtual worlds in healthcare education, Taekman and Shelley (2010) described different activities requiring different levels of fidelity. For example, carrying out virtual surgery will require a highly realistic environment, whereas teamwork and communication training among health care professionals do not have the same requirements. My study focuses on cultural competence acquisition for nursing and other health care related students, which belongs to the second category. Therefore, no highly realistic simulation is required.

2.5.2 Embodiment for Role Play

According to Csordas (1993), "embodiment can be understood as an indeterminate methodological field defined by perceptual experience and the mode of presence and engagement in the world" (p. 135). Virtual embodiment is shaped by the user's prior virtual experiences and the virtual mode or platform itself. For instance, in 3D virtual worlds, an avatar is the user's on-screen persona, which Gerhard, Moore and Hobbs (2004) describe as "user embodiment" in a virtual environment (p. 5). Away from the text-based online interaction navigated through text-hyperlinks, virtual worlds provide the embodiment of learners in the form of avatars (Thomas & Brown, 2009). Avatars can do various actions such as walk, run, fly and different gestures that users can control using keyboards, joysticks, mice, touchpads, or touch screens. With identities embodied with avatars, learners can immerse in 3D content through interacting with other participants. Avatars make it possible for learners who are geographically distributed to co-present in a common shared virtual space (Wang, 2012). Visual interaction with avatars is part of this embodiment (Bailey & Moar, 2001).

A 3D virtual world enables "role playing, collaboration, real-time interactions between students and faculty, and experimentation" in nursing clinical education (Skiba, 2009, p. 129). Savin-Baden (2008) claimed that 3D virtual worlds are effective for role playing, fostering dialogic learning, and social interaction. From situated learning and experimental learning perspectives, many researchers developed and utilized role-playing scenarios in 3D virtual worlds, which suggested an implicit shift to an experiential learning (Davies et al., 2015; Jamaludin, Chee, and Ho 2009; Jarmon et al. 2009). The pedagogical affordance of 3D virtual worlds for role play is commonly used in nursing and other health related education.

According to Lowenstein (2011), “Role play is a dramatic technique that encourages participants to improvise behaviors that illustrate expected actions of people involved in defined situations” (p. 187). Role plays in nursing and related health professions may be scripted, semi-scripted, and unscripted. Semi-scripted and unscripted scenarios rely on improvised interplay among participants.

It is traditional to incorporate role play for clinical simulations, which interconnects experiences, theoretical underpinnings, and learning outcomes (Bastable, 2008; Cannon-Diehl, 2009). In this study, participants play roles in the simulated 3D virtual world. Instead of real person-to-person and computer-controlled mannequin play, open-ended scenarios were afforded among avatars with assigned roles, in which participants can test behaviors and decisions in an environment that allows experimentation without risk.

2.5.3 Interactivity

3D virtual worlds provide the affordance of interactivity with multiple dimensions that enable deep learning experiences for learners. Baker, Wentz and Woods (2009) noted that virtual worlds were useful in helping the interaction among students or between students and teachers. The interaction happens not only among avatars; objects in 3D virtual world have properties to interact with avatars as well.

Based on the affordance of interaction, educators utilize 3D virtual worlds as experiential spaces. The use of virtual worlds allows users to virtually experience information and learn by doing as opposed to passively listening to the instructor or reading text, so content learned can have real significance for students (Corder & U-Mackey, 2018; Davies et al., 2015; Hew & Cheung, 2010).

The affordances of virtual worlds including simulation, embodiment, and interactivity provide the opportunity for student to create a sense of immersion, which refers to the sense of being enveloped by, included in, and interacting with the environment (Witmer & Singer, 1998). A degree of psychological immersion was believed to be necessary engagement and learning (Dalgarno & Lee 2010).) It was claimed more immersion equated to more emotional engagement, which leaded to more effective learning. Interacting with avatars and objects in the environment, students psychologically immerse in the 3D learning content and context, and dynamically create new meanings (Hew & Cheung, 2010; Savin-Baden, 2010).

2.6 Cultural Care and Cultural Competence

2.6.1 Defining Culture and Cultural Competence

Care is a major philosophical orientation of the contemporary nursing profession (Bevis & Watson, 1989; Donnelly, 2000; Leininger, 1985). Caring, according to Bevis, is a "unique plan designed to help an individual or a collective client system find meaning in experiences to foster, adapt, and mature" (1989, p. 128). To reflect a philosophy of care and provide authentic care to patients, nurses and other health providers have professional responsibilities to show sensitivity and respect for differences in beliefs and values of patients. Specifically, for the care of ethnically diverse populations, cultural heritage is a significant factor affecting the perception of health, illness, and accepted treatment modalities from care service providers and patients (Elliott, 2001). In situations where require cross-cultural nursing, sensitivity to the patient's value system is of paramount importance because it may differ markedly from that of the caregiver (Donnelly, 2000).

Based on care as the essence of nursing, as early as late 1940s, Leininger explored the meanings of care within cultural contexts and identified the need for addressing cultural aspects of care in nursing. As a consequence, she introduced the concept of cultural care, which centers culture as a way to understand individuals and their responses to health and disease (Leininger, 1991). Nurses are providing health care within an increasingly multicultural and global society. Therefore, cultural competence is becoming an ethical imperative for qualified health care professionals and nurses.

2.6.1.1 Defining Culture

To explore the core concepts of culture and cultural competence in a cultural care context, I did a series of electronic searches in the MEDLINE/PubMed, Education Resources Information Center (ERIC), and Cumulative Index of Nursing and Allied Health Literature (CINAHL). The body of literature on culture and cultural competence in nurse education and health care delivery has grown exponentially since the mid-1970. The definitions of culture and cultural competence are found in many articles and are complex as they are defined in a variety of ways based on different standpoints and worldviews. Each standpoint or worldview is based on a given set of assumptions that structures how one sees and interprets the world. Among existing considerable variations, there are two major philosophical bases for the definitions of culture and cultural competence: Essentialist and Critical Constructivist views.

2.6.1.1.1 Essentialist View of Culture

The traditional essentialist view reflected in nursing literature is dominant (Gray & Thomas, 2005). Philosophical essentialism derives from Platonic theories, which taught that

every functioning entity has defining essences. Essences make those entities what they are. There are essential traits that entities of that kind must possess. An essence characterizes a substance. It is permanent, unalterable, and eternal; and independent of one's perceptions. From an essentialist perspective, a concept such as culture is objective and unchangeable in human nature, which defines clear and authentic differences among people.

Traditionally, literature relating culture to nursing has reinforced an essentialist understanding, which describes the features of cultural and ethnic groups, and forms of assumptions about groups that are subsequently applied to all individuals who are part of those groups (Gray & Thomas, 2006). An essentialist view categorizes all people who share certain characteristics of the same cultural group and may further stereotype or generalize. Many definitions of culture equate culture with race and ethnicity, which may include an essentialist problem of stereotyping (Williamson & Harrison, 2010). Stereotyping and generalizing all people within that cultural group has the potential to feed into biases without recognizing the differences and inequalities between groups and individuals in society. This understanding of culture is reinforced within nurse education and practice (ANAC, 2009; Browne & Varcoe, 2006). There are various fundamental nursing textbooks used and other health care programs that are based upon an essentialist viewpoint.

An essentialist view promotes a rational approach to individualized care, claims objectivity and facilitates a continuing and detached way of thinking, talking and performing social practices associated with social and human differences. It blurs the complex context culture is situated in, which includes historical, social, and political relations.

2.6.1.1.2 Critical Constructivist View of Culture

In a critical constructivist view, concepts and their meanings are seen as historically, socially and politically constructed artifacts that arise within a specific context (Rosenblum & Travis, 2000). One distinguishing feature of a constructive cultural perspective is the way of thinking about diversity and categories of social and human difference. Instead of viewing difference as distinct, bounded, and static biological facts and essentialized categories of human identities, constructivists view culture as deeply interconnected social, political, and ideological categories to which complex meanings are attached (Rosenblum & Travis, 2000; Woodward, 1997).

Another distinguishing feature of a constructivist approach is it makes visible the processes by which concepts are created, developed, and maintained. From a constructivist view, culture is a sociopolitical construction, dynamic and ever-changing meaning. As Gray and Thomas assert (2006), instead of a list of features to be memorized, nurses should examine and engage complex interactions to connect and communicate with patients in a meaningful way. A constructivist view of culture actively and dynamically responds to the diversity and uniqueness of individuals, families and communities.

There is a variety of definitions of culture in nursing literature. According to Leininger and McFarland (2002c), culture is the values, beliefs, norms, and practices of a particular group that is learned and shared. These guide thinking, decisions, and actions in a patterned way. Purnell and Paulanka (1998) also define culture in this traditional way: "the totality of socially transmitted behavioural patterns, arts, beliefs, values, customs, lifeways, and all other products of human work and thought characteristics of a population of people that guide their worldview and decision making (p. 2).” Similarly, Cuellar et al. (2008) define culture as connoting "an integrated pattern of human behaviour that includes thoughts, communications, customs, beliefs,

values, and institutions of a racial, ethnic, religious or social nature" (p. 144). Suh (2004) summarized the definitions for culture from multiple authors: culture is understood as an important societal factor determining values, beliefs, and behaviors of an individual or group in respect to health care practices (p. 96).

These definitions all capture the essence of culture. They are mainly from an essentialist view even though the social factor is added. They list beliefs, values, practices, and biological symbols that are recognized by individuals, and portray them as homogenous and static. This obscures the very interactive and dynamic way in which people shape their lives.

Higginbottom et al. (2011) indicates in a recent study that most people would agree that having a shared culture is part of belonging to an ethnic group, but in practice there is always great diversity in the beliefs, values and behaviors of people even though they share the same ethnic identity. Further, Higginbottom used the term diaspora, which refers to individuals who are originally from the same ethnocultural group, then form a group settled far from ancestral homeland. She uses this example to illustrate the dynamic feature of culture by showing how the culture of these groups is dramatically influenced by the host community. The complexity of social contexts affects culture formation, which is an evolving and dynamic process.

In 2009, Aboriginal Nurses Association of Canada (ANAC) and Canadian Nurses Association (CAN) brought the definition of culture collectively from a social constructive perspective. It indicates that culture is a dynamic lived process inclusive of beliefs, practices, and values, and comprising multiple variables which are inseparable from historical, economic, political, gender, religious, psychological, and biological conditions. In this definition, culture is indicated as a dynamically lived and continually evolving process instead of a list of static features. Culture is situated in complex historical, economic, political contexts, the shared

meanings held within groups and individual identities are interacted and shifted during the dynamic constructing process.

Unlike an understanding of culture from essentialist view, culture is "a relational aspect of ourselves that shifts over time depending on our history, our past experiences, our social, professional and gendered location, and our perceptions of how we are viewed by others in society" (Browne & Varcoe, 2006, p. 162). In this way, culture is not a reduced list of features and characteristics to be memorized, but rather a set of complex interactions to be dynamically engaged.

2.6.1.2 Defining Cultural Competence

With Canada's identity as a multicultural society, the need for cultural competence in health care is clearly recognized. The concept of cultural competence has been a focus of the nursing profession over the past decades and there is growing body of research. Becoming a culturally competent nursing professional is a growing prerequisite in this multicultural society. Cultural competence is explored and defined in various ways. To take the concept of culture one step further, cultural competence refers to the ability of healthcare providers to apply knowledge and skills appropriately within the cultural context of a client in their practice.

2.6.1.2.1 Essentialist View of Cultural Competence

In *Equity and Responsiveness in Access to Health Care in Canada* prepared for Health Canada, Masi (2001) addresses the definition of cultural competence and its importance. He indicates that cultural competence refers to a provision of health care that responds effectively to the needs of patients and their families, recognizing the racial, cultural, linguistic, educational

and socio-economic backgrounds within the community. Even though Masi asserts that the development of cultural competence involves both knowledge and attitudes, he emphasizes the knowledge aspects from service providers and biological facts that impact upon health care instead of emphasizing the interactive and dynamic features of cultural competence. It is from as essentialist viewpoint and has the potential to stereotype groups.

Betancourt et al. (2010) define cultural competence as the ability of health care professionals to communicate and provide high-quality care to patients effectively from diverse sociocultural backgrounds; aspects of diversity include, but go beyond, race, ethnicity, gender, sexual orientation, religion, and country of origin. Betancourt et al. (2010) indicate that cultural competence is beyond biological and objective facts, but the interactive and dynamic features are not reflected in this definition. The recognition of "the very complex ways in which race, socio-economic status, gender and age may intersect" can be further addressed (Culley, 1996, p. 568).

Reflecting an essentialist perspective, this type of definition of cultural competence has been defined as a diverse set of skills, knowledge, attitudes and behaviors that operate at the level of the individual practitioner. They focus on understanding and appreciation of cultural differences and similarities within groups (Felder, 1995). However, the broader context of the health care organization and the dynamics of health care system are not emphasized; the importance of intercultural competence in a global context is not well recognized either.

2.6.1.2.2 Critical Constructivist View of Cultural Competence

From a critical constructivist viewpoint, Campinha-Bacote (1999) defines cultural competence as “the process in which the healthcare provider continuously strives to achieve the ability to effectively work within the cultural context of a client (individual, family or

community)" (p. 203). In this definition, cultural competence has been defined as an ongoing process seeking cultural awareness, cultural knowledge, cultural skill, cultural encounters and cultural desire.

Dynamic features of the culture are emphasized. With wide recognition in the nursing community, Campinha-Bacote's definition (1995, 1999) from a constructivist paradigm is the most frequently cited one in nursing and other related health literature (Suh, 2006). Also, from a constructivist viewpoint, Giger and Davidhizar (2002) define cultural competence as a dynamic, fluid, continuous process whereby an individual, system, or health care agency finds meaningful and useful care-delivery strategies based on the knowledge of the cultural heritage, beliefs, attitudes, and behaviours of those to whom they render care.

Further, Mixer (2008) urges to manage the potential systemic dynamics and include the consideration of ways in which culture interacts. Cultural competence is not just about understanding client cultural values, but also about understanding our own limitations. Cultural competence is a continuing process of learning and understanding among health care providers and patients. It resonates with what Mayeroff (1971) describes about care: "To care for someone, I must know many things. I must know, for example, who the other is, what his powers and limitations are, what his needs are, and what is conducive to his growth; I must know how to respond to his needs and what my own powers and limitations are" (p. 13).

Therefore, instead of reinforcing a predefined list for social and human differences, the purpose of providing culturally competent care is to transform human relations within a complex and dynamic context. It is a process of co-creating realities. In this study, a constructivist view of culture and cultural competence is chosen as the essential guide. It emphasizes the process and dynamic nature of culture, and its social constitution and historical situation.

2.6.2 Transcultural Nursing

2.6.2.1 Introduction

In the 1950s, with care as the essential focus of nursing, Leininger, a nurse anthropologist, was the first to make culture the central organizing feature of a nursing theory and coined the term “transcultural nursing” (TCN). During the decades that followed, TCN gained wide acceptance in the United States and Canada and promoted competent healthcare from diverse cultures. With the growing trends toward globalization of health care in the twenty-first century, Leininger further instituted the theoretical foundation of TCN and developed it to a separate discipline in nursing. TCN now has become widely used in nursing research, education, and practice.

2.6.2.2 Conceptualization

TCN is also known as cultural care. It opens the door to discuss culture for care, care for culture and put culture and care together as a holistic concept, which advocates totality of human being. It grasps a holistic perspective of knowing, respecting, and understanding care and culture. The goal of TCN is to provide culturally congruent care, care that fits in the culture. In 1995, Leininger defined TCN as: A substantive area of study and practice focused on comparative cultural care (caring) values, beliefs, and practices of individuals or groups of similar or different cultures with the goal of providing culture-specific and universal nursing care practices in promoting health or well-being or to help people to face unfavorable human conditions, illness, or death in culturally meaningful ways. (p. 58)

Leininger states that from the beginning, TCN has maintained a strong and deliberate focus on discovering comparative nursing knowledge. The ultimate goal of TCN is the use of relevant knowledge to provide culturally specific and culturally congruent nursing care to people (Giger & Davidhizar, 2007). These people include not only individuals; family and community are included as well.

Literature demonstrates the demands for incorporating TCN into nurse education and practice are widespread in recent decades. TCN has been essential related to increased signs of cultural conflicts, cultural clashes, and cultural imposition practices between nurses and clients of diverse cultures (Lenniger, 1998). There are scenarios in which users display fear and mistrust of clients who are culturally other. It is not possible to provide safe and appropriate care without proper transcultural training.

Leininger and McFarland (2002c) predicted that over the next few decades, all nurses would need to develop professional competencies in TCN and envision themselves as global health care providers and global world citizens.

2.6.2.3 Theory of Cultural Care Diversity and Universality

As the cornerstone of TCN, the theory of Culture Care Diversity and Universality (CCDU) was created by Leininger in the 1950s and has been continuously developed and refined during the past six decades. It not only adds meaning, depth, and clarity to the overall focus of culturally congruent nursing care, but also provides care measures in harmony with an individual and group's cultural beliefs, practices, and values using a holistic and comprehensive approach. Leininger's CCDU has been widely used in nursing research and education. A lot of schools of

nursing include this theory in their curricula to guide students and others to discover cultural care diversities and universalities.

The central purpose of the theory is to discover and explain diverse and universal culturally-based care factors influencing the health, well-being, illness, or death of individuals or groups. Essential tenets include (summarized from Leininger, 2002a, p. 47):

- Care is the essence of nursing; it is to assist others with evidence for anticipated needs in an effort to improve a human condition or lifeway.
- Culture refers to patterned values, beliefs, norms, and practices of individuals, groups, or institutions that are learned, shared, and transmitted intergenerationally over time.
- Cultural care, as a central construct to transcultural nursing, refers to the cognitively learned and transmitted professional and indigenous folk values, beliefs and patterned lifeways that are assistive, supportive, and facilitative caring. It acts to enable another individual or group to maintain their well-being or health or to improve a human condition or lifeway.
- Cultural care universality refers to common professional care or similar meanings that are evident among many cultures.
- Cultural care diversity refers to the differences in meanings, values, or acceptable modes of care within or between different groups of people.

Every culture has generic folk remedies (emic) and professional care (etic). The nurse must identify and address these factors consciously with each client in order to provide holistic and culturally congruent care. The goal of CCDU is to provide culturally congruent holistic care. Leininger (1995) expands on culturally congruent care:

> those cognitively based assistive, supportive, facilitative, or enabling acts or decisions that are mostly tailor made to fit with an individual's, group's, or institution's cultural values, beliefs, and life ways in order to provide meaningful, beneficial, satisfying care that leads to health and well-being. (p. 75)

Providing culturally congruent care refers to the use of emic care based on local cultural knowledge in meaningful and tailored ways that fit with the etic, largely professional outsiders' knowledge, to help patients in accord with their cultural values and lifeways. Culturally congruent care is achieved through the collaborative relationship building between nurses and clients as Leininger clarifies (1991):

> Together the nurse and the client creatively design a new or different care lifestyle for the health or well-being of the client. This mode requires the use of both generic and professional knowledge and ways to fit such diverse ideas into nursing care actions and goals. Care knowledge and skill are often repatterned for the best interest of the clients…Thus all care modalities require co-participation of the nurse and clients. (Consumers) working together to identify, plan, implement, and evaluate each caring mode for culturally congruent nursing care. These modes can stimulate nurses to design nursing actions and decisions using new knowledge and culturally based ways to provide meaningful and satisfying holistic care to individuals, groups or institutions. (p. 44)

Leinniger's theory of CCDU provides a foundation for many TCN models that developed in the 1990s. These models provide conceptual and assessment frameworks for cultural competence acquisition and guide specific aspects of nursing practice, management, education and research (Giger & Davidhizar, 1991). Beside Leinniger's model, other transcultural nursing landmark works such as Purnell's (1991, 2002) "Model for Cultural Competence" and

Campinha-Bacote's (1999) "Process of Cultural Competence in the Delivery of Healthcare Services" are widely used as well.

2.6.3 Transcultural Nursing Models

Based on Leininger's theory of CCDU, there are several transcultural models created. In this section, I introduce three models from Leinniger, Purnell and Campinha-Bacote, which are applicable to nurses and other health care providers.

2.6.3.1 Sunrise Model of Cultural Care

Depicting the structure of CCDU, Leiniger (1991) built the "Sunrise Model of Culture Care". The Sunrise Model was developed as a conceptual holistic research guide with multiple theoretical factors embedded. It is "a cognitive map to orient and depict the influencing dimensions, components, facts or major concepts of the theory with an integrated total view of these dimensions" (p. 49). Through qualitative research methods, the Sunrise Model greatly expands the worldview and minds of researchers to look for obvious knowledge to obtain a comprehensive view of care in cultural context (Leininger, 1995, 2002a; Leininger & McFarland, 2006).

The model states seven cultural and social structure dimensions in assessing and caring for individuals, families, groups, communities, and institutions in various health systems, which include technological factors, religious and philosophical factors, kinship and social factors, cultural values and lifeways, political and legal factors, economic factors, and educational factors (Leininger, 1995, 2002a, 2002b, 2006). In order to provide culturally congruent care, the nurse "enters the client world to discover cultural knowledge that is often embedded within individual

and family values" (Leininger, 2002b, p. 117). With aspects from traditional and professional health care systems synthesized, nurses provide care unique to each individual or group.

The three predicted theoretical modes in the Sunrise model to provide culturally congruent care are culture care preservation or maintenance; culture care accommodation or negotiation; and culture care re-patterning or restructuring to provide culturally congruent and beneficial care (Leininger, 2002a, 2006). After being refined for six decades, the Sunrise model is used in other health-related disciplines as well as nursing (Leininger, 1995, 2002a; Leininger & McFarland, 2006).

2.6.3.2 Purnell Model for Cultural Competence

The Purnell model for cultural competence (PMCC) was initially developed in 1991 as a framework for clinical assessment. It was developed into a complex and holistic conceptual model with the aim to provide frameworks for all health care providers to promote culturally responsive and competent health care (Purnell, 2002) (Figure 2.1).

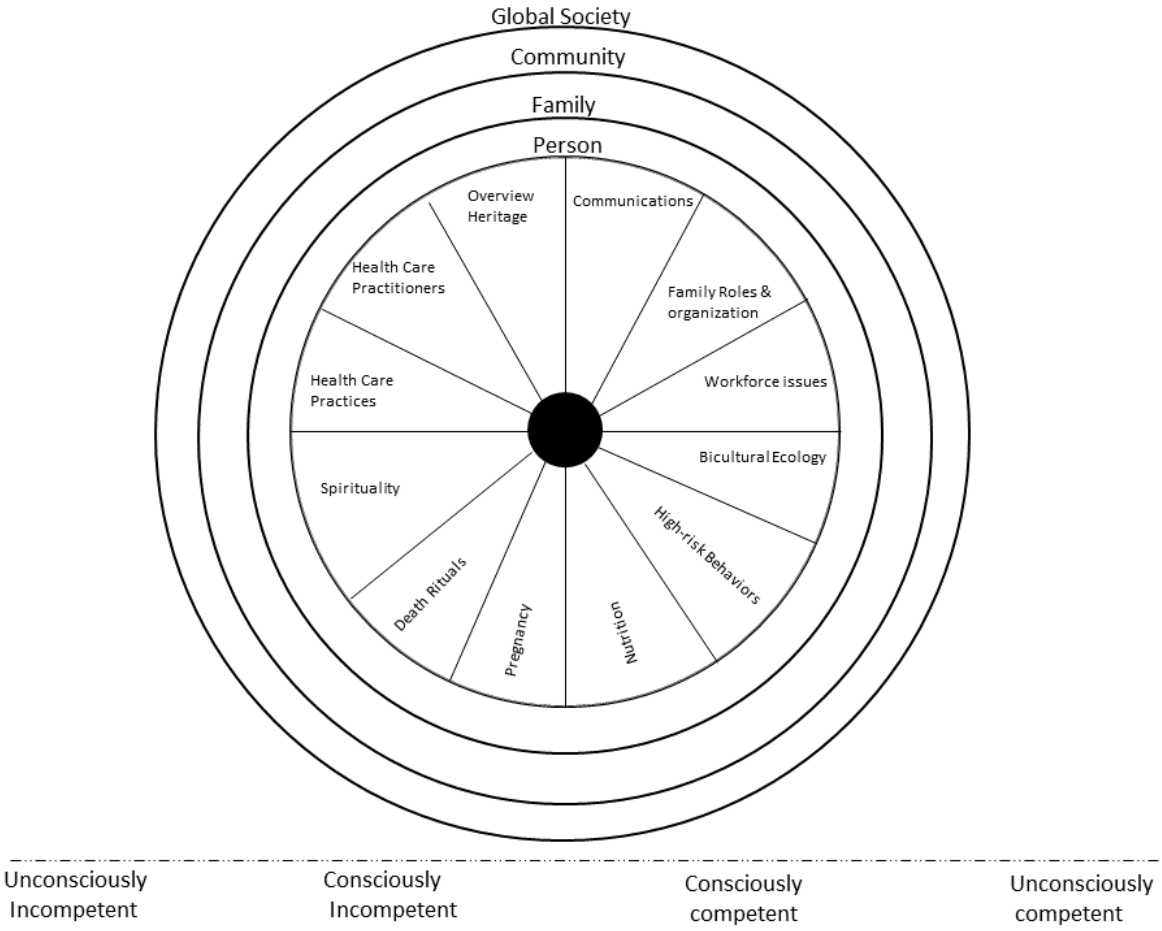

Figure 2.1 Purnell (1991) model for cultural competence

The four circles represent the paradigm concepts of global society, community, family and the person. The dark center is empty denoting the unknown part of a culture. Twelve pie-like wedges reflecting cultural domains or constructs are within the circle of the model. These interconnecting domains comprise the micro-level of the model and they affect and are affected by one another (Purnell, 2002, 2008). The jagged line on the bottom of the circles represents the concept of cultural consciousness of health care provider or organization to illustrate the "nonlinear concept of cultural competence", which has four levels:

- Unconsciously incompetent - the absence of awareness that one is lacking cultural knowledge;

- Consciously incompetent - the presence of awareness about one is lacking cultural knowledge.
- Consciously competent - the stage of learning about a patient's culture and rendering culturally congruent nursing interventions.
- Unconsciously competent - spontaneous provision of culturally responsive care to patients from diverse cultural backgrounds. (Purnell, 2008)

Lipson and Desantis (2007) note that Purnell's model is one of the most widely used models in nursing school curricula. Purnell's model and Campinha-Bacote's model are the two major models which American Association of Colleges of Nursing (AACN) chose as the framework for the inclusion of cultural competence in baccalaureate nursing curricula (2008).

2.6.3.3 Campinha-Bacote's Cultural Competence Model

As a constructivist view of culture and cultural competence is chosen as the essential guide for this study, Campinha-Bacote's conceptual model of cultural competence is adopted, which emphasizes the process and dynamic nature of culture. With wide recognition in the nursing community, Campinha-Bacote's definition (1995, 1999) from a constructivist paradigm is the most frequently cited one in nursing and other related health literature (Suh, 2006).

As defined earlier, Campinha-Bacote (1999) views cultural competence as a process of becoming instead of the state of being. This process requires that health care providers see themselves as becoming culturally competent rather than being culturally competent (Campinha-Bacote, 1998). Cultural competence is a process not an event, which can develop over years. Therefore, instead of being aware, nurses must be motivated to engage in keep developing cultural awareness and becoming culturally competent (Campinha-Bacote, 2002).

According to Campinha-Bacote, the five constructs of cultural competence include cultural awareness, cultural knowledge, cultural skill, cultural encounters, and cultural desire. These five constructs have "an interdependent relationship with each other and no matter where health care providers enter this process, all five constructs eventually must be experienced or addressed" (Campinha-Bacote, 1998, 204). Because of the interrelatedness among these five constructs, "health care providers can work on any one of these constructs to improve the balance of all five" (p. 204). The areas of intersection among these constructs indicate the process level of cultural competence. "As the area of intersection becomes larger, health care providers internalize the constructs more deeply" (Campinha-Bacote, 1999, p. 204).

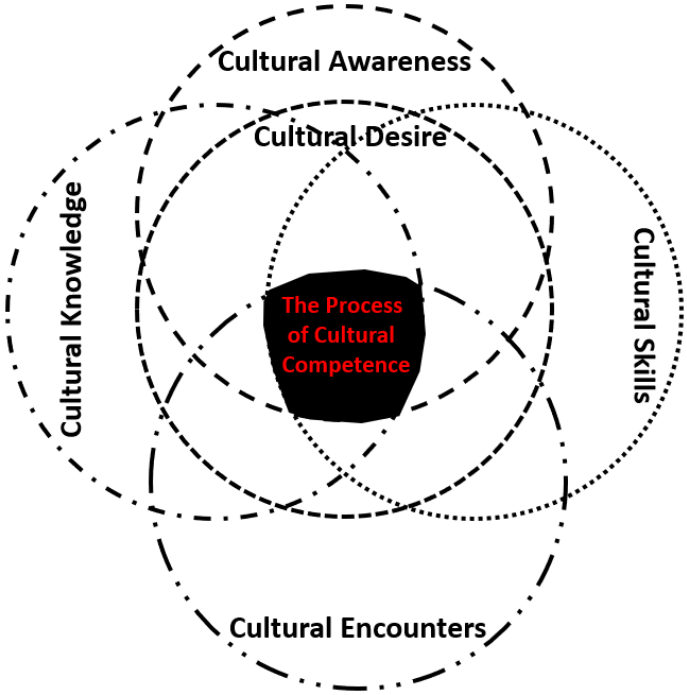

Figure 2.2 The process of cultural competence in the delivery of healthcare services (Campinha-Bacote, 1998a)

To further elaborate, Campinha-Bacote (1999) defines each construct as in the following sections.

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2.6.3.3.1 Cultural Awareness

Campinha-Bacote (1999) defines cultural awareness as “the deliberate, cognitive process in which health care providers become appreciative and sensitive to the values, beliefs, lifeways, practices, and problem solving strategies of clients' cultures” (p. 204). This is a self-examination process and in-depth exploration of one's own cultural background. During the Cultural Awareness stage, health care service providers begin to develop the presence of awareness that one is lacking cultural knowledge, similar to the Consciously Incompetent stage in Purnell’s model, which prevents cultural imposition from a health provider’s own cultural background. Based on this, health care providers can move forward and develop other needed components of cultural competence.

2.6.3.3.2 Cultural Knowledge

Campinha-Bacote (1999) defines cultural knowledge as the process of seeking and obtaining a sound educational foundation for different cultures, which includes various worldviews for understanding clients' behaviors. In addition, the process of cultural knowledge also involves obtaining knowledge regarding specific physical, biological, and physiological variations among ethnic groups. Similarly, Purnell (1998) notes that biocultural ecology includes biological variations, skin colour, physical difference in body habitus, heredity, genetics, economics, biological differences that affect drug metabolism.

2.6.3.3.3 Cultural Skill

Campinha-Bacote defines cultural skill as the ability to collect and assess clients' heath data in cultural context. Patients have physical, biological, and physiological variations from an ethnically diverse background. Healthcare providers should know how to conduct an accurate and appropriate evaluation based on these physical and biological variations (Bloch, 1983; Campinha-Bacote, 1999; Pumell, 1998). For conducting cultural assessments for ethnically diverse clients, Campinha-Bacote emphasizes the importance of the assessment for every client so as to prevent "cultural blind spot syndrome", which refers to healthcare providers' assumptions that there are no cultural differences because the patients look and behave much the same way they do.

2.6.3.3.4 Cultural Encounter

Campinha-Bacote defines cultural encounter as "the process which encourages health care providers to engage directly in cross-cultural interactions with clients from culturally diverse backgrounds" (1999, p. 205). Campinha-Bacote acknowledges that engaging in cultural encounters can be difficult and uncomfortable at times. To address the complexity and dynamics of the real world, Campinha-Bacote emphasizes intra-ethnic variation, which refers to the fact "there is more variation within a cultural group than across cultural groups" (1999, p. 205). Face-to-face experiential encounters in the real world can possibly further eliminate health care provider's stereotyping from academic knowledge and existing experience.

2.6.3.3.5 Cultural Desire

Campinha-Bacote defines cultural desire as the motivations of health care providers, which indicate they "want to" engage in the process of cultural competence" instead of "have to" (1999, p. 205). It is "the genuine desire and motivation to work with culturally different clients" (1999, p. 205). Cultural desire is the most key and pivotal construct among the five. It reflects the fundamental philosophy of nursing, which is care. The genuine care from intrinsic motivations of health care providers make patients feel valued. This type of caring begins in the heart and not the mouth. Instead of politically correct comments (words from the mouth), it refers to comments that reflect true caring (words from the heart) (Campinha-Bacote, 1998a).

2.7 Summary and Conclusion

This chapter provided a review of literature related to the philosophy of experience, focusing on Deweyan and Confucian philosophies. Dewey uses continuity and interaction as two principles to articulate and analyze the philosophy of experience in its educational function and force. The interactive union and dynamic action of these two principles provides criteria to measure the educative significance and value of an experience. Confucianism and neo-Confucianism were introduced. Confucian pragmatism is most relevant for this research (Wen, 2009; Zhang, 2003).

Dewey's philosophy of experience and Confucian philosophies are integrated in this study. The similarities between Chinese and English definitions of experience were examined. Wen's (2009) Confucian pragmatism is introduced, which integrates Deweyan pragmatism and Chinese Confucianism from a perspective of the wholeness of experience.

The chapter then transitioned into a review of 3D virtual worlds. Definitions and characteristics of 3D virtual worlds were explored along with educational attempts to use 3D

virtual worlds across a variety of disciplines. Nursing and health related areas frequently use 3D virtual worlds. Educational affordances include simulation, embodiment, and interactivity. Further, how affordances of 3D virtual worlds aid the learner in developing complex learning experiences and building deeper meaning for future experiences are explored.

The balance of the chapter addressed definitions of culture and cultural competence from essentialist and critical constructivist views. Leininger's transcultural nursing theory and multiple cultural competence models were examined. Cultural care is responsive to the design of learning experiences in 3D virtual worlds. Chapter 3 provides details of the 3D world designed for the study as well as details of the research design and methods.

Chapter 3: Research Methodology

This chapter describes the methodologies of the research and procedures used for data analysis and findings. The primary methodology was design-based research (DBR) while the secondary methodology was user experience (UX). The two were used in complementary ways. The chapter begins by describing these two methodologies that form the base of the research design. These sections are followed with a discussion of the taxonomy of experience used for data analysis. A description of the product developed, a 3D virtual world, is provided. The chapter concludes by providing a description of the participants in the research, ethical considerations, and the role of the researcher.

3.1 Research Design

This research employs DBR and UX to explore student, instructor, and instructional designer experience in a 3D virtual world. To fully understand user experience and ground the framework of experience described in Chapter 2, the taxonomy of experience (ToE) established by Coxon in 2007 is introduced to guide data collection and qualitative data analysis in this study.

3.2 Design-Based Research

Bridging theoretical knowledge and its applied usage is an ongoing pursuit for researchers in education. DBR emerged in the 1990s to make research more relevant to practice and policy (Brown, 1992; Collins, 1992).

3.2.1 Design Science and Design-Based Research

DBR combines motives stemming from educational researchers who sought to conduct studies under real-world circumstances so as to produce more relevant and useful knowledge (Brown, 1992; Collins, 1992), as well as from educational designers and educators, who had needs for embedding theoretical insights into the creation of programs and classroom activities (van den Akker, 1999). As a pragmatic approach to research, DBR seeks to resolve real-world problems by creating usable products in education, while at the same time generating new knowledge, and at times new design principles (Anderson & Shattuck, 2012; McKenney & Reeves, 2012; Reeves, 2006). In a context-based environment, through an iterative process of designing and testing artifacts, researchers in DBR strive to create products usable in practice instead of producing general and context independent knowledge. Iterative and *in situ* are two major characteristics of DBR (Bell, 2004). Educational theorists have referred to DBR as the engineering of innovation in everyday settings (Bell, 2004; Petrina, 2010). As a high-level methodological orientation, DBR seeks to transfer educational research into practice. It has been widely adopted by a variety of disciplines.

The origin of DBR is in the design sciences— engineering, aeronautics, architecture, and product design (Collins, 1992; Zaritsky et al. 2003). Collins (1992) drew on insights from Simon's classic book *The Sciences of the Artificial* (1969), which makes a distinction between natural (or analytical) sciences and sciences of the artificial, by which he meant design sciences. Professions such as engineering, architecture, and education are identified by Simon as the sciences of the artificial.

Simon argued the design sciences were neglected because of the lack of rigorous theories at that time. Recent developments in engineering began to provide the theoretical underpinnings

that the sciences of the artificial needed. Based on Simon's theory for the engineering sciences, Collins (1992) provided the theoretical foundations for a design science of education, and he further distinguished analytical sciences such as physics, biology, and anthropology. He urged to further develop a design science of education, through which researchers investigate how different learning environment designs affect teaching and learning.

Klabbers (2009) also explained two distinct branches of science: design sciences and analytical sciences. He argued the learning science communities needed to clarify their understanding of the differences between these two types of sciences. The goal of a design science is to build and assess artifacts, and determine how designed artifacts behave under different conditions. Design sciences are issue-driven to address human needs, conquer bottlenecks, and capitalize on opportunities (Klabbers, 2009). Theory-driven approaches of the analytical sciences mainly focus on building and testing theories. They emphasize different criteria for success.

3.2.2 Conceptualization of Design-Based Research

Modeled on design sciences, the term design experiment was first introduced in 1992 by Brown and Collins. In the 1990s, there was a movement to develop a new methodology for carrying out studies of educational interventions under the labels design experiments or design research. Brown was a leader in this movement (Collins, Joseph, & Bielaczyc, 2004). Also, she is widely acknowledged as the first developing DBR, which was modeled as design experiments contributing to design sciences, such as aeronautics and artificial intelligence (Collins, 1992).

Educational researchers further conceptualized DBR. Barab and Squire (2004) proposed a generic definition that encompasses most variations of educational design research: "a series of

approaches, with the intent of producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings" (p. 2). The new theories here do not refer to universal knowledge that is context free. According to the Design-Based Research Collective (2003), DBR communicates this knowledge in various forms, including "narratives of planned and enacted instruction (Hoadley, 2002; Linn & Hsi, 2000), design principles connecting enacted designs to educational outcomes of interest (Bell, 2002b), and design patterns abstracted from one or more settings describing how a designed innovation interacts with settings and evolves (Orrill, 2001)" (p. 8). The Design-Based Research Collective calls for adopting common and standard communicative approaches and connecting theory to local applied understandings similar to research in architecture or engineering.

With the development of DBR, many experts have created an abundance of terms to describe it in literature. As introduced in the last section, in 1992 the term "design experiments" was introduced by Brown and Collins. Design experiments were developed as a way to carry out formative research to test and refine educational designs based on principles derived from prior research (Brown, 1992; Collins, 1992; Collins et al., 2004; Reinking & Bradley, 2008). The term "experiment" had to be expanded from its connotation of a controlled environment with randomized trials in social and behavioral sciences. The formative research here differentiates from formative evaluation designs in that "the design is conceived not just to meet local needs, but to advance a theoretical agenda, to uncover, explore, and confirm theoretical relationships" (Barab & Squire, 2004, p. 5).

Depending on the context in which it is being used, DBR is known as design research (Gravemeijer & Cobb, 2006; Reeves, Herrington, & Oliver, 2005), development research (Conceicao, Sherry, & Gibson, 2004; van den Akker, 1999), developmental research

(Freudenthal,1971; Gravemeijer,1994 & 1998; Streefland,1990), formative research (Newman, 1990; Reinking & Bradley, 2008), engineering research (Burkhardt, 2006), and educational design research (Kelly, Lesh, & Baek, 2008; van den Akker, Gravemeijer, McKenney, & Nieveen, 2006).

Regardless of what it is called, a DBR paradigm combines exploration with design by putting research, design, and practice into one process (Design-Based Research Collective, 2003). Based upon the assumption that human learning is situated in a real-world context, it effectively bridges the gap between research and practice in education.

Van den Akker et al. (2006) describes the three motives for design research: 1) increasing the relevance of research for educational policy and practice, which is the most compelling purpose; 2) developing empirically grounded theories to further understand the learning process; and 3) increasing the robustness of design practice. DBR holds great promise for enhancing both the theoretical contributions and public value of educational technology research (Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006).

Similarly, the two widely agreed main goals of DBR are producing working artifacts (learning environments, curricula and programs, technology applications, etc.) and developing interventions in the real world. On the other hand, advancing theoretical understanding and committing theory construction while solving real-world problems is also important (Anderson & Shattuck, 2012; Collins et al., 2004; Design-Based Research Collective 2003; McKenney and Reeves, 2013; Reeves, Herrington, & Oliver, 2005). This dual focus represents a defining feature of DBR.

What methods does DBR utilize to achieve the above goals? Reinking and Bradley (2008) state clearly: “There is no single, agreed-upon methodological framework for

conceptualizing, planning, conducting, and reporting formative and design experiments" (p. 61). DBR is often conceived as an approach to research than methodology (Reinking & Bradley 2008). Kelly et al. also suggest the practice of DBR is a set of methods for conducting research rather than a coherent research methodology. Recently, McKenney (2012) describes DBR, which was called Educational Design Research (EDR) in her book, as a genre of educational research instead of a methodology, in which the iterative development of solutions provides rigorous scientific inquiry.

Therefore, with design as the center of the research, DBR is less a specific method than a collection of approaches to deal with complex educational problems through iterative processes and products, collecting evidence of their effectiveness to feed it recursively into future designs (Barab, 2006; Wang, 2012).

DBR gained momentum, particularly in education (van den Akker, Branch, Gustafson, Nieveen, & Plomp, 1999). Several special issues of highly respected journals have addressed design research, including *Educational Researcher* [2003, 32(1)], *Journal of the Learning Sciences* [2004, 13(1)], *Educational Psychologist* [2004, 39(4)], and *Journal of Computing in Higher Education* [2005a, 16(2)]. Also, a number of books are devoted to the topic examining areas such as theorizing and conceptualizing design research (Akker, Gravemeijer, McKenney, & Nieveen, 2006), and methodological modeling (Kelly, Lesh, & Baek, 2008), along with textbooks with user guides and tools for conducting design studies (McKenney & Reeves, 2012; Reinking & Bradley, 2008; Richey & Klein, 2007). Anderson and Shattuck's recent findings reveal that DBR is being utilized increasingly, especially in K-12 contexts with technological interventions, and that most interventions yield (potentially) improved learning outcomes or student attitudes (Anderson & Shattuck, 2012).

3.2.3 Characteristics of Design-Based Research

How do design science researchers characterize DBR studies? DBR studies have been characterized with varying emphases depending on the study. Cobb et al. characterize DBR as iterative, process focused, interventionist, collaborative, multileveled, utility oriented, and theory driven (2003). Similarly, van den Akker et al. (2006) propose the characteristics of DBR as interventionist, iterative, process oriented, utility oriented, and theory oriented. Reinking and Bradley's (2008) proposition includes similar criteria: intervention-centered in authentic instructional contexts, theoretical, goal oriented, adaptive and iterative, transformative, methodologically inclusive and flexible, and pragmatic. More recently, Anderson and Shattuck (2012) did an extensive analysis of the impact of DBR and suggest that it's characterized by being situated in a real educational context, focusing on the design and testing of a significant intervention, using mixed methods, involving multiple iterations, involving a collaborative partnership between researchers and practitioners, evolution of design principles, and practical impact on practice.

Among these different sets of characteristics, there is a high degree of overlap and congruence as to how DBR is constructed. A common emphasis on theory and utility integration is noteworthy, which indicates DBR has a strong pragmatic orientation. Instead of thinking of research and practice as separate, DBR focuses on bridging research and practice in education. (Bell, 2004; Brown & Collins, 1992).

McKenney and Reeves (2006) also emphasize the integration. They use Schoenfeld's example of the Wright brother's flying machine to illustrate how the advance of fundamental understanding and practical applications can be synergistic. Also, drawing on the highly-

acclaimed *Pasteur's Quadrant: Basic Science and Technological Innovation* (Stokes 1997), Reeves (2006) addresses the artificial separation of basic science and applied science, and calls for research with the goals of being use-inspired and applications in practice . Therefore, among all DBR characteristics, the most defining one is its being situated and conducted in real educational contexts. The following section illustrates details.

3.2.3.1 Being Situated in Real Educational Contexts

Instead of isolating educational research in the ivory tower and separating it from real problems and issues of everyday practice, DBR is a research approach that speaks directly to problems of practice (Design-Based Research Collective, 2003). To emphasize the importance of context in educational research, Reeves (2006) cited the later work of Cronbach, one of the most eminent educational researchers of the last half of the twentieth century. With the experience of decades of experimental research, Cronbach (1975) concluded "when we give proper weight to local conditions, any generalization is a working hypothesis, not a conclusion" (p. 125).

With user-centered design as the base, design-based researchers involve users in the design and formative evaluation of the intervention. Based on raw, aggregated data generated in a real world like context, researchers further analyze intervention outcomes and refine them. A strength of DBR is the close connection of data with context. However, the data collected are necessarily messy; in addition, the constant refinements of the design have led to a certain queasiness about DBR (Dede, 2004).

Going beyond perfecting a particular intervention, DBR views a successful innovation as a joint product of the designed intervention and the context (Design-Based Research Collective, 2003). DBR is not aiming to create de-contextualized principles or grand theories universal to all

contexts, which only provide general philosophical orientations to educational matters. Instead, theories produced through DBR reflect the conditions in which they operate. They must do real work and provide detailed guidance. Both context and intervention are considered to maximize learning (Cobb et al., 2003). This necessity for impact in real education settings is also succinctly captured by Barab and Squire (2004) who argued that "design-based research that advances theory but does not demonstrate the value of the design in creating an impact on learning in the local context of study has not adequately justified the value of the theory" (p. 6).

3.2.3.2 Design Focused

As discussed earlier, DBR is rooted in the design sciences. It has a pragmatic view and design is a center component of it. What fundamentally makes a study DBR? It is its intention to solve a design problem. In DBR, there is a large overlap between what research is and what practice is. It is design that links research and practice. Design is a form of inquiry in-and-of-itself .

DBR is more than just simply making things to see if they work. Instead, it explains what it means for a design to work and the ways in which it is working. DBR strives to make theoretical explanations explicit, so the derived design principles can inform future development and implementation decisions (Sandoval, 2004). As a single unified process, the design is the hypothesis, intervention, and outcome.

The effort to design educational interventions is an inherently theoretical activity aiming at developing theories of practice rather than developing theory that can be translated later into practice. Design knowledge is not something that educational researchers derive from

experiments for subsequent application by teachers (Sandoval, 2004). Theory building, theory testing, and theory adoption are embedded into one research design process in DBR.

3.2.3.3 Collaborative Partnership among Researchers, Designers and Practitioners

Another primary advantage of DBR is that it stems from collaborative partnerships among researchers, designers and practitioners addressing complex problems in real teaching and learning contexts (Anderson, 2012; Cobb et al., 2003; Reeves, 2006). Based on the quest for effective educational interventions and design principles in complex and naturalistic settings, DBR in education uses an eclectic collection of specific approaches implemented by an integrated team with common goals. DBR is not an activity that an individual researcher can conduct in isolation; its protocols require intensive and long-term collaboration involving researchers, designers, and practitioners. Also, DBR significantly blurs the roles of researchers, designers, and teachers because it involves a pronounced emphasis on the narrative report of complex interactions and feedback cycles (Kelly & Lesh, 2000).

The partnership in DBR recognizes that designers and practitioners are usually not professionally trained to conduct rigorous research. Likewise, the researchers are often not knowledgeable of the complexities of the operating educational system to effectively create and measure the impact of an intervention. Educational researchers need to work closely with practitioners who “own” the problem they are addressing to increase the effectiveness (Anderson & Shattuck 2012).

Across the whole process, the developed partnership team including researchers, designers, and practitioners negotiate the study and work collaboratively from initial problem

identification, intervention design and construction, implementation, assessment, and to the production of reusable products and design principles.

3.2.3.4 Integrated and Iterative Process

To arrive at desired results, DBR involves an integrated process of identifying research problems, developing design solutions and producing design principles with iterative cycles of testing and refinement so as to bring the desired results. DBR is iterative in that it involves tightly linked design-analysis-redesign cycles that move toward both learning and activity or artifact improvement (Shavelson et al., 2003). Reeves (2006) illustrates in Figure 3.1 the difference between traditional predictive research and DBR.

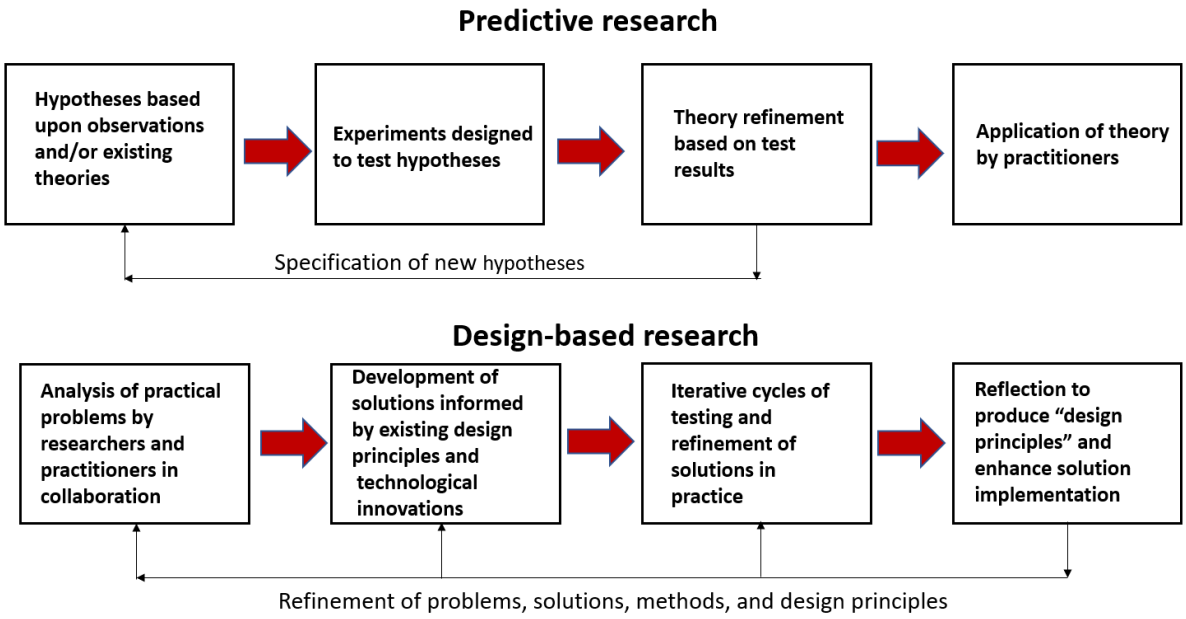

Figure 3.1 Predictive versus design-based research. Adapted from Reeves (2006).

In traditional predictive research, hypotheses are put to tests in a strictly controlled experimental environment. The experiment time is specified to produce study results. There is not an iterative process for the design for these one-shot studies. Iterations are only encouraged in order to refine hypotheses. The final learning solutions are rarely refined and they produce limited impact and insights.

On the contrary, DBR is process oriented. It focuses on the design and testing of prototypes and involves multiple iterations that lead to a better understanding of the real problem. After prototype solutions based on existing design principles are created, there are iterative testing and refinements of both the prototype and the design principles until satisfactory outcomes have been reached (Reeves, 2006). It is idealistic to expect significant and transferable results from a one-time intervention study. In reality, it is rare that initially designed and implemented interventions operate perfectly in authentic practice. Thus there is always room for improvement in subsequent iterations. Brown (1992) describes an example of "effective intervention" as "migrating from experimental classroom to average classrooms operated by and for average students and teachers, supported by realistic technological and personal support" (p. 143). These iterative real-world practices not only foster learning, but also can be reused and inform the work of others facing similar problems.

Anderson and Shattuck (2012) further describe the constant and iterative refinements of design as characterized by "research through mistakes" (p. 3). Similarly, Burkhardt (2006) states an important strategy in DBR is to learn from mistakes, as what he describes as fail fast, fail often to develop robust solutions.

During repeated cycles of enactment, secondary research questions can emerge as needs demand. The intensive cycles of re-design capture meanings constructed by individual subjects over an extended length of time, and further generate more transferable and reusable results.

3.2.3.5 Mixed Methods

DBR is underpinned by the philosophy of pragmatism and, as such, it incorporates methods from two epistemological views, quantitative and qualitative as the need demands. It offers one framework for integrating methods from both views into a cohesive whole, and typically involves a variety of research tools and techniques (Collins et al., 2004; The Design-Based Research Collective, 2003).

It is widely acknowledged human learning is too complex a phenomenon to be explored using one single research methodology; however, the educational research community has long-term struggles focusing on establishing the legitimacy of one educational research tradition over the other, adhering to either quantitative or qualitative paradigms rather than focusing on education (Reeves, 2006). Conceptualized in an evolutionary way, DBR incorporates methods within and across various research traditions and strives to create usable learning technologies Most DBR researchers concur with Maxcy (2003) who argues: “It is perfectly logical for researchers to select and use differing methods, selecting them as they see the need, applying their findings to a reality that is both plural and unknown” (p. 59).

Quantitative and qualitative methods complement each other in DBR through mixed methods. The flexibility allows researchers to see “the magnitude of the effect in terms of outcome measures and to get a feel for the phenomenon itself” (Brown & Campione 1996, p. 156). That is, researchers use quantitative methods to reveal broad patterns of design-based

discourse, and use qualitative methods including observing the features of interactions, interviewing faculty and students, and others to facilitate local clarifications (Anderson & Shattuck, 2012). Among the literature extolling the potentials and opportunities of DBR, there have also been critiques. Validity is a common one.

3.2.4 Validity

Barab and Squire (2004) notably argued that "if a researcher is intimately involved in the conceptualization, design, development, implementation, and re-searching of a pedagogical approach, then ensuring that researchers can make credible and trustworthy assertions is a challenge" (p. 10). Not only for DBR, this challenge is a familiar one for many forms of qualitative research in that none of these methods can claim the researcher's bias is removed from the research process. Indeed some qualitative proponents argue that the researchers themselves, with their biases, insights, and deep understanding of the context, are the best to judge the research. This inside knowledge adds as much as it detracts from validity (Onwuegbuzie & Leech, 2007).

Good research demands skepticism, commitment, and detachment (Norris, 1997). But DBR requires close partnership and collaboration to actively support the intervention. As such, how do researchers conduct quality DBR? Data from DBR are closely connected to context and within the framework of the real world, which some researchers argue limits the generalizability of the research findings. Even though studies that are developed within a controlled, laboratory environment have higher degrees of external validity, design-based researchers do not criticize artificially controlled environments and isolated variables (Reeves, 2006). What DBR researchers advocate is "ecologically valid" experiments, as such, ecological validity.

Rather than supporting universal laws of human behaviors if there are such broad laws, design-based researchers describe practices and their usefulness in real world contexts, using research procedures for real world conditions and make sense in the real world. Ecologically valid research designs allow for higher degrees of generalizability in real world than those obtained in an artificially produced lab environment. While design-based researchers focus on specific objects and processes in specific contexts, they try to study those as integral and meaningful phenomena. The context-bound nature of DBR suggests that context-free generalizations are not what design-based researchers seek (Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). Design-based researchers strive to develop contextualized theories of learning and teaching, with the elements of context that matter for the nature of learning and for the implications of policy for local educational practices (The Design-Based Research Collective, 2003).

This study utilized DBR to explore nursing and other health care provider candidates' cultural competence acquisition, drawing on McKenney and Reeves' (2012) model.

3.3 Design-Based Research Model

After reviewing DBR models from Bannan-Ritland (2003), Middleton, Gorard, Taylor, and Bannan-Ritland (2008), McKenney and Reeves (2006, 2012), I chose to use McKenney and Reeves's model for my study. Based on their earlier work on DBR in 2006, McKenney and Reeves synthesized existing guidelines and other DBR models, and further developed a new general or "generic" model for DBR in 2012 (Figure 3.2). This model is applicable to research across a variety of domains and social settings. Its simplified three-phased research approach not only combines the characteristics of the DBR, but also is flexible and dynamic.

This model is designed for research projects with different scales and scope, including long-term and broad scope and single studies conducted and disseminated in a short-time frame and local settings. Also, the depicted iterative process does not prescribe fixed, set pathways for iterations. Rather, many potential routes can be designed according to this model.

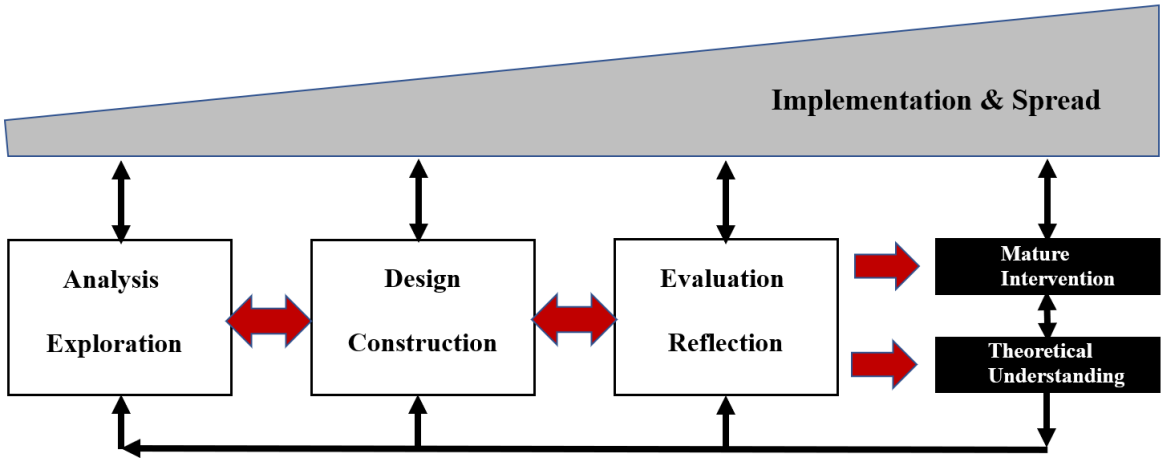

Figure 3.2 Generic model for design research in education. Adapted from McKenney & Reeves (2012).

This generic model is based on DBR characteristics including being theoretically oriented, interventionist, collaborative, responsively grounded, and iterative. Also, it is consistent with prevailing views and practices of DBR and compatible with studies "at different scales, toward varying theoretical goals, in diverse settings" (McKenney & Reeves, 2012, p. 76).

DBR has been described as iterative and flexible (Kelly, 2006; Reinking & Bradley, 2008) and most models reflect these aspects, but at different levels. Some models just show several pathways that could be taken, whereas that of McKenney and Reeves' model (2012) depicts integrated design activities and research outputs, both interacting directly and indirectly with practice through multiple pathways. Also, various levels of effort and attention can be put on different phases. This model includes three sets of concepts

- The three main phases of research and development activities in a flexible and iterative structure (represented by squares), which includes Analysis and Exploration, Design and Construction and Evaluation and reflection;
- The dual outputs of design research: theory and practice (represented by rectangles). They are connected and contribute directly and indirectly to each other, mature with each DBR cycle. At the same time, they contribute directly to practice and share among community to inform similar endeavors for new intervention building.
- The indications of use-inspired: Implementation and Spread is taken into consideration at very beginning and approached from every phase of research and micro-cycle. The interaction to practice is increasing over time (represented by triangle).

During the three main phases, McKenney and Reeves (2012) define three types of cycles in terms of cycle size: micro-, meso-, and macro-. Every phase is one micro-cycle. Every micro-cycle is relatively independent and constitutes "its own cycle of action, with its own logical chain of reasoning" (McKenney & Reeves, 2012, p. 78). There are two types of micro-cycles, empirical cycles and deliberative-generative cycle. Analysis and Exploration phases, as well as the Evaluation and Reflection phase, belong to empirical cycles that feature data collection. The Design and Construction phase belongs to a deliberative-generative cycle. Every micro-cycle follows "a sound, coherent process to produce an intervention in draft, partial, or final form" (p. 78). Meso-cycles contain more than one of the three core phases, but less than a complete process of DBR. In a DBR process, several micro-cycles of activity are combined to create one meso-cycle.

A macro-cycle includes the entire DBR process as reflected in the generic model. A macro-cycle comprises at least three micro-cycles, one from each phase. However, most

educational design research macro-cycles involve numerous micro and meso-cycles over long periods of time because of the iteration. In the following section, more details are provided about these three main phases.

3.3.1 Analysis and Exploration

The Analysis and Exploration phase constitutes one empirical micro-cycle with the main goal of problem identification and diagnosis. According to McKenney and Reeves (2012), the following processes are included in the Analysis and Exploration phase.

- Identifying the problem from practice, including site visits and field-based investigations, collaboration with practitioners for a better understanding of the educational problem in real world; looking for clear problem definition and articulation of long-range goals.
- Identifying the problem from a literature review, which is conducted to gain theoretical inputs to identify problems and contexts, and inform building frameworks and later data collection efforts.
- Networking and professional meetings, including processes of reaching out to practitioners, experts, and researchers to create a network to inform the research.

3.3.2 Design and Construction

During design and construction, a coherent process is conducted and documented to arrive at a tentative product. This deliberative-generative cycle of design and construction is usually repeated and often described as a meso-cycle in the literature. It takes inputs from multiple other phases, including Analysis and Exploration, Evaluation and Reflection, and interaction with practice through the Implementation and Spread phase. This involves an

intervention grounded in both theory and reality. The following processes are included in the Design and Construction phase (McKenney & Reeves, 2012).

3.3.2.1 Design

1. Exploring solutions
    - Generating ideas through brainstorming or more analytical and systematic manner.
    - Considering ideas, which are generated, deliberated, and selected throughout many phases in DBR.
    - Checking ideas for potential viability in the target setting based on literature and context

Also, documenting the evolution of design ideas and planning for unexpected results during this process; sharing documentation to make the process and rationale transparent, e.g., design log, building research trajectories, planning time and mechanisms that will allow new insights generated.

2. Mapping solutions
    - Requirements and propositions. Design requirements provide guidance on what is to be accomplished in a specific setting, whereas the design proposition informs how that can be done and why. The requirements and propositions are usually revisited during the iterative process.
    - Skeleton design, which helps designers identify core design features and distinguish these from supporting ones. They are generally created for internal audiences because of the brief nature of this kind of design.

- Detailed specifications, which are developed after the skeleton of design is set. It has detailed specifications or specific components of the entire intervention.

As the output of this process, theoretical and practical grounding are specified and articulated; potential solutions to the problem are explored and considered.

3.3.2.2 Construction

The main processes within this phase include

- Creating prototypes
- Revising prototypes and consider revisions

A prototype approach is generally taken, where successive approximations of the desired solution are re-created.

3.3.3 Evaluation and Reflection

The Evaluation and Reflection phase constitutes one empirical micro-cycle. Evaluation refers to the empirical testing of a design or a constructed intervention. Evaluation can pertain to testing conducted on or through an intervention, including the designs in initial, partial or final form. Reflection involves active and thoughtful consideration of what has come together in both research and development for further theoretical understanding.

3.3.4 Two Main Outputs

The generic model depicts two main outputs as Maturing Interventions and Theoretical Understanding, which are both produced through the previous micro or meso-cycles. Maturing

Interventions are practical outputs, which are a designed intervention, such as a process, a product, or (most often) a combination of the two. The Maturing Intervention and Theoretical Understanding phases are connected and contribute directly and indirectly to each other, mature with each DBR cycle. At the same time, they contribute directly to practice and share among community to inform similar endeavors for new intervention building.

3.3.5 Implementation and Spread

With use-inspired as the defining characteristic of DBR, Implementation and Spread phase deals with "real contextual opportunities and constraints" (McKenney & Reeves, 2012, p. 80). Implementation and Spread is taken into consideration at very beginning and approached from every phase of research and micro-cycles. McKenney and Reeves (2012) indicate that the broad involvement of educational practitioners is important for the Implementation and Spread phase; educational practitioners can include teachers, administrators, teacher educators, inspectorates, policy makers, etc. With users' perspectives embedded in, the involvement not only helps define the problem during the analysis and exploration phase, but also makes choices during design and construction phases, the "messy, varied realities of educational context" to connect to real world usage (McKenney & Reeves, 2012, p. 81). Implementation considerations play a role throughout the entire process, typically increasing over time.

Seven DBR iterations or micro-cycles from McKenney and Reeves (2012) were used in this study:

1. Micro-cycle: Analysis and Exploration
2. Micro-cycle: Design and Construction
3. Micro-cycle: Evaluation and Reflection
4. Micro-cycle: Re-design and Construction
5. Micro-cycle: Re-Evaluation and Reflection

6. Micro-cycle: Re-design and Construction
7. Micro-cycle: Implementation and Spread

DBR and UX data collection and analysis are presented in Chapter 4 (see summary Tables 4.1 and 4.2). The next section addresses UX methodology.

3.4 User Experience

3.4.1 User Experience Introduction

A secondary methodology in this study is User Experience (UX). Touloum, Idoughi, and Seffah (2012) define UX as "something felt by the user, or by a group of users, following the use of a product (or service), or during its interaction with the product (usability and aesthetics), or even a possible use (or purchase) of a product". "We use the word 'something,'" they continue, "to refer to the broad meaning that covers the term experience (emotions, perceptions, reactions)" (pp. 2994-2995). Based on the holistic nature of the experience, UX highlights crucial aspects and their implications for the design of interactive products. As Hassenzahl (2010) clarifies, UX

> focuses our interest on *interactive products* (as opposed to, for example, other people) as creators, facilitators and mediators of experience. Although interactive products are not considered as experience in themselves, through their power to shape what we feel, think, and do, they will inevitably influence our experience. (p. 8)

Ideally, users should be involved in all aspects of a product's design, from product vision to co-design to testing to enhancement. In a DBR process, the most important step of UX is user testing. The phase of UX involves a process where user feedback is gathered regarding the product design or prototype. This feedback and input are important because it allows designers to

refine the experience that users will ultimately have of the product and refines the product with core criteria, including usability and navigability, etc. Norman and Nielsen (2007) define usability as "a quality attribute of the UI [user interface], covering whether the system is easy to learn, efficient to use, pleasant, and so forth".

Usability in UX is much a function of the users' perspectives than of ideal principles. UX suggests that design should be holistic rather than narrowly limited to a device, interface, or software. Instead of putting functionality before experience, designers should take an experiential approach and investigate the entire experience of the user, including the context of use and user environment. According to Hassenzahl and Tractinsky, (2006), UX is a consequence of a user's internal state which includes predispositions, expectations, motivation, mood, etc. along with the characteristics of the designed system which include usability, functionality, etc. In addition, UX depends on the context or the environment within which the interaction occurs. Hassenzahl (2010) expanded: "subjective, holistic, situated, and dynamic are defining attributes of experience and experiences. An experience will never be objective; it will never focus on a small proportion of processes and aspects only, and it will never be context-free or static" (p. 27). In this way existing patterns of design can be challenged, new and creative design ideas can possibly flourish. In this study, UX is also emphasized in the Evaluation and Reflection stage of DBR.

3.4.2 Taxonomy of Experience (ToE)

Dewey (1934) considers every experience to be holistic: "In every experience, there is the pervading qualitative whole that corresponds to and manifests the whole organization of activities which constitute the mysterious human frame" (p. 35). As indicated in Chapter 2,

Dewey (1934) defines an experience as "a whole and carries with its own individualizing quality and self-sufficiency" (p. 35). Similarly, as Wen (2009) emphasizes, "Confucian pragmatism starts from the wholeness of experience" (p. 234).

To ground the wholeness user of experience in this study, the taxonomy of experience (ToE) established by Coxon (2007) guided data collection and qualitative data analysis. This ToE offers a multi-layered way to understand user experience and is responsive to researching virtual experience and user experience. Figure 3.3 depicts Coxon's (2007) taxonomy, which contains sensorial, affective, cognitive, and contextual experiential elements within an existential framework of temporality, spatiality, relationality, and corporeality. These existentials derive from van Manen's (1990, pp. 101-106) distillation of Merleau-Ponty's (1962) units of experience.

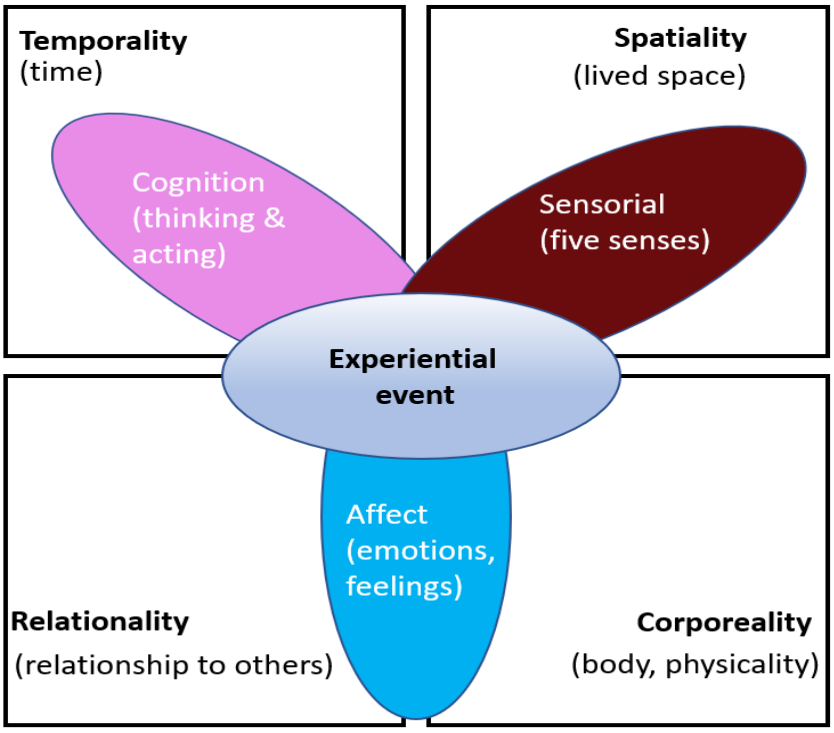

Figure 3.3 Taxonomy of experience. Adapted from Coxon (2007).

Coxon (2007) explained three types of experience. Sensorial experience includes five senses. It involves a "sense of" things, such as sight, smell, touch, and sound, and contributes to aesthetic and ergonomic appreciation within experiences. Affective experience contains emotions, feelings, and moods, which significantly influence the nature of an experience. Cognitive experience includes conation, which is reflective thought of external doing, and cognition, which is reflexive thought of internal thinking, such as personal identity. Cognition and conation are interwoven constructs in which experiential information is processed and considered in terms of possible future interactions.

The contextual components are the existential parameters within which any experience takes place, with many layers of complexity. They are usually understood in relation to a specific experiential event. This contextual space has layers of complexity and can be partially understood by being broken down into existential component parts in relation to a specific experiential event (Coxon, 2007). In order to understand the nature of experience, inputs from sensorial, affective, cognitive, and contextual factors all need to be thoroughly considered.

The nature of experience requires understanding within a context, which includes 'four dimensions' of existence (space, time, the physical body and its relationships to other people). These existential factors are differentiated from contextual factors. The existential factors have an immediate impact on an individual experience, while the contextual factors include the environmental, legal, economic, social, and cultural.

Following van Manen (1990), Coxon (2007) explained the four existential elements. Spatiality is the space in which the experience happens. Temporality is a temporal way of being in the world, considering of past, present, and future. Corporeality refers to the condition of being bodily in the world. This is the way in which a person physically interacts with it, which

includes motion, standing, moving, sitting, body movements etc. Relationality includes the interaction experiences with others that impact on the appreciation of a particular experience.

Coxon's (2007) ToE helped guide data collection and qualitative data analysis. In the interviews in this study, the experiential elements are interwoven within existential or contextual components of the narrative. Details for data analysis techniques are provided in section 4.2.2 below,

3.5 3D Virtual World Design

The DBR product is a 3D virtual world designed in OpenSimulator, which is also the field site for the study. This design is elaborated in the initial sections of Chapter 4 along with images (screen shots). Briefly, as reviewed in Chapter 2, the principles of holistic experience, interaction, and continuity are embedded in the design of this 3D virtual learning environment. Deweyan and Confucian pragmatist understandings of experience prompted me to design with the importance of holistic experience and interaction in mind. Affordances of 3D virtual worlds, including simulation, embodiment, and interactivity were utilized to facilitate the acquisition of cultural care (Anderson & Shattuck, 2012; Bowman, 2013; Collins et al., 2004; Corder & U-Mackey, 2018; Design-Based Research Collective 2003; McKenney & Reeves, 2012; Reeves, Herrington, & Oliver, 2005; Squire, 2006).

The final 3D virtual world includes four main rooms: conference room, classroom, clinic, and café (Figure 3.4) (see more images in Chapter 4):

Figure 3.4 Four Rooms in the 3D Virtual World: Classroom, Conference room, Clinic, and Café.

Figure 3.5 The roles of the doctor, the nurse, and the patient in the 3D virtual world

1) **Conference room and classroom:** Users interact in groups, three in one group. Participants choose their session themes and character roles instead of being assigned. After discussing and planning effective and interesting scenarios for role-play, and then choosing roles and adopting appropriate clothes to symbolize the avatars, users enter the classroom. Doctor, nurse, and patient clothes help users imagine themselves in respective roles for expressing various questions or concerns about cultural competence in a healthcare scenario they create. Virtual clothes for cultural variety were created and are stored in a virtual inventory. In the classroom, the content for the role-play scenarios is given through training packages for cultivating cultural competence in healthcare in multiple formats, including text, PowerPoint, and streaming videos. The content includes concepts, theoretical foundations of transcultural nursing, transcultural models, cultural knowledge, and skills. Users can learn in the classroom with the content and coordinate in the conference room before proceeding to the clinic.

2) **Clinic:** Experiential learning in the virtual world begins in the virtual clinic (Figure 3.4). In the clinic, users play roles of doctor, nurse, and patient in open-ended scenarios. Scenarios adopted by users varied. A few scenarios challenged the English-speaking nurse and doctor to respond appropriately to patients that spoke English as a second language. This is a common communication scenario in healthcare professions. In another example scenario, users adopted different ethnic and cultural identities that then challenged the nurse and doctor to competently and appropriately give a positive diagnosis. These could be debriefed or informed in the conference room or users could enter the café to relax and debrief.

3) **Café:** The café room provides a casual setting for users to debrief content and scenarios, socialize, or plan ahead for another scenario.

For the purposes of the research, users were given flexibility to create scenarios and choose and exchange roles in the 3D world. This type of open-ended or student-centred approach to role-play in the acquisition of cultural competence is common (Lowenstein, 2011; Qing, 2011; Shearer & Davidhizar, 2003). In different sessions, participants can choose different themes or exchange roles with other players when in the virtual world, signaled in part by the avatar wearing clothes from the inventory. “Repeating a scenario with the same or different characters can sometimes afford a more in-depth examination and add to the experience” (Lowenstein, 2011, p. 194). Users in this research were able to repeat the scenarios and play the same or different roles in the virtual world.

In summary, researchers have actively examined various aspects to understand the culture and experiences in virtual worlds, which include: what are the overarching cultural norms? Does an enduring cultural logic (assumptions, practices, social relations) exist? What do virtual worlds

borrow from actual world social practices; are these practices less meaningful or alienating? Are there continuities between actual and virtual worlds?

3.6 Participants, Data Sources, and Other Research Design Aspects

3.6.1 Participant Recruitment and Settings

Data were collected by gathering the responses and attending to user experiences of instructional designers, instructors, and students. The first population targeted was instructional designers and instructors with 3D virtual world experience in health care related fields. The second population targeted was students, health care provider candidates, instructional designers and instructors in postsecondary institutions. Participants were recruited on voluntary basis. Consent was obtained before participation.

In the initial iterations, instructional designers and instructors were recruited for interviews to provide initial evaluations given their experiences of the platform. Student participants were introduced for interviews and surveys in later iterations. Interviews took place on two campuses in Metro Vancouver area while the virtual world served as the setting.

Initial participants included two instructors, two instructional designers, and two digital arts builders. Two instructors are from a faculty of health at a Vancouver postsecondary institution with extensive experiences in high fidelity patient simulation education. The two instructional designers and two digital arts builders all have more than ten years' experience in curriculum design and digital production. A subsequent iteration added three instructors from a faculty of education at other Canadian and Asian universities with a research focus on instructional technology.

Student data were collected from a convenience sample of ten second year diploma students in the faculty of health at a post-secondary institution in Metro Vancouver area. The students were diverse, with a variety of ethnic backgrounds of Asian Canadian, East India Canadian, Caucasian Canadian, and African Canadian. Demographic information was not explicitly captured because the research is about inviting a diverse group of participants without segmenting by demographics. The participants represent cultural and socio-economic diversities. This group of students were in the same class for two years and were familiar with each other. Even though the students have been actively using high fidelity patient simulation in labs for the past two years, it was their first time to do role plays in the OpenSimulator virtual world environment. In summary, participants included (Table 3.1):

Table 3.1 Participant List

DBR Iteration	Date	Participants	Pseudonyms
3	January – March 2018	2 instructors 2 instructional designers 2 digital arts builders	2 instructors: Melody, Sabin 2 instructional designers: Yuliana, Yvette 2 digital arts builders: Jabez, James
5	March – July 2018	10 Students from KPU 5 instructors 2 instructional designers 2 digital arts builders	5 instructors: Melody, Sabin, Ethan, Gabriel, Barbara 2 instructional designers: Yuliana, Yvette 2 digital arts builders: Jabez, James 10 Students from KPU: Daniel, Harry, Daisy, Fay, William, Logan, Oliver, Henry, Sebastian, Caleb

3.6.2 Data Sources

Field data were captured through semi-structured interviews, survey, and screen shots of the virtual world. Multiple data sources and collection methods were adopted for triangulation (Table 3.2).

Table 3.2 Data Sources

DBR Iteration	Date	Data Source
1-7	January 2017 – December 2018	Documentation of the DBR process throughout seven micro-cycles
3	January – March 2018	Audio recordings and notes from interviews with instructors, instructional designers, and digital arts builders
5	March 2018	Nurse Cultural Competence Scale instrument (NCCS)
5	March – July 2018	Audio recordings and notes from interviews with students
5-7	March – December 2018	In-world images captured during the process of student learning activities

3.6.3 Survey Using the NCCS

The Nurse Cultural Competence Scale (NCCS), developed by Perng and Watson (2012), was selected because it is based on Campinha-Bacote's five construct conceptual model. Participants were given the NCCS survey (Appendix D) with an option of completing the survey on a MS Word file and emailing it back or completing the survey online. Survey responses were anonymous; no internet protocol addresses were collected from those who completed the surveys online. For the measurement of cultural competence, there are two major categories: culture-specific tools and culture-general tools (Capell et al., 2007). The use of culture-specific tools is usually limited to specific ethnic groups of clients; while culture-general tools are designed to apply to different groups of clients. The NCCS belongs to culture-general tools, which was

created at the Tzu-Chi College of Technology in Taiwan in 2012 (Loftin, Hartin, Branson, & Reyes, 2013).

Culturally competent care is a multifaceted concept. The NCCS includes four cultural constructs, cultural awareness, cultural knowledge, cultural sensitivity, and cultural skill, to assess cultural competence among nurses and other health care professionals. In this study the two constructs of cultural awareness and cultural sensitivity were adopted to understand student experiences and assess the effectiveness of the virtual world design. It uses five-point Likert scale with response categories of strongly disagree, disagree, no comment, agree, and strongly agree. Ten items from the NCCS's Cultural Awareness Scale and eight items from the Cultural Sensitivity Scale were analyzed (Appendix D). Total scores for these 18 items ranged from 0-72 to indicate the cultural competence level from less culturally competent to more culturally competent. Higher scores demonstrate a higher level of competence. According to the authors' report, the reliability ranged from .78 to .96 during pilot testing. Face validity was established through the review of the scale by nursing experts.

The cultural competence practice is dynamic and ongoing. In this study, I researched the initial stage of the process: cultural awareness and cultural sensitivity were selected to understand cultural acquisition of nursing students and health care provider candidates. Completing the questionnaire took approximately 10 minutes.

3.6.4 Interviews

Potential participants were presented with a cover letter, consent form, and interview questionnaire. Users were encouraged to express their experiences during the semi-structured

interview. Experiential and existential elements of the ToE helped shape the questions for instructional designers, instructors, and students.

Interview data were entered into Microsoft Office 365 Excel spreadsheets and analyzed using the SEEing technique created by Coxon (2007), which is a structural interpretation of the experiential phenomena. Details of this analysis are provided in section 4.2.2.

3.6.5 Ethical Considerations

This research is covered by UBC's Behavioral Research Ethics Board (BREB) certificate #H06-80670 (under the Supervisor, Dr. Stephen Petrina). In accordance with BREB procedures, all participants received a "Consent to Participate" letter outlining the conditions for participating and withdrawing from the study. Anonymity and confidentiality were maintained during the study. I used pseudonyms for all participants, including instructors, instructional designers and students. Questionnaire coding and responses were not linked to any individual student. All data are stored on a password-protected computer and paper-based documents are stored in a locked filing cabinet.

3.7 Summary

This chapter outlined the research methodologies and clarified the research design. An extensive description of DBR was provided with an emphasis on its use in this study. UX was described as a secondary methodology for the research. The ToE was described as an effective way of analyzing experience. An overview of the 3D virtual world designed for the purposes of this research was given. Recruitment and participants were described along with data sources.

The ethical protocols followed were briefly summarized. The following chapter provides the analysis of data and findings.

Chapter 4: Design-Based Research and UX Data Analysis and Findings

This study follows a DBR process through early work and testing pilots, building prototypes, and developing design products over seven iterations. The ultimate goal of the design is to develop usable and useful systems that support learning in a 3D virtual world by understanding user experiences. This chapter begins with the presentation of the phases of the DBR methodology, then presents the data analysis organized through iterative reviews of interview scripts, screen shots, and notes taken in the virtual world. Survey data and interview data were collected in the fifth micro-cycle. The initial survey data helped the researcher further sharpen observation and interview focus. The interview data helped the researcher gain deeper understanding of user experiences. Therefore, quantitative and qualitative data complement each other, which further enhances the effectiveness of the 3D virtual world design.

4.1 Design-Based Research Process

4.1.1 The First Micro-cycle: Analysis and Exploration

The study began with an analysis and exploration phase, which is an empirical cycle of micro-cycle type. Every micro-cycle is relatively independent and constitutes "its own cycle of action, with its own logical chain of reasoning" (McKenney & Reeves, 2012. p. 78). In this micro-cycle, the main goal is problem identification and diagnosis. The following processes were included in this analysis and exploration cycle.

The design problem was to create an effective 3D virtual learning environment to facilitate students' cultural competence acquisition. I wanted to explore and understand user experiences in the virtual world, to further guide designing and teaching in the 3D virtual world.

After an extensive literature review, based on the researcher's substantive instructional design experience, the following major design guidelines were considered:

- Embed culturally diverse background knowledge for a diversity of users.
- Select and embed the instructional design model in the design process.
- Select and embed the system design and production model in the design process.
- Carefully select and design scenarios with learning activities so as the affordances of 3D virtual world are utilized to enhance experience.
- Examine and test multiple 3D virtual world platforms for design affordances.
- Select what Aldrich (2009, p. 88) calls a "tough-love" approach, the users are selected to enter the virtual world and "figure it out themselves".

4.1.2 The Second Micro-cycle: Design and Construction

Taking inputs from the previous micro-cycle Analysis and Exploration, the study moved to second phase Design and Construction. The design requirements and propositions were revisited during this iterative process. In this micro-cycle, the following aspects were considered.

4.1.2.1 Instructional Design

For the instructional design of the 3D virtual world, pedagogical rationale and approaches based on experiential learning in immersive virtual world were adopted (Jarmon, Traphagan, Mayrath, & Trivedi, 2009). Together with other pedagogical approaches, the ADDIE instructional design model was utilized as the base. ADDIE includes five phases: Analysis, Design, Development, Implementation and Evaluation. The traditional ADDIE model is process-

oriented, linear, and static. The ADDIE model utilized in this study represents a dynamic, flexible guideline for building effective teaching and training applications (Morrison, 2010). Instead of a process or waterfall model, each step in the updated ADDIE model has an outcome that feeds into the subsequent step so as all steps are highly interrelated.

Learning resources regarding cultural care and competency were delivered in the virtual world. As described in Chapter 3, role playing scenarios utilizing virtual affordances were designed as open-ended learning activities (Jamaludin, Chee, & Ho, 2009). These were supplemented by PowerPoint lectures, instructional videos, and small group discuss sessions.

4.1.2.2 Agile Design Methods for Production

Agile design methods were also adopted to guide the design of the system, and further understanding of user experience. Agile means that developers' primary concern is delivering a functioning product by listening to users' feedback, and making adjustments and improvements through constant iterations (Sy, 2007). Agile development requires regular releases for feedback, continuous assessment of system functions, responsive modifications and reviews. Since only high-level objectives are defined upfront, it also requires both researchers and technical staff to work together very closely and frequently on specifying detailed design features to go through multiple micro-cycles, meso-cycles for the phases of Analysis and Exploration, Design and Construction, Evaluation, and Reflection. Of course, given the time constraints of the research, I was unable to design for a series of releases.

4.1.2.3 3D Virtual World Platform Exploration and Selection

The facilitation of teaching and learning through the use of 3D virtual worlds is not a new phenomenon. There are extensive research and applications in higher education (Hew & Cheung, 2010; Wang & Burton, 2013).

A variety of software has been widely utilized for educational applications among development communities, educators and users. These include ActiveWorlds, which has shown substantial potential to support learning in K-12 environments, and Anytown, River City, Taiga worlds, two of which were created under the auspices of the Quest Atlantis National Science Foundation project (Barab, Dodge, & Ingram-Goble, 2008). The interactive learning environments which have extensive usage in medical related fields are Second Life, virtual platforms such as Fablusi™, and the virtual nursing lab of Duke (OpenReality Duke Nursing Virtual Lab, 2010).

As reported in Chapter 3, I used OpenSimulator for the 3D virtual world in this study. The application can be downloaded free at opensimulator.org. OpenSimulator is an open source multi-platform, multi-user 3D application, which can be used to create a virtual world to be accessed through a variety of clients. It also has the Hypergrid facility to allow users to visit other OpenSimulator installations across the web. Compared to Second Life, OpenSimulator provides similar virtual environments but more controllable for educational settings. In addition, OpenSimulator is flexible to revise, adapt, make changes, and re-implement to fit the special requirements of target context and users. It strongly matches the needs of DBR, with the research objective of enhancing virtual world design to support students' ability to acquire cultural competence.

4.1.2.4 Tentative Product

For the tentative product designed in this cycle, the following core design features of a clinic room were identified and developed:

- Training materials being selected and designed by the researcher as the instructional designer.
- Designing pre-training opportunities through the OpenSimulator interface.
- Designing the segmentation and learner controls over components within identified learning tasks.
- A virtual clinic with one patient bed, computer desk and chair being created in the virtual world.
- A combined conference room and classroom with PowerPoint lectures and streaming videos being embedded in the virtual world.
- Communication tools being activated in the user interface in the virtual world, including
  - Local text-based chat tool
  - Private channel instant message (IM) tool
  - Group text chat tool
  - Built-in synchronous voice tool in OpenSimulator allows for communication over a client-server Voice-over-IP (VoIP) to support collaboration within the environment
- Three sets of clothes for the roles of a physician, a nurse and a patient being designed and created.

The skeleton design was completed in this phase (Figures 4.1-4.3). At this phase of the design, selected participants were able to interact with each other in real time, and interact with the researcher.

Figure 4.1 3D virtual world image: a physician with a patient

Figure 4.2 3D virtual world image: a nurse with a patient

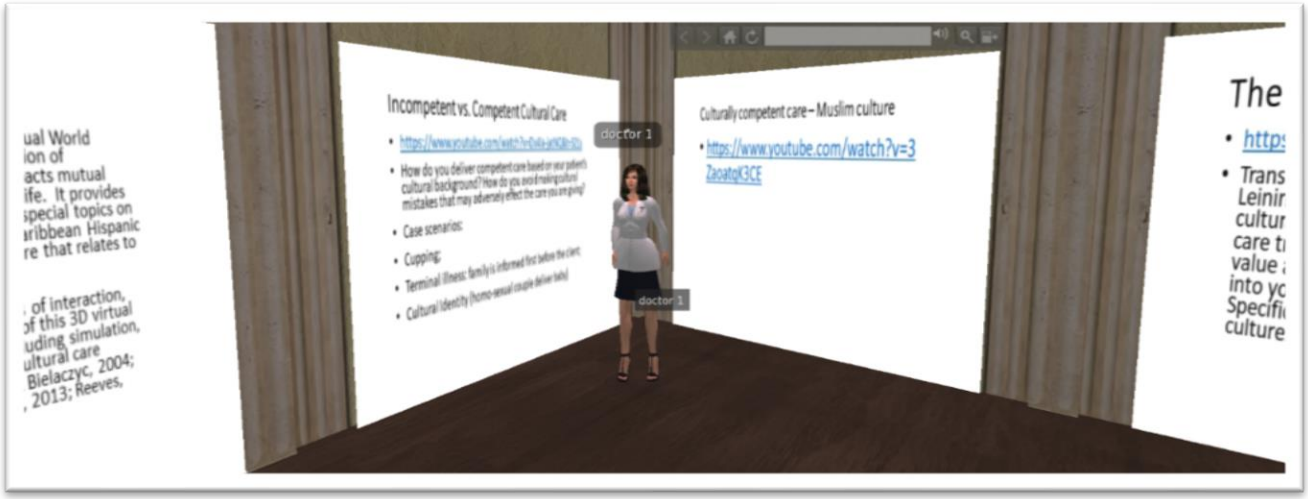

Figure 4.3 3D virtual world image: a combined conference room and classroom with PowerPoint lectures and streaming videos.

4.1.3 The Third Micro-cycle Evaluation and Reflection

The Evaluation and Reflection phase constituted another empirical micro-cycle. Evaluation and reflection involve active and thoughtful consideration of what has come together in previous development for further theoretical understanding. Further, the time and mechanisms are planned that will provide new insights generated during the DBR iteration process, and the evolution process of the design is documented.

To do the initial evaluation for the instructional design and production from last phase based on the skeleton design, I invited two instructors, two instructional designers and two digital arts builders to role play together in the virtual world with the specified learning objectives and tasks. The role-play lasted for two weeks with three stages in one session: preparation, implementation, and reflection

As the researcher, I was submerged in the 3D virtual world environment, utilizing in-world observation and individual interview methods to collect data. Audio files collected during the interview were transcribed and saved as text files. A qualitative, inductive analysis was conducted on interview data. The initial feedback from the users was positive in general. The instructors, the instructional designers, and the digital arts builder all indicated that cultural competence acquisition in 3D virtual world was an educationally meaningful project with significant need. Besides the positive comments that the 3D virtual world potentially enhances learning, several key factors that restricted learner engagement in the virtual world were identified in the interviews and the observations.

4.1.3.1 Extraneous Overload Scenarios

Participants' feedback from the first-round indicated they were cognitively too busy and felt like they were getting lost in the virtual world. I reviewed the literature in virtual world design regarding this aspect, especially Mayer's extensive publications on multimedia and rich media design for learning. According to Mayer and Moreno (2003), Mayer (2005), and Mayer and Clark (2007), the problem I confronted is caused by "extraneous overload scenarios", which refer to the situations in which the combination of both essential (relevant) and extraneous (irrelevant) information is beyond a learner's capacity. Extensive extraneous materials, which do not directly contribute achievement of an instructional objective, overload users' visual and verbal channels together with information. Several solutions were embedded to avoid the content overload in the next phase design.

4.1.3.2 Adding Broader Roles in Role Plays

It was advised by an instructor participant that in typical role play scenarios in high fidelity patient simulation practicum experiences, there are usually more roles to enhance the realism of clinical practice. In addition to the roles of physicians, nurses, and patients, the new roles including observer roles, family member roles, and friend roles were recommended to add.

During the role play, the physician usually does diagnoses and assessment while the nurse provides patient care. The observer evaluates the outcomes of patient care in the scenario. There are also family members that can be role played by participants to provide a more realistic experience. It was recommended that the next iteration further optimize the processes for engaging the roles as well as outcomes of these roles.

4.1.3.3 Creating More Designed Objects for a Realistically Simulated Learning Environment

For the virtual clinic, it was recommended that I design and create more objects for a more realistically simulated learning environment, such as more patient beds, wall-mounted bedside monitors, medical supply cabinets, and other medical equipment and supplies.

4.1.4 The Fourth Micro-cycle: Re-design and Construction

Based on the previous product design, evaluation and reflection, the successive approximations of the desired solution are created in this phase.

4.1.4.1 Managing User Cognitive Load

For this design iteration, problems of cognitive load or demands on memory processing, were problems of information overload and confusion primarily due to the structuring of the virtual world and too much information in places (Mayer & Moreno, 2003). This is a common challenge for instructional designers. Based on the evaluation and reflections from the previous phase, redesign in this phase adhered to avoiding an overload of content and to further situating learning to mimic real-world situations. First, most external links were removed from the images to reduce the split attention effect. When a student clicks on an image in the virtual world, instead of a visually separate web content window popping up, the student's view now zoomed in to a close-up of the object inside the 3D virtual world to get the related information.

A second approach to managing cognitive load is to offload some of the content from one channel (visual) to the other (verbal), which separates the processing of essential information in either visual or verbal channels (Mayer & Moreno, 2003). Based on this principle, several

simultaneous image and voice presentations in the original design were recreated to offload the user cognitive load.

Also, some in-world interactions were redesigned to stay inside the 3D virtual world so learners can examine objects in the virtual world instead of in a visually separate location on the screen, which causes attention to split. The conference room and classroom with PowerPoint lectures and streaming videos were recreated separately as different rooms instead of in a combined room in the virtual world, which reduced attention split as well (Figures 4.4-4.5).

Figure 4.4 3D virtual world image: conference room and classroom are separate - 1.

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Figure 4.5 3D virtual world image: conference room and classroom are separate - 2.

4.1.4.2 Broader Roles in Role Plays Added

Based on the evaluation from the last phase, broader roles were added. Family member roles including two parents, and several friend roles (female and male) were added. More clothes representing different roles were designed and created in the inventories of the virtual world. With these clothes objects, students can choose different roles for their avatars and do role play based on the cultural knowledge they acquire.

Observer roles were added as well. The observational activity from the observer role is similar to peer review or peer assessment. It is an "organized, systematic process whereby peers can evaluate the professional practice of another colleague using a standardized tool with the

goal of providing constructive feedback to promote professional growth and development" (Boehm & Bonnel, 2010. p. 109). Guided observation activity sheets were provided to students.

Figure 4.6 3D virtual world image: simulated sessions with the family member roles added.

Figure 4.7 3D virtual world image: simulated sessions with the family member and friend roles added.

Figure 4.8 3D virtual world image: simulated sessions with the observer role added - 1.

Figure 4.9 3D virtual world image: simulated sessions with the observer role added - 2.

4.1.4.3 More Designed Objects for the Learning Environment Created

More designed objects were created for a more realistically simulated learning environment. Some medical equipment and supplies were created. Note cards were placed in the virtual world to facilitate the process. The learning activities are flexible, allowing students to complete in their preferred sequences. Students can also constructively build cultural objects based on their own background and understanding.

4.1.5 The Fifth Micro-cycle: Re-Evaluation and Reflection

This cycle of evaluation and reflection used a descriptive, exploratory approach. First, the ten students participating in this research study took a survey using the NCCS instrument before playing, which provide an initial perspective on their prior learning and helped the researcher understand user experiences. Second, nineteen participants including ten students, five instructors, two instructional designers, two digital arts builders were randomly assigned to role play groups in the 3D virtual world in the roles of physicians, nurses, patients, observers, and others. Participants can exchange roles based on their own preferences. Third, the researcher conducted in-depth interviews with the participants using the ToE to understand and explore the user experiences holistically.

4.1.5.1 Survey

At the beginning of this cycle before role play sessions started, the ten students took a survey using the Nurse Cultural Competence Scale (NCCS), which provides an initial perspective on students' prior learning. Two constructs of cultural awareness and cultural sensitivity are selected to explore the initial stage of cultural competence acquisition. It uses a

five-point Likert scale described in Chapter 3. The full NCCS survey items are listed in Appendix D. The NCCS uses five-point Likert scale: strongly disagree (0), disagree (1), no comment (2), agree (3), and strongly agree (4). Higher scores on the NCCS suggest a higher level of competence.

The initial summary of the scores of the ten student participants using descriptive statistics through Microsoft Office 365 Excel is described below. We can see the prior cultural competence level is relatively high for this group of students as the total selection in the strongly agree category is 38.3%.

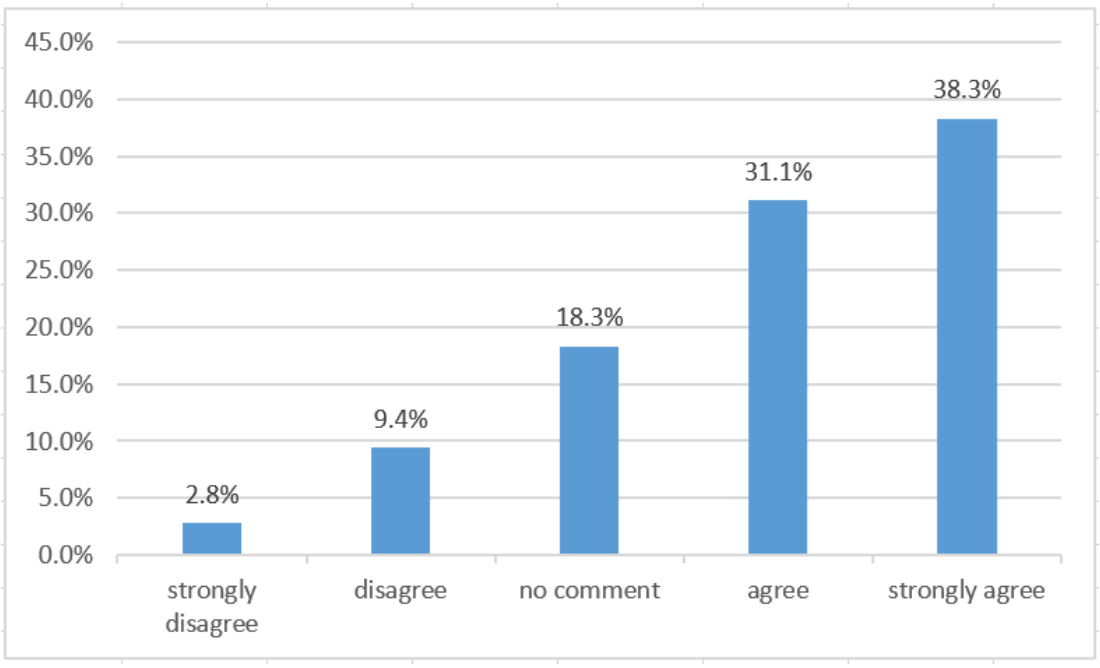


Figure 4.10 Prior learning of cultural competence.

As the study was not designed to measure the participants' acquisition, the NCSS is only used to describe the students' prior cultural competence level. Instead of administering the NCSS

as a post-test, I explored the participants' experiences in the 3D world, which facilitates the acquisition of cultural competence.

After the questionnaire, students were assigned accounts in the OpenSimulator 3D virtual world. The students had normally scheduled mannequin-based simulation experiences in simulation lab in their institution. Complementary with these mannequin-based simulation sessions, the consenting students and other participants including the participating instructors, instructional designers, and digital builders were randomly assigned to role plays as physicians, nurses, patients, observers, and other roles. As indicated, participants exchanged roles based on their own preferences. Participants in different roles were provided a five-minute instructional session for the guided activities. Debriefing sessions were held after most play sessions.

4.1.5.2 Interview

After two weeks of the role play sessions, all consenting participants were asked to complete a semi-structured face-to-face interview session based on the ToE. Compared to the initial information and understandings derived from the survey at the beginning of this cycle, the interviews after role play sessions gave more insights and further depth to the data.

One unique feature of the interviews conducted in the virtual worlds needs to be taken into consideration given the relative lack of facial expressions and gestures of avatars, even though the graphical realism of avatars continues to increase. Therefore, interviews are recommended to be conducted at least partially face-to-face in the real world, complementary with those conducted in a 3D virtual world.

4.1.6 The Sixth Micro-cycle: Re-design and Construction

Following up the previous evaluation and reflection cycle, there were updates for the virtual world design. Three more clinics were created, making four clinic sites in total for participants to role play, which facilitates building broader learning communities. Inside the virtual clinic, more patient beds were added. There are up to four patient beds in one room.

More medical equipment and supplies were created in the virtual world inventory, such as blood pressure gauges, bedside cardiac monitor, and wheelchairs etc. More clothes for different professions including charge nurse, bedside nurse, nurse assistant, and other roles were created. With these additional objects and clothes, students can have greater flexibility to choose different roles for their avatars to do role plays and other activities.

A student café room was created, which has coffee tables with chairs. In addition to the discussions regarding simulation sessions and other formal topics, participants' avatars can also sit here for casual chats for non-academic topics to further build learning communities.

Figure 4.11 3D virtual world image: a participant in doctor role sits in the café room.

Figure 4.12 3D virtual world image: a participant in nurse role sits in the café room.

Figure 4.13 3D virtual world image: the participants in observer role and doctor role sit in the café room.

Figure 4.14 3D virtual world image: multiple participants in café room - 1.

Figure 4.15 3D virtual world image: multiple participants in café room - 2.

4.1.7 The Seventh Micro-cycle: Implementation and Spread

The dissemination phase has two main outputs, Maturing Interventions and Theoretical Understanding, which are both produced through the previous iterations. Maturing Interventions are practical outputs, which are designed interventions including the designed simulation environments in OpenSimulator 3D virtual world, role-play scenarios, procedures, and related products created and refined from multiple cycles. They can possibly be implemented for wider usage. Theoretical Understanding is the distilled user experience of students, instructors, instructional designers, digital arts builders and others based on the framework of the ToE and analytic Seeing techniques, created by Coxon (2007). This was a systematic process to analyze the qualitative data and acquire an advantageous understanding of the deeper meaning of the experiences.

Maturing Intervention and Theoretical Understanding are connected and contribute directly and indirectly to each other, maturing together in DBR iterations. With use-inspired as the defining characteristic of DBR, McKenney and Reeves (2012, p. 159) note that Implementation and Spread are taken into consideration at the very beginning and approached from every phase of research and micro-cycle. Implementation refers to an adoption of the design or intervention while spread refers to insights for diffusion and actual diffusion to other settings. As the OpenSimulator 3D virtual world design for this research was implemented, perspectives of the researcher, instructors, instructional designers, students and other participants helped define problems for cultural competence acquisition, make design choices, and facilitate the connecting of "messy, varied realities of educational context" to real world usage (McKenney & Reeves, 2012, p. 81). Although the 3D virtual world was not spread or diffused beyond this research, insights for diffusion were generated.

Table 4.1 summarizes the DBR iterations above, which include the seven micro-cycles, participants, and research focus of each cycle.

Table 4.1 DBR iterations, participants and focuses

DBR Iteration	Participants	Data Source	Focus
The First Micro-cycle: Analysis and Exploration	The researcher	No formal data collection	Problem identification and diagnosis.
The Second Micro-cycle: Design and Construction	The researcher, A digital arts builder.	No formal data collection	Instructional design, 3D virtual world and tentative product production.
The Third Micro-cycle: Evaluation and Reflection	Two instructors, Two instructional designers, Two digital arts builders.	Audio recordings and notes from interviews with instructors, instructional designers, and digital arts builders	Evaluation of the skeleton design through in-world observation and individual interview methods. A qualitative, inductive analysis are conducted for the data collection.
The Fourth Micro-cycle: Re-design and Construction	The researcher, A digital arts builder.	No formal data collection	Based on the previous evaluation and reflection, the improvements including managing user cognitive load, adding broader roles in role plays, creating more objects for the learning environment are made.
The Fifth Micro-cycle: Re-Evaluation and Reflection	Ten Students from KPU, Five instructors, Two instructional designers, Two digital arts builders.	Nurse Cultural Competence Scale instrument (NCCS) Audio recordings and notes from interviews with students In-world images captured during the process of student learning activities	Survey using the NCCS instrument provides an initial perspective on students' prior learning. In-depth interviews with the participants using the framework of Taxonomy of Experience.
The Sixth Micro-	The researcher,	In-world images	Three more clinics are

cycle: Re-design and Construction	A digital arts builder.	captured during the process of student learning activities	created, more patient beds, medical equipment and supplies are added, more clothes for different professions are created to provide greater flexibility for participants to do role plays and other activities. A student café room is created
The Seventh Micro-cycle: Implementation and Spread	The researcher	In-world images captured during the process of student learning activities	Two main outputs, Maturing Interventions and Theoretical Understanding are summarized.

4.2 Data Analysis

Qualitative data analyses based on the ToE was the main analysis used for the research in this dissertation. Details are described in the following section. Quantitative data, descriptive statistics through Microsoft Office 365 Excel, were used in the fifth micro-cycle of Re-Evaluation and Reflection. The descriptive statistics describe the students' prior learning, which informed the researcher of their prior cultural competence.

The following Table 4.2 describes iterations three and five, during which virtual world evaluation was conducted and data were collected. It includes the participants of the study, the dates of the conducted research, and the focuses during the iterations.

Table 4.2 Data collection iterations, dates, participants and focuses

DBR Iteration	Date	Participants	Focus
The Third Micro-cycle	January – March 2018	Two instructors Two instructional designers Two digital arts builders	Evaluation of the skeleton design through in-world observation and individual interview methods. A

			qualitative, inductive analysis are conducted for the data collection.
The Fifth Micro-cycle	March – August 2018	Ten Students from KPU Five instructors Two instructional designers Two digital arts builders	Survey using the NCCS instrument provides an initial perspective on students' prior learning; In-depth interviews with the participants using the framework of Taxonomy of Experience.

4.2.1 The Structure of the Taxonomy of Experience

The ToE helped guide the collection, categorization, and analysis of data meaningfully for this study. First, collection and analysis categories are created for the interview questions in the study. The ToE guides a deeper and more elaborate understanding of elements of an experience (Coxon, 2007). The taxonomy provides a gathering point for the experience data collected in the field and a starting point to explore the deeper meanings. The ToE provides a perspective that allows virtual experience to be viewed in a new way, which is a more structured and comprehensive way that has not been available before (Coxon, 2007, Wang, 2017, Aisa, 2013).

The meta-themes of the taxonomy include the following categories (Table 4.3). First, the body-somatic experiences, or sensorial experiences, which include five senses of sound, touch, feel, sight, smell, taste, comfort-ergonomics, and appearance-aesthetics. Second, heart-affective experiences, emotions, or feelings, which include positive and negative emotions. Third, head-cognitive experiences, or thinking and acting, which include conation, reflective experiences,

reflective thought of external doing, and cognition, reflexive experiences, and reflexive thought of internal thinking.

Existential factors include time, space, corporeality, and relationality (van Manen, 1990, pp. 101-106). They refer to the body's relationship to others.

The third category of contextual factors include environmental factors, regulatory factors, and social factors.

Table 4.3 Meta-themes and sub-themes of ToE

	Meta-themes	**Sub-themes**
Experiential elements	body- somatic experience/ sensorial experiences (five senses)	sight, touch, sound, comfort-ergonomics, and appearance aesthetics
	heart-affective experience (emotions, feelings)	positive–negative emotions
	head-cognitive experience (thinking and acting)	conation- reflective experience, reflective thought of external doing; cognition - reflexive experience, reflexive thought of internal thinking
Existential factors	spatiality (space)	
	temporality (time)	
	corporeality (body, physicality)	motion, standing, moving, sitting, body movements
	relationality (Relation to others)	
Contextual factors	environmental factors, regulatory factors, social factors	

4.2.2 Data Coding and Analysis through ToE-SEEing

The analytic approach of SEEing facilitated the use of the ToE for data analysis. The SEEing technique is a systematic process to analyze the qualitative data, helping establish deeper meaning of user experience. The ToE-SEEing process includes nine steps to categorize and analyze users' interview data. User experience is analyzed through a series of progressive steps to extract the essences of the experience and allow them to be "seen", which provides a way to make abstract concepts comprehensible and visible. This method offers an opportunity to look deeper into the data collected while extracting conclusions (Coxon, 2007).

The ToE-SEEing process refines other qualitative analysis methods. Instead of providing an abstract concept as an outcome, experiences in comprehensible and visible format emerge from the ToE-SEEing process.

The nine-step process of the ToE-SEEing process is described in the following paragraphs. The nine steps are:

Step 1 Submersion and Data Gathering
Step 2 Descriptive Narratives
Step 3 Sorting Fragments into ToE Themes
Step 4 Developing Meaning(s)
Step 5 Essential Elements
Step 6 Super-Ordinary Elements
Step 7 Weight
Step 8 Superordinary Summary Words
Step 9 Summary Word Descriptions

It begins by transforming the users' interview fragments and ends by synthesizing them into superordinary themes. Overall, the first three steps of the ToE-SEEing included gathering and transcribing data, establishing structure, and storing information about an experience. Steps from four to five are the analysis phases to allow deeper meaning to be "seen". Finally, this

analytical process results in seven overall category elements. Microsoft Office 365 Excel worksheet was customized and adopted for this analysis.

4.2.2.1 Step 1 Submersion and Data Gathering

The submersion in this step emphasizes the researcher is immersed in the experience to the maximum that they are prepared to be involved (Csikszentmihalyi, 1991; Hanington, 2000). The purpose of immersion is to gain a valuable knowledge, which helps establish a common understanding when doing the interviews with the participants. It is important that the researcher becomes familiar with the experience and understands its nature (i.e., virtual) (Coxon, 2007, Wang, 2017).

As an instructional designer in elearning for more than 10 years, I have extensive experience in 3D virtual worlds in education since 2007. I am familiar with the experience and its "language". Therefore, I was able to converse with experiencers as an "experienced experiencer", to gain a deeper understanding of the actual experience as the researcher (Coxon 2017).

The semi-structured interviews served as the data source for the analysis in this study, through which the large amount of empirical data was collected to explore the participants' feelings and impressions. Before the interviews, I introduced the participants to the field of research, and informed them of the purpose of the interview, so as the participants had a clear idea about the research focus.

With each semi-structure interview question presented, the participants talked about their experiences in the 3D virtual world. The questions were open-ended and participants talked in a free way about the most valuable information. I listened to understand the insights from

participant comments about their own experiences. The ToE structure was very helpful to guide the conversations along the right path during the process. Two mobile phones were utilized at the same time to record the interviewee voices, and I took notes during the conversations. Some interview data reinforced early insights from the literature review.

4.2.2.2 Step 2 Descriptive Narratives

The researcher reduced the verbatim data collected in step 1 of the ToE-SEEing process into detailed descriptive narratives, which are a common textual format for analysis. In the interview data, the experiential elements can be seen interwoven within existential and contextual elements of the narrative. Next the texts of the experience are broken into fragments of a single word or a phrase in Microsoft office 365 Excel for SEEing step 3.

4.2.2.3 Step 3 Sorting Fragments into ToE Themes

The fragments of information from the second step are first interpreted in a literal and superficial manner to facilitate the generation of themes, meta-themes, and sub-themes from the data. Meta-themes include the somatic/sensorial experiences, affective experience, cognitive experience, existential factors, and contextual factors (see details in Table 2). The themes are established in the Microsoft Office 365 Excel worksheet vertically.

Data analysis in this step helps clarify the key themes of users' experience and to establish a good foundation for further analysis. Through steps 1-3, data were entered into the Excel worksheet for further analysis. The core of the analytical process starts in next step.

4.2.2.4 Step 4 Developing Meaning(s)

The fourth step focuses on developing meanings of the interview fragments. This step is one of the most important ones for the research, which took a lot time to process. The researcher reviews each of the fragments in step 3 and extracts deeper and suggested meanings by asking, "what is really being said here?" (Coxon, 2007, p. 314), The researcher begins by carefully looking at each fragment of information not as it is presented, but for what other meanings it might have (Coxon, 2007). All possible hidden and deep meanings contained within the fragments are developed and accepted, and are entered into the step 4 column of the Excel worksheet for SEEing process.

In addition, the screenshots recorded in the 3D virtual world and observation notes taken during the interviews were reviewed by the researcher to understand the context of users' experiences.

4.2.2.5 Step 5 Essential Elements

Based on the researcher's experience and knowledge gained during the immersion, the researcher tried to determine if the meanings listed in step 4 were incidental or vital to the nature of the experience. I then reduced these to the most essential elements by filtering out the less important meanings to make later analysis more manageable.

4.2.2.6 Step 6 Super-Ordinary Elements

This step is to extract "the Superordinary (unexpected, novel and hidden) aspects of the experience" (Coxon, 2007, p. 317). The surprising elements, the unintended impacts of the experience, are searched in this step (Wang, 2011). Similar to Wang (2017), I analyzed

participants' user experience separately during steps 1-5. Starting from step 6, all superordinary elements were analyzed and all elements were processed together during steps 7-9.

4.2.2.7 Step 7 Weight

Based on the researcher's understanding of the experience, the essential meanings were weighted subjectively using Likert ratings from 1 to 7 (where 1 is low) according to how important these elements were for the experience. The importance and number of times the experience was mentioned during the interview were both considered during the weighting process. The most intense superordinary-element was ranked as 7.

4.2.2.8 Step 8 Superordinary Summary Words

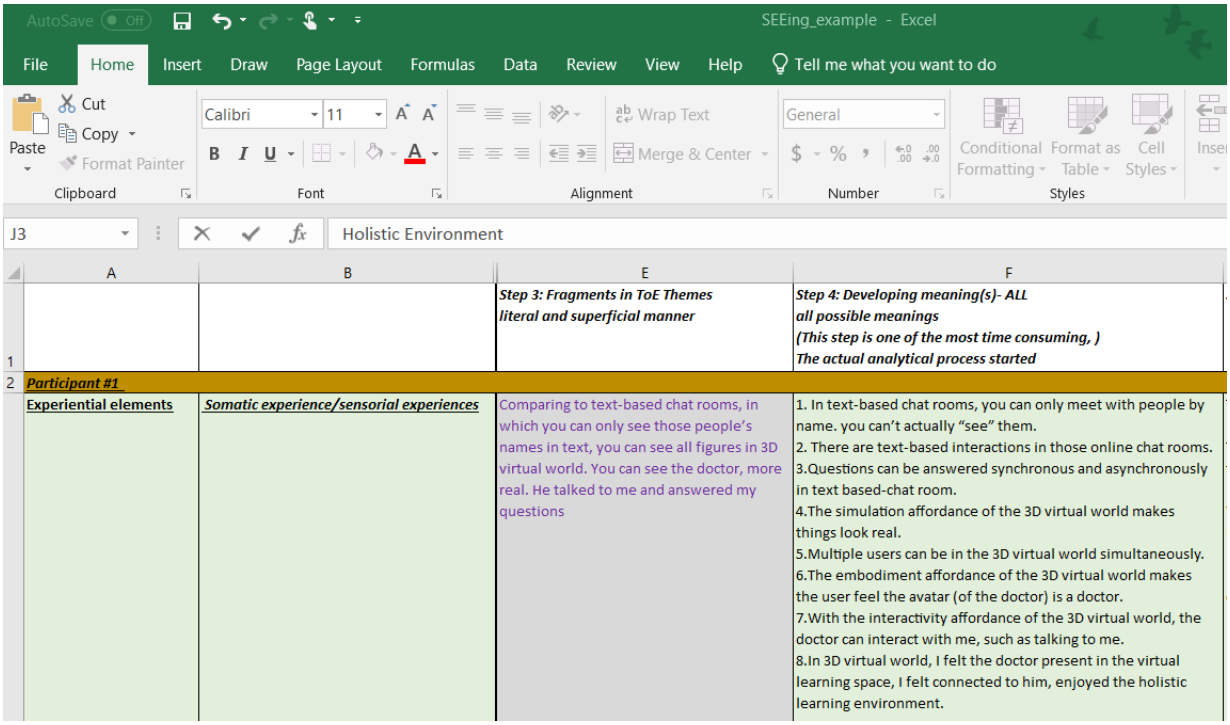
The essential elements of the experiences are classified in seven different categories respectively, which are grouped together with the similar meanings. The elements were ordered in descending format, which provided a ranking of the essential elements by intensity. In the next step, they were given descriptions to indicate a main, collective meaning.

4.2.2.9 Step 9 Summary Word Descriptions

The narrative paragraphs are provided to present an understanding of the experience. This step concludes the work of step 6-8. In summary, participants' experiences were analyzed through the nine steps above. The next section provides an example of the data analysis.

4.2.3 An Example for Data Coding and Analysis

In Step 1, I gathered field data through interview and recorded voices. In Step 2, the audio files were transcribed into a text file as a detailed descriptive narrative. In Step 3, the fragments of ToE themes in a literal and superficial manner were entered into the Excel worksheet. The following presents an example of the analysis worksheet depicted in Figures 4.16 and 4.17.



	A	B	E	F
1			***Step 3: Fragments in ToE Themes literal and superficial manner***	***Step 4: Developing meaning(s)- ALL all possible meanings (This step is one of the most time consuming,) The actual analytical process started***
2	***Participant #1***			
	Experiential elements	***Somatic experience/sensorial experiences***	Comparing to text-based chat rooms, in which you can only see those people's names in text, you can see all figures in 3D virtual world. You can see the doctor, more real. He talked to me and answered my questions	1. In text-based chat rooms, you can only meet with people by name. you can't actually "see" them. 2. There are text-based interactions in those online chat rooms. 3.Questions can be answered synchronous and asynchronously in text based-chat room. 4.The simulation affordance of the 3D virtual world makes things look real. 5.Multiple users can be in the 3D virtual world simultaneously. 6.The embodiment affordance of the 3D virtual world makes the user feel the avatar (of the doctor) is a doctor. 7.With the interactivity affordance of the 3D virtual world, the doctor can interact with me, such as talking to me. 8.In 3D virtual world, I felt the doctor present in the virtual learning space, I felt connected to him, enjoyed the holistic learning environment.

Figure 4.16 The Example of ToE-SEEing process in an Excel spreadsheet - part 1.

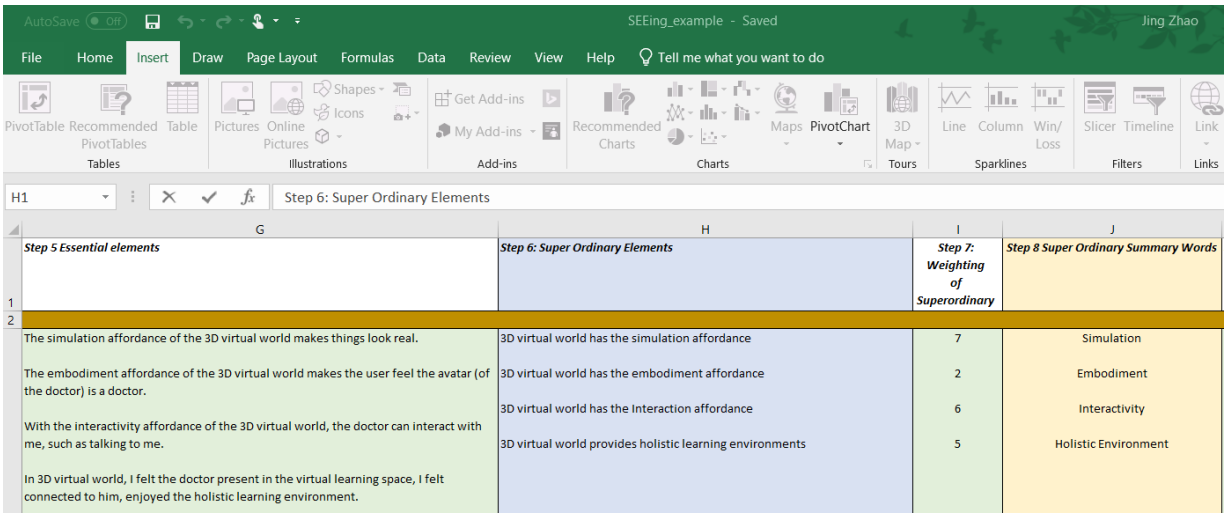


Figure 4.17 The Example of ToE-SEEing analysis in an Excel spreadsheet - part 2.

Column E: "Comparing to text-based chat rooms, in which you can only see those people's names in text, you can see all figures in 3D virtual world. You can see the doctor, more real. He talked to me and answered my questions."

From this fragment, I extracted and developed the following meanings during step 4.

Column F:

- In text-based chat rooms, you can only meet with people by name. you can't actually "see" them.
- There are text-based interactions in those online chat rooms.
- Questions can be answered synchronous and asynchronously in text based-chat room.
- The simulation affordance of the 3D virtual world makes things look real.
- Multiple users can be in the 3D virtual world simultaneously.

- The embodiment affordance of the 3D virtual world makes the user feel the avatar (of the doctor) is a doctor.
- With the interactivity affordance of the 3D virtual world, the doctor can interact with me, such as talking to me.
- In 3D virtual world, I felt the doctor present in the virtual learning space, I felt connected to him, enjoyed the holistic learning environment.

In step 5, I filtered out the less important meanings, and outlined the most essential elements for the experience. See **Column G:**

- ~~In text-based chat rooms, you can only meet with people by name. you can't actually "see" them.~~
- ~~There are text-based interactions in those online chat rooms.~~
- ~~Questions can be answered synchronous and asynchronously in text based-chat room.~~
- The simulation affordance of the 3D virtual world makes things look real.
- ~~Multiple users can be in the 3D virtual world simultaneously.~~
- The embodiment affordance of the 3D virtual world makes the user feel the avatar (of the doctor) is a doctor.
- With the interactivity affordance of the 3D virtual world, the doctor can interact with me, such as talking to me.
- In 3D virtual world, I felt the doctor present in the virtual learning space, I felt connected to him, enjoyed the holistic learning environment.

In step 6, I classified Superordinary Elements. See **Column H:**

3D virtual world has the simulation affordance

3D virtual world has the embodiment affordance

3D virtual world has the Interaction affordance

3D virtual world provides holistic learning environments

In step 7, I gave them the weight based on their importance level. **Column I:**

3D virtual world has the simulation affordance (7)

3D virtual world has the embodiment affordance (2)

3D virtual world has the Interaction affordance (6)

3D virtual world provides holistic learning environments (4)

In step 8, I categorized Superordinary Elements to Superordinary Summary words. See **Column J:**

Simulation (7)

Embodiment (2)

Interaction (6)

Holistic Environment (4)

In Step 9, one or two narrative paragraphs were developed to describe every super-ordinary summary for the general audience to understand the experience. Details are presented in section of 4.3 of the Findings.

4.3 Findings

In step 7 of SEEing process, with the rating from 1 to 7 in relation to how important the super ordinary elements are to the cultural competence acquisition experience (7 is the most important), I set the weight as a researcher based on the knowledge gained during the immersion

in step 1, my extensive literature review, and comprehensive working experience: Simulation - 7, Interactivity - 6, Technical Aspects - 5, Holistic Environment - 4, Embodiment - 3, Co-construct - 2, Continuity -1.

After doing a simple addition of all the items within a certain super ordinary element and summary words, we can see how important the element is. For example, for “Simulation” element, the final score is 7+7+…, for “Interactivity” element, the final score is 6+6+… . In the end, the super ordinary elements with the weight of higher values and appearing more times, the importance levels are higher.

In the following paragraphs, key findings are presented in the order of the super ordinary elements scores from the highest to lower ones, which are in an order of decreased importance. Relevant literature and participant comments are summarized in each element category to inform deeper layers of users’ experiences.

For an overview of the following findings, we can see for the superordinary elements of Simulation, the final importance level is the highest, which is consistent with the weight value of 7 the researcher set. Therefore, we can probably draw the conclusion that the simulation affordance of 3D virtual worlds is most significant based on this study. For the superordinary element of Holistic Environment, the final importance level has jumped up to the second, which is much more significant comparing to the weight value of 4 the researcher set. Embodiment element follows as the third most important element. Interactivity element ranks as the fourth, followed by the elements of Technical Aspects, Continuity, and Co-construct.

4.3.1 Simulation - Simulation for 3D learning Environments is Best Grounded in Real-world Contexts

As media rich platforms, 3D virtual worlds offer the possibility of learner experiences that enhance deep learning through realistic simulation (Corder & U-Mackey, 2018; Davies et al., 2015; Delwiche, 2006; de Freitas & Neumann, 2009; Gee, 2003). In this study, the 3D virtual world was designed with the user experience of students, instructors, instructional designers, and others. Virtual worlds allow the development of simulation activities which otherwise would be difficult due to its high cost.

Most user experiences regarding simulation were positive. The following are representatives: “It's better than any other text-based learning platform. It has a much better interface which lets you feel you are in the real world” (Iteration 5/Jabez). “Comparing to text-based chat rooms, in which you can only see those people’s names in text, in virtual world, you can see all figures, you can see the doctor, more real. He talks to me and answer my questions” (Iteration 5/Ethan). “There is no risk. It's always safe for students to try. No concerns as those when they have when deal with real patients, feeling a much safer environment. No ethical concern” (Iteration 5/Yuliana). Of course, this last comment is a challenge to integrate ethical demands with demands of cultural competence.

An instructor’s insights are more moderate. “I had some close to real experience, but not that real. Cognitively, I can understand that type of knowledge quite clearly; Visually, I can see, somewhere between the reality and pure text, it's quite good; Emotionally, I like it. I like it if I am a student, or a practitioner, this software/platform is totally fine, effective” (Iteration 5/Sabin).

Enhancements were suggested from the user experiences as well. “The avatar is a bit simplified, hope to have more facial expressions” (Iteration 5/Yuliana). “The platform is really much better than the two dimensional. This virtual world has a lot of functions. But to some extent, it’s still not as good as real environment, but it has its own advantages. So, they can be designed and used to teach in different scenarios and compensate to each other” (Iteration 5/Sabin). The interplay between the real and virtual world was encouraged and valued.

To create educative experience for students, it is essential to design simulation in the 3D virtual world with concrete association with real world learning spaces. To best facilitate the learning transfer, the virtual space should often replicate real world scenarios and learning activities with simulated environments. Lectures presented with PowerPoint, professional seminars, the virtual clinic and hospital visits, role plays, and video streams are drawn from the real-world experiences of nurses and other health related students.

4.3.2 Holistic Environment - 3D Learning Environments Should be Shaped through Holistic Design

The affordances of virtual worlds provide the opportunity for students to create a sense of immersion, which refers to the sense of being enveloped by, included in, and interacting with the environment (Witmer & Singer, 1998). Warren and Brixey (2008) point out that students are provided a sense of presence in a 3D virtual world. The use of personal avatars contributes to the creation of a sense of telepresence, the sense of being there, and copresence, a sense of being together (Schroeder, 2002; Wang, 2012). Several participants in this study commented about feeling as if they are actually present in the virtual learning space, feel connected to one another, and enjoy the holistic learning environment. "It gives me a sense of space and connection. Other

online learning platforms, especially the text-based ones, don't have this affordance. I feel I am in the real clinic with patients" (Iteration 5/Ethan). Objects and processes common to real world experiences are important in 3D virtual worlds. As one student mentioned: "Learning resources including the PPT and streaming videos provide background knowledge. Pre-made objects and items, such as furniture, beds, clothes help create immersion. It is great we can have multiple options for clothes. We can dress differently to look more real and immerse into the environment" (Iteration 5/Gabriel).

Some participants in this study agreed that the range of media formats integrated in the 3D virtual world contributed significantly to the holistic learning environment (e.g., videos, synchronous communication tools, graphics, power point presentations, posters and others). "Comparing to Skype, and other traditional platforms, the 3D virtual world provides much richer learning environments. You can see, hear and feel" (Iteration 5/Ethan). "I really like it. I watched the videos on the wall in the simulated classroom. Everything is embedded there" (Iteration 5/Barbara). "The voice tool enables you to talk anytime you want, it's much easier to get your ideas crossed, and talk more. Especially you can act out scenarios [role play], which you cannot do it through text easily. For text messaging communication and conferences, you cannot visually act out" (Iteration 5/Daisy).

4.3.3 Embodiment - 3D Learning Environments Should Include Design for Embodiment

Virtual worlds shape the embodiment of learners in the form of avatars (Thomas & Brown, 2009). With identities acted or expressed through avatars, learners can immerse in 3D content through interacting with other participants.

The success level with which avatars engage learners is highly dependent on the level participants can project themselves into or identify with the avatar. Instructors and designers can adopt a variety of design methods through which learning activities develop within the learning space, encourage learners to characterize themselves as avatars to enhance the experience of virtual worlds and promote engagement. Several instructors and instructional designers indicated: “Embodiment depends on how much control you have over the avatar. Also, the time, you won't get the embodiment feeling if you just play 15 minutes. But if you have played for days, more embodiment will be built” (Iteration 5/Yuliana). “Interestingly, if you watch the video games kids play, the avatars are not polished at all, no real face, actually just boxes. But they are so attached to them. I think because they have the full control over it. I think more control brings more embodiment feeling” (Iteration 5/Yuliana).

However, when coupled with the interaction with others during role play, the avatar can help remove the sense of an external viewer and replace it with a sense of embodiment. A student commented: “I travelled a lots places in 3D Virtual Worlds. Most time I didn’t have much interaction and communication. However, if I saw my friends’ avatars, I began to talk to them, and do activities together, I feel much more engaging. The embodiment is because of the communication and interactivity” (Iteration 5/Melody).

Through 3D virtual worlds and avatars, some personality differences, interpersonal power differentials and social barriers that exist within the real world can be removed. Instead of trappings in their own bodies, participants can embody themselves in avatars to get enhanced confidence, and further explore and participate in the virtual world. Several students really like this affordance of the 3D virtual world. “I am a shy person. I used to have hard time during high fidelity simulation sessions in the lab. It is good I can access the role plays in virtual worlds to

practice first, then I am more confident to go the simulation sessions in the lab" (Iteration 5/Ethan). "I really liked several of my role play sessions. The nurse was so experienced and gave me a lot of guidance. I didn't realize actually he was my instructor when we were playing" (Iteration 5/Daniel).

Participants commented on the limitations of the Opensimulator 3D virtual world. "I like the clothes and my appearance in the world. If the facial mapping is more like me. It will make me feel more the avatar is me" (Iteration 5/Ethan). "I can see the embodiment [in the 3D virtual world], but compared to VR environments, it is much less. The screen is too small. You are not completely in that environment" (Iteration 5/Sabin).

4.3.4 Interactivity - 3D learning Environments Should Include the Design for Interactivity

It has been widely acknowledged that 3D virtual worlds present educational potential in terms of fostering dialogic learning and social interaction. Student experiences in this study generated positive comments about this affordance. "I strongly felt the social interaction. The voices were so natural in the virtual space. We talked among the avatars of doctors, nurses and patients" (Iteration 5/Jabez). "It creates online learning community. You can help each other out by acting as different roles, such as doctors and nurses. We share tips for role plays. It is like a group learning, social learning. It creates a great learning community" (Iteration 5/Jabez). "Students can learn from peers. When students switch to different roles, they all bring their own prior knowledge and experiences. Multiple perspectives and approaches contribute to the learning scenarios" (Iteration 5/Yuliana).

Synchronous role plays decrease interpersonal boundaries and facilitate group dynamics to conduct learning tasks. Complex decisions can be taken in real time to apply theory to practice in complex situations (Hew & Cheung, 2010). The synchronous interaction among student peers and faculty in this study was most evident in the simulated virtual clinics. Students' comments resonated with the results with previous research. "For the synchronous role plays, when I spoke, I could see several people listening to me, and responded, which is total different comparing to me posting message in an online forum, no idea if there is any body possibly to respond at all" (Iteration 5/Sabin) "You don't know the reaction the patient [avatar] will present. It is dynamic in real time. It is two-way interactions" (Iteration 5/Yuliana).

3D virtual worlds provide the affordance of interactivity with multiple dimensions that enable experiential learning experiences for learners. As Chow, Andrews, and Trueman (2007) put it, the use of virtual worlds allows users to virtually experience information and learn by doing as opposed to passively listening to an instructor or reading text (Hew & Cheung, 2010). Problem-based learning environments can be effectively designed in virtual worlds, in which complex decisions must be taken in real time to apply theory to practice in complex situations (Hew & Cheung, 2010).

Instructional designers and instructors in this study confirmed that virtual worlds facilitated interaction. As one noted: "I saw there were a series of buttons at the bottom of the screen, we could do editing and create objects. The potential for interactions is a lot. Once the users are more familiar with all the buttons, they will have all the interactions" (Iteration 5/Sabin). At the same time, limitations of the affordance of interaction in the 3D virtual world were reported. A student reflected: "I like the 3D virtual world because it has more ways to

interact and communicate comparing to traditional platforms. But the facial expressions and gestures are limited" (Iteration 5/Fay).

4.3.5 Technical Aspects - 3D Learning Environments Should Take the Complexity of the Technical Interface into Account

Comments regarding the technical interface of the 3D virtual world were generally mixed. For example, some students acknowledged: "I am confident to use it. It's easy to get familiar with" (Iteration 5/Ethan). "It's easy to use. It can create blended learning scenarios to provide the flexibility of learning. Students can be either in classroom, or at home through distributed learning" (Iteration 5/Yuliana). However, the findings in this study also revealed that participants needed technical support at beginning in order to learn effectively. The participants' previous experience with online games, even with 3D virtual worlds directly, does not automatically transfer to the mastery of essential controls in the OpenSimulator 3D virtual world. An instructor commented: "It really depends on the digital proficiency you have. I noticed some are probably more familiar with the interface, but several students got lost." "I was in the wrong room, but I didn't know how to get to the virtual clinic which I was in last time" (Iteration 5/Harry). "I think all the possibilities to give new users trouble are the different controls. Probably prepare tutorials for how to use them. The controls may seem natural for some people if they worked in virtual worlds, but for some people it may not seems natural" (Iteration 5/Jabez). "A training package should be provided as an option from my instructional design perspective, which can reduce the learning curve and anxiety. A short instructional video can help users to get many features quickly" (Iteration 5/Yuliana).

Therefore, orientation sessions for the navigation control, view control, and other basics are recommended. After a short orientation, ample time should probably be arranged to let participants explore and learn how to control their avatars, such as moving and changing clothes, and how to click on various objects to easily participate in the activities in the virtual world. Supporting students requires more than just explaining how the technical pieces work and helping them get familiar with tools and controls in the virtual world, social skills and cultural awareness abilities are essential in the orientation session as well (Jones, Ramanau, Cross, & Healing, 2010).

The potential technical enhancements are recommended by the participants as well: "The body movements seem to be limited, just sit, stand up…etc. Can more complicated body movements be designed, such as the finger movements during the process of the doctor's examination for patients? This currently cannot be presented in this 3D virtual world" (Iteration 5/Ethan).

4.3.6 Continuity- 3D learning Environments Should Include Design for Continuous Experience

3D virtual environments are persistent, which maintain learners and the learning environment as a continuum. Lowenstein (2011) notes that "repeating a scenario with the same or different characters can sometimes afford a more in-depth examination and add to the experience" (p. 194). This resonates with the participants' comments in this study. "If I stay in the virtual world and be associated with this avatar longer time, I feel much more engaged. Every time we did role play with peers, we learned different things together" (Iteration 5/Ethan). "It is really nice the virtual world continuously exists online. When we finish one role play session, we

can do another session whenever we want" (Iteration 5/Harry). "This 3D virtual environment continues to exist even as participants log off, which provides a great learning environment. When you don't have limited time for activities, you can master things much deeper" (Iteration 5/Yuliana).

4.3.7 Co-construct - 3D learning Environments Should be Designed to Facilitate Co-constructing Knowledge

Cultural competence is a dynamic, fluid, continuous process to co-create realities (Campinha-Bacote, 1995, 1999). During the role play scenarios in the 3D virtual world in this study, students did not only explore how to respond to patient needs, but also understand more about their own powers and limitations. "I like the role plays to practice cultural competency. Things are so dynamic. Decisions are made in real time. This really helped me realize the cultural context I originally situated" (Iteration 5/Yuliana). "It is good to do the role plays without pre-created scripts. I always learn something new during different sessions. My classmates brought a lot of new ideas and cultural knowledge. It really raised my cultural awareness" (Iteration 5/Fay).

In 3D virtual worlds, students co-construct and develop knowledge. To a large degree, the 3D virtual world is infused with new meanings (Thomas & Brown, 2009). Students noted: "I have design experiences. I really enjoy the process of creating in virtual worlds. I built some cultural objects and noticed some other users already used them" (Iteration 5/Melody). "When you are in a virtual world, there are always problems for you to solve. You need to find creative ways, I like to build objects, sometimes I made mistakes. The real learning happens by making mistakes" (Iteration 5/Yuliana).

Instructors and instructional designers in this study advised that it was effective to provide some pre-created artifacts and scripts, which can be stored in the OpenSimulator inventory and share with others. Building and constructing in the 3D virtual world is time consuming. An instructional designer advised: “I think some students may not have enough skills to build objects themselves, pre-made items really help. This can reduce the learn curve. You should always have options for learners to make things differently” (Iteration 5/Jabez). Another acknowledged: “In 3D virtual worlds, for the beginners it will be very helpful if there are pre-designed items in the world to use, even for me. Actually, I do have some design background, still, I modified and used a pre-created chair in my play, which had been built by other participants. I think for junior designers, pre-created items are even more useful” (Iteration 5/Melody).

4.3.8 Chapter Conclusion and Summary

This chapter presented an analysis of findings, beginning with seven iterations of the DBR methodology. Iterations extended from the micro-cycle of Analysis and Exploration to the seventh micro-cycle of Implementation and Spread. Interview data were collected during the third micro-cycle. Survey data and more interview data were collected during the fifth micro cycle.

Qualitative data analyses based on the ToE framework were presented in this chapter as well. The nine-step ToE-SEEing process systematically analyzed the users’ interview data. User experiences were processed through a series of progressive steps to extract the essences of the experietance (Coxon, 2007). User experiences of students, instructors, instructional designers, digital content builders, and others were distilled based on the ToE-Seeing technique.

Seven themes of experiences in comprehensible and visible format emerged. The outcomes of user experiences in the 3D virtual world were listed in an order of accumulated importance among all the participants. The super ordinary elements were summarized from the highest score of participants to lower scores as the key findings to inform audience of deeper layers of users' experiences. Chapter 5 presents Conclusions, Implications, and Recommendations.

Chapter 5: Conclusions, Implications and Recommendations

As the adoption of 3D virtual worlds becomes more commonplace within teaching and learning, there are significant needs for more empirical research. This study involved the design of a 3D virtual world to facilitate the acquisition of cultural competence. DBR was used to methodologically evolve the design while UX was used to document the users' experiences as feedback to evolve the design. The purpose was to guide educators in determining the appropriateness of using 3D virtual worlds in the acquisition of cultural competence. This chapter summarizes the research findings and discusses the implications. Based on reflection upon practice and findings in this study, future research is recommended.

5.1 Conclusions

The research questions were: 1) What are the experiences of instructional designers and instructors in a simulated immersive learning environment of a 3D virtual world for the acquisition of cultural competence for students in nursing and other health related fields? 2) What are the experiences of students in a simulated immersive learning environment of a 3D virtual world for the acquisition of cultural competence? To explore these research questions, I employed DBR to design an extensive 3D virtual world and UX to analyze users' feedback and insights into the design. Multiple DBR iterations with UX methods were used to further understand the participants' experience. The design of the 3D virtual world and user experiences in the acquisition of cultural competence were informed by Dewey's philosophy of experience integrated with Confucian pragmatism.

Experience is multifaceted. Based on the nature of experience within a virtual context, the experiences are categorized into four existentials derived from van Manen's (1990)

distillation of Merleau-Ponty's (1962) units of experience. These existentials are spatiality, corporeality, temporality, and relationality, which are analyzed as fundamental themes in this study. Three types of experience, sensorial, affective and cognitive, were analyzed within a ToE (Coxon, 2007). Key findings in this study address deeper layers of the users' experiences.

Data were collected through a ToE and analyzed through the process of SEEing (Coxon, 2007), which helped generate deeper understandings of the users' experiences. The ToE-SEEing technique was effective in distilling meaning from participants' experiences in the 3D virtual world. With the multiple DBR iterations, the designed product in OpenSimulator 3D virtual world matured over the course of the study. For instance, role play scenarios, avatars, and spaces (e.g., the clinic) were refined. This improvement was in large part due to the interaction of the DBR and UX methodologies.

Seven key themes or findings were presented: 1) Simulation for 3D learning environments is best grounded in real-world contexts; 2) 3D learning environments should be shaped through holistic design; 3) 3D learning environments should include design for embodiment; 4) 3D learning environments should include design for interactivity; 5) 3D learning environments should include design for continuous experience; 6) 3D learning environments should take the complexity of the technical interface into account; and 7) 3D learning environments should be designed to facilitate co-constructing knowledge.

The study addressed the design of a 3D virtual world for the acquisition of cultural competence. The study was not designed to measure the participants' acquisition. Although I administered the Nurse Cultural Competence Scale in the fifth micro-cycle of the DBR or prior to the students' experiences in the 3D virtual world, I did not administer the NCSS as a post-test.

Instead, the research explored the participants' experiences of the 3D world as a potential medium for the acquisition of cultural competence. As one participant responded, "I like the role plays to practice cultural competency." This student felt that this 3D world certainly affords the acquisition and practice of cultural competence. The student felt that virtual experience is important.

5.2 Implications

Virtual worlds and learning environments afford virtual experience. Bell's (2008) definition of virtual worlds is still adequate: "A synchronous, persistent network of people, represented as avatars, facilitated by networked computers [or smart devices]" (p. 2). The virtual world or learning environment designed for this research did not include options for user-designed content and artifacts. This feature would be helpful in future iterations and research. Yet even with that feature, the relationship of virtual world to user could be seen analogously as a relationship of host to guest. Likewise, the relationship of designer to user is a host-guest relationship.

5.2.1 Conceptualization of Virtual Experience: Host, Guest, Virtual World, and User

Host-guest relations are conceptually dimensions of hospitality. Hawthorne (1932) provided an interesting etymology of hospitality: The Latin *hospes*, a guest, and *hospitium*, a guest chamber, are roots of "hospitality" and related terms, including "hospital," "hostel," "hospice," and "hotel" (p. 117). These terms suggest dual meanings of space as host and person as host. In each, guests are to be welcomed or entertained, implying the existence of hosts ready and willing to provide and practice hospitality.

This could be a productive analogy for conceptualizing virtual worlds in that not all hosts and guests act the same (e.g., some hosts are frustrating or uncomfortable while some guests are rude). Aitken's commentary on the *Wu-Men Kuan* 无门关 is insightful: "Host and guest, parent and child, we switch roles and have fun, bringing forth the music of the stars" (p. 99). Virtual experience may require role switching and code switching in ways that actual or real experience does not.

In Chinese, this relation is rendered as *zhu bin* 主宾 (host-guest) or *bin zhu* 宾主 (guest-host). During the Six Dynasties (317-588), the ordinary sense of a relationship between host and guest was expanded to mean a scholar involving a guest in intellectual debate on metaphysical truths (Wang, 1988). This metaphysical sense was later developed into kung-an 公案, in which *bin* may mean the object or the contemplated, and *zhu* the subject or the contemplator. The two parties engaged in the endeavor to seek truth or attain enlightenment (Wang, 1998). Derived from the Lin Ji collections (临济录), Yang (2001) gave a detailed description of four types of *bin zhu* 四宾主 relations: guest over host 宾看主, host over guest 主看宾, host and host 主看主 and guest and guest 宾看宾.

The interchangeability between the role of host and guest is also described by other Chinese scholars. The host does not always have full authority and the guest is not always being controlled. The dynamic interactions between the host and guest build the fundamental relationship among them. And further, the host and guest cooperate with each other.

Zhu Xi also stated the dynamics between the host and the guest are not simply cognitive but have other emotional connections and interactions. Further, it relies on "exploration from body and understanding from mind" (体悟) and "experience through heart" (体会). This grasp of

mutual understanding, which is called *Li* (理), is not limited in exploration and experience. Instead, *Li* (理) can only be established with deeper communications, which is similar host and guest interactions (Zhu, Volume 15, Zhu zi yu lei 朱子语类, p. 297).

5.2.2 Designer as Host: Implications for Design and Confucian and Deweyan Pragmatism

Charles Eames (1972) had a conversation with Eero Saarinen on the subject of the guest and host relationship, which was published as part of an interview:

> One of the things we hit upon was the quality of a host. That is, the role of the architect, or the designer, is that of a very good, thoughtful host, all of whose energy goes into trying to anticipate the needs of his [or her] guests— those who enter the building and use the objects in it. We decided that this was an essential ingredient in the design of a building or a useful object. (p. 16)

The ideas behind the guest and host relationship permeated extensively in Charles and his wife Ray's design work.

My experiences in this research resonate with Eames's comments on the role of the designer as a host who devotes a core of energy to best meet the needs of guests. This research went through seven DBR iterations, modifications for every iteration during the 3D virtual world design process, responding to user experience, until a final design product emerged. More potential design enhancements will be added in the future, with the purpose to better respond to guest or user experience. In my research, my role as a designer-host enabled me to modify the learning environment creation with effective relations with users over time. Through the

exploration, adaptation, and enhancements during multiple DBR interactions, as a designer-host, I was able to successfully observe and respond to learning within in the 3D virtual world.

Williams (2018) elaborates on the "designer as host:"

> The host is catalyst for a series of actions and encounters to take place, which may involve a specific piece or shape, or may include the transformation of that piece through learning experiences. The host facilitates learning, exploration, adaptation and interaction to 'malleable' situations, shapes and forms. (p. 287)

Williams & Fletcher (2010) also described the designer in a host role, which moves the design framework from its traditional hierarchical structure into a networked heterarchy.

The conceptualization of virtual experience has become important as technological advances enable multisensory interactions including high-fidelity Virtual Reality, Artificial Intelligence (AI), and other new technologies (Li, Daugherty, & Biocca, 2002, 2003; Soukup, 2000). The characteristics of virtual experiences were examined by various researchers to explore how participants generate sensorial experiences, affective experience, and cognitive experience when interacting with 3D virtual products (Li, Daugherty, & Biocca 2001, 2002, 2003). In my research, I found that the 3D virtual world has great potential for enhancing cognitive, emotional, and behavioral aspects of learning. Virtual experiences in a 3D virtual world are multi-dimensional (e.g., affective, cognitive, haptic). In addition, they reduce temporal and psychological distance (Larson & Redman, 2014).

According to Heeter's (2000) categorization, virtual experiences and indirect experiences are mediated. Compared to indirect experience, virtual experience is typically afforded by simulation, embodiment, and interactivity, featured in the 3D virtual world designed for this study. For example, participants in this research were afforded a virtual experience of cultural

competence *and* the 3D virtual world. At this point, there is no way of excluding this second dimension of *what* is experienced. But this is a point of Deweyan and Confucian pragmatism: we experience an event, situation, etc. *and* the physical environment or world.

Deweyan and Confucian pragmatists necessarily take holistic views of knowledge and human experience. The world is understood as an intrinsically relational one. Humans and their surroundings are interdependent in the generation of experience. A learner and the learning environment are an organismic continuum, which should not be dichotomized or fragmented (Zhang, 2014). This study implicates the importance of virtual experience and suggests an expansion of Deweyan and Confucian pragmatism. 3D virtual worlds have a role in Deweyan and Confucian philosophy and this role is best understood as an affordance of virtual experience. With an ability to complement reality, scenario-based simulations in 3D virtual worlds can tailor virtual experience. e.g., for acquisition of cultural competence (Belei et al., 2009; Corder & U-Mackey, 2018). High-fidelity simulation in virtual worlds for healthcare education can especially enhance student virtual experiences. Given interview data in this study, affordances of the 3D virtual world enhance direct experience in the real world. The virtual experiences reflected a transfer the knowledge from classrooms. Virtual experience can reduce psychological distance among participants (Larson & Redman, 2014).

A key theoretical implication is what users lend in transaction or interaction with virtual worlds. If virtual experience is understood as virtual interaction with a virtual environment, what are users giving to this environment? In basic terms, through UX methods in this research, users or participants gave their expertise and the virtual environment seemingly responded as I made design changes based on their feedback. But this does not address the question of what is given to the virtual environment in virtual experience. Repetition or copying without loss is a benefit

and cost of digital and virtual artifacts, unlike actual or real artifacts, which in Deweyan and Confucian pragmatism change through use or experience. Excepting intervention by a designer, the virtual environment does not change use after use or experience after experience. Of course, many virtual environments include design options for including or uploading user-designed content and artifacts. This user-as-designer feature does not address the theoretical implication of what is given to and back in the interaction. It is recommended that this theoretical implication be addressed in further research.

5.2.3 Cultural Competence and Hospitality

Hamington (2010) describes hospitality as the guest and host disrupting each other's lives to allow for meaningful exchanges that foster interpersonal connections of understanding. Hospitality reflects a "performative extension of care ethics" that seeks to "knit together and strengthen social bonds," which is not limited to personal exchanges but is "conceived as having social and geopolitical implications" (pp. 21, 24). Hospitality is a performed activity directed at particular individuals as "acts of socializing care", which is significant for "fostering caring relations in the face of social and political distance" (pp. 33, 32).

Similarly, within a philosophy of care and provisions for authentic care to patients, health providers have professional responsibilities to show sensitivity and respect for differences in beliefs and values (Bevis & Watson, 1989; Donnelly, 2000; Leininger, 1985). Caring is a "unique plan designed to help an individual or a collective client system find meaning in experiences to foster, adapt, and mature" (Bevis & Watson, 1989, p. 128). Care requires a high level of cultural competence, which I examined in this study. With globalization, hospitality

involves more ethnically diverse populations and cultural heritage as well as social and geopolitical dimensions. Cultural competence is a significant factor affecting hospitality.

Hamington stated (2010) that historically "hospitality had been understood as having a directional and hierarchical character. The host gives and the guest receives" (p. 28). The hospitality "resists this directionality" and values the "exchanges between host and guest as reciprocal" (p. 28). The *zhu* and *bin* (host and guest) have a dynamic relationship, in which they ideally switch roles with the mutual respect and humility, with an objective to achieve and grow together. Health care providers and patients, host and guest, should be involved in a continuing process of mutual learning and understanding to strive to achieve the best hospitality and care in medical settings. With a higher level of cultural competence and respect for the cultural heritage, beliefs, attitudes, and behaviors of those to whom the care is rendered, health care providers can adopt more meaningful care-delivery strategies.

5.2.4 Cultural Competence: Implications for Instructional Design

New technologies extend the reach of instructional designers for new options. Concerns regarding instructional designers using educational technology in cross-cultural settings are growing. Extensive research suggests the need for instructional designers to be more aware of and responsive to cultural differences in the design of environments enhanced by technologies (Chen, Mashhadi, Ang, & Harkrider, 1999; Kawachi, 2000; Robinson, 1999; Bentley, Tinney & Chia, 2005).

Spronk (2004) states that culture, in learning contexts, is more profound and dynamic than surface features suggest. Instructional designers are not immune from the influence of their own cultural biases. Spronk (2004) recognized that "many features of the academic culture

familiar to most learners whose first language is English may strike learners from other linguistic and cultural traditions as alien" (p. 172). A range of challenges and concerns are presented to instructional designers in cross-cultural contexts. Even though instructional designers are trained in professional settings, who they are and what they bring makes a difference in how design is approached (Rogers, Graham & Mayes, 2007).

Ideally, instructional designers would be culturally responsive in a general sense and culturally sensitive in a specific sense. For example, Zhang and Zhou (2010) investigated the experience of Chinese students in Canadian educational systems. Among a range a communication and social networking challenges, Chinese students are challenged to adjust to demands of group work for activities and projects. There are cultural differences in the experiences that students have in group work: instructional designers should have a level of cultural competence in recognizing the need to scaffold group work expectations and procedures.

Recognizing various cultures and sub-cultures of users during the instructional design process requires cultural competence. Support can often be provided to instructional designers to recognize cultural assumptions of not only themselves, but also the users. Further research into the cultural competence of instructional designers is recommended.

Instructional designers should keep in mind the challenge of diversity in their products. For example, avatars and associated features, such as clothing, should reflect cultural diversity. This adds a design challenge within 3D virtual worlds, as user content and vendor content often limit avatars and clothing to western skin features and styles. This was a limitation in the 3D virtual world I designed for this study. Upon reflection, I should have been more attentive to these specific features to reflect the diversity of the users. Nowak and Fox's (2018) extensive review found that users "select avatars they believe will help them meet interaction goals, which

could include revealing or concealing elements of their identity to other users" (p. 40). Hence. It is important for designers to provide a range of choices of avatars with visible cultural or racial characteristics and roles.

5.2.5 Virtual Experiences in Rare or Infeasible Medical Situations

For nursing and medical areas, because of patient safety and ethical reasons, evidence suggests exclusive traditional clinical placements are not always ideal for providing learning experiences (Heinrichs, Youngblood, Harter, & Dev, 2008). Real world experiences of medical situations are often unavailable or infeasible. In these cases, a 3D virtual world learning environment can be utilized to provide virtual experience. Virtual experiences can enhance learning. Many nursing and medical schools include or integrate virtual simulations and experiences as part of the overall education process and curricula (Gaba, 2006, Han, 2011a, 2011b, Jeffries, 2005, 2006, Jeffries & Rogers, 2007). Virtual experiences through advanced learning technologies (ALTs) emerged to provide educators and students with a new opportunity to develop clinical experience, which has potential for students to connect knowledge learned in classrooms with real clinical settings and further provide students nursing and other health care students opportunities to develop their cultural competence through novel ways.

5.2.6 Artificial Intelligence (AI) Technologies with Virtual Worlds

Another significant new technology is Artificial Intelligence (AI) technologies, which are increasingly becoming a common part of our everyday lives. As in other disciplines, ALTs with AI are increasing in healthcare and nurse education. With recent developments with VR products in the market, how will virtual experience change? For example, Gatebox

(https://gatebox.ai/home/) and its virtual assistant can engage human conversation and control settings based on users' preferences. An implication of my research finding is that Deweyan and Confucian philosophies and Coxon's taxonomy can be revised to accommodate these new virtual experiences.

5.3 Recommendations for Future Research

Similar research with other demographics of participants should be conducted. For example, this research focused on experiences of a group of students, instructors, instructional designers. Physicians and practicing nurses would have additional insights into simulated environments and the acquisition of cultural competence.

Research is needed to further facilitate learning in virtual environments, including cultural competence acquisition. Milgram and Kishino (1994) developed the Virtuality Continuum, which is helpful to conceptualize VR, augmented reality, and mixed reality. Mixed reality extends on a continuum between real and virtual reality. Milgram and Kishino (1994) provide a framework for understanding how different types of reality might fit into this continuum (Figure 5.1).

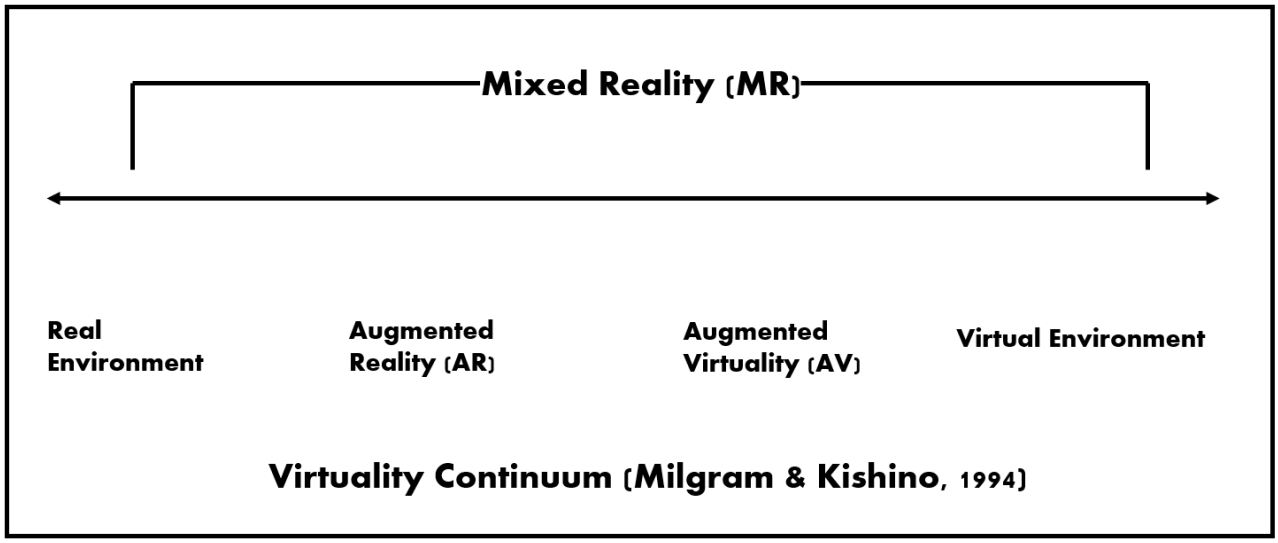


Figure 5.1 Virtuality Continuum (Milgram & Kishino, 1994).

With recent technical advancements, VR, augmented reality, and mixed reality in relation to 3D virtual worlds are increasingly being incorporated in education, including in online and blended settings. These technologies provide different levels of immersion, which include: 1) Partial or semi-immersive environments - a system that gives the users a sense of feeling of being partially immersed in a virtual environment; and 2) Fully immersive environment - a system that uses special hardware where users are completely isolated from the physical world and fully immersed in the virtual environment.

Among these technologies, the terms of VR, augmented reality, and mixed reality are often used interchangeably. Tokareva (2018) provides a description of the differences between virtual, augmented, and mixed reality technologies:

- Virtual reality (VR) immerses users in a fully artificial digital environment.
- Augmented reality (AR) overlays virtual objects on the real-world environment.

- Mixed reality (MR) not just overlays but anchors virtual objects to the real world.

New devices (e.g., Oculus Rift) and the subjects of instructional design for learning activities are flourishing in VR, especially in medical areas (Sharif, et al. 2018; Tokareva,2018). It is recommended that research with VR simulation be conducted to explore the acquisition of cultural competence in nursing, medical and other related areas. VR has significant potential for learning. As one student commented, "I can see the embodiment [in the 3D virtual world], but compared to VR environments, it is much less. The screen is too small. You are not completely in that environment." Another said, "I like the 3D virtual world here, but the VR I tried in Microsoft store last week is better, in which I interacted with my whole body, arms and legs."

The degree of complexity of 3D virtual worlds is demanding. Embodied actions and object manipulation need to be carefully calibrated and designed. The expertise of professional graphic design, digital and media production and programming skills are required to create a 3D virtual world, which most researchers do not have. Similarly, design of professional, functional games for learning cultural competence or a range of STEM concepts and competencies is demanding (Lin & Shih, 2018; Shih, Huang, Lin, & Tseng, 2017). Therefore, this demands collaboration with instructional designers and IT professionals.

For the future research in VR using UX, the simulation developments will be even more technically demanding compared to those in 3D virtual worlds. Besides research collaboration among a range of professionals across disciplines required for 3D virtual world design, professionals in computational modeling and artificial intelligence are needed as well. The developments of VR educational applications in medicine, nursing, and other related areas usually involve computer simulations of clinical scenarios involving patients and health professionals. In the simulations, the technologies including immersive clinical environments

and interactive virtual actors are merged (Sharif et al., 2018; Tadeusiewicz, 2009; Zamin et al., 2018). The systematic reviews of the efficiency of virtual patient applications consistently show the improved student competence when compared with no interventions. (Cook et al., 2010; Consorti et al., 2012; Chung Van Le et al., 2018).

There are more recent developments of technologies. New devices released in recent years are flourishing in the fields of virtual realities, and mixed, augmented realities. With the significant developments of AI technologies and intersections between AI and VR, there will be huge potentials for the combination of AI with VR to possibly provide increasingly diversified virtual experiences in the future. It is recommended that researchers adopt DBR and UX empirical studies of these ALTs. However, researchers should also focus on the changing nature of virtual experience.

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Appendix A: Cultural Competence Interview Questions

THE UNIVERSITY OF BRITISH COLUMBIA | VANCOUVER

Department of Curriculum and Pedagogy

Cultural Competence Interview Questions

How We Learn (Media & Technology Across the Lifespan)

1. What's your experience regarding the holistic learning ecologies in the 3D virtual world comparing to other types of online learning environments?
2. What's your experience regarding the interactive activities in the 3D virtual world?
3. The 3D virtual world is persistent, which continues to exist and develop even as participants log off. What's your experience regarding the continuity affordance in the 3D virtual world?
4. Cultural competence is defined as an ongoing process. What's your experience regarding the object designing and building in the 3D virtual world to possibly facilitate cultural competency acquisition, further transform human relations? Why?
5. Simulation affordance provides the possibilities of learning environment design grounded in real-world context. What's your experience regarding teaching or learning in the simulated 3D virtual world?
6. In the 3D virtual world, the representation of self is linked to ones' avatar. What's your experience regarding the avatar representation in the 3D virtual world?
7. The learning/teaching in the 3D virtual world presents technical challenges to some people. What's your experience?

Appendix B: Example of Cultural Competence Consent Form

THE UNIVERSITY OF BRITISH COLUMBIA | VANCOUVER

Department of Curriculum and Pedagogy

Cultural Competence Consent Form

Investigators
The principal investigator for this study is Dr. Stephen Petrina, Professor in the Faculty of Education and who may be reached at [redacted]. This research will be used for the PhD dissertation of Jennifer Jing Zhao, PhD candidate, who may be reached at UBC [redacted].

Study Purpose and Procedures
The study investigates how simulated immersive learning environments are designed and customized. The total time necessary to participate in the study is approximately 2 hours. Your participation will be primarily through interviews, observations, surveys and focus-group discussions.

Confidentiality
Your identity will be kept strictly confidential. All documents will be identified only by code. Physical hard copies will be kept in a locked filing cabinet. Electronic copies will be encrypted and protected by password. This data will be kept in the research office in the Neville-Scarfe building on the UBC campus and will be accessed only by research team members.

Contact Information
If you have any questions or desire further information with respect to this study, you may contact Dr. Stephen Petrina at [redacted] or Jennifer Jing Zhao at [redacted]. If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at [redacted] or if long distance e-mail RSIL@ors.ubc.ca or call toll free [redacted].

Consent
Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time.

Participant Signature _____ Date _____

Printed Name of the Participant _____

Appendix C: Example of Visual Images Consent Form

THE UNIVERSITY OF BRITISH COLUMBIA | VANCOUVER

Department of Curriculum and Pedagogy

Visual Images Consent Form

How We Learn (Media & Technology Across the Lifespan)

Visual data analysis will be conducted in this research and specific segments of video in 3D virtual world or still photos will be used in analysis and communication of the research.

Please check the box indicating your decision.

I will have an opportunity to review the photographs or recorded segments in 3D virtual world that are being used in the research report and communications about this project and

☐ I CONSENT to the use of these photographs or recorded segments in 3D virtual world in this way.

☐ I DO NOT CONSENT to the use of these photographs or recorded segments in 3D virtual world in this way.

Participant's Name (please print) _____

_____ _____

Signature Date

Appendix D: Nurse Cultural Competence Scale instrument (NCCS)

(Perng & Watson, 2012)

Cultural Awareness Scale

What do you think about the following descriptions:
0 strongly disagree
1 disagree
2 no comment
3 agree
4 strongly agree

1.	One's belief and behavior are influenced by one's cultural background.	0 1 2 3 4
2.	Those who came from diverse cultural backgrounds usually have different value systems.	0 1 2 3 4
3.	Most people's belief/behavior about health and illness are influenced by cultural values.	0 1 2 3 4
4.	Understanding the client's cultural background is very important to nursing care.	0 1 2 3 4
5.	When getting immersed into a different culture, the acceptance level among individuals is quite different.	0 1 2 3 4
6.	A client's behavioral response originates from his/her cultural system, therefore the care provider should understand the client's subjective interpretation of his/her own behavior.	0 1 2 3 4
7.	Nursing education is itself a cultural system.	0 1 2 3 4
8.	Understanding a client's cultural background can promote the quality of nursing care.	0 1 2 3 4
9.	A nurse's cognition of health and illness is deeply influenced by nursing education.	0 1 2 3 4
10.	Nursing knowledge and the client's comprehension of interpretation of health/illness are usually different systems.	0 1 2 3 4

Cultural Knowledge Scale

What do you think about the following descriptions:
0 strongly disagree
1 disagree
2 no comment
3 agree
4 strongly agree

11.	I understand the social and cultural factors that influence health and illness.	0 1 2 3 4

12. I can identify the specific health problems among diverse groups. 0 1 2 3 4
13. I can use examples to illustrate communication skills with clients of diverse cultural backgrounds. 0 1 2 3 4
14. I can comprehend diverse cultural groups' interpretations of their health beliefs/behavior. 0 1 2 3 4
15. I can list the methods or ways of collecting health-, illness-, and cultural-related information. 0 1 2 3 4
16. I am familiar in health- or illness-related cultural knowledge or theory. 0 1 2 3 4
17. I can explain the possible relationships between the health/illness beliefs and culture of the clients. 0 1 2 3 4
18. I can compare the health or illness beliefs among clients with diverse cultural background. 0 1 2 3 4
19. I can easily identify the care needs of clients with diverse cultural backgrounds. 0 1 2 3 4

Cultural Sensitivity Scale

What do you think about the following descriptions:
0 strongly disagree
1 disagree
2 no comment
3 agree
4 strongly agree

20. I very much appreciate the diversities among different cultures. 0 1 2 3 4
21. I think it doesn't matter what method of health s/he adopts, if has its advantages. 0 1 2 3 4
22. I can tolerate diverse cultural groups' beliefs or behavior about health/illness behavior. 0 1 2 3 4
23. Even if a client's use or adoption of a health maintenance method differs from my professional knowledge, I usually don't oppose it. 0 1 2 3 4
24. Even if a client's use or adoption of a treatment method differs from my professional knowledge, I usually don't prohibit it. 0 1 2 3 4
25. I usually discuss differences between the client's health beliefs/behavior and nursing knowledge with each client. 0 1 2 3 4
26. I usually actively strive to understand the beliefs of different cultural groups. 0 1 2 3 4
27. In addition to traditional Chinese medicine and western medical ways of treatment, I would also try to understand alternative treatment methods. 0 1 2 3 4

Cultural Skills Scale

What do you think about the following descriptions:
0 strongly disagree
1 disagree
2 no comment
3 agree
4 strongly agree

28. I can use communication skills with clients of different cultural backgrounds.	0 1 2 3 4
29. I can illustrate non-verbal expressions of clients from different cultural backgrounds.	0 1 2 3 4
30. Before planning a nursing activity, I will completely collect cultural background information on each client.	0 1 2 3 4
31. To me collecting information on each client's beliefs/behavior about health/illness is very easy.	0 1 2 3 4
32. I can explain the influence of culture on a client's beliefs/behavior about health/illness.	0 1 2 3 4
33. I can explain the influences of cultural factors on one's beliefs/behavior towards health/illness to clients from diverse ethnic groups.	0 1 2 3 4
34. I can establish nursing goals according each client's cultural background.	0 1 2 3 4
35. When implementing nursing activities, I can fulfill the needs of clients from diverse cultural backgrounds.	0 1 2 3 4
36. When caring for clients from different cultural backgrounds, my behavioral response usually will not differ much from the client's cultural norms.	0 1 2 3 4
37. I can teach and guide other nursing colleagues about the differences and similarities of diverse cultures.	0 1 2 3 4
38. I can teach and guide other nursing colleagues about the cultural knowledge of health and illness.	0 1 2 3 4
39. I can teach and guide other nursing colleagues about the communication skills for clients from diverse cultural backgrounds.	0 1 2 3 4
40. I can teach and guide other nursing colleagues about planning nursing interventions for clients from diverse cultural backgrounds.	0 1 2 3 4
41. I can teach and guide other nursing colleagues to display appropriate behavior, when they implement nursing care for clients from diverse cultural groups.	0 1 2 3 4