COMMON CHARACTERISTICS OF EFFECTIVE ONLINE TRAINING: A THEORETICAL DISCUSSION AND FRAMEWORK FOR ONLINE COURSE DESIGN

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AUTHORIZATION TO SUBMIT DISSERTATION

This dissertation of Ali Abedi, submitted for the degree of Doctor of Philosophy in Education with a major in Educational Leadership and titled "Common Characteristics of Effective Online Training: A Theoretical Discussion and Framework for Online Course Design," has been reviewed in final form. Permission, as indicated by the signatures and dates given below, is now granted to submit final copies.

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DEDICATION

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ABSTRACT

Online learning offers a convenient and popular choice for those needing courses to accommodate busy schedules. These include busy professionals, students with limited or no access to physical training facilities, businesses with diverse and global workforces, and students studying on campus. Online learning has experienced steady growth in both the academia and business worlds in recent years. Despite this steady adoption rate, however, there is a gap in the literature for empirical research to determine common factors of successful online courses. The Framework for Interaction and Cognitive Engagement in Connectivist Learning Contexts (FICECLC) Theory (Anderson et al., 2014), a modern online-learning theoretical framework, states that the purpose of an online course is to transfer knowledge to the learner via his/her interaction with other learners, the course, and the instructor. This mixed-method study investigated online student course success with respect to student interaction by validating the FICECLC Theory framework by examining the correlation between student social interactions and progress for an online course built on the basis of the FICECLC Theory and an online course not built on the basis of the FICECLC Theory. Descriptive statistics, Mann-Whitney U test and Pearson's Correlation found no statistically-significant difference between the levels of student interaction, correlation of student interactions to success, and student performance levels between the students from the online course built on the basis of the FICECLC Theory and the students from the online course not built on the basis of the FICECLC Theory. Themes from semi-structured interviews found that social interaction in an online course is not a precondition for course success, but an interactive course content and instructor support, when oriented to promoting application based course exercises, are. The interaction between the student,

content, and instructor would lead to deep learning if the interactions among them are multi-directional and centered on content-based exercises.

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Chapter I

Introduction

Over the last decade, the adoption rate of online education in both the academia and in the business world has steadily increased (Arbaugh, Marks, & Sibley, 2005; Boris & Reisetter, 2004; Castle & McGuire, 2010; McKay & Vilela, 2012). Higher education and training sectors now consider online instruction an integral part of their operations (Ahmad, Ives, & Piccoli, 2001; Bradley, 2011; Brazina & Ugras, 2014; Emmerson, 2004; Kearns, 2012; McKay & Vilela, 2012; Safar, 2012). Bradley (2011) notes, however, that online course designers face substantial challenges. Historical data confirm that developing an online course requires excessive effort and time to design in comparison to a typical face-to-face course (Bradley, 2011). As referenced in the next paragraph, in the absence of a unified online theory regarding how best to design online courses, understanding how different facets of online learning theories can apply to online learning offers an opportunity for improvements in the field of online instruction and learning.

The absence of a uniform and recent framework for evaluating online training became evident after an extensive literature review. Research as recent as 2015 (Armellini & Padilla Rodriguez, 2015; Rao & Krishnan, 2015), 2014 (Chang & Chen, 2014), 2012 (Safar, 2012), and 2009 (Balandin, Reed, Sigafoos, & Smidt, 2009) continued to use Donald Kirkpatrick's classic four levels of learning evaluation from 1959, a tool suited for evaluating the success of traditional classroom training. In spite of Estraillier, Malki, Pham, Rabah, and Trillaud (2012) voicing a similar concern about the absence of a uniform and recent online learning framework in their research, these researchers do not offer a viable alternative to historical models like Kirkpatrick's model.

Other studies conducted were either theoretical or library based, and the resulting frameworks have not yet been validated through empirical research (Bradley, 2011; Foster, Pepper, & Shurtz, 2014; McKay & Vilela, 2012). Many studies focused on a single narrow aspect of online training involving student interaction modes, student assessment methods, or degrees of student control over the pace of a course. (Ahmad et al., 2001; Eskey & Schulte, 2012; Kearns, 2012). Although available research adequately combines existing theories and provides rational frameworks, the body of research related to evaluating effective online learning either focuses on narrow aspects of online learning or incorporates the theoretical online learning framework, which results in these studies lacking an empirically-tested and comprehensive framework (Ahmad et al., 2001; Anderson, Chen, & Wang, 2014; Arbaugh et al., 2005; Bradley, 2011; Chariker, Naaz, & Pani, 2012; Cook, 2005; Safar, 2012; Balandin et al., 2009).

Theoretical Framework: Framework for Interaction and Cognitive Engagement in Connectivist Learning Contexts (FICECLC) Theory

W. E. Bradley (2011) notes, "there is little research that has compared the effectiveness of online learning modules that have different characteristics" (p. 20). The contribution of this study to the body of online learning knowledge involves its incorporation of a theoretical framework for evaluating online training based on the literature and its validation through an empirical study. This research is feasible for two reasons. First, the theoretical research studies used for the creation of this study's theoretical framework, although not validated through empirical research, approach online learning at a macro level. Secondly, the empirically-based studies to which this study refers provide this research with current and specific insight into components for inclusion in the framework. This study is strengthened by the theoretical

framework that it adopted as well as by the validation of that theoretical framework through empirical means.

This study's theoretical framework, a 2014 study by Anderson, Chen, and Wang (2014) by the name of A framework for Interaction and Cognitive Engagement in Connectivist Learning Contexts, which this study will refer to as FICECLC Theory, incorporates an online learning theory on the basis of the connectivism learning paradigm and Anderson (2003) Interaction Equivalency Theory. The FICECLC theory focuses on the role of learners' interactions and the effectiveness of the online learning course. The studies of Anderson (2003, 2009) and Anderson et al. (2005, 2014) assert that in order for an online course to be effective, the learner must have at least one efficient interaction with the following elements of the course: other learners, the course content, and the instructor. In the absence of an efficient interaction with one or two of these elements, the other one(s) interaction(s) should compensate for the missing one(s) in order for the course to be effective.

The theoretical framework for this study is based on the research of Anderson et al. (2014), which takes the interaction-effectiveness model to a more advanced level and affirms the need for the management of additional types of relationships in order for effective learning to result. Two additional dimensions that Anderson et al. (2014) address include the following: interaction between the learner and the course delivery system, commonly known as course management system, such as Moodle, Blackboard, and Instructure Canvas, and the learner's before-and after-the-course knowledge interactions, which result in deep learning as a result of critical thinking.

The FICECLC Theory (Anderson et al., 2014) avers that if the student receives the appropriate type and number of interactions within the course delivery system, the course

content, the instructor, and the other students, the course will be effective, since it will enable the creation of personalized knowledge by the learner in order that he/she can apply that knowledge to work and life settings. This theoretical framework, FICECLC Theory Model (Anderson et al., 2014) is a pedagogy theory based on the works of Siemens (2005b) and Downes (2006) and holds that deep learning in online learning environments requires connected social interaction-based learning as a critical component.

Statement of the Problem

The percentage of students taking a minimum of one online course during their studies in the United States is growing and has risen from 9.6 percent in 2002 to 33.5 percent in 2011 (Brazina & Urgas, 2014). The 2015 Infographic from the online learning consortium, a global organization dedicated to quality and innovation in online learning (Online Learning Consortium, 2015), illustrates the importance of effective online learning to the future of education. It states that enrollment in US higher education has doubled over the last two decades, and trends indicate that 50% more US graduates are expected by 2020.Four-year colleges cannot accommodate this increase in enrollment. The percentage of universities who view online education as essential to their long-term plans has increased from 48.8% in 2002 to 70.8% in 2015. Classrooms in the United States are changing with elementary students learning keyboard skills, and 99% of high school students gaining Internet access, regardless of income level (Online Learning Consortium, 2015). Only 14% of college students will attend full-time and live on campus, and 42% will be 25 or older. Additionally, the workforce is evolving, since by 2020, over 60% of jobs will require post-secondary degrees, and many adult workers will need to keep learning throughout their careers (Online Learning Consortium, 2015).

As a result, the importance and acceptance of online learning is increasing, allowing administrators to diversify their revenue streams; in addition, 74.1% of educators rated online education as on par with or better than face-to-face instruction, which rose from 57.2% in 2003 (Online Learning Consortium, 2015). For-profit companies offer online education, also, and not-for-profit institutions indicate a similar trend and are experiencing steady growth in adoption (Chen & Shaw, 2006; Darren, 2006; Estraillier et al., 2012; Foshay, Huett, & Moller, 2008).

With this rise in the usage adoption rate of online training, one could conclude that a lively discussion would have arisen by now regarding the characteristics of successful online learning courses. This, however, does not seem to have been the case (Altintas & Gunes, 2012; Bradley, 2011; Park, Santhanam, Sasidharan, & Yi, 2013). Research conducted in this field has either been largely theoretical or focused on specific areas of online course learning through user participation or student attrition (Anderson et al., 2014; Arbaugh et al., 2005; Bradley, 2011; Castle & McGuire, 2010; Chapman, Goode, & Margolis, 2014).

This study, therefore, endeavors to research the common characteristics of effective online training regarding learner interactions and to uncover those characteristics. Bradley (2011) discussed the process of creating an online course module in the absence of an empirically-validated framework and concluded that this process is primarily an exhaustive trial-and-error exercise for an instructor. With the expected growth in the adoption rate of online training in academia and business settings and the absence of an empirically-validated theoretical framework for effective online learning, the potential value of this research study's findings to seek empirical validation that the FICECLC Theory has both academic and practical importance.

The population groups most affected by this study include mature and working students, who are completing all or most of their courses in an online format offered by their workplace or

university. For many students, online training is synonymous with a lack of focus, with anxiety, with procrastination, and/or with not completing the module. This research endeavors to increase the likelihood of these groups completing their online courses. Some of the typical members of the population group targeted by the empirical portion of this research include the aging workforce, professionals required by their work to update skills, and students living in distant and rural areas. Since the courses in question are offered online, the surveyed students were not required to reside in the same geographical location.

Background to the Study

Student debt in the United States has recently exceeded one trillion dollars--second to only mortgage debt (Hyman, 2012). Over the past 30 years, funding for public higher education has dropped, while enrollment numbers have increased. Viewed as a cost reduction measure by higher education institutions (Bunn, Fischer, & Marsh, 2014), online learning has the potential to deliver training to more students with greater flexibility and lower cost (Flagg, Saarmann, Seidman, & Sweeney, 2008; McKee, 2010). It is also experiencing growth in both academia as well as in the business world (Chen & Shaw 2006; Estraillier et al., 2012; Foshay et al., 2008).

Some of the reasons for the continued growth in the adoption rate of this type of learning tool include the flexibility of online learning afforded in terms of ease of access, removal of geographical barriers, and potential cost-savings by the training institution. (Altintas & Gunes, 2012; Altintas & Gunes, 2013; Anderson, 2009; Brown et al., 2012; Castle & McGuire, 2010; Darren, 2006; Eskey & Schulte, 2012). The FICECLC Theory asserts that an online course includes the transference of knowledge to the learner based on his/her interactions with other learners, with the course, with the instructor, and with the learner's pre-course knowledge (Anderson et al., 2014). If the learner receives the appropriate type and number of interactions,

the online course will be effective, since it enables the learner to create personalized and internalized knowledge (Anderson et al., 2014). Researchers have questioned which online course factors contribute to the success of an online course. The following pattern was identified among the studies intending to answer this critical question:

(1) *Narrow focus*: This research focused on specific areas of online learning that incorporated interaction among students, discussion thread participation, use of a course management system and computer technology, learning results, or the difficulty of the content taught (Agosto & Zach, 2009; Boris & Reisetter, 2004; Chariker et al., 2012; Gathany & Stehr-Green, 2005).

(2) *Literature review*: This research focused on constructing theoretical frameworks for the creation of effective and successful online courses. Theories within this group are not empirically validated (Anderson et al., 2014; Bradley, 2011; Cook, 2005; Estraillier et al., 2012; Foshay et al., 2008; Henkel, 2012; Phillips, 2005).

(3) *Empirical study with a narrow focus*: This type of research focused on validating narrow theories by comparing synchronous and asynchronous online delivery mediums or by comparing online and classroom training, associating attrition with the ethnicity, experience, or education levels of students or various other narrow applications (Ahmad et al., 2001; Altintas & Gunes, 2012; Altintas & Gunes, 2013; Arbaugh et al., 2005; Castle & McGuire, 2010; Chapman et al., 2014; Chen & Shaw, 2006; Flagg et al., 2008; Heshmatpanah & Neyestanak, 2011; Newton, Oswald, Stuart, Varonis, & Waltonen-Moore, 2006; Rappoport & Rounds, 2008; Safar, 2012; Strang, 2011).

(4) *Case study-based or narrative research*: The primary focus of this class of studies derives best practices for online learning by examining existing and established online learning

courses, or by creating an online course for the purpose of testing a theory or a framework. The benefit of this type of research involves bringing together the strengths of purely library studies with that of validating a learning framework (Creswell, 2013). These studies, however, were frequently limited in their scope of research in the same way that empirical studies with a narrow focus (Branch & de Groot, 2012; Brown et al.; 2012; Fabry, 2009; Wolf, 2006).

A void in the literature exists for studies that examine the factors of successful online courses and that empirically validate an underlying, broad theoretical framework (Bradley, 2011). This study aspires to fill this gap as well as to contribute to the body of online learning knowledge.

Research Questions

Research questions provide guidance in validating a practical plan when conducting a study (Creswell, 2013; Mills, 2007). Foundational to this study is the need to address the common characteristics of effective online training modules with respect to their modes of learner interactions. This process involves answering the following three research questions:

1. Is there a difference in the level of online students' interactions between students taking an online course built on the basis of the FICECLC Theory (afforded social learning tools), and those taking an online course that was not developed on the basis of the FICECLC Theory?
2. Is there a perceived difference in the success factors between a group of online students completing an online course built on the basis of the FICECLC Theory and another group taking an online course not built on the basis of the FICECLC Theory?

3. Is there a correlation between the implementation of the FICECLC Theory and online course success in comparison to an online course not built on the basis of the FICECLC Theory?

Description of Terms

This section lists and defines terms of significant importance to this study.

Successful online learning. Success is measured in terms of student attrition, improvement in post-training knowledge, ability to apply learnings in work settings, and student satisfaction with the course. These success factors have been used in the literature collectively (Agosto & Zach, 2009; Arbaugh et al., 2005; Altintas & Gunes, 2012; Boris & Reisetter, 2004; Branch & de Groot, 2012; Chapman et al., 2014; Flagg et al., 2008; Foshay et al., 2008; Gathany et al., 2005; Heshmatpanah & Neyestanak, 2011; Park, Santhanam, Sasidharan, & Yi, 2013).

Course management system. Also known as course management system (CMS), in the context of the Connectivist Learning Model, the focus involves how the course delivery system interacts with students (Branch & de Groot, 2012; Estraillier et al., 2012; Fabry, 2009; Wolf, 2006; Yelon, 2006).

Online learning interaction models. Learners in the Connectivist Learning Model are believed to experience the following types of interaction: learner with the course media, also known as course management system or CMS, and in some literature as course management system or (CMS); the learner with the instructor, the course content, and other learners; and the learner with his/her own knowledge (Anderson et al., 2014).

Connectivist learning pedagogy. The basic notion behind the Connectivist learning theory asserts that the higher the level of networked and social-based learner interaction, the more advanced the learning experience and, hence, the higher the degree of course success (Anderson, 2003; Anderson, 2009; Anderson, Annand, & Wark, 2005; Anderson et al., 2014).

Learner-paced online learning. An important benefit of online learning includes its provision freedom from time and/or geographical constraints. Challenges associated with this freedom involve the following: (a) a loss of interest and focus by the student; (b) a sense of helplessness; and (c) high attrition rates. A significant challenge stems from balancing this freedom with some degree of control in order to address these issues (Anderson et al., 2005; Cook, 2005; Malliga, 2013).

Online course configuration. Broadly used in the literature when referring to the structure and composition of an online course, this term includes such elements as discussion threads, syllabi, rubrics, and course pace, as well as how these are arranged and collectively referred within an online course configuration (Cook, 2005; Fabry, 2009; Henkel, 2012).

Online assessment methods. Online courses use online assessment methods for two reasons: (a) for instruction with assessments to reveal the correct and incorrect choices after submission, and (b) for grading and assessing with tools, such as discussion threads, papers, multiple choice questions, and assignments (Arbaugh et al., 2005; Branch & de Groot, 2012; Kearns, 2012).

Online instructional methods. These are the approaches an instructor incorporates to teach students. Similar to a traditional classroom, an instructor teaches using several tools, such as lectures, question-and-answer sessions, probing of students, individual assignments, and group projects. Except for the fact that instructors must prepare their instruction prior to the class due to the freedom that online training provides to students in terms of space and time, the same is true with online instructors (Chariker et al., 2012; Cook, 2005; Newton et al., 2006; Yelon, 2006).

Student satisfaction. This term refers to the overall satisfaction that students experience with a course. It can be measured by inquiring about students' degrees of satisfaction (Altintas & Gunes, 2012; Altintas & Gunes, 2013; Chen & Shaw, 2006; Flagg et al., 2008; Foshay et al., 2008; Strang, 2011).

Significance of the Study

A growing force in both academia and business (Boris & Reisetter, 2004; Bradley, 2011; Castle & McGuire, 2010; Darren, 2006; Eskey & Schulte, 2012; Phillips, 2005), online learning is only expected to grow, since it has the potential to deliver training to more students with greater flexibility and lower cost (Flagg et al., 2008; McKee, 2010). Two major disadvantages of traditional distance learning involve the lack of learner-to-learner and learner-to-instructor interaction (Guri-Rosenblit, 2012). The most common theme in the discussion of online learning practice affirms that a successful online course should include a substantial volume of student to student as well as students to instructor interaction (Driscoll, Hunt, Jicha, Thompson, & Tichavasky, 2012).

Effective online course instruction requires new methods of design, interaction among course participants, and instructor preparation and support (Crawford-Ferre & Wiest, 2012). New technologies address two of the main shortcomings of the traditional distance learning, which include enabling the revising of the course content on an ongoing basis and facilitating the interaction between the instructor and students and among the students (Guri-Rosenblit, 2012). The ever-changing tool sets for online course delivery, however, can easily overwhelm the course management systems' tools and resources (Cavanagh, Crampton, & Ragusa, 2012).

The FICECLC Theory asserts that the purpose of an online course involves transference of knowledge to the learner through the student's interactions with the course, with other student,

with the instructor, and with the student's pre-course knowledge (Anderson et al., 2014). If the student receives the appropriate type of interactions, she/he will, in turn, be able to create personalized knowledge from the course that he/she can then apply to work and life settings (Anderson et al., 2014).

The online course instructor must spend considerably more time preparing an online course than preparing a face-to-face class (Cavanagh et al., 2012, Hutchinson, 2007), since the course must be adequate to stand-alone without active instructor intervention (Newton et al., 2006). A gap in the literature exists in relation to addressing this very important issue. Therefore, this research endeavors to add to the body of online learning knowledge by conducting an experimental study to validate the FICECLC Theory, a widely accepted model that is frequently cited in published research on the subject.

Limitations

This quantitative research endeavored to validate the FICECLC Theory empirically by comparing the performances of two groups of students assigned to online classes with identical content and instructor but which incorporate two different instruction frameworks. The ability of the researcher to measure the social media-based learner interaction was limited, since the course management systems available in the market to the researcher did not provide statistics required for answering this study's research questions. The researcher, therefore, was required to customize Moodle into a course management system that had the capability of logging student interaction statistics and, as such, the resources of the researcher were not fully utilized in recruiting potential students to conduct this experiment and to answer this study's research questions. For future research, the researcher recommends customizing the Course Management

System (CMS) of choice very early in the study in order to spend the limited resources available for the study on other requirements of the study at a later time.

Overview of Research Methods

The data collection for this research study was comprised of the creation and marketing of two online course used as a platform to validate the FICECLC Theory, the collection of ex post facto data from the online an online course built on the basis of the FICECLC Theory as well as the online course not built on the basis of the FICECLC Theory, and followed by the analysis of ex post facto data for answering the research questions of this study. Finally, it was complimented by semi-structured interviews with study participants, and coding interviews and identifying of emerging themes.

Research question one was answered by comparing the levels of student interaction between the two online courses. The ex post facto data for student interaction for the two online courses were compared to answer research question one. Research question one sought to compare the differences in the levels of student interaction between the online course built on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC theory.

To answer research question two, the measurement of the success of the experiment group had to be calculated. Due to the fact that success in the FICECLC Theory (Anderson et al., 2014) is defined as the student's pre-course and post-course knowledge levels shifting through networked social interaction. The performance index for the online each course student was calculated on the basis of each student's interaction with the online course and scores from the assessment exams (Appendix A). A series of semi-structured interviews were conducted to

examine the relationship between the features of an online course built on the basis of the FICECLC Theory and online course success factors.

Data collected in this mixed-method study was comprised of a collection of facto factors that includes student interaction with the course, which was determined by the number of times students access the course content, interacted with other students and with the instructor, as well as student course performance scores (Appendix A). Descriptive statistics, Mann-Whitney U test, and the Pearson's Correlations statistical analysis was applied to the student interaction index, student performance index, and the correlation between student interaction index and student performance from the online course built on the basis of the FICECLC Theory in comparison to the values from the online course not built on the basis of the FICECLC Theory for examining the correlation between social interaction and student performance in an online course. Additionally, twelve semi-structured interviews with participants from the experimental and control groups were conducted to identify coded themes to classify associations between online course factors and student success in reaching a deep level of learning in the online course. The emerging themes from the semi-structured interviews were incorporated in conjunction with the ex post facto data in order to answer this study's questions.

Two groups of experimental and control students completed online trainings with the same instructor and with identical course content. One online course, the experimental group, was developed on the basis of the FICECLC Theory, and the other online course, available only to the control group, was not developed on the basis of the FICECLC Theory. Research question one was answered using the Mann Whitney U statistics by examining the student interactions ex post facto data collected from the study between the experimental and control groups. Research question two was answered by performing the Mann Whitney U test to the student performance

ex post performance data from the experimental and control groups of the study and by analysis of the emerging themes from a series of semi-structured interviews conducted with study participants. Research question three was answered by analyzing descriptive statistics and Pearson's Correlation test against the interaction and success factor indexes for the experimental and control groups and by analysis of the coded themes extracted from semi-structured interviews with twelve study participants.

Chapter II

Literature Review

Introduction

The origins of online learning can be traced back to nineteenth century correspondence-based learning. Mail-based courses were delivered by the United States Postal Service to underserved populations in order to democratize knowledge and to provide access for those unable to study otherwise (Anderson, 2009; Emmerson, 2004). Research confirms online learning as a growing force in the academia and business worlds (Boris & Reisetter, 2004; Bradley, 2011; Castle & McGuire, 2010; Darren, 2006; Eskey & Schulte, 2012; Phillips, 2005). Factors behind the steady growth in the adoption of online learning include an aging population that constantly needs to acquire new skills, the scalability of online courses, and advances made in the Internet--making it much easier than even a few years ago to deliver online courses (McKay & Vilela, 2012). Despite the rapid growth of web-based technologies, which include search engines; social media, such adaptive markets as eBay and Amazon; and such media-sharing portals as YouTube, online training courses to this day are still largely modeled after advances that took place several decades ago.

Ironically, these advances occurred when prerecorded lectures broadcast over television networks, instructors lectured their students over phone conferences, or students and instructors engaged in USENET discussion boards dating back to the 1980s (Emmerson, 2004). USENET, a [legacy] global teleconferencing program that consists of specialized and local newsgroups (Lee, 2002), was frequently featured prior to the introduction of the Web. The primary difference between the pre-Internet and the current distance-learning education mediums is the ease of recording, storing, and transmitting information (Anderson, 2009).

What currently constitutes a successful online course appears inadequate and, in many cases, still roots in traditional classroom learning theories (Ahmad et al., 2001; Anderson, 2009; Anderson et al., 2005; Anderson et al. 2014; Arbaugh et al., 2005; Boris & Reisetter, 2004; Bradley, 2011; Castle & McGuire, 2010; Chariker et al., 2012; Cook, 2005; Eskey & Schulte, 2012; Foster et al., 2014; Heshmatpanah & Neyestanak, 2011; Kearns, 2012; McKay & Vilela, 2012; Newton et al., 2006; Phillips, 2005). Recent studies (Armellini & Padilla Rodriguez, 2015; Balandin, Reed, Sigafoos, & Smidt, 2009; Chang & Chen, 2014; Rao & Krishnan, 2015; Safar, 2012) used Kirkpatrick's 1959 classic evaluation model, which focuses on a traditional learning evaluation. An updated model is needed to pave the way for an empirically-tested theoretical framework. The purpose of this study involves forming and validating empirically such a theoretical framework for the evaluation of successful online learning courses.

Online Study Interaction Model

Student interaction with course content, the instructor, and other students in distance learning is typically a focus of studies concerning distance education (Ahmad et al., 2001; Anderson, 2009; Anderson et al., 2005; Anderson et al., 2014; Arbaugh et al., 2005; Armellini & Padilla Rodriguez, 2015; Boris & Reisetter, 2004; Bradley, 2011; Castle & McGuire, 2010; Eskey & Schulte, 2012; Foster et al., 2014; McKay & Vilela, 2012; Newton et al., 2006; Phillips, 2005). The foundation of the Framework for Interaction and Cognitive Engagement in Connectivist Learning Contexts (FICECLC) Theory (Anderson et al., 2014) is the study of learners of an online course's interaction model. As online learning by definition differs from traditional learning in the interactions afforded to the student, this aspect of an online course remains of high importance. To a large degree, online study interaction and engagement type dictate the experience of a student with his/her online course, since Belland, Kuoa, Schroderc,

and Walker (2014) concur that interaction in distance education provides a critical indicator of student satisfaction (Belland et al., 2014).

As mentioned in the FICECLC Theory described in the next section of the literature review, Anderson (2003) bases his Interaction Equivalency theory on the idea that effective distance learning needs to be supported by one or more of the three types of learner-centered interactions: learner-content, learner-instructor, and learner-learner. This theory significantly asserts that in distance-learning courses, it is frequently necessary to identify and select elements of course design because of cost, distance, time constraints, and lack of control over the environmental settings of students. According to Boris and Reisetter (2004), this takes place as a result of the existence of any of these two major factors that contribute to the success of online learning:

1. The first involves coherent course design-organization, ease of use, and clear expectations and procedures. Students appeared less impressed with bells and whistles than with clarity, usability, and coherence.
2. The second major factor indicated that personal preferences of the teacher in designing and delivering the course had a major impact on the course's success.

Although the students in Boris and Reisetter's 2004 study did not communicate extensively with their instructors through chat rooms or email, the hidden voice of the teacher through the course structure remained critical. The greater the number of opportunities students had to sense their teacher's personality throughout the course, the higher the value of the course to them (e.g., conversational style material and examples). In other words, a competent instructor can create a course that is well-structured and, by association, create opportunities for learning and communicating with other students without physically being in constant

communication with his/her students (Boris & Reisetter, 2004). Arbaugh et al. (2005) indicated that "instructor-student interaction is most important, twice that of student-student interaction; that some student-content interaction is significantly related to perceived learning; that antecedent variables are not significant; and that distance education advantages/flexibility, although significant, are less important than other interactions" (p. 531).

Castle and McGuire (2010) confirmed that the more closely an online course provides face-to-face opportunities, as in the case of live video synchronous meetings and live audio feeds for its students to interact among themselves and with the instructor, the higher the level of satisfaction. Their study determined that the self-assessment score was highest for traditional learning followed by hybrid learning and online learning. Online courses, however, that use technologies, which more closely imitate traditional classroom interactions, as in live video synchronous meetings and live audio feeds, tend to result in higher satisfaction levels for students than those of online courses delivered entirely through an asynchronous mode (Castle & McGuire, 2010). Castle and McGuire (2010) cautioned against simply making a course more visually appealing, since visual appeal should be a result of good course design. These researchers argue that a well-designed online course encourages participation, includes an attractive appearance, feels vibrant, and features activities that promote the learning objectives by incorporating elements from asynchronous and synchronous online learning in a manner that increases student engagement (Castle & McGuire, 2010).

McKay and Vilela (2012) summarize four organizational barriers to e-learning:

- costs
- relevance
- technical support and training effectiveness

- employee barriers of time, content, and training effectiveness

McKay and Vilela (2012) suggest that the medium through which the institutions provide e-learning opportunities should be designed in a way that is approachable for the user, particularly for the aging population. So that the user can easily focus more on the subject and content of the e-learning experience itself (McKay & Vilela, 2012).

Notable trends in more recent research include the following:

- Distinguishing between the content of the course and the delivery medium (Anderson et al., 2014; Chapman et al., 2014; Foster et al., 2014).
- Acknowledging the interactions a student experiences with non-students that can enhance his/her learning. In this context, the relationship is not confined to the student taking the course but includes those with whom the learner interacts who enhance his/her learning (Anderson et al., 2014; Malliga, 2013).

The instructor-learner interaction can in whole or in part channel through the course medium itself with proper design (Anderson et al., 2014; Bradley, 2011; Foshay et al., 2008). The online study interaction model ties closely to the learner-paced online learning section, since the instructor has to be careful not to avoid making the course too structured or too student-reliant in order to enhance the opportunities for student learning.

Theoretical Framework: Framework for Interaction and Cognitive Engagement in Connectivist Learning Contexts (FICECLC) Theory

Online education, a new form of distance learning, in its early days was delivered through the mail, and the interactions between the instructor and learner were largely asynchronous (Anderson, 2009; McKee, 2010). With the rise of the web and affordable communication technologies during the last decade, in addition to student to content interaction, online learning

now allow students to interact with the instructor and other students, since even in its simplest form, an online course involves more than just the content provided to the learner (Anderson, 2009; Branch & de Groot, 2012; Emmerson, 2004; McKee, 2010).

Anderson's (2003) Interaction Equivalency Theory maintains that a meaningful learning experience requires support from one or more of the three interaction types available to the learner: the course content, other learners, and the instructor (Anderson et al., 2014; Branch & de Groot, 2012). High levels of interaction in at least one of these areas will result in a meaningful learning experience (Anderson, 2003). Therefore, a course can be designed in a way to substitute one or two of these interaction modes for another type through a modified interaction model. For example, in the absence of an instructor, a learner can receive a quality education if the course offers interaction with automatic test and response components and a learner-learner community that becomes vibrant with more knowledgeable learners supporting others (Anderson, 2003; Anderson et al., 2005).

Bradley (2011) combined Anderson's (2003) Interaction Theorem and Cook's (2005) Course Design Framework and developed a framework that begins by carefully assessing the interaction mode and assessment models most appropriate for the type of course offering. The following two figures originate with Bradley's (2011) theoretical framework study and assert that a course's design must consider the parameters shown in the figures to make it effective. In the figure, Bradley (2011) utilizes the interaction model from Anderson's 2003 work and places student interaction at the core of its conceptual framework for online learning module design.

Figure 1

Conceptual Framework for Learning Module Design and Research in Online Learning

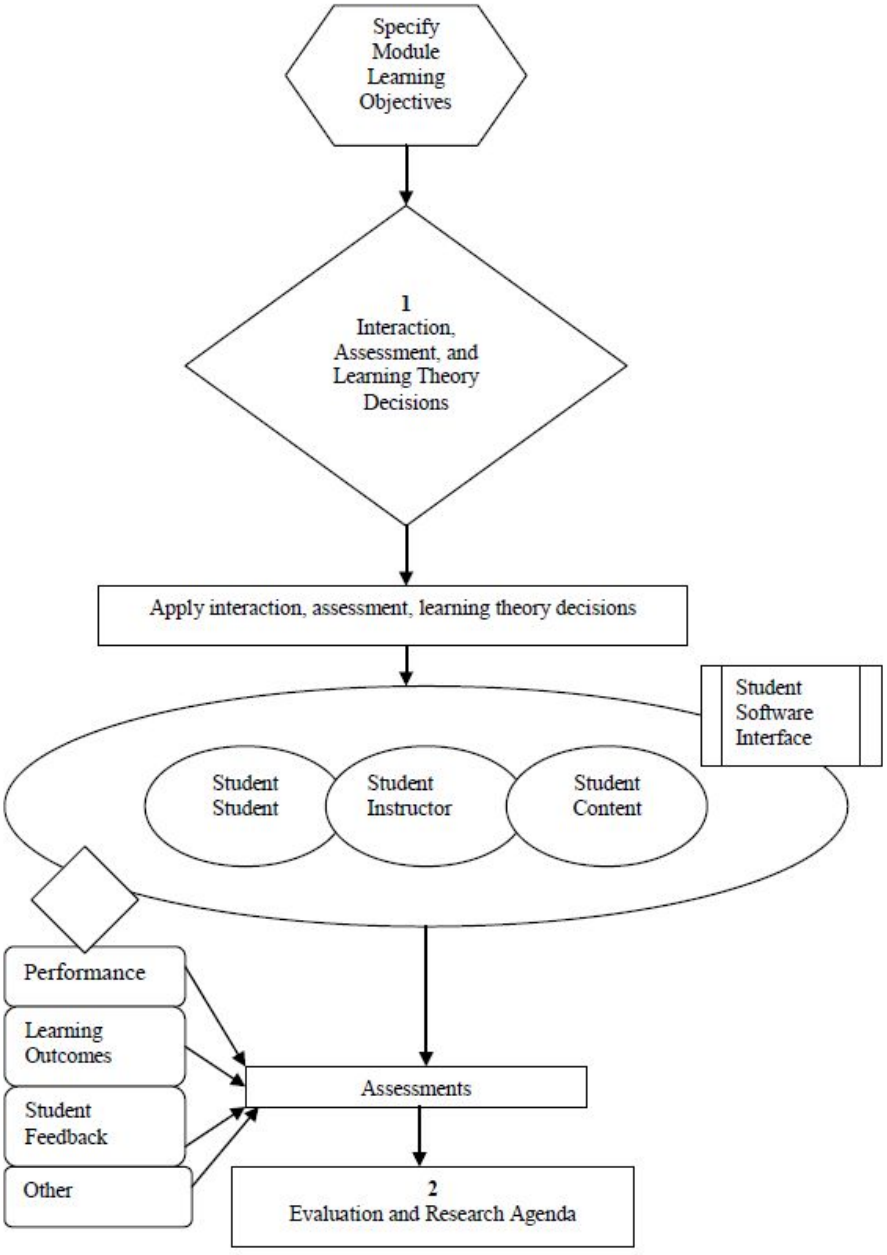

Figure 1. Conceptual Framework for Learning Module Design and Research on Online Learning. From "A conceptual framework for design and evaluation of online learning modules in professional training and academic education in business," by Bradley, W. E., 2011, *The Business Review, Cambridge, 18*(1), Figure 1, p. 22, www.jabc.com. (Permission is granted to use this figure for this dissertation ONLY by Dr. Turan Sengunder). Reprinted with permission (Appendix B).

Another framework worth mentioning for the purposes of strengthening this section includes Cook's (2005) theoretical framework for comparing Computer-Based Learning (CBL) courses based on their configuration, their instruction method, and their presentation. This framework is comprised of four levels: course medium, course configuration, instructional method, and presentation. Choices for each level constrain the available options for the subsequent levels. The first level is the course medium or the course mode of delivery of instruction. Examples include face-to-face lectures, a textbook, or a pre-recorded educational video. The next level is the course configuration, or the setup for delivery within the adopted medium. Examples include online discussion board, problem-based learning, and instruction through lectures. The third level of the hierarchy, the instruction methods, incorporates the instructional strategies or techniques that support the learning processes feasible due to the medium and configuration selection. Finally, the last level involves the presentation of the content within the instructional method. Choices of size, speed, intensity, and format all belong to the presentation layer (Cook, 2005).

In a recent study, Anderson et al. (2014) expanded Anderson's (2003) Interaction Equivalency theory (2003) and combined it with the connectivism learning theory, into the Framework for Interaction and Cognitive Engagement in Connectivist Learning Contexts (FICECLC) Theory Model with the three modes of interaction between the student and the content, between the student and the instructor, and with the student and the other students at its center. This new model explains how students can transform from acting as novice learners to teaching others and to forming their own ideas. Figure 2 (page 24) shows the framework endorsed by Anderson et al. (2014). Figure 2 illustrates how a learner progresses from the basic interaction between learner and course delivery system to interaction with the instructor, other

learners, and the course content to concept interaction, a place the learner gains the ability to gain new knowledge by interacting with old (pre-training) and new knowledge (post-training).

Figure 2

Conceptual Development of Interaction in Connectivist Learning

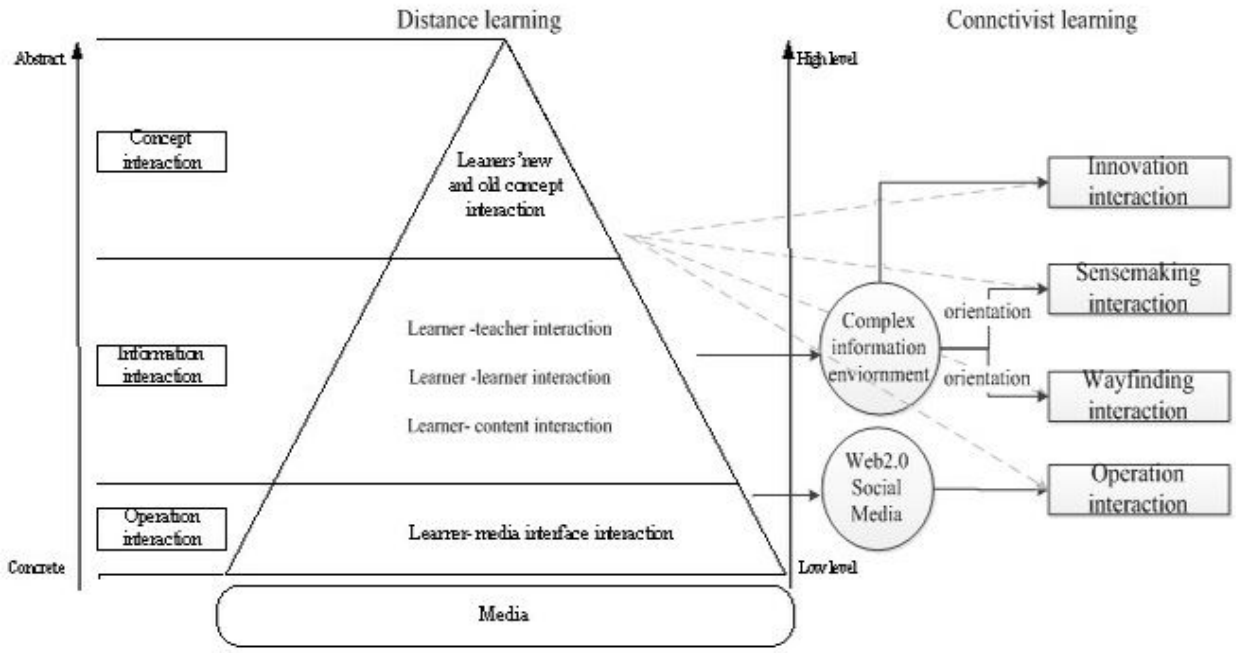

Figure 2. Conceptual Development of Interaction in Connectivist Learning. From "A framework for interaction and cognitive engagement in Connectivist Learning contexts," by Anderson, T., Chen, L., Wang, Z., 2014, *The International Review of Research in Open and Distance Learning (IRRODL), 15*(2), p. 129. Reprinted with permission (Appendix C).

Introduced by Anderson et al. (2014), the FICECLC Theory is based on two core principles. First, the purpose of an online course is to transfer knowledge to the learner. Second, the transfer of knowledge is based on the interaction and engagement the student experiences with the course interface, other learners, the instructor, and the course content. With the interaction of the learner's pre-training and post-training knowledge of the course through critical thinking and contrasting the two sets of knowledge, the learner is able to generate applicable knowledge (Anderson et al., 2014).

A common element among these frameworks asserts that the medium of study (the online course portal) plays a vital role of the learning experience, and, as such, computer aptitude and the online learning experience of students are defined with respect to the medium under the learner-content interaction (Ahmad et al., 2001; Anderson et al., 2014; Bradley, 2011; Chariker et al., 2012; Cook, 2005). Students experience a new role in the more recent literature and renamed "learners" in order to account for their collaboration with friends and coworkers (Anderson et al., 2014; Branch & de Groot, 2012). These frameworks reference how a self-study course can benefit from the structure and support of a cohort-based course, which enable a learner to enjoy the autonomy and control over pace and location of learning that the learner-paced course brings. Studies including Chariker et al. (2012) offer insight related to how to choose instructional methods based on the difficulty and level of challenge for particular sections of a course.

Historical Trends in Online Learning

Distance learning has evolved from the mail-based correspondence courses during the nineteenth century to the present day's online learning options (Anderson, 2009; Emmerson, 2004). Changing demographics of potential students and advances made in delivery mediums,

Table 1

Three Generations of Distance-Learning Evolution (from Anderson, 2009)

Distance-Learning Generation	Primary means of interaction	Interaction mode	Method of delivery
First Generation	Student to instructor	Infrequent	Mail
Second Generation	Student to instructor Instructor to student	Passive	Mail and telephone TV and radio
Third Generation	Student to instructor and Student to student	Active	Internet

regulations, and the rate of adoption by public and private universities have influenced the evolution of distance education (Ahmad et al., 2001; Anderson, 2009; Arbaugh et al., 2005; Boris & Reisetter, 2004; Castle & McGuire, 2010; Emmerson, 2004). Anderson (2009) breaks the evolution of distance learning into three generations, which Table 1 presents.

Anderson (2009) argues that online education falls now at the threshold of what he labels the self-paced, FICECLC Theory. In this model, the learner is provided with such tools as blogs, up-to-date knowledge, and patterns for the discipline taught that include showing connections between concepts through mind maps, collaborative case studies, and projects. Anderson (2009) defines the application of social software in distance education as a networked tool that encourages and supports learners to learn with and from others while maintaining control over their choices of time, space, presence, activity, and identity.

The rate of distance education adoption is steadily rising due to its ease of content transmission over the web, the aging and constrained work force in constant need of updating skills, and the scalability of online learning (Brown et al., 2012; Darren, 2006; Foshay et al., 2008; McKay & Vilela, 2012). Technology experts have argued most of what comprises today's web-based distance learning technology as originating from the 1960s and 1970s University of Wisconsin Articulated Instructional Media (AIM) project. This project, created to address the shortcomings of a mail-based correspondence distance education model, in turn, introduced delivery mediums, such as recorded audio tapes, instruction through radio and television, telephone conferences, library support, and local study groups (Emmerson, 2004).

Although online distance education is considered a success in terms of accessibility (Ahmad et al., 2001; Arbaugh et al., 2005; Boris & Reisetter, 2004), the same has not been claimed for its effectiveness in striking a balance between providing a self-paced study medium

that also offers the benefits of a group-based learning medium. As Anderson (2009) points out, web-based online courses have the potential for effectiveness by striking a balance between the self-paced and group-oriented training paradigms.

Evaluation Criteria for Online Learning Success

Despite the steady growth of distance education in academia and the business world, limited consensus occurs among researchers regarding what constitutes a successful online learning experience (Agosto & Zach, 2009; Ahmad et al., 2001; Anderson et al., 2014; Arbaugh et al., 2005; Bradley, 2011; Brown et al., 2012; Chariker et al., 2012; Cook, 2005; Estraillier et al., 2012; Fabry, 2009; Foster et al., 2014; Henkel, 2012). A study as recent as 2015 (Armellini & Padilla Rodriguez, 2015; Rao & Krishnan, 2015) used Kirkpatrick's 1959 classical learning evaluation model for assessing online learning courses. This model evaluates the success of a learning experience on four different levels: (a) student reaction--what the student felt and thought about the training; (b) learning--the knowledge or skill increase; (c) behavior--degree and extent of behavior change or level of implementation/application; and (d) results--the outcomes of the training in business or elsewhere resulting from the trainee's learning experience.

McKay and Vilela (2012) cite from other research that Kirkpatrick's model remains the most popular method used by researchers to measure training effectiveness in corporate settings. Since Kirkpatrick's model focuses more on the learning event itself and its effectiveness and less on the course structure (McKay & Vilela, 2012), it does not clarify this research. This dissertation work, on the other hand, is interested in differentiating factors in a learner-paced online course that lead to a successful learning experience rather than on learning experiences specifically.

The key to developing learning effectiveness and success evaluation criteria for online learning involves identifying the defining characteristics of the new generation of online courses and their potential (Bradley, 2011; Cook, 2005; Fabry, 2009; Henkel, 2012; McKee, 2010). Anderson (2003, 2009), a distance education authority in Canada, argues that a successful online course must have a high level of student interaction of one of the following types in order to be successful: student and content interaction, student and instructor interaction, and student and student interaction. From a survey based on Anderson's (2003) interaction model, which categorizes interactions in online courses as the interaction between the student and the content, instructor, and other students, Arbaugh et al. (2005) found that regarding online course success, the importance of student to instructor interaction is twice as much as student-to-student interaction, and that only certain student-to-content interactions strongly contribute to course success.

Anderson et al. (2014) expanded Anderson's Interaction Equivalency theory (2003) from a model focused on student interactions with other students, the content, and the instructor to account for three layers of interaction: learner-media; the three interaction types of student to instructor, content, and other students; and concept interactions, which takes place when a learner's old and new knowledge interact in order to create a sum greater than the two. This bottom-up approach accounts for the features and characteristics of the learning medium and information complexity in assessing the ability of students to navigate from learner-medium interaction to concept interaction, which involves the student internalizing the knowledge from the course and becomes actionable insight (Chariker et al., 2012; Heshmatpanah & Neyestanak, 2011). Researchers Heshmatpanah and Neyestanak (2011) designed assessment models specific to the characteristics of an online program that address levels of student experience with

computers and online courses, levels of student engagement with the course medium, and time spent on learning the course environment, as opposed to studying the material itself and its effect on student learning outcomes.

Chariker et al. (2012) conducted a quantitative study to examine the relationship between content complexity and the effect that the selection of learning medium has on a successful learning experience. The researchers determined that the greater complexity of the information presented, the more critical the choice of teaching medium. They used such factors as short-term and long-term memorization, student ability to generalize, and student ability to think critically (Chariker et al., 2012).

A common factor among these assessment models involves their attention to course complexity as opposed to Kirkpatrick's 1959 evaluation model. In essence, distance education incorporates elements of face-to-face teaching, self-study learning, and community-based learning with the group-based model. Therefore, an evaluation model to determine its effectiveness has to account for learner interactions with course content, the instructor, other learners, and the course medium, the ability of the course management system to accommodate both self-paced and cohort-based styles of learning, and, above all, an algorithm for grading these elements in order to arrive at a pass/fail grade for an online course under evaluation (Boris & Reisetter, 2004; Bradley, 2011; Eskey & Schulte, 2012; Estraillier et al., 2012; Kearns, 2012). The theoretical framework adopted for this study, the FICECLC Theory, addresses these concerns and provides a rubric for evaluating a successful learner-paced online course.

Self-Paced Online Learning

Historically speaking, the first wave of distance education courses was student-oriented, and the instructor communicated through mail (Altintas & Gunes, 2012; Anderson, 2009;

Emmerson, 2004, Lim, 2016; Rao & Krishnan, 2015). Time-intensive, this approach did not serve as an ideal medium for all types of interactions between a student and instructor. In his research, Anderson (2009) draws parallels between dancing and student interactions in a distance-learning environment. Anderson argues that during the first wave of distance learning courses, the student was a solo dancer receiving instructions and material in the mail and had to learn through a self-taught structure with little support from an instructor. Despite its drawbacks, this model brought about a high level of self-control and freedom for students--something not available in traditional classroom settings (Anderson, 2009).

In the second wave of distance education, mediums included telephone, radio, television, and satellites. Larger groups of students were able to join distance learning courses, but that, however, came at the expense of the learner-control and flexibility that the first wave exhibited (Altintas & Gunes, 2012; Anderson, 2009; Elahi & Rashid, 2012; Emmerson, 2004, Olsen, 2015). In the third wave of distance education, online education programs were able to offer fully self-reliant courses through instructor-less, computer-based training courses in corporate settings, using the cohort-based online training model, in which all students were paced together against a structured timeline (Altintas & Gunes, 2012; Anderson, 2009; Emmerson, 2004; McKee, 2010; Venkataraman & Sivakumar, 2015).

Ahmad et al. (2001) affirm that virtual learning environments (VLE) differ from traditional classrooms with regard to the role of the student in two ways: 1) the level of control a student has over the pace and direction of the learning and 2) the use of computer technology. In their assessment, motivation and higher levels of computer aptitude are factors that play roles in students' success in learning within an online course. These researchers further argue that because virtual learning environments require all participants to interact extensively with

computers, the ability to use a computer can result in lower levels of anxiety typically associated with self-study online courses. In the 2001 study in which students took a computer-related course over the computer, however, Ahmad et al. (2001) determined that there was not enough evidence to suggest that online course students receive higher scores than students in the traditional learning setting. The online course students indicated lower levels of satisfaction with their course and higher levels of computer self-efficacy in comparison to the traditional classroom students reasons for the lower satisfaction resulted from level of course user-friendliness amount of time required for learning how to use the online course management system, and feelings of anxiety and isolation (Ahmad et al., 2001; Anderson et al., 2005, Dunston & Crosby, 2013; Kauffman, 2015).

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Anderson et al. (2005) note that universities offer distance and e-learning courses either in a self-paced or cohort format. Historically, cohort-based online programs have had a higher completion rate among their students than self-paced courses. Therefore, the central question inquires the extent to which peer-based learning techniques can be utilized in self-paced study

mediums without affecting the core values of this medium, involving learner-control and timing and scalability of the program (Anderson et al., 2005).

Anderson et al. (2005) asked 29 online instructors to respond to questions about the advantages and disadvantages of imposing peer-based learning methods on learner-paced courses. The findings of this phase of their study determined that peer collaboration enhances the learning experience by doing the following: (a) creating a community of inquiry, (b) exposing students to other learners' questions, and (c) helping them navigate through the course and complete the program faster, but they found it difficult to blend the peer-based learning style with learner-paced courses due to the low number of students at the same stage of learning, or the fact that students may have already paired with coworkers or friends to support them in their studies (Anderson et al., 2005).

Equipped with the insight from their interviews, Anderson et al. (2005) surveyed 388 online students about the value of community-building tools that comprised of discussion boards and blogs. Their findings concluded that most learner-paced course students did not favor participating in the interactive components of their courses, which included discussion groups, because of lacking time, not seeing their value, shortage of recent postings, or having nothing to contribute. Seventy-eight percent agreed or strongly agreed that they would interact with other online learners as long as the interaction would not interfere with their pace of learning. About 95 percent of the learners expressed the desire to have access to the work of other students who were either currently enrolled or who had previously taken the courses, and about 77 percent expressed a desire to have access to animated content-learner tools, such as "ChatBot" (Anderson et al., 2005).

The Anderson et al. (2005) study, as well as other research studies, suggests that students prefer not to be engaged in collaborative activities modeled after the cohort-learning style, such as activities incorporating strict timelines and frequent group participation. Students have, however, expressed interest in such activities as long as they do not constrain their freedom to set the learning pace (Anderson, 2009; Anderson et al., 2014; Eskey & Schulte, 2012). France-Harris, Meddaugh, & Southard's (2015) empirical research determined that self-paced online is for driven students and is not a suitable choice for all students. Anderson (2009) believes that by simply introducing elements from a cohort-based online structure into a self-paced course, students will not realize the benefits associated with the cohort-based learning model.

According to Phillips (2005), active learning is an active process in which the instructor and learners become partners in the creation of knowledge and involves the role of the instructor shifting from a subject expert to a coach and facilitator. Phillips (2005) researched the characteristics of an active learning online course and concluded that when a student involved in all phases of the learning process, she/he actively learns. As a result, the student self-directs and prefers active learning strategies. Seven principles of good design for learner-centered learning guide the course development:

1. high expectations for the learner set by the instructor;
2. interaction among students;
3. active engagement in the course delivery process, enabling students to learn faster and retain information longer;
4. time spent by the instructor in creating the course;
5. feedback that includes purposeful interactions among the learner and other learners; technology, and the instructor(s);

6. instructor-student interaction; and
7. respect between the instructor and learners. Such respect enables and promotes learners, while the instructor and the learners respect different cultural values (Phillips, 2005).

With regard to the role of the student in the interaction model afforded by an online course, a shift in focus in the research material can be noticed in the early-to-late 2000s. The student-student interaction included one of the three accepted types of interaction with the course content, the instructor, and other students (Anderson et al., 2005; Arbaugh et al., 2005; Bradley, 2011; Cook, 2005). In more recent publications, the student-student interaction is transformed into a learner-learner interaction with the student drawing support from any individual assisting him/her in learning the online course while adhering to a cohort-based learning structure (Anderson et al., 2014; Branch & de Groot, 2012; Thiessen, 2014).

Online Course Configuration

In its early forms, Anderson's (2003) Interaction Equivalency theory treated both the course content and its delivery management system as one. Revised in Anderson et al. (2014) study, the new view places the course medium at the bottom of its model as opposed to a part of the triple interactions among the learners, instructor, and course content. Cook (2005) conducted research on the topic of dissecting a course medium into the pieces of configuration, instructional methods, and presentation. Each level can contain one or more elements of the next level, with medium in the lowest level of the hierarchy and presentation in the highest that lies closest to the user. Figure 3 outlines these relationships.

Figure 3

Levels of Instructional Design in Computer-Based Learning

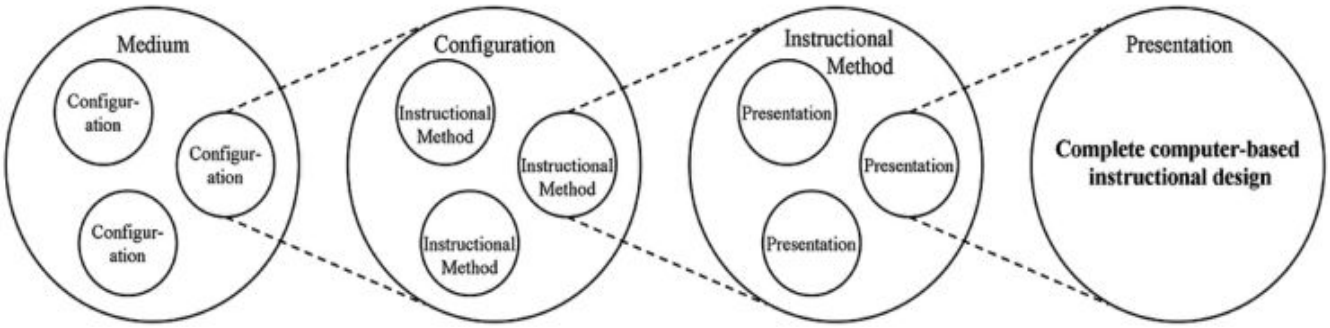


Figure 3. Levels of Instructional Design in Computer-Based Learning. From "The research we are still not doing: An agenda for the study of computer-based learning," by Cook, D. A., 2005, Academic Medicine, *80*(6), p. 543. Reprinted with permission (Appendix D).

In this model, the configuration includes the building blocks that comprise the medium or the big picture. Using this model, a face-to-face teaching configuration can include lecture, Q&As, and case-based teaching. A computer-based learning (CBL) configuration incorporates such elements as PowerPoint presentations, discussions, and lectures, which parallel those of face-to-face learning. A promising element for CBL involves just-in-time learning, which provides instruction at critical points based on learner performance (Cook, 2005). Instructional methods include techniques that support learning processes involving questions, cases, group discussions, and feedback. It can be argued that much of the differences between mediums can be linked to differences in instructional methods rather than to attributes of the mediums. Finally, differences in presentation include differences in the elements of the presentation. For instance, the font or color of a PowerPoint slide and its simulation fidelity are presentation factors and improve the ease of use and facilitation of navigation (Cook, 2005).

Chariker et al. (2012) conducted a thorough quantitative research study examining the relationship between the complexity and difficulty of course content and the significance of course configuration choices on the effectiveness of training. Their research determined that the

relative efficiency of instructional methods appeared more pronounced when analytical methods accounted for items with high levels of difficulty. In their study, mastering basic and whole anatomy prior to learning sectional anatomy resulted in performance improvement 1.5 times better for simpler items, whereas, performance improvement for the more difficult items rose by a factor of 10 (Chariker et al., 2012).

McKay and Vilela (2012) refer to two modes of learning. The first is for novice learners, for which the learning tool should be more detail-oriented and supportive and includes guidance and answers to possible questions. The second, for more advanced users, offers greater opportunities for practical training and refers the more advanced learner to the basics and the kind of supportive material reserved for novice users only when needed. In their view, one of the challenges with e-learning systems involves attempting to cater to both the novice and advanced users at the same time and with a single medium (McKay & Vilela, 2012).

Research conducted by Estraillier et al. (2012) further argues that the settings and features of the course management system (CMS) must align with the learning environment requirements and student backgrounds (Estraillier et al., 2012). Both of these research studies acknowledge that the course configuration must also align with the content complexity and student knowledge level (Estraillier et al., 2012; McKay & Vilela, 2012). Heshmatpanah and Neyestanak (2011) reached similar conclusions after conducting several field study experiments while rolling out online training programs in a high school. The FICECLC Theory explains how to create a successful online learning experience through learner interactions, and, as such, should be taken into consideration when designing a learner-paced online course configuration.

Online Course Instructional Methods

Course delivery medium and channels largely dictate instructional methods available to course developers for distance learning (Altintas & Gunes, 2012; Anderson, 2009; Boris & Reisetter, 2004; Branch & de Groot, 2012; Cook, 2005; Estraillier et al., 2012; Henkel, 2012; Malliga, 2013; McKee, 2010). Historically, the trend has included a greater number of interaction choices for the student, since the web has made it possible to include many instructional methods: video-based meetings, chat rooms, discussion boards, automated quizzes, notices, a calendar, and file-sharing (Anderson, 2009; Anderson et al., 2014; Emmerson, 2004; McKee, 2010). One should not, however, mistake the availability of these instructional methods as a ticket for their use in an online course.

Newton et al. (2006) indicate in their research that just as the face-to-face discussion setting in a classroom is one of educators' most-favored instructional methods, in online courses discussion boards are deemed critical by educators in the sense that the tool is the closest to a discussion setting in a classroom. They can reduce the chances of the online student feeling isolated; their literature review, however, indicates that discussion boards on their own will not automatically translate into thriving conversations (Newton et al., 2006).

The survey of Anderson et al. (2005) of 388 online students revealed that they did not favor participating in interactive components of their courses when pressed for time or when not graded. Eskey and Schulte (2012) conducted research that shows there is disconnect between course developers and student perceptions of the value of instructional methods that online courses were conducted by. This study involved 1,028 students and 267 online adjunct faculty members who participated in an online survey with Likert-style scale answers to questions from the following areas: 1) creation of a student community in the online class, 2) facilitation of

discussions, 3) grading and assessments, 4) online learning environment and course climate, and 5) instructor response times (Eskey & Schulte, 2012).

The outcome of Eskey and Schulte's (2012) study indicated that college students expect prompt and descriptive gradebook comments from instructors with less importance placed on discussion board grades. In contrast, faculty placed the highest importance on discussion board grades, and grade comments for auto-graded quizzes were the least important to this group. Eskey and Schulte's (2012) study provide a framework designed specifically for evaluating online training courses based on characteristics of online training that have value to students.

Web-based course management systems provide for the course developer a standard set of instructional methods that includes lectures, quizzes, discussion boards, chat rooms, blogs, wiki pages, file-sharing, announcements, a calendar, and automated emails. The implication of the research cited above, however, suggests that these methods cannot be used simply because of their availability to the course developer. Validation of the FICECLC Theory enables course developers to make informed decisions as to which components to include in their learner-paced online courses to make them effective and successful. Therefore, the instructional methods will be catalogued based on their benefits and value proposition for various course settings.

Online Learning Assessment Methods

The selection of an evaluation method for a distance education course largely depends on the course delivery media or course management system (Arbaugh et al., 2005; Branch & de Groot, 2012; Kearns, 2012; Arbaugh et al., 2005; McKee, 2010). The 19th century mail-based correspondence courses could not afford the same level of interactivity and synchronous instruction and evaluation tools in relation to which is available in the 21st century for students in online courses (Anderson, 2009; Emmerson, 2004; McKee, 2010). Phillips (2005) states in

her research that the teaching-learning process is pivotal to learning, and it includes a personal relationship that expands beyond the subject matter. This process requires four steps: 1) assessment, 2) planning, 3) execution and implementation, and 4) evaluation implemented in a circular fashion. In this context, assessment methods are both a teaching and a testing tool (Phillips, 2005). Bradley (2005) proposed a theoretical framework, with the starting point to specify the module of learning objectives and followed by careful design assessment, interaction, and learning theory decisions (Figure 2). He further states that a course can be over-designed, and, in turn, result in an unreasonable student workload, and/or that a course can become overly assessment-intensive. The assessment parameters should align tightly with the learner interaction opportunities aspect of the module management (Bradley, 2005).

Kearns (2012) undertook a study to verify assessment methods utilized in online courses and the ways the online learning environment constrains or facilitates them. He identified five categories of online assessment: 1) written assignments, 2) discussion threads, 3) fieldwork, 4) exams and quizzes, and 5) presentations (Kearns, 2012). The study's findings concluded that written assignments and online discussion boards are the most frequently-used assessment methods in online courses, and that online assessment difficulties arise as a result of the physical distance between the students and the instructor, coupled with an ongoing need to provide feedback to students and assess them, as well as workload and time management issues (Kearns, 2012). Kearns' (2012) study makes several recommendations regarding learning assessment methods: (a) break down complex topics in online courses, (b) use rubrics for grading, (c) utilize self-check quizzes for teaching and assessment of highly complex subjects, (d) use peer-assessment models to foster a communal sense among students with students teaching each

other, and (e) look for opportunities to pull the whole class into one setting to reduce time in answering questions or teaching critical topics.

The assessment methods used by the online instructor play a critical role in motivating students to remain engaged with the course, to form study groups, and to interact with the instructor (Arbaugh et al., 2005; Altintas & Gunes, 2012; Boris & Reisetter, 2004; Brown et al., 2012). As studies like those of Anderson et al. (2005) and Eskey and Schulte (2012) indicate, however, the value and weight given to assessment methods differ among instructors and students.

Eskey and Schulte (2012) discovered that students place a low value on automatically-graded quizzes and a greater value on descriptive gradebook comments provided in a timely fashion. Their research suggests that assessment methods must also, like the other topics covered in previous sections, align closely with the objectives of the online course and configure according to their relative benefits in regard to the expectations from the learner-paced online course structures (Eskey & Schulte, 2012).

Conclusion

Over the past thirty years, public universities have faced increased demand and enrollment all the while their budgets were cut. Online delivery mode emerged as a cost-effective alternative to traditional teaching and enabled those schools to expand their markets to students not enrolled in their traditional markets. In traditional learning, the learner has the capability to interact with the instructor and other learners, which leads to personal transformation. This interaction model has proven essential to the success of a learning environment. Online classes do not provide for this type of peer-to-peer interactions. There are many advantages to the face-to-face learning mode. Face-to-face learners perform better than

online learners (Jaggars, 2013), and students have rich peer-to-peer and student-to-instructor interactions and enjoy the classes more than their online counterparts (Akers, Atchley, & Wingenbach, 2013; Jaggars & Xu, 2013). Recent innovations in educational delivery, however, are making it possible for online learning to offer a peer learning capability (Hyman, 2012).

The distinction between traditional distance learning and online learning is the potential for the online learning model to provide its students the ability to interact among themselves as well as with the instructor (Crawford-Ferre & Wiest, 2012). Due to the space and time difference between the instructor and students, encouraging active learning by students is the most challenging aspect of e-learning (Cook & Dupras, 2004).

The distance education and online learning literature collectively view student interaction in distance-based as important, because of the primary role that student interaction with content, the instructor, and other students plays in all forms of education. (Abrami, Bernard, Bures, Borokhovski, & Tamim, 2011) Ertmer, Ertmer, and Sadaf (2011) argue that the purpose of all online interactions involves increasing students' comprehension of the course content. Citing from a 2009 meta-analysis of 74 studies, the goal of increasing the student understanding of the course content was met when at least one of the following interaction types were utilized: student-content, student-instructor, or student-student (Ertmer et al., 2011). Since the distinction between the online learning model and traditional learning as well as with the correspondence distance learning method is its potential for enabling the students to interact among themselves and with the instructor, the study of student interactions in online education is a central theme in online education research.

One of the online study interaction models frequently cited in related research is Anderson's (2003) Interaction Equivalency Theory. This theory states that as long as the student

experiences effective interaction course content, the instructor, and/or with other students, the learning experience is effective. Anderson et al. (2014) later upgraded this theory to the FICECLC Theory, which adds to the interaction model social interactions via social networks as a crucial requirement for active learning and deep knowledge creation by the learners.

There is little consensus among researchers regarding how to assess the effectiveness of online learning courses. Some studies measure student satisfaction (Altintas & Gunes, 2012; Altintas & Gunes, 2013); some track student performance (Castle & McGuire, 2010; Cavanagh et al., 2012; DiRienzo & Lilly, 2014); and some collect both performance and satisfaction scores (Hyman, 2012; Driscoll et al., 2012; Flagg et al., 2008). Anderson et al. (2014) define success as transforming the level of knowledge of an online student from its pre-course level to a stage of deep learning as a result of social interactions in the online course.

Due to the fact that the distinguishing factor for online education is enabling the students to experience greater interaction than traditional distance learning students, any study of online education effectiveness needs to include learners' interactions. The FICECLC Theory, a widely accepted model, satisfies this requirement. The FICECLC Theory states that the student's learning experience is highly dependent on the types of interactions experienced by him/her, and, as such, is in synch with the new wave of digital communication social interaction medium, and how the learner can learn from non-student learners as well as from registered classmates.

Chapter III

Research Design and Methods

Introduction

This study endeavored to define common characteristics of effective online learning courses with respect to the modes of learner interactions. The theoretical framework adopted for this study, the Framework for Interaction and Cognitive Engagement in Connectivist Learning Contexts (FICECLC) Theory (Anderson et al., 2014), seeks to explain how online course learners can be transformed from novice learners to those who can teach others and as well as to form their own ideas (Anderson et al., 2014). The notion behind the Connectivist learning model asserts that the higher the level of learner interaction, the more advanced the learning experience and, hence, the higher the degree of course success (Anderson, 2003; Anderson, 2009; Anderson et al., 2005; Anderson et al., 2014). The core argument of this theory states that the purpose of an online course is to transfer knowledge to the learner. This transfer will take place through the learner's interactions with other learners, with the course content, with the instructor, with the learner's pre-course and post-course knowledge.

Data collection for this research study was comprised of four main points:

1) Creating and marketing of the online courses used as a platform to validate the FICECLC Theory.
2) Collecting of ex post facto data from the experiment of providing online courses built on the basis of the FICECLC Theory and an online course not built on the basis of the FICECLC Theory.

3) Conducting semi-structured interviews with twelve participants from the online courses built on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC Theory.
4) Mixed-method analyzing of ex post facto data and analysis of the coded themes from the semi-structured interviews for answering the research questions of this study.

By empirically validating the FICECLC Theory in this study, the researcher endeavored to address the common characteristics of effective online training modules with respect to learner interactions by answering the following three research questions:

1. Is there a difference in the levels of online students' interactions between students taking an online course built on the basis of the FICECLC Theory (afforded social learning tools), and those taking an online course that was not developed on the basis of the FICECLC Theory?
2. Is there a perceived difference in the success factors between a group of online students completing an online course built on the basis of the FICECLC Theory and another group taking an online course not built on the basis of the FICECLC Theory?
3. Is there a correlation between the implementation of the FICECLC Theory and online course success in comparison to an online course not built on the basis of the FICECLC Theory?

This study's research questions were answered by conducting a complimentary, mixed method study for measuring the effectiveness of an online course developed on the basis of the FICECLC Theory in comparison to an online course not developed on the basis of the FICECLC Theory.

Research Design

The research methodology most suited to this study is a mixed method study. According to Creswell (2012), a mixed-methods study that combines qualitative and quantitative research offers a better grasp of the research question than when used separately or alone. Johnson, Onwuegbuzie, and Turner (2007) define mixed method research as a practical combination of quantitative and qualitative research and one that acknowledges the advantages of the qualitative and quantitative research but, nevertheless, offers an effective choice by mixing the two that is often more balanced, informative and useful. Creswell (2012) states that testing a theory in a quantitative research represents the most rigorous form of research (Creswell, 2012). Quantitative research provides an effective method for determining the difference in learner interaction for students in an online course built on the basis of the FICECLC Theory and the learner interaction for students in the online course not built on the basis of the FICECLC Theory.

Qualitative research is a suitable choice for studies that seek to capture tacit knowledge and subjective understanding of research participants or for studies for delving into complexities and processes (Marshall & Rossman, 2011). Qualitative research is the best method to determine the success of the online course developed on the basis of the FICECLC Theory in comparison to the online course not built on the basis of the FICECLC Theory.

Research question one was answered by performing the Mann Whitney U test against the ex post facto data, since the focus of this question was on the differences in student-to-course interaction which were logged in the course management system. Research question two was answered by the coded themes extracted from the interviews conducted by the study participants, since this question emphasized the differences in perceived degrees of success for the

experimental and control groups students, which was best captured and explained by the semi-structured interviews. And, finally, research question three was answered by examining both the ex post facto data with the Pearson's Correlation test and the emerging themes from the interviews with the study participants, since research question three seeks to answer the question of whether there is a correlation between the implementation of the FICECLC Theory in an online course and that course success in comparison to an online course not built on the basis of a framework?

The use of a mixed-method study gives the researcher the ability to understand the impact of implementing the FICECLC Theory in an online course on its degree of success. Ex post facto data for student interaction and student performance were used to answer research questions one, two, and three. In addition, coded themes from semi-structured interviews were utilized for answering research questions two and three, by examining study participants' perception of course success factors and the impact implementation of the FICECLC Theory has on an online course success. The combination of quantitative analysis of the ex post data and the coded themes from the semi-structured interviews were used to answer the research questions for this study.

Participants

In this study, participants included students enrolled in a basic online computer training course titled *High Performance Excel – Tips and Tricks for Busy Professionals* offered by TrainingCo (pseudonym). The three-week online course was designed for busy professionals who had a desire to learn a collection of techniques for effective use of Microsoft Excel.

TrainingCo is a Project Management and IT training business and specializes in IT and management training. TrainingCo delivers training to companies and individuals in the

Washington, D.C. area in both face-to-face and online formats. TrainingCo is a Registered Education Provider (REP) with the Project Management Institute (PMI), the world's leading project management governing body (PMI.org, 2015). PMI owns the globally-recognized professional designation of the Project Management Professional (PMP®), which is one of the most popular certifications in its industry (Techopedia, ND).

In June of 2011, TrainingCo began its operation in Canada and moved its main functions to its newly-established US branch in June of 2014. With two full-time employees, one part-time employee, and two contractors, this company has offices in both United States and Canada.

The core feature of probability sampling techniques includes randomly-drawn units from the population using probabilistic methods to enable the researcher to make statistical inferences from the sample under study to the population of interest (Laerd Dissertation, 2012). The simple random sampling is a probability sampling technique. With this technique, there is an equal chance for any given unit of being selected from the population under study (Laerd Dissertation, 2012). Simple random sampling allows the researcher to use statistical methods to analyze the sample population. Statistical analysis is not appropriate when non-random sampling methods are utilized (Stat Trek, 2015). The sampling method for conducting this study was probability sampling with simple random selection method. The invitation to participate in this research (Appendix E) was made available on a random basis to a group of 741 working professionals living in U.S. or Canada through LinkedIn, of which 129 invitations were emailed and 612 invitations were posted on LinkedIn profiles.

The participants were informed that the class would train them to use advanced Microsoft Excel skills. A popular software product (Britannica, ND), the free Microsoft Excel courses offered would be of use to many individuals. As an extra incentive, participants in the study who

managed to complete the study were offered free submission to TrainingCo's PMP® Preparation course, a premium product sold at a high price in the market. Additionally, after completing the online course, students were entered into a drawing to win a variety of prizes, including a flip camcorder.

The course registration system was setup to exclude participants who identified themselves as minors. Ninety-eight participants clicked on the invitation link and were directed to the online course registration page. The participants were provided with the informed consent form (Appendix F), a demographic questionnaire, and a pre-course Excel aptitude test (Appendix G). Among the 98 volunteer study participants, 14 were removed either because there had duplicate user accounts, or they provided invalid email addresses.

Table 2

Demographics on Ex Post Facto Data

n = 84

Variable	*Number*	*Percentage*
Male	49	58.33%
Female	35	41.66%
Caucasian	35	41.66%
African-American	16	19.04%
Asian	25	29.76%
Hispanic	3	3.57%
Other/Undefined	5	5.95%
Age 18-25	16	19.04%
Age 26-35	23	27.38%
Age 36-45	29	34.52%
Age 45+	16	19.04%

The eighty-four registered students translated to an 11.33% conversion rate of the 741 potential participants recruited for the study. According to Tomei (2006), the ideal online class size is 12 students. While the conversion rate is only an 11% response rate, the class size of 42 for each of the experimental and control groups was, therefore, large enough to represent typical online courses.

The 84 participants registered for the online professional Excel course were divided into two normalized groups on the basis of gender, and results from the Microsoft Excel aptitude test (Appendix G), the student population was normalized into two classes. The Microsoft Excel skill level of the control and experiment classes were three weeks in length and were offered entirely online. The students were distributed evenly into the two groups: 1) control group taking the online course developed on the basis of the FICECLC Theory with 42 students and 2) an experimental group, taking an online course with the same instructor, grading scheme, and an identical content to that of the control group, but delivered by an online course not based on an online learning theory—also with 42 students. Table 3 includes the demographics data for the study participants.

Table 3

Participant Demographics

Demographics	Adult Learners, US and Canada
Participant (n)	84
Participants Invited	741
Campus Size	84 students registered evenly into two groups of control and experimental
Research Participant (n)	• experimental group using FICECLC Theory, n = 42 • control group not using a theoretical framework, n = 42
Gender	58.33% male, 41.66% female

Study participants provided permission to TrainingCo to release their class ex post facto data, regarding course content access attempts labeled as student-to-content interaction, course quizzes and final assessment scores and answers, and the count of student-to-student and student-to-instructor interactions. Table 4 contains the detailed demographics profile for the experimental and control participant groups.

Table 4

Demographics on Experimental and Control Groups

n=84 (sample size = 42 for each of the experimental and control groups)

Group	Variable	Ratio	Range	Mean	Standard Deviation
Experimental	Male	59.52%			
	Female	40.47%			
	Age		20-65	35.14	10.25
	Pre-course aptitude test		6-20	11.70	3.44
	Asian	30.95%			
	African-American	23.81%			
	Caucasian	35.71%			
	Hispanic	2.38%			
	Other/Undefined	7.14%			
Control	Male	57.14%			
	Female	42.85%			
	Age		21-64	38.55	10.64
	Pre-course aptitude test		3-25	11.55	3.86
	Asian	28.57%			
	African-American	14.29%			
	Caucasian	47.62%			
	Hispanic	4.76%			
	Other/Undefined	4.76%			

The average pre-course assessment score for the experimental group was 11.70 with a standard deviation of 3.44, and the average pre-course assessment for the control group was 11.55 with a standard deviation of 3.85. The students were normalized into experimental and control groups with respect to their sample size, gender composition, and Microsoft Excel aptitude test (Appendix G) score.

The online course developed on the basis of the FICECLC Theory and the online course not developed on the basis of the FICECLC Theory were identical in content. The only

difference between the two online courses was the availability and application of social interaction learning tools made available to them in the two online courses. The experimental group was provided social interaction tools of wiki for co-creation of knowledge by learners, and forum, which was structured exactly like the instructor-led discussion board with the difference that the students could start their own conversation threads. The experimental group of students were encouraged by the instructor to further research the topics discussed in the content from external resources and share their inquiries and findings with other students through the student forum and the wiki.

The participants in each course (n=42) provided consent to take part in this research study (Appendix F). They also granted permission to TrainingCo to release their class ex post facto data of learner interaction, which included course content access attempts regarded as student-to-content interaction in this study, student-to-student interactions, student-to-instructor interaction, and course quiz scores. Additionally, twelve semi-structured interviews with six participants from the experimental group and six participants from the control group were conducted, transcribed, and coded for repeating themes to identify what factors influenced the ability of the participants in the study to learn from the online course built on the basis of the FICECLC Theory, and the online course not built on the basis of a framework.

The certification for Human Research through the National Institute of Health was acquired (Appendix H), and the site visit permission letter was communicated to the Human Research Review Committee (HRRC) chair of Northwest Nazarene University (Appendix I). Consent was obtained from the HRRC at Northwest Nazarene University prior to commencing this study (Appendix J).

Data Collection

The FICECLC Theory (Anderson et al., 2014) was adopted as the theoretical framework for this study. For both the experimental and control groups, the levels of student and course content interaction, student-to-student interaction, and student and instructor interactions were captured through a customized Moodle CMS setup.

To validate the FICECLC Theory, two groups of students were offered the exact same basic computer skill Microsoft Excel training program. One group of students, the experimental group, took the online course, constructed from the ground up based on the FICECLC Theory, and the other group, the control group, participated in an online course not based on an online learning theory. The two courses, both authored by TrainingCo, a Northern Virginia-based IT and management training company, had the same instructor and grading structure. The only difference between the two online courses was the application, affordance and endorsement of social interaction tools of forum and Wiki. The experimental group of students were instructed to treat the content as a starting point and develop on that knowledge from external sources and share their findings and inquiries with other students and the instructor through the knowledge co-creation and social interaction tools of wiki and student forum.

The online course built on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC Theory were conducted and instructed by MarketingCo, (pseudonym) a Northern Virginia marketing and technical company that handles TrainingCo website development and marketing functions (Appendix K). The instructor from MarketingCo stored the data from the online courses on a password protected secure external disk drive. At the conclusion of the collection of ex post facto data, the instructor purged all identifying data from the original files and provided the researcher with aggregated ex post facto data containing

anonymous student identification numbers in an encrypted USB memory with the password known only to the course instructor and the researcher (Appendix L). The digital copy of aggregated ex post facto without identifying data handed to the principal researcher, which was stored in a password protected computer and secure files and will be destroyed by the researcher three years following the study in compliance with the Federal wide Assurance Code (45 CFR 46.117).

The ex post facto data collected for this study (Appendix A) was comprised of the following primary data collection points:

1) Student-content interaction: measured by the count of instances each student accessed course content pages.
2) Student-instructor interaction: measured by the count of times the students and the instructor interacted through the instructor-led discussion board added to the number of emails sent from the student to the instructor. For the experimental group, student-instructor interactions through social media tools of wiki and student-led forums were added to this index.
3) Student-to-student interaction: measured by the count of discussion board threads written by each student addressed to other students for both experimental and control groups, and the count of student to student interaction through social learning tools of forum and Wiki, which were afforded only the experimental students taking the online course developed on the basis of the FICECLC Theory.
4) Student success factor in the online course: the performance score of the students for both the experimental and control groups were calculated on the basis of the course rubric (Appendix M). The course grade was a composite score of student-to-content

interaction, student-to-instructor interaction, student-to-student interaction, and course exam scores (Appendix N).

Table 5

The Experiment and Control Courses Curriculum and Grading Structure

Course section	Ex post facto collected
Content: Six lectures for the three week course	Count of times the student accessed course content
Discussion board participation: Three discussion boards	Count of student-student and student-instructor interactions in the instructor-led discussion board
Email interaction with instructor	Count of emails sent by the student to the dedicated instructor email address
Social interaction tools participation (experimental group)	Count of student-student and student-instructor interactions through social interaction tools
Course final score	Final grade for the student is comprised of points for • accessing the content: 1.25% per lesson, total score is 7.50% for six lessons • discussion board participation: 10% per weekly discussion board thread, 30% for the three weeks • course exams: 62.50%, 25 questions, 2.50% per question

The ex post facto data for the study was collected from mid-October 2015 to mid-November 2015. All identifying data were removed from the ex post facto data prior to submitting the data for research. With the aggregate student interaction and student performance Mann Whitney U data statistical analysis was processed with IBM SPSS Statistical Software Version 23 (IBM, 2016) to measure the difference of levels of student interaction between the

experimental and control groups students, and the difference between students from the experimental and control groups.

The aggregate student interaction index and student performance scores were analyzed against each other for both the experimental and control groups to find correlations between the overall level of student interaction and student performance in the online learning environment. Correlation provide information about how variables relate to each other (Tanner, 2012). The significant statistical difference between the overall student interaction between the groups, and the significant statistical difference between the experiment and control groups for overall student performances were performed by IBM SPSS Statistical Software Version 23 (IBM, 2016) using the Pearson's Correlation method to determine whether the implementation of the FICECLC Theory does result in statistically significant differences in terms of student interactions and student performances with online courses not built on the basis of the FICECLC Theory.

Prior to conducting the interviews, the interview questions were piloted with two participants who were not members of the experiment or control groups in this study. These two pilot interview participants were both doctoral students with a minimum of two years of online learning experience. The first pilot interview was conducted with the participant who had completed his doctorate study interviews, and the second pilot interview was conducted by the participant who, in addition to being a doctoral student, was a university professor and had prior experience with online courses both as a student and an instructor. Based on the pilot interview experience, it was discovered that the interview questions were not open-ended enough and, as a result of the pilot study, were adjusted to provide the interviewees with more opportunities to

define the answer parameters and expand on them in greater detail rather than answering with short sentences (Appendix O).

All interviewees, both face-to-face and telephonic, were provided with the interview demographic questionnaire (Appendix P) and the consent form (Appendix Q) and received a detailed review of the interview process. All participants signed the informed consent form (Appendix Q) agreeing to participate in the study, to be audio recorded, and to allow the use of direct quotations in this study; they also completed the demographic questionnaire before the interviews.

All participants were debriefed at the start of the interviews (Appendix R), and all received copies of the interview consent form (Appendix Q) and interview process (Appendix S). The participants also received all the coded themes extracted from their interview responses at interview question level (Appendix U) at the conclusion of the interview process. All 12 participants validated the coded themes from their interviews. Furthermore, at the conclusion of the study a member checking email was sent to the participants so in order that they could notify the researcher if their voice was not heard correctly (Appendix T). All participants validated the findings and major themes of the study.

Between late November 2015 and early December 2015, 12 semi-structured interviews were conducted with 12 study participants. The length of interviews averaged 55 minutes and were performed using the piloted interview questions—seven nearby subjects participated in face-to-face interviews, and five telephonic interviews took place with the participants not living within driving distance of the researcher or were unable to meet in person.

Six interviews were conducted with participants from the experimental group and six interviews took place with participants from the control group. At the conclusion of the

interviews the transcripts were analyzed for identification of the study coded themes. All interviews were recorded using Audacity™ (Audacity, 2016), and the interviews were transcribed by a professional transcriptionist who signed a confidentiality agreement (Appendix V). All identifying data were removed from the transcriptions, and the encrypted copy of all the physical elements (print outs, hand writings, index cards, etc.) from the qualitative segment of the research and were destroyed at the conclusion of the study. The digital copies of the

Table 6

Interview Participant Synopsis

n=12

Group	Pseudonym	Race	Age	Gender
Experimental	Peter	African-American	38	Male
	Ferdinand	Caucasian	55	Male
	Cynthia	Caucasian	37	Male
	Veronica	Caucasian	27	Female
	Todd	Caucasian	35	Male
	Donald	Asian	41	Male
Control	Bob	Caucasian	41	Male
	Edward	Caucasian	24	Male
	Jenifer	African-American	59	Female
	Steven	Caucasian	46	Male
	Bridget	Hispanic	48	Female
	Nancy	Caucasian	39	Female

interview data without identifying data will be saved in an encrypted memory card and stored in a safe and secure location and will be destroyed by the researcher three years after the study in compliance with the Federal wide Assurance Code (45 CFR 46.117). Most of the participants

interviewed were working professionals and two were full-time college students. Table 6 includes the list of the interviewees with pseudonyms to protect their identities.

During the interviews field notes, participant body language or mood, and the setting of the interview were collected to assist me in the multi-layer process of coding the themes from the interviews. Immediately after the interviews, field notes were reviewed and edited to reflect the major themes of the interview. Interviews were transcribed by a professional transcriptionist (Appendix V). Following the transcription process, all transcripts were reviewed against the field notes and the recorded interviews for ensuring the validity of the material for the coding process.

Analytical Methods

Human Research Review Committee (HRRC) at Northwest Nazarene University approved the study with the protocol number of 1232015 on March 11, 2015 (Appendix J). The research data was scrubbed of any identifiable data providing an anonymous data source for the data analysis stage of the research. The ex post facto phase of this research involved collecting data from 42 participants in the experiment group taking the online course built on the basis of the FICECLC Theory, and the control group taking the online course not built on the basis of the FICECLC Theory. The study explored three research questions:

1. Is there a difference in the level of online students' interactions between students taking an online course built on the basis of the FICECLC Theory (afforded social learning tools), and those taking an online course that was not developed on the basis of the FICECLC Theory?

2. Is there a perceived difference in the success factors between a group of online students completing an online course built on the basis of the FICECLC Theory and another group taking an online course not built on the basis of the FICECLC Theory?
3. Is there a correlation between the implementation of the FICECLC Theory and online course success in comparison to an online course not built on the basis of the FICECLC Theory?

Data analysis was performed by IBM SPSS Statistical Software Version 23 (IBM, 2016). The first research question examined if a difference exists between the experiment and control group participants' student-interaction levels. Tanner (2012) states that Mann-Whitney U is the appropriate choice for determining if the difference between interval dependent variables not conforming to normal distribution from two groups are statistically significant. (Tanner, 2012). Therefore, Mann Whitney U test was performed against the student interaction index for answering research question one by determining whether there a statistically significant difference exists between the overall student interaction for students from an online course built on the basis of the FICECLC Theory and for student from an online course not built on the basis of the FICECLC Theory.

Table 7

Data Collection for Research Question 1 (Comparing the student interactions between the test and experiment groups)

Data Collection	Analysis
Overall student interactions comprised of total count of student interactions with the course content, other students, and the instructor.	Mann Whitney U

Research question two examined the difference between the performance of the experimental and control groups. The student overall performance index for the experimental and control groups of students did not conform to normal distribution. Therefore, the Mann Whitney U test was used for determining if the difference between these two interval dependent variables from the experimental and control groups is statically significant. Themes from the interview related to the perceived degree of success for the student of the experimental and control group were complimented with the results of the Mann Whitney U test performed by IBM SPSS Statistical Software Version 23 (IBM, 2016) to answer the research question number two.

Table 8

Data Collection for Research Question 2 (Comparing success factors between the test and experimental groups)

Data Collection	Analysis
Composite course performance score based on the course grading rubric comprised of course content access score, discussion board participation score, and course exam scores	Mann Whitney U
Themes from the interviews identifying the role of social interaction tools and the FICECLC Theory in an online course success	Coded interview themes analysis

The third research question sought to examine the existence of the relationship of implementation of the FICECLC Theory and success for the experiment group in comparison to the success of the control group students. If the correlation between student interaction and student performance for the online course built on the basis of the FICECLC Theory differed

significantly with the relationship between student interaction and student progress in the online course not built on the basis of the FICECLC Theory, the argument could be made that the implementation of the FICECLC Theory causes a significantly different student progress than an online course not based on the FICECLC Theory.

The Pearson's Correlation provides information related to how a dependent variable correlates to an independent variable in which at least one of the variables is on interval scale and there is a linear relationship between the variables (Tanner, 2012). The overall level of student interaction as an independent variable and the student performance index as the dependent variable were analyzed using IBM SPSS Statistical Software Version 23 (IBM, 2016) to determine if the variables have a statistically significant relationship between the implementation of the FICECLC Theory and student success in an online course, and could be used as a predictor for student performance in an online course.

The student interaction for the experimental group of students was comprised of two sub types. The first type of interaction for the experimental group of students was identical to that of the control group of students, which consisted of the student-to-content, student-to-instructor, and student-to-student interaction through the instructor-led discussion board and student to instructor interaction through email. The second type of interaction, which was afforded only to the experimental group, was the student to student and instructor and student to student interactions through the social interaction tools available to the experimental group of students only. Descriptive statistics were used to examine the ratio of these two types of interactions for the experimental group and the weight of the social interaction based interactions in the experimental students' overall interaction.

SPSS Version 23 was utilized for performing the analysis for this research question. Themes from the interview related to the perceived role of social interaction tools in an online course success level and the degree of success for the student of the experimental and control group were complimented with the results of the Pearson's Correlation test performed by IBM SPSS Statistical Software Version 23 (IBM, 2016) to answer the research question number three.

Table 9

Data Collection for Research Question 3 (Relationship between implementation of the FICECLC Theory and online course success)

Data Collection	Analysis
Overall student interactions comprised of total count of student interactions with the course content, the instructor, and other students.	Pearson's Correlation
Composite course performance score based on the course grading rubric comprised of course content access score, discussion board participation score, and course exam scores	Pearson's Correlation
Student interaction indexes for experimental group of students partitioned by interactions with and without the social interaction tools	Descriptive statistics
Themes from the interviews identifying the role of social interaction tools and online course success	Coded interview themes analysis

Twelve interviews were conducted with 12 study participants to answer Research Question #2 and Research Questions #3. During the interviews, notes were taken by the researcher on the sheet with the interview questions. These notes were used during the coding and transcription process as a reference point. Seven of the twelve interviews were transcribed by a professional transcriptionist, and five of the interviews were transcribed by the researcher.

After the transcription process, the interviews were reviewed many times in order to detect patterns, repeated answers, and themes (Marshall & Rossman, 2011).

The transcribed interviews were highlighted, itemized, and cross referenced against a multi-column Microsoft Excel spreadsheet. The raw theme entries were cross referenced to the transcribed interviews, audio recordings, and field notes. The themes were then processed further by sorting the themes by interview question, by association to research questions, and by categories that emerged from triangulation of the themes with the literature review, the research questions, and the themes from the interview not represented in the literature review.

At the final stages of identification of the study themes, the categories of themes were traced back to the raw transcripts and audio recordings and validated against the field notes from the interviews. The themes were identifiable by participant group, participant name, interview question, and research question. Study participants were contacted by email with the themes associated with their answers to the interview questions. All participants responded and validated the themes from their interviews.

The qualitative data collection method of the study provided the opportunity to the study to discover elements behind the correlation between student interaction in an online course and student performance that would have not been possible in a quantitative only study. It explained the perceptions of study participants in order to explain the lack of difference between the interaction levels and student progress for the online course built on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC Theory.

Role of the Researcher

Researchers are not without bias. I have more than four years of managing online education systems and am genuinely interested in learning from the interviewees the reasons

behind the success of online courses. The interviews were conducted in a way that the interviewees were providing their understanding of the mechanics behind a successful online course, and I probed them with additional questions to learn more about their points of view. The transcript and coding process took place in multiple iterations, in which each iteration was compared to and validated against the field notes and the audio-taped interviews to minimize concept conversion issues and the bias from the researcher.

As a result of this laborious process, most of the themes identified as a result of the interview process were completely unknown to me prior to the study. This was the ideal role for the researcher, since my role involved finding the answers to the research questions by extracting patterns and themes from the interviewees' answers.

Limitations

Driscoll et al. (2012) argue that many studies comparing performances of different study mediums suffer from small, non-random samples, failure to replicate findings, lack of demographics control, and comparison of online courses with significant disparities in course content, supporting materials, instructors, and student performance evaluation methods. This study was, therefore, designed specifically to address these shortcomings and included a measured control for normalizing the two classes on the basis of selection factor, demographics, and student background in the field being thought through the pre-course Microsoft Excel aptitude test (Appendix G). Bunn et al. (2014) notes the random assignments and experimental manipulation are not possible for a study that uses the same instructor for two classes, unless the classes are offered one after the other, which, due to time constraints for this study, was not possible.

The failure to gather more extensive student demographic information, as Bunn et al. (2014), too, experienced, limited the ability of this research to investigate the relationship between the independent and dependent variables. An additional limitation involved the inability of the researcher to measure how efficient the instructor is in teaching the two classes. If the instructor is more advanced at teaching a traditional online class, the difference in the two classes' performance could not be directly correlated to the delivery medium alone. With identical course content and assessments within the two courses, the issue of whether the instructor was as efficient for both of the classes was a factor that was not controlled for in this study. Although the study participants were asked to rank the efficiency of the instructor during the semi-structured interviews, this input could not be used to eliminate the possibility that the instructor was not equally efficient for both classes.

Additionally, the participants in the study were active students of the online course built on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC Theory. The absence of inactive online students in the interview process took away the opportunity to hear the voice of online students that were unable to connect with their online education setting. With the low rates of online completion rates, especially in MOOCs online courses, the inclusion of inactive students in this study could result in formulating reasons for an online course lack of adoption by some of its students.

Chapter IV

Results

Introduction

This study's primary focus endeavored to examine the common characteristics of effective online learning with respect to the modes of learner interactions. The study answers this question by validating the Framework for Interaction and Cognitive Engagement in Connectivist Learning Contexts (FICECLC) Theory, which explains how to enable students to gain deep knowledge from an online course (Anderson et al., 2014). The philosophy behind the FICECLC Theory asserts that the higher the level of networked learner social interaction, the more productive the learning experience will be, and as a result the deeper the degree of learning for the learner will be (Anderson et al., 2014).

The FICECLC Theory argues that as the purpose of an online course is to transfer knowledge to the learner, this transfer will take place via the interactions the course affords to its students (Anderson et al., 2014). The modes of interaction discussed in this theory are the interaction among learners, the interaction between the instructor and the learner, the learner's interaction with the course content (Anderson, 2003; Anderson, 2009; Anderson et al., 2005), and eventually, the learner's pre-course knowledge interaction with the learner's post-course knowledge (Anderson et al., 2014).

The FICECLC Theory (Anderson et al., 2014) argues that higher learner interaction leads to higher motivation to learn, persistence of transferred knowledge, and deep learning. According to this theory, higher degrees of social interaction lead to increased levels of learner engagement with the course and deeper levels of knowledge (Anderson et al., 2014).

The core assumption behind this theory is that affordance of social interaction tools would lead to increased levels of learner interaction, which in turn would result in deeper degrees of learning. The three levels of learning discussed in this model are:

1. Concrete/Base: At this level the learner interacts with the course management system (CMS) and learns how to operate in the course environment. This level is also known as Way Finding as the learner learns how to orient herself to the learning environment in the online course.
2. Information-interaction: At this level the student learns how to navigate the complex course management system and to interact with the course content, the instructor, and with other students. This level is also known as Sense Making as the student learns how to make sense of the learning environment and learn from the course. Anderson's (2003) Interaction Equivalency theory is at the core of this level. The Interaction Equivalency theory is posits that effective distance learning needs to be supported by one or more of the three types of learner-centered interactions: student-content, student-instructor, and student-student.
3. Concept interaction: At this level the learner interaction will be between the learner's pre-course knowledge and post-course knowledge. The learner's focus at this stage is on the expression of new ideas and patterns, which is deep learning. (Anderson et al., 2014)

In order for a course to satisfy the requirements of this theory, it must create information spaces for the learners to share and create knowledge among themselves by providing them social interaction tools, such as Wiki, forum, and blogs, in order that the students can, in turn, co-create content and knowledge. The goal is to create tribal learning experience centered on a user-

controlled social interaction environment. (Anderson et al., 2014). In order to validate this theory, from mid-October 2015 to mid-November 2015, an online course built on the FICECLC Theory was assigned to an experimental group, and an online course not built on the basis of a theoretical framework was assigned to a control group. The research questions guiding this dissertation study were:

1. Is there a difference in the level of online students' interactions between students taking an online course built on the basis of the FICECLC Theory (afforded social learning tools), and those taking an online course that was not developed on the basis of the FICECLC Theory?
2. Is there a perceived difference in the success factors between a group of online students completing an online course built on the basis of the FICECLC Theory and another group taking an online course not built on the basis of the FICECLC Theory?
3. Is there a correlation between the implementation of the FICECLC Theory and online course success in comparison to an online course not built on the basis of the FICECLC Theory?

The research questions of this study examine the relationship between implementation of the FICECLC Theory in an online course and student performance. Two online courses, one built on the basis of the FICECLC Theory and one not built on the basis of a framework, were provided to 84 participants between mid-October, 2015 and mid-November, 2015.

Research Question #1

At its core, the FICECLC Theory argues that affordance of social interaction tools to online learners would result in a deep learning experience. As such, the first research question of this study asks:

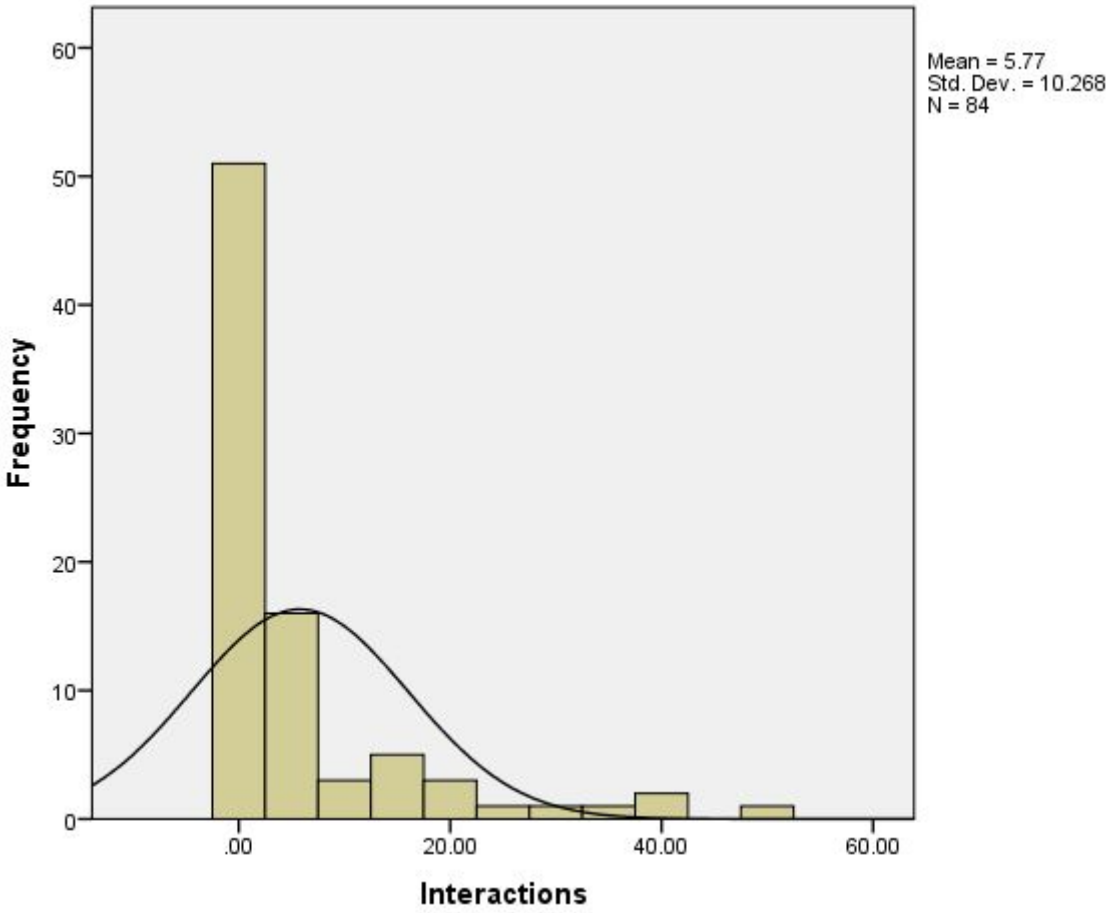
Is there a difference in the level of online students' interactions between students taking an online course built on the basis of the FICECLC Theory (afforded social learning tools), and those taking an online course that was not developed on the basis of the FICECLC Theory?

This question is answered by measuring the difference in student interaction between an online course based on the FICECLC Theory provided tools for the learners that would allow students to openly integrate networked knowledge nodes with their course by communicating with each other through the social interaction tools of wiki and student forum, as well as create and manage discussion threads and content components, and the online course that was not based on a framework did not provide student-led social interaction tools to the students. Between mid-October 2015 and mid-November 2015, the experimental group of participants were provided with the online course based on FICECLC Theory, and the control group of participants were provided with the online course not built on the basis of the FICECLC Theory. These two courses were identical in every aspect as they had the same course content, same instructor, used the same course management system setup, and had the same syllabus, except for the training and affordance of social interaction tools to the experiment group.

Ex post facto data was collected from the course management system log structure with anonymous identification numbers and were aggregated and processed in order to answer the research question one. The Mann-Whitney U test was applied to the ex post data related to the research question one due to non-normality (Figure 4) of the student interaction for the two groups and the need to assess the significance in their difference, Mann-Whitney U test is the appropriate choice for answering the research question number one (Tanner, 2012).

Figure 4

Test of Normality for the Research Question One Dependent Variable



For research question one, test H_0: $\mu_1 = \mu_2$ will be tested. The null hypothesis maintains that there is no significant difference in the level of student interaction with the course for the experimental and control group sample population. Student interaction for the purpose of answering research question one is defined as:

1. Student-to-content interaction: Each time a student visited a content page, that visit was recorded in the course management system log.

2. Student-to-student interaction in the instructor-led discussion board: The course management system log recorded every reply post a student placed in the instructor-led discussion board in response to another student's post.
3. Student-to-instructor interaction: The total count of emails sent by a student to the instructor with the posts the student placed in the instructor-led discussion board were recorded as student-to-instructor interaction counter.
4. Overall student interaction: The sum of the above counters is the student interaction index dependent variable. The research question number one is examining whether there is a significant difference between the experiment group and control groups total student interaction levels?

It is worth mentioning that the student interaction in the social interaction tools provided to the experiment group was not factored in for this research question. The actual results with anonymous identification numbers and no identifying data has been presented in Appendix N.

Table 10

Mann-Whitney U Test Ranks for Student Interaction in the Experimental and Control Groups

Variable	N	Mean Rank	Sum of Ranks
Experimental Group Student Interaction	42	39.99	1679.50
Control Group Student Interaction	42	45.01	1890.50

Table 11 contains the Mann-Whitney U statistics for the comparison of the dependent variable of student interaction between the experimental and control groups of students.

Table 11

Mann-Whitney U Statistics Grouped on the Student Interaction Variable

Measure	Performance Score
Mann-Whitney U	776.50
Wilcoxon W	1679.50
Z	-1.00
Asymp. Sig. (2-tailed)	0.31*

*Correlation is not significant at 0.05 (2-tailed)
**Correlation is not significant at 0.01 (2-tailed)

There is no evidence to support a difference between the student interactions of the two control and experimental groups as the p value for the Mann-Whitney U test is at 0.31 which is larger than the α of 0.05, with a Mann-Whitney U value of 776.50. Additionally the mean ranks between the two groups are almost the same 39.99 and 45.01, which suggests that the null hypothesis cannot be rejected and there is not a significant difference between the experimental and control group's student level of interaction with their online courses. In other words, students in both the experiment and control groups had the same interaction with their courses. This finding is in contrast with one of the tenants of the FICECLC Theory, which asserts that the availability of networked social interaction tools would result in higher student interaction in an online course.

Research Question #2

According to Anderson et al. (2014), student interaction has always been highly valued in education and is associated with motivation and deep learning. The Connectivist Learning Pedagogy affirms that learning is a result of learner's networked knowledge creation (Downes, 2012). The FICECLC Theory at its core maintains that learning is a social process where

learning occurs through social interaction. Therefore, in order to validate the FICECLC Theory the second research question of this study was formulated as:

> Is there a perceived difference in the success factors between a group of online students completing an online course built on the basis of the FICECLC Theory and another group taking an online course not built on the basis of the FICECLC Theory?

The measurement criteria of student performance for both the experimental and control groups was identical. In order to standardize the two comparison of the two groups' performance, no grades were assigned to student interaction through social interaction tools, since they were available only to the experimental group. The rubric for the course grading was as follows:

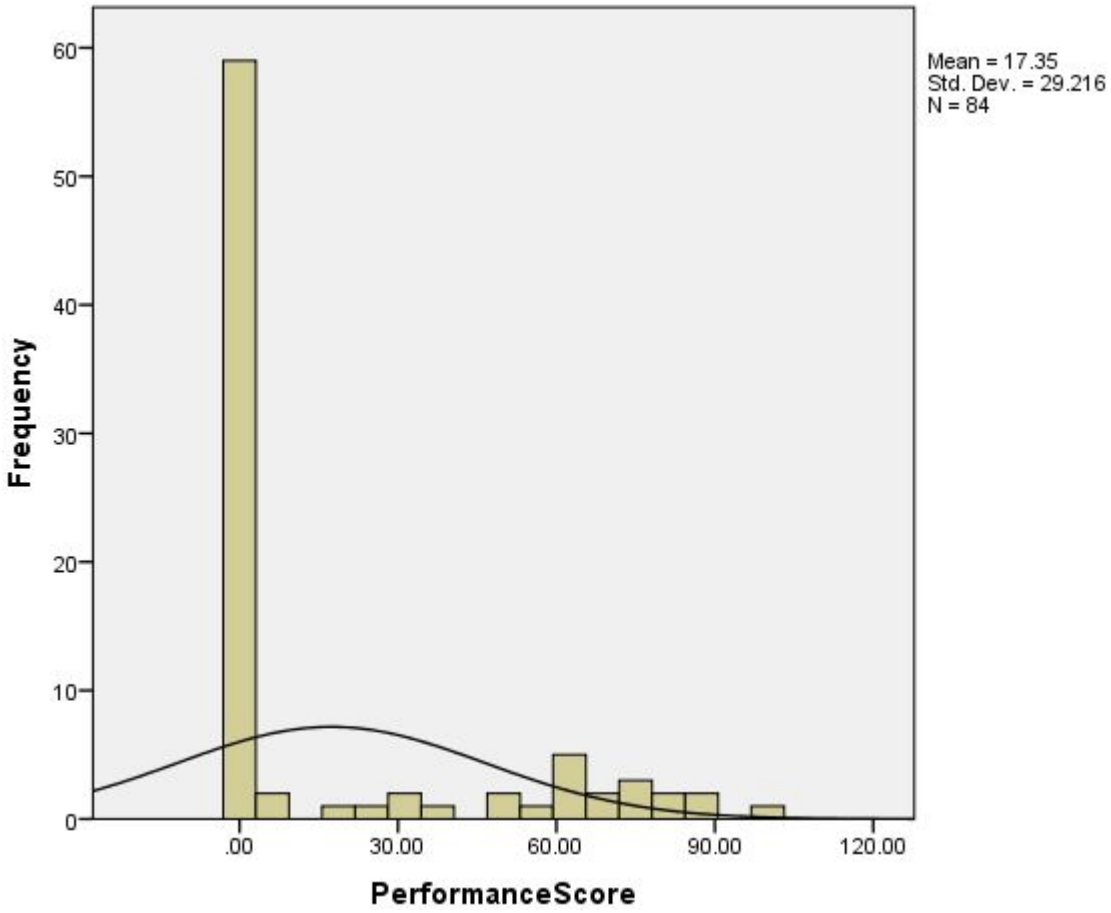
1. Scored quizzes and the final exam: The pre-course assessment exam had 25 questions, and the course had 25 questions that were carefully normalized against the pre-course assessment questions and the level of the course. Each question accounted for 2.5% of the total grade. The range for the exam score was between 0 to 62.5%.
2. Instructor-led student interaction: The student had to answer the discussion board main question and respond to one student to get the full grade for that week. The student would earn 5% for each of those posts. Additional posts would not secure extra points. Students were not rewarded for interacting more than two times per week. If a student did post more than two threads in a given week, it was not for the grade. The range of the grade for discussion board-based interaction was between 0 and 30% of the total grade.
3. Content-interaction score: The course had six lectures and if the student accessed each of those lectures at least once, 1.25% was assigned to the student. Additional views would not secure extra points for the students. In other words the grading

scheme did not reward students for accessing the content more than the mandated minimum one view per content. The range for this component of the grading scheme was between 0 and 7.5% of the total grade.

The actual results with anonymous identification numbers and no identifying data has been presented in Appendix N. The Mann-Whitney U test was applied to the ex post data related to the research question two due to non-normality (Figure 5) of the student performance for the two groups and the need to assess the significance in their difference (Tanner, 2012), Mann-Whitney U test is the appropriate choice for answering the research question number two.

Figure 5

Test of Normality for the Research Question Two Dependent Variable



For research question two analysis of the ex post facto data, H_0: $\mu_1 = \mu_2$ was tested. The null hypothesis maintains that there is no significant difference in the level of student success factors with the course for the experimental and control group sample populations.

Table 12

Mann-Whitney U Test Ranks for Student Success Factor in the Experimental and Control Groups

Variable	N	Mean Rank	Sum of Ranks
Experimental Group Student Success Factor	42	40.48	1700.00
Control Group Student Success Factor	42	44.52	1870.00

Table 13 contains the Mann-Whitney U statistics for the comparison of the dependent variable of student success factors between the experimental and control groups of students.

Table 13

Mann-Whitney U Statistics Grouped on the Student Success Factor Variable

Measure	Performance Score
Mann-Whitney U	797.00
Wilcoxon W	1700.00
Z	-0.81
Asymp. Sig. (2-tailed)	0.41*

*Correlation is not significant at 0.05 (2-tailed)
** Correlation is significant at p<.01 (2-tailed)

The core argument behind the FICECLC Theory avows that by situating online students in an environment in which they can interact in a networked environment via social interaction tools, they will be able to collaborate in creation of knowledge and reach a deep level of learning. There is no evidence to support a difference between the student success factors for the

two control and experimental groups as the *p* value of 0.4 is larger than $\alpha = 0.05$. Additionally the mean ranks between the two groups are almost the same 40.48 and 44.52, which indicate that the null hypothesis cannot be rejected and there is not a significant difference between the experimental and control groups' student levels of success with their online courses. In other words, students in both the experiment and control groups had the same level of performance with their courses.

The analysis of the ex post facto data for the student performance of the experimental and control groups of students showed no significant difference in their success factors. Using a group of 12 volunteer participants, semi-structured interviews were conducted, transcribed, and coded for themes to determine the perceptions of students about the relationship between student interactions consisting of student interaction with course content, with the instructor, other students, and students' degree of success. The participants were a diverse group and all shared a common goal of having taken the online courses to improve their Excel skill level.

The FICECLC Theory is based on the notion that online students exposed to learning environments with social interaction tools would collaborate in the creation and dissemination of new knowledge, and, hence, will reach a deep level of learning. The analysis of ex post facto data from the experimental and control groups does not show a difference in the levels of student performance between students.

With respect to the effectiveness of social interaction in an online course and student success in gaining deep learning, the study's participants regarded the course content as the reason they reached or did not reach a deep level of learning. Ferdinand argued that "I think the learning moments were mostly due to the content, but also its way of the teaching, [an interactive content] gives you some insight that you put things together." All but one of the study

participants regarded the course content as the most important component of an online course, as Todd puts it "the point is that if the lecture is not good, then, for example [in the case of] myself I wouldn't need that course".

The degree in which the participants were able to reach a deep level of learning or not was directly correlated to the newness and application of the course content. Most participants interviewed believed that the online course was successful in leading them to a deep level of learning. Nancy defined deep learning as internalizing the information to the point where I could teach it and recounted her learning experience as:

> I did have a lot of deep learning moments from the very first lesson about the many attributes of a cell. And it might seem like, you know, okay, people should know this, but I think when you explain the information like that, that elementary concept, they help me to build [new knowledge], it was such an a-ha moment where I was just like, yes, this cell looks this way but then why is it changing, why is it doing this, you know? And to have, that kind of verbiage that you the content gave us to, explain it, I thought that was really, to me, it was like an a-ha moment, okay, great, this is a real reference for me to begin to think about Excel and when I'm working in the sheet or I send the sheet to somebody and they do not understand.

Jennifer found the concept taught at the course interesting but did not consider it as a deep learning experience due to the fact that the teachings from the course were not applicable in her current role "it would have been a deep learning experience if I was still working as a financial analyst. It is a good to know thing for here, but that's not what my focus is anymore." Todd and Peter did not reach a deep level of learning because the course was not adequately advanced enough for them. Regardless of whether the student had a deep level of learning or not the

primary reason for the experience was quoted to be the level of interaction and adaptability between the student and the course.

Despite the affordance of social interaction tools in the online course built on the basis of the FICECLC Theory, the centrality of the content and dependency of the role of the instructor and the social interaction on the interactivity of the content was stressed by all participants. Bridget recounts her experience with social interaction in the online courses she has taken in the past as:

> I would not add interaction with other students. I've done [online] courses where I've had interaction with other students and to be quite honest, I don't see any [value], it was not a better benefit for me in my learning process.

Nancy too shares a similar opinion about social interaction that is not centered on the application of the course content:

> I think, you know, like, you could sit down, you could get so deep into the social media that you're like, oh my god, I've already spent an hour doing this and I have not started anything. And so I think there's just like this fine balance between the use of social media to facilitate and to supplement or even to innovate because then you might be missing the goals of your course. That's why I always say, it's good to have all these mediums and everything, but at the end of the day, did I grasp the concepts, you know? Or did I talk around the concepts and I really don't know how to apply it? So I might be able to speak the language and everything, but when it's time to sit down and take the mouse and do a V-lookup, you know, table and use a pivot table and do all this other stuff, like, am I going to be able to demonstrate it?

The participants stated that the educational value of social interaction and the effectiveness of the role of the instructor both depend on the interactivity of the content. The content is considered interactive if its level matches student level, so that the content is not too basic or too advanced for the student, and the course includes content-based practical exercises. Veronica saw social interaction not oriented towards solving problems from the course as a distraction:

> I think it can actually distract you from learning. Because you will …. While talking to the other students, [you] will start with the topic about the Excel, and then you go on and on, and you [will] get distracted from what you were learning.

In an ideal course environment the content would include content-based exercises that the student would use to internalize the knowledge presented in the content. The social interaction and instructor support have to be subordinated to the interactive content in order for the learner to reach a deep level of learning.

The emerging theme from the interviews conducted with the participants indicated that whether the participant reached a deep level of learning or not, the factor behind the experience was the course content and not the social interaction of the online course. Most of the participants interviewed experienced reaching a deep level of learning from the course because of the content newness, application of content in their professional life, and/or the content meeting their level of expertise. The three participants who did not experience deep levels of learning too attributed their degree of deep learning to their interaction with the course content. The primary reason they did not reach a deep level of learning was that the content was not advanced enough for them, or the content lacked application in their current professional job setting.

The study participants' recommendation for increasing the likelihood of having a successful online course was to have the instructor assess the specific educational needs and goals of students in the beginning of the course. Such endeavors would enable the instructor to tailor the content to the course students' level. Therefore the main themes from the assessment of the factors behind an online course success by the participants was assessment of the students' needs at the beginning of the online course by the instructor, and tailoring the content and its level to that of the students levels.

The Mann Whitney U statistical analysis of the ex post facto data from the experiment provides no evidence to support a difference between the student performance of the two Control and Experimental groups as the p value of 0.4 is larger than the α of 0.05. The performance of the two group of students are close as their mean ranks between the two groups are 44.52 for the control group and 40.48 for the experimental group. This finding is further supported by the themes from the interview with the participants that the effectiveness of an online course is primarily reliant on the interaction of the student with the course instructor and course content.

Research Question #3

The FICECLC Theory (Anderson et al., 2014) core argument asserts that for the online students to reach a deep level of learning, they must interact through student-controlled social interaction tools and collaborate in creation and distribution of new knowledge in a networked environment. To validation the FICECLC Theory, an online course built on the basis of the FICECLC and an online course not built on the basis of the FICELCLC Theory were made available to an experimental group and a control group of volunteer study participants.

An online course not built on the basis of the FICECLC Theory was built and made available to a control group of study participants. Both of these online courses were afforded an

instructor-led discussion board platform, and the experimental group of students were provided with social learning tools of forum and Wiki. The students were provided with ample support and training for these collaborative social interaction tools so that they could collaborate in creation and dissemination of knowledge. The experimental group of students were encouraged by the instructor to further research the topics discussed in the content from external resources and share their inquiries and findings with other students through the student forum and the wiki.

Both groups of students had access to the instructor led discussion board interaction tool and shared the same course management system setup, instructor, course content, timings, curriculum, and grading structure. Research question three seeks to validate the claim by the FICECLC Theory that social interaction facilitated through social interaction tools is a necessary requirement for deep learning in an online course. Therefore the third research question was formulated as:

> Is there a correlation between the implementation of the FICECLC Theory and online course success in comparison to an online course not built on the basis of the FICECLC Theory?

The independent variable for answering this question is the student to course interaction index. The student interaction index for the experimental group is composed from the summary of the following student to course interaction metrics:

1. Student to content interaction: Each time a student visited a content page, that visit was recorded in the course management system log.
2. Student to student interaction in the instructor-led discussion board: The course management system log recorded every reply post a student placed in the instructor-led discussion board in response to another student's post.

3. Student to student interaction in social interaction channels: Students were provided with video training on how to use these tools, one of which was very similar to the instructor-led discussion board. For the posts that started conversations, and each post that responded to a student post, the course management system updated this counter.
4. Student to instructor interaction: The total count of emails sent by a student to the instructor with the posts the student placed in the instructor-led discussion board were recorded as student-to-instructor interaction counter.
5. Student to instructor interaction in social interaction channels: Each time a student responded to the instructor's posts in the social interaction channels, the course management system acknowledged the activity.

Total student interaction per experimental group student is the sum of the above counters. Research question one, examined the correlation of social interaction and student performance for the experimental group in comparison to the control group, the baseline student interaction and the total interaction, which includes the social interaction tools index as well, have to be compared. The interaction index used for answering research question one for the experimental and control groups contained only the base student interaction, which is the sum of student to content interaction, student to student and student to instructor interaction in the instructor led discussion board, and student to instructor interaction through email. But for the purpose of answer research question three, the student interaction index was made of the base interaction plus the student interactions through social interaction tools. The following table includes descriptive statistics for the student interaction indexes for research question three.

Table 14

Descriptive Statistics for Ex Post Facto Data of Student Interaction for the Experimental Group n=42

Variable	Range	Mean	Standard Deviation
Base student interaction = Student to content interaction + student to student and student to instructor interactions through discussion board + student to instructor interaction through email	0-49	5.23	11.20
Student social interaction = student to student and student to instructor interactions through social interaction tools	0-8	0.35	1.32
Total student interaction = base student interaction + student social interaction	0-51	5.59	11.81

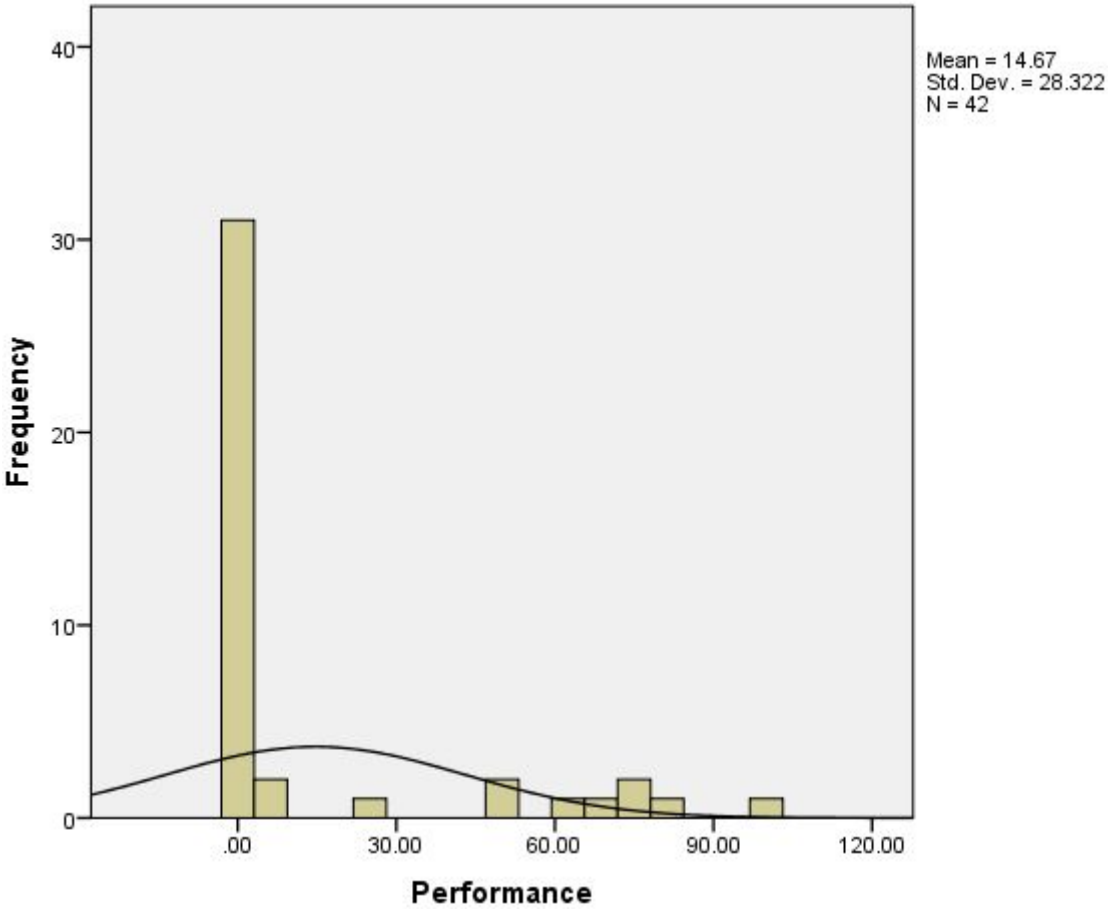
The data from the above table indicate that the experimental group of students interacted with the course primarily through the base interaction mediums made available to them. The range of student interaction with the course through student-to-content, discussion board student interactions with the instructor and other students, and email interactions with the instructor had a range of 0 to 49, a mean of 5.23, and a standard deviation of 11.20. On the other hand, although the experimental group of students did not interact as much through the social interaction tools, as evident by the range of 0 to 8, a mean of only 0.35, and standard deviation of 1.32, the smaller standard deviation for social interaction compared to base student interaction indicates that the students who utilized social interaction tools interacted with them more consistently than interacting with the content, students, and the instructor through the baseline interaction channels.

Research question number three examines whether a correlation exists between student interaction in an environment with social interaction tools and student performance. In order to determine what statistical tool to utilize for answering this question, the normality of the

dependent variable has to be examined first. The raw data for this question with anonymous identification numbers and no identifying data are stored in Appendix N. The following figure exhibits the non-normality of data.

Figure 6

Test of Normality for the Research Question Three Dependent Variable



An effective method for examining the correlation between a dependent and independent interval variable in sample populations that are not normally distributed is the Pearson's Correlation (Keller & Warrack, 2000; Tanner, 2012). Coefficient of correlation always falls between -1.00 and +1.00. A correlation close to -1 indicates that there a strong negative correlation between the independent and dependent variable, and a correlation close to +1.00

means that there is a strong positive correlation between the variables. A correlation of 0.00 means there is no correlation between the variables. (Keller & Warrack, 2000).

For this study, $H_0: \rho = 0$ was tested. The null hypothesis states that no correlation exists between student interaction in an environment with social interaction tools and student performance with significance at $p<0.05$ for the experimental group. The following table displays the result of calculating the coefficient ratio between the social interaction-based student interaction and learner progress measure for the experimental group.

Table 15

Pearson Correlations for Research Question Three for the Experimental Group

Variables	N	Correlation	r^2	p-value
Student interaction-Student performance	42	0.87	0.77	0.00**

* Correlation is significant at p<.05 (2-tailed)
** Correlation is significant at p<.01 (2-tailed)

There is a significant positive relationship between student interaction in an environment with social interaction tools and student performance, $r(40)=0.87$, $p=0.00<0.05$ for the experimental group. Research question one examined the difference between the experimental and control groups student interaction indexes and found no significant differences between them. This means existence or lack of social interaction tools have no effect on student interaction with the course content, and with the instructor and other students via an instructor led discussion board.

Research question number three seeks to compare the degree of correlation of student interaction and performance in the experiment group with the degree of correlation of student interaction and student performance in the control group. Therefore, in addition to the analysis performed the correlation between student interaction and student success in the control group

needs to be examined as well. $H_0: \rho = 0$ will be tested. The null hypothesis states that there is no correlation between student interaction and student performance for the control group with significance at $p<0.05$ for the experimental group. The following table displays the result of calculating the coefficient ratio between student interaction and learner progress measure for the control group.

Table 16

Pearson Correlations for Research Question Three for the Control Group

Variables	N	Correlation	r^2	p-value
Student interaction-Student performance	42	0.90	0.81	0.00**

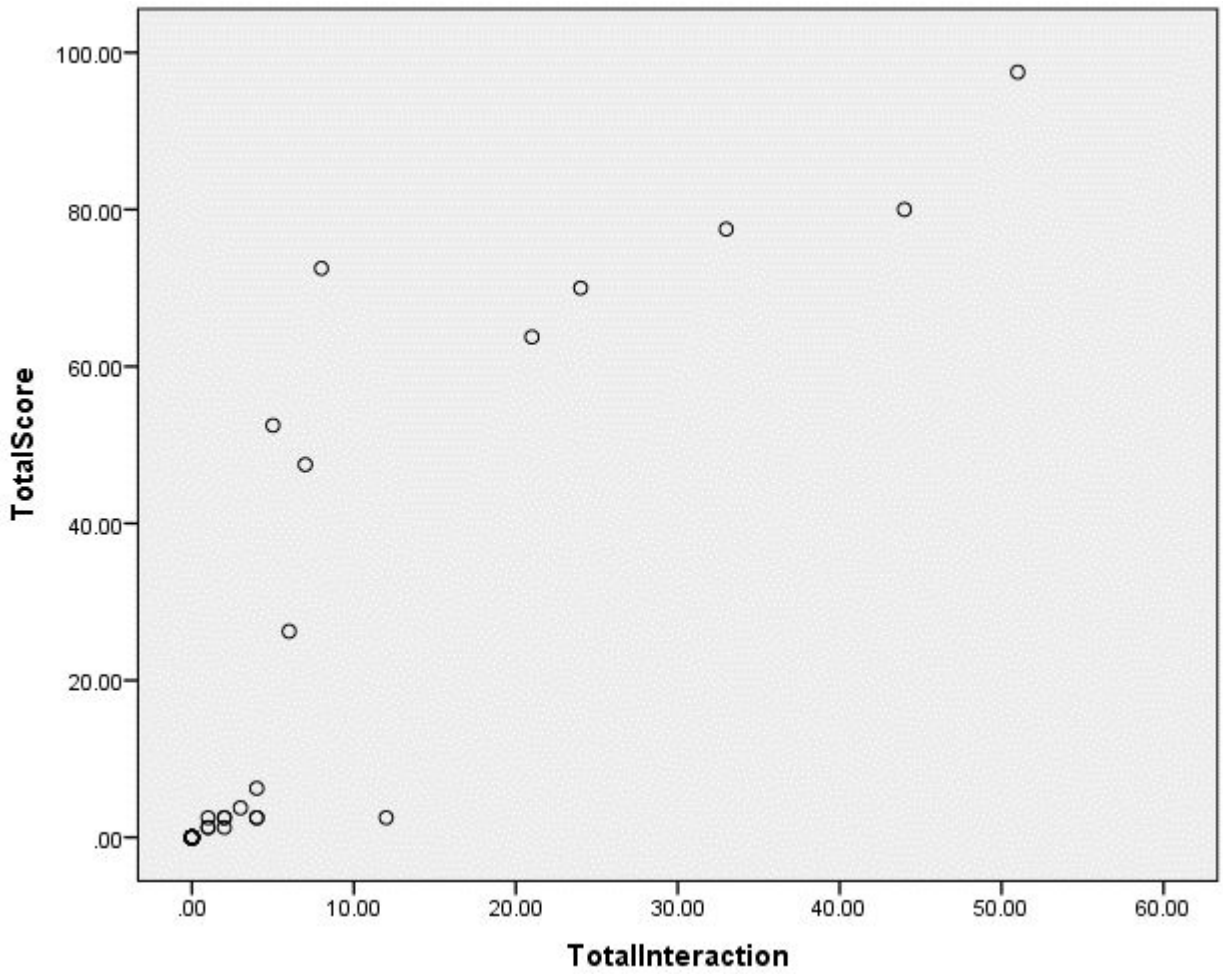
* Correlation is significant at p<.05 (2-tailed)
** Correlation is significant at p<.01 (2-tailed)

There is a significant positive relationship between student interaction in environment and student performance, r(40)=0. 90, p=0.00<0.05 for the control group. The Pearson correlation of 0.90 for the control group is very close to the Pearson correlation of 0.87 of the experimental group. Considering the descriptive ex post facto analysis performed for the different types of interaction with the experimental group of students, and the results of the ex post facto analysis for the research questions one and two, it can be concluded that there is not a significant correlation between the social interaction activity and student performance in the experimental group. There is also no significant difference between the levels of student interaction and student performance between the experimental and control groups.

The following figure displays the strong correlation between student interaction and student performance in the experiment group.

Figure 7

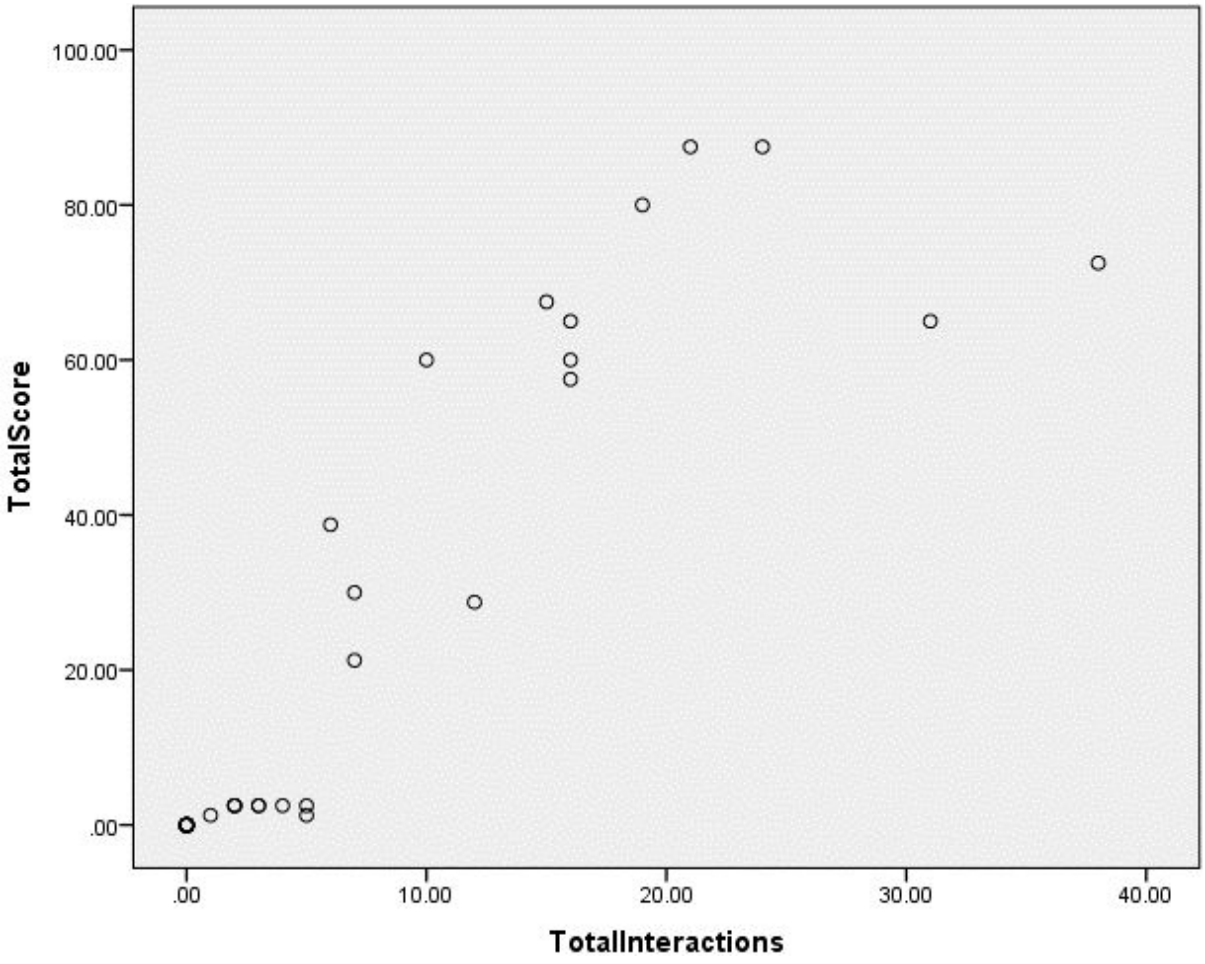
Correlation between Student Performance and Student Performance for Research Question Three (Experimental Group)



The correlation between student interaction and performance in the control group exhibits a similar pattern. The FICECLC Theory is based on the notion that online students exposed to learning environments with social interaction tools would collaborate in the creation and dissemination of new knowledge, and, hence, reach a deep level of learning. The analysis of ex post facto data from the both experimental and control groups showed a significant correlation between the student interaction and student performance.

Figure 8

Correlation between Student Performance and Student Performance for Research Question Three (Control Group)



The FICECLC Theory was validated in this study by providing access to knowledge sharing and social interaction tools of wiki and student forum to only the experimental group of students for the purpose of sharing their inquiries and findings as a result of extending their knowledge from external sources. The ratio of student interactions through these tools were lower than the experimental group of students overall interaction with the course through instructor-controlled discussion board, and with the course content and instructor. Additionally,

the results of the analysis for the ex post facto data for Research Question #2 indicate that both the experimental group and control group exhibited very similar correlations between student interaction and student performance. The analysis of ex post facto data insufficient for determining the role of networked social interaction in an online course success, therefore, 12 semi-structured interviews were conducted, transcribed, and coded for themes to determine the correlation between networked social interaction and student performance.

The role of social interaction in helping a student reach a deep level of learning, as debated by all study participants, was a supportive and auxiliary role. They argue that if a course's content is not sufficient, social interaction alone will be insufficient. On the basis of an interactive and exercise based content, social interactions can lead to deep learning. Like other study participants, Nancy questioned the educational value of social interaction:

> I think the challenge with [social interaction] is [maintaining a] balance being in a course [while] reading the social media component. [It is an] awesome tool, [is] great [at] bringing everybody together, [creates a sense of belonging to] a learning community, but then at the end of the day, have you concretely been able to internalize the information or the goals of the course or the critical concepts?

Todd argued social media interaction is a source of information, and information is not the same as knowledge. If social interaction tools are not centered on and oriented around a learning road map, the information in the social media tools will not be translated to knowledge:

> I [do] not agree with connecting social media with [acquisition of] knowledge. To me knowledge is deep, I mean, is [a few] steps after gathering the information, I mean [after] shaping the information, we need a couple of more steps to reach the knowledge [creation stage]. Social media is just [for collecting] informing, [it] is [an] informative [tool].

> To me, in social media you just have news. The point is, [social interaction] is not about "knowledge", because as I mentioned knowledge needs experience, but the point is if you want to find something in a social media environment, it takes time. Since you cannot spend a long time for learning by just searching. Therefore, content is really important in such a way, because [good] content gathers all the information, important information about that topic together, it is like putting the information inside a pill and give it to the student, but sometimes that pill is not enough, you need to find some [additional references], [to] elevate it, add some more stuff. And those [additional] elements are based on the, the level of the student, the type of the course, those stuff might need Google, social media, or need instructor support.

The recurring theme from the participants' answers affirms that the higher educational value of interactive content and supportive instructor than social interaction in an online course. As verbalized by Todd, the social interaction and instructor will play a larger role in the instances where the content falls short. Social interaction has an educational value when it supports the content by allowing students validate their learnings by discussing their point of views and collaborate in solving content-based exercises. Bob and other participants believed that students can benefit from their interaction in an online course if student produce knowledge together or comment each other's work:

> Well, I think what you had [instructor-led discussion board] was pretty good, you know, basically post an answer and then comment on two other responses. I thought that was pretty good, I enjoyed that. Maybe, I guess, just taking [on how to make] it deeper in the sense of the exercises and comments being able to produce or comment on other's work…that would have made it a little bit better. I think if I had to produce something

> and share it with the class, so to speak, and then other classmates be able to comment on my work, not just my answers, I think that would have been more effective.

Edward talked about a positive learning experience at his university with social interaction subordinated to a class project:

> I would also prefer, to have, like, a lecture one day and then, it's basically what we have in the class, like, regular classroom. I'm at college. So we have one class, have the professor stand up there and teach the class. And second, maybe second lecture, have us, like, go out and do our research. Something like that would be really beneficial. I learned a lot

The FICECLC Theory argues that a course environment in which the students actively interact through social media interaction tools in a networked environment is necessary for reaching deep levels of knowledge (Anderson et al., 2014). All participants interviewed believed that social interaction is not a critical factor behind an online course success. The success of an online course is dependent on the degree of student-to-content interactivity and the instructor support. Social interaction educational value is secondary and supportive to the role of the content and instructor.

The following table lists the top ten frequent codes from the interviews. Although the focus of this dissertation study lay primarily on the correlation between social interaction and deep learning, while interviewing the participants in this study, three main areas of focus emerged as the requirements for a successful online course with student to student interaction capability. The three main themes for this study included:

1) Interactive content and instructor support: an interactive content and a supportive instructor are primary requirements for a successful online course,

2) Tailored content: in order for the content to be interactive the instructor has to assess student needs early in the course and tailor the content to the level of the students,
3) Content-based exercise is the central component of a successful online course: The interaction between the student and content, student and instructor, and student to student have to be centered around content-based exercises

Table 17

Top 10 Frequent Codes from Interviews

Theme	Frequency
Interactive content	81
Content-based exercise	68
Structured course environment is preferred	62
Tailored content	51
Instructor support	49
Social interaction is not a core requirement for deep learning	46
Course structure should be subordinated to student type	42
Fine grain content	40
Course configuration should be subordinated to course type	33
Exercise-based interaction is needed for effective social interaction	31

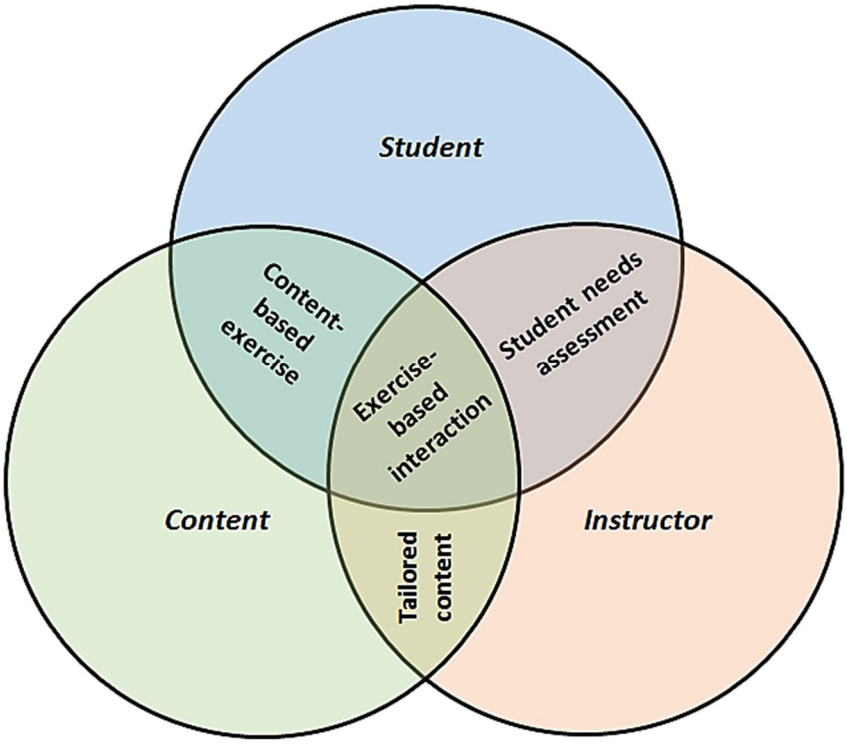
The FICECLC Theory (Anderson et al., 2014) is based on Anderson's (2003) Interaction Equivalency Theory which contents that effective distance learning needs to be supported by one or more of the three types of learner-centered interactions: learner-content, learner-instructor, and learner-learner. The themes from this study suggest an interlocked relationship between these three types of student interaction. The top 10 frequent themes from the study are explained

further in Appendix W; these themes display a pattern of dependency between the three main student interaction types in an online course.

In Figure 9, the three student interaction types of student-to-student, student-to-instructor, and student-to-content are integrated to increase the level of connection between the student and the online course and to deepen the learning level for the students.

Figure 9

Themes from Interview Data



The themes from the interviews conducted with the participants and the ex post facto data analysis for answering the research questions reinforced each other, as both students from both the experimental and control groups exhibited the behavior with respect to their amount of interaction with their courses, their extent of progress, and the level of correlation between interaction and progress factors. The finding of this study's analysis was that there is not a correlation between the implementation of a social-learning interaction-based Connectivist

Learning framework and online course success in comparison in an online course not built on the basis of the FICECLC Theory.

Conclusion

Chapter IV provided a summary of the research findings from the qualitative and quantitative data collection methods. This study examined common characteristics of effective online learning with respect to the modes of learner interactions by validating the FICECLC Theory, which explains how to enable students to gain deep knowledge from an online course (Anderson et al., 2014). The philosophy behind the FICECLC Theory is that the higher the level of networked learner social interaction, the more productive the learning experience will be, and as a result, the deeper the degree of learning for the learner will be (Anderson et al., 2014).

In order to assess the impact of student interactions through social interaction tools on student performance, descriptive statistics, Mann-Whitney U, and Pearson's Correlation's found no significant difference between the levels of student interaction, student performance and correlation between student interaction and performance between the students of an online course built on the basis of the FICECLC Theory and students of an online course not built on the basis of the FICECLC Theory. Furthermore, the Pearson's Correlation showed that both of the online courses exhibited significant correlation between student interaction and course performance. Since there was no difference in the levels of student interaction and student performance between the experimental and control groups, and the fact that the experimental group of student did not interact as much through the social interaction tools as they did with the content, and the instructor and other students through the discussion board, qualitative methods were necessary to gain further insight into the impact and role of student interaction through social interaction tools and student performance in an online course setting. Themes from the semi-structured interviews found that with respect to deep learning in an online course, an

interactive content and a supportive instructor are core requirements, while the social interaction component of an online course is not a core requirement for reaching deep levels of learning unless it is integrated with the course content and is supported by the instructor, both directly and indirectly.

The FICECLC Theory (Anderson et al., 2014) is based on Anderson's (2003) Interaction Equivalency Theory states that a meaningful learning experience needs to be supported by one or more of the three interaction types possible among the student, which was renamed to learner, the course content, other learners, and the instructor. High levels of interaction in at least one of these areas will result in a meaningful learning experience (Anderson, 2003). The second main theme from the semi-structured interviews was that the instructor to student interaction should be used by the instructor to assess student educational needs and as a result tailor the course content accordingly. This finding adds to the body of knowledge by creating a framework for which the interaction of the three interaction stakeholders of student, content, and instructor should interrelate.

The third main finding of the study is that content-based exercise, which itself is tailored to the level of students by the instructor, as addressed in the above paragraph, should act as the central component for all student to course interactions. The student-to-content interaction will be effective and impactful when the student internalizes the content teachings by practicing them through the content-based exercises, the student to student interaction is impactful and purposeful when the student's social interaction is exercise based and results in collaborative knowledge creation and distribution, and the student to instructor interaction is effective when the invisible hand of the instructor monitors the student to content and student to student

interactions and steps in when students need validation of their learnings and or need to be steered in the right direction.

While interviewing the participants in this research, the main focus was to uncover the association between the role of social interactions in an online course and the course success factor. The themes that emerged from the study broadened the framework for understanding the educational value of social interaction in specific and student interaction in general in an online course. The finding of this research was that the interactions between the student, content, and instructor leads to deep learning if these components are connected through application-based and collaborative content-based exercises.

In conclusion, the finding of the study determined that networked social interaction in an online course is not a precondition for course success, but interactive course content and instructor support when oriented to promoting application based course exercises are preconditions for success. The interaction between the student, content, and instructor lead to deep learning if the interaction among them are multi directional and centered on content based exercises. The data presented in this chapter will be expanded further in the following chapter to discuss in greater detail the factors impacting student progress in an online course with respect to student interaction.

Chapter V

Conclusion

Introduction

Online learning has become a popular instruction modality for higher education institutions as well as for professional learning training programs (Baki, Güven, Özyurt, & Özyurt, 2014; Castle & McGuire, 2010; Hull & Saxon, 2008; McKay & Vilela, 2012; Nakamura, 2016). In the field of education there has always been a three-way relationship between the student, the course content, and the instructor. Depending on the emphasis placed on these three types of interaction different learning pedagogies have been employed (Kop, 2011).

Student interaction with course content, the instructor, and with other students in distance learning is usually a focus of studies related to distance education (Ahmad et al., 2001; Anderson, 2009; Anderson et al., 2005; Anderson et al., 2014; Arbaugh et al., 2005; Armellini & Padilla Rodriguez, 2015; Boris & Reisetter, 2004; Bradley, 2011; Castle & McGuire, 2010; Eskey & Schulte, 2012; Foster et al., 2014; McKay & Vilela, 2012; Newton et al., 2006; Phillips, 2005). All online interactions purposes to increase students' comprehension of the course content (Ertmer et al., 2011). Unlike earlier waves of distance education, online education can now provide more than just the course content (Anderson, 2009; Branch & de Groot, 2012; Emmerson, 2004; McKee, 2010). Garrison (2011) states that, "… the type, extend, and integration of various types and modes of interaction is a defining component of each generation [of distance education]" (p.39). This study's theoretical framework, the A Framework for Interaction and Cognitive Engagement in Connectivist Learning Contexts (FICECLC) Theory, incorporates an online learning theory that focuses on the role of learners' interactions in a networked connected environment and its effect on the success of the online learning course.

The theoretical framework for this study was based on Anderson et al.'s 2014 research, which takes the interaction-effectiveness model to a more advanced level and affirms the need for the management of additional types of relationships in order for effective learning to result.

The research questions investigated in this study include:

1. Is there a difference in the level of online students' interactions between students taking an online course built on the basis of the FICECLC Theory (afforded social learning tools), and those taking an online course that was not developed on the basis of the FICECLC Theory?
2. Is there a perceived difference in the success factors between a group of online students completing an online course built on the basis of the FICECLC Theory and another group taking an online course not built on the basis of the FICECLC Theory?
3. Is there a correlation between the implementation of the FICECLC Theory and online course success in comparison to an online course not built on the basis of the FICECLC Theory?

Chapter V interprets the results of this research and how they relate to the Anderson et al. (2014) FICECLC Theory. It also lists recommendations for future research and practical implications for the findings of this study.

Summary of Results

This study investigated common characteristics of effective online training with respect to networked social learner interactions and the impact they have on student performance. Creswell (2008, 2012) and Johnson et al. (2007) affirms that the use of both quantitative and qualitative methods provide a more thorough understanding of the research problem than either

of the two methods alone. In this study, ex post facto data of student interaction and performance from an online course built on the basis of the FICECLC Theory and an online course not built on the basis of the FICECLC Theory were used to examine the correlation between implementation of a Connectivist Learning online course and student achievements. In addition, a series of semi-recorded, audio recorded, and transcribed interviews with students of the online courses built on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC Theory was performed to determine online students' perceptions regarding the factors behind the correlation between student interaction in an online course and student performance that would have not been possible in a quantitative only study.

This study examined adult learners taking two professional training online courses by TrainingCo. (pseudonym) a Northern Virginia training company. Ex post facto student records were recorded and analyzed to determine the difference between the interaction level of the online course built on the basis of the FICECLC Theory and that of the online course not built on the basis of the FICECLC Theory, the difference between these two courses' student performance, and the degree of correlation between student interaction and performance for the students within these two courses.

Additionally, a series of semi-structured interviews were administered with a group of volunteer students from the experimental and control groups taking the online courses built and not built on the basis of the FICECLC Theory. Twelve students volunteered and were interviewed from late November 2015 to early December 2015. Qualitative data were collected and analyzed after the quantitative data, and both were utilized in answering this study's research questions.

The proper configuration of student interaction, viewed as a key element of learning within online courses, can challenge course developers (Armellini, Padilla Rodriguez, 2014). A study by Anderson et al. (2014) introduced a framework, which provides online instructional course designers and researchers a structure that combines the Connectivist Learning pedagogy with a scheme for evaluating student interactions. This study collected and analyzed both quantitative and qualitative throughout this study to evaluate the FICECLC Theory from Anderson et al.'s (2014) research.

Quantitative Data

This study defined student interaction as the sum of student-to-student, student-to-content, and student-to-instructor interactions. Both experimental and control group students were provided with equal access opportunities to the instructor, to the content, and to their peers through an instructor-mediated discussion board. Additionally, students in the online course, built on the basis of FICECLC Theory were trained on, and provided with social interaction tools and were, therefore, able to interact with the instructor and other students through social interaction tools that included Wiki and student forums in order to share their inquiries and findings with other students. The degree of difference between student interaction levels for the experimental and control groups of students was assessed by performing Mann Whitney U test against the ex post facto data. Comparison between the levels of interaction for the two groups was performed with IBM SPSS Statistical Software, Version 23 (IBM SPSS, 2016). Table 10 (page 71) shows descriptive statistics for the two groups' interaction level, and Table 11 (page 72) shows the Mann Whitney U calculations. For the student interaction variable, H_0: $\mu_1 = \mu_2$ was tested. The null hypothesis maintains that there is no significant difference in the levels of

student interaction between the course for the experimental and the course for the control group sample population, calculated as two-tailed probabilities with significance at $p<0.05$.

There is no statistically significant difference in the levels of student interaction for the students of the online course built on the basis of the FICECLC Theory and that of the online course, which was not built on the basis of the FICECLC Theory. The mean value for the interaction level index for the experimental and control group students remained very close at 39.99 and 45.01; the Mann-Whitney U test value of 0.3, which is greater than the significance level of 0.05, indicates that the null hypothesis cannot be rejected and the students in both the experimental and control groups had the same levels of interaction with their courses. Students in both experiment and control groups had the same levels of interaction with their courses.

This finding is in contrast with one of the tenants of the FICECLC Theory which states that the existence of peer-to-peer social interaction tools used in the context of a networked environment, would result in higher student interaction in an online course. The literature is divided regarding the effects of networked- and social-media-based student interaction on the level of student interaction with an online course. Some students procrastinate and becomes distracted in online courses with social media tools (Chase, Davies, Good, & Spencer, 2010), which results in reduction in the level of student interaction and collaboration (Aghaee & Hrastinski, 2012). Other researchers have associated the use of social media in online learning with improved sense of belonging, increased interaction levels, and augmented knowledge sharing (Wodzicki, Schwämmlein, & Moskaliuk 2012). Participants in the study indicated that social media tools and networked interactions can positively impact their learning experiences if the educational value of social interaction is evident and supported by the instructor. Ferdinand echoed the position of other students towards social media tools in an online course as:

> I prefer a course with the simplest environment because I want to learn the subject, but not the things that they're on. For example, I don't use Twitter and so if I go to the course and I must use Twitter, then I will not learn the [course] subject. …. If I wanted to learn Twitter, then I would take a Twitter course.

The connectivist learning pedagogy attempts to explain the effects of technology and connected social networks on learning. This instruction paradigm discusses how delivery of instruction should orient towards digitally literate students in networked social settings (Borel, 2013). Connectivism pedagogy asserts that knowledge is distributed across a network of individuals and technology, and that learning is the process of forming, growing, and participating in those networks (Siemens & Tittenberger, 2009). Since connectivism remains is a new online learning pedagogy, much of the literature focuses on theoretical discussion of this paradigm (Anderson et. al., 2014; Anderson & Dron, 2011; Downes 2006; Hill & Kop, 2008; Schoenack, 2013; Siemens, 2005b; Siemens & Tittenberger, 2009; Tschofen & Mackness, 2012).

Though a thorough review of current literature took place, only two studies were found that examined the experiences regarding implementing the connectivist learning paradigm. Kizito (2016) implemented the connectivist learning model based on FICECLC Theory (Anderson et al., 2014) and Ng'ambi (2013) 5-phase processes, discovered that the instructor assumes a central role in successful implementation of the theory, she also determined, that successful implementation of the FICECLC theory depends on the degree of instructor support for adoption of technology to enable collaboration and individual learning. Participants in this study echoed similar findings and confirmed that the key to a successful online course is individualizing the learning experience by the instructor.

This study's third finding indicated that although the social interaction tools of forum and wiki were afforded to online students and supported by the instructor, the interactions levels for the experimental and control group of students remained the same. This finding supports Kizito (2016) recent research, where the social interaction tool of blog was introduced and supported in the case study for validating the FICECLC Theory, yet the modes of student interaction remained largely unchanged (Kizito, 2016). Her findings support those of this study, which indicated within a short-term, online course, the implementation of the FICECLC Theory does not change the interaction patterns and behaviors of online students.

Kop (2011) provides an account of a long term research project for implementing the connectivist learning paradigm in a MOOCs setting undertaken by the National Research Council of Canada. The project, Personal Learning Environments, Networks, and Knowledge (PLENK), utilized social interaction tools of blogging, Tweeter, Wiki, and discussion boards. This long-term project had a core group of between 40 and 60 active students, who generated a large amount of content that was, in turn, consumed by the rest of the students in this experiment. The subject matter of the PLENK course involved the discussion of how to create personal learning environments, and the students were working professionals within the education field. This global experiment increased in its number of students from 846 during the first week to 1,616 by the tenth week. The knowledge generation by students, networked community buildings, and the role students played in shaping the direction of the course confirmed this course's implementation a success.

Findings from the analysis of the ex post facto data for this study reveal that its findings align with the research conducted by Kizito (2016) and points to pre-requirements to include the following:

- MOOCs environment with a large and resourceful pool of students. With a student population of eight hundred or more, only a small group of 40 to 60 active and content generating students is sufficient for fostering and sustaining the network environment needed for the FICECLC Theory.
- Inquiry-based learning experience: The PLENK project did not incorporate a structured learning environment with content provided by the instructor but was, instead, designed to be shaped by the contributing students. As noted by the students posting comments, the challenge with this environment involved the difficulty of aggregating the sheer volume of content generated by students.
- Timed correctly: The ten week PLENK project provided adequate time for the participants to form their own identities and to build networks. It should be noted, however, that the volume of knowledge creation dropped after the fourth week for both the students and the facilitators. Provided that the participants in the study as noted above are already invested in the topic of the course, four to six weeks appears sufficient. In the case of the online course built on the basis of the FICECLC Theory, however, and the online course not built on the basis of the FICECLC Theory, the students remained more interested in learning from the content than in forming networks and generating original knowledge.

Student performance ex post factor was calculated on the basis of student interaction levels and test scores (Appendix M). The student performance scores (Appendix N) for the experimental and control groups of students were examined to determine if a statically significant difference exists between the performance in the online students of the online course built on the basis of the FICECLC Theory and the online students in the online course not built

on the basis of the FICECLC Theory. For the student performance test, H_0: $\mu_1 = \mu_2$ was examined. The null hypothesis asserts that there is no significant difference in the levels of student success factors with the course between the experimental and control groups' sample populations.

The core argument behind the FICECLC Theory asserts that situating online students in a networked learning environment with social interaction tools afforded will enable the students to collaborate in the creation of knowledge and to reach a deep level of learning. In this study, there is no evidence to support a difference between the student success factors for the two control and experimental groups, since the p value of 0.4 is greater than $\alpha = 0.05$. Additionally, the mean ranks between the two groups, 40.48 and 44.52, are almost identical, which confirms that the null hypothesis cannot be rejected, and there is not a significant difference between the experimental and control groups' student levels of success in their online courses. Literature is divided regarding the correlation between social media affordance in an online course and student performance. Some aver that social media can strengthen social bonds among students in an online course, foster a culture of collaborative learning, and improve student performance (Tian, Kwok, Yu, & Vogel, 2010).

Self-regulation is one of the issues that can arise from the use of social media tools in an online course (Berger & Wild, 2015), and, in some studies, a negative correlation between exposure to social media tools and student performance have been reported (Baker, Cochran, & Paul, 2012; Forste & Jacobsen, 2011, Karpinski, Kirschner, Mellott, Ochwo, & Ozer, 2013). Participants in the study considered social media a distraction and non-value added, unless the social media student interaction was subordinated to application-based case studies and projects to facilitate student collaboration in creating and internalizing new knowledge. Jennifer,

Ferdinand, and Bridget did not participate in social media interactions, since they were primarily interested in learning from the content, had little time to spend on the course, and did not have confidence in learning from social media interactions. Jennifer argued:

> I am very busy. I'm busy professionally, and busy personally, I have 20 hour days. So I don't have a whole lot of time. I need to get in the course and get out. The potential to learn something [from social media interactions] every now and then, in my mind is slim to none. Because I think if you are in a focused discussion board, that is instructor-led, they take you down a path, and that path gets you to where you need to go. There are too many divergent paths to follow in the social media because people often go to tangents that aren't really related to the overall objectives of the course.

Ferdinand did not interact in social interactions because of the course type. Both the online course developed on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC Theory were offered without chard and did not result in college credits, an industry recognized professional certificate, or employee training credits. Ferdinand stated:

> I didn't interact with other students because it was okay for me to listen to the lesson and do the homework. And it's [the course] not really official course so I don't need the grade, I just need the learning.

Bridget argued that she would not use social media tools unless she needed to learn about the opinions of other students about her experiences and thoughts. She explained the reason for not embracing social interactions:

> I'm proudly behind the curve when it comes down to social media, but again, I stay behind the fence because I just think there's just so much information and people tend to think that they have to share everything.

Students reasoned that the relationship between a learner and social networks in online education is not a simple and linear phenomena. It depends on the age of the student, whether the student is taking the course for a college degree or for professional advancement, the duration of the course, the degree of complexity of the course topic, and the topics of discussion in the social networks. The themes discussed in the next section expand on these factors in more detail.

This study was conducted to examine the effect of a connectivist learning environment on student achievement. To investigate this correlation, $H_0: \rho = 0$ was tested. The null hypothesis states that there is no correlation between student interaction in an environment with social interaction tools and student performance as two-tailed probabilities with significance at $p<0.05$ for the experimental group. The Pearson's Correlation coefficient of 0.87 with a significance of $p<0.05$ indicated a strong positive correlation between student interaction in an online course with social interaction and student performance. This relationship exists with a 99% confidence level. In order to isolate the impact of social media interaction on student performance, the correlation between student interactions from the control group, which was not afforded social media interactions, was also examined against student performance. A significant positive relationship exists between student interactions in an online course not afforded with social media tools and student performance. The Pearson's Correlation coefficient of 0.90 for student in the online course not built on the basis of the Connective Learning Theory is slightly stronger than the correlation between student interaction and performance for the students in the online course built on the basis of the FICECLC Theory.

The FICECLC Theory portrays an ideal course environment as one in which the instructor assumes the role of a facilitator and the students learn from a network of nodes of people, media, and places (Anderson et. al., 2014). The online course built on the basis of the

FICECLC Theory was administered in a way that students were provided with a static content and were instructed to expand their knowledge through external resources, and use the social interaction tools of wiki and student forum to share new content, and their inquiries with other students. The course instructor by design and on purpose was not the author of the course content but played the role of a facilitator so that the students in the both online courses could research the topic of the course by themselves. The hypothesis stated that the experimental group students would show a higher level of interaction and research the topic of the course from references outside of the course and, in turn share their findings in the social media interaction tools afforded to them.

Considering the fact that the interaction levels and student performances of the two groups of students were not significantly different, and both the online course built on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC Theory exhibited the same degree of correlation between student interaction and student performance, the ex post facto data by itself could not fully explain the correlation between social interaction and student performance. The participants in the study considered networked social interaction as a positive feature for building a sense of belonging and membership. They did not, however, conclude that having support, training, and access to social media tools in a networked environment by itself was adequate for creating knowledge and improving student performance. Bob explained his view of the educational value of networked social interaction:

> I think as long as the instructor was instructing effectively, I'd be getting new information. I mean, certainly there's a benefit for being able to communicate with fellow students, but, I hate to say it this way, but it's not essential to learning.

Bridget, whose sentiment was shared by many students, objected to the idea of collecting knowledge from a network of social media tools and nodes. She argued:

> If I'm taking a course and then I have to go back and, you know, post things on another medium in order to be able to understand or try to hear or understand what other people are doing and understand myself, I don't know that that would add value or not."

The students in the online course developed on the basis of the FICECLC Theory were provided ample training and support regarding how to use social media and knowledge co-creation tools of wiki and forum, and also had easy access to references related to how to research the subject of the course further and to collaborate together in creating new and original knowledge. All but one of the students interviewed from the experimental group were opposed to this type of instruction, which is, in fact the core of the connectivism teaching pedagogy. Donald summarized his and others' point by stating:

> Because the time I'm going to spend to gather material from those references, I can spend maybe one hundredths of that time to learn it quickly from maybe one common instructor. [That way] I don't get off the point.

Steven concluded that measuring performance in a purely connectivist learning course, in which the students are in charge of creating and distributing knowledge, is more difficult than a structured course.

> I think, if a course is to give a certificate of completion. The structure has to be a little more structured, a little more rigorous, I guess. A little more controlled. If you are just out there learning how to program something and you watch some YouTube videos and then you leave a comment saying "how did you do this?" and someone comments back, that is great. But I don't [think] there is any way to quantify if certain [learning]

> objectives have been met, in that sense. So, I don't think you will be able to give a certificate, say for learning, I don't know thirty hours of Java [a computer programming language], if you are just watching YouTube videos and maybe commenting and getting feedback, but in a structured program, I think there will be a structured space for students and the instructor to interact.

As pointed by Clarà and Barberà (2013), one of the shortcomings of the connectivist learning pedagogy is over simplification of student interactions. The FICECLC Theory incorporates the Interaction Equivalency Theory (Anderson, 2003) to highlight the role and importance of different types of student interactions in the connectivist pedagogy. Both the research by Kizito (2016) and this study, found that in order to encourage students to adopt the FICECLC Theory and the connectivist learning pedagogy, a central role has to be afforded to the instructor. Additionally, both this study and Kizito's (2016) research found that in a short term course that include social interaction components not represented in the course grading rubric, the chances of adoption of the connectivist learning pedagogy is not high.

Anderson's study (2009) stated that by just introducing social interaction tools to an online setting, students will not necessarily benefit from the benefits associated with learner-paced models. Similarly, as both Kizito's (2016) research and this study indicate, introduction and affordance of collaboration tools of wiki, forum, and blog without being subordinated to a broader framework, does not result in social interaction and adoption of the connectivist learning pedagogy. Anderson et al. (2014) FICECLC Theory provides a comprehensive account on how to promote learners from one level of cognitive engagement to a higher level, but due to its theoretical nature does not provide the reader with an implementation guideline on how to implement the connectivist learning pedagogy with interaction and cognitive engagement levels

as described in the FICECLC Theory. Given the shortage of empirical research on implementation of the connectivist learning method, studies such as this and Kizito (2016) have the potential of promoting the connectivist learning pedagogy for use by online education practitioners.

Qualitative Data

An interview is a social negotiation between the researcher and the subject of the research for electing knowledge about the phenomenon under investigation (Martins, Mojtahed, Nunes, & Peng, 2014). A semi-structured interview is structured enough to address the research questions while providing flexibility to the subject to project new meanings and perspectives to the study (Galletta, 2013). Twenty-one themes were identified and are listed in Appendix X. The top ten themes from the interviews are listed in Table 17 (page 2) and explained in detail in Appendix W. Coding interviews is a heuristic and critical aspect of interview analysis (Basit, 2003, Saldaña, 2015). The results for the identified themes for this dissertation study are illustrated in Figure 9 (page 94).

The three primary interactions in an online course occur between the student and other students, student and the content, and student and the instructor. Figure 9 displays an interlocked mechanism for managing these interactions for effective online learning. The three major themes for this study in order of importance include student interactions with the instructor and content, customization of the online course on the basis of student needs, and the centrality of content based exercises to the architecture of a successful online course. These three themes will be discussed individually in this chapter and explained in greater detail using the experiences of the participants of the study, professional literature, and Anderson et al. (2014) FICECLC Theory framework for implementing the connectivist learning pedagogy in an online course.

Theme One: Interactive Content and Instructor Support

Student interaction with content, the instructor, and course content has long been recognized an essential element of any educational program (Armellini & Padilla Rodriguez, 2015). Belland et al. (2014) and Richardson and York (2012) associate student interaction in an online course with satisfaction, motivation, and learning. Student interaction is the subject of many online studies (Ahmad et al., 2001; Anderson et al., 2005; Anderson, 2003; Anderson, 2009; Arbaugh et al., 2005; Armellini & Padilla Rodriguez, 2015; Boris & Reisetter, 2004; Bradley, 2011; Castle & McGuire, 2010; Eskey & Schulte, 2012; Foster et al., 2014; McKay & Vilela, 2012; Newton et al., 2006; Phillips, 2005). Anderson's (2003) Interaction Equivalence theory is comprised of two thesis—the first one of which is that of the three student interactions: student to student, student to content, and student to instructor—if one of them falls at a high level, the course will be successful in transferring knowledge to students. The second thesis indicates that an increased level of interaction would result in higher quality of learning (Armellini & Padilla Rodriguez, 2014) if an online course affords high levels of interaction between student and student as well as student to content interaction, that course would logically exhibit a higher quality of learning compared to a course that only affords its students with student to content interaction.

Anderson's (2003) Interaction Equivalency theory is a widely cited study over 550 different occasions. Many studies have validated this theory and reported incompatible results (Abrami et al., 2011; Anderson & Miyazoe, 2010a; Anderson & Miyazoe, 2010b; Anderson & Miyazoe, 2012; Anderson & Miyazoe, 2013; Arbaugh et. al., 2005; Armellini & Padilla Rodriguez, 2014; Armellini & Padilla Rodriguez, 2015; Byers, 2010; Miyazoe, 2009; Rhode, 2008; Rhode, 2009).

The meta-analysis of Analysis of Abrami et al. (2011) determined that all three interactions are important, while student-to-student and student-to-content interactions are more important than student to instructor interaction. Miyazoe's 2009 study concluded that depending on face-to-face or online course types, important interactions are either student-to-student plus student-to-content, or student-to-instructor plus student-to-content interactions. Rhode (2008) developed a complicated model for ranking the three different types of interactions on the basis of course characteristics. The primary findings of his study indicated that the two interactions of student-to-instructor and student-to-content are core, and in a self-paced online course student-to-content interaction is more important than student to student interaction. Armellini and Padilla Rodriguez (2014, 2015) validated the Interaction Equivalency theory in a large company and found no significance difference between the three interaction types with regards to their impact on student performance. Anderson and Miyazoe's 2010 study analyzed few of the studies conducted on the basis of the Interaction Equivalency theory and refer to Rhode (2008) and endorsed his findings by noting "the forms of interaction valued by learners could be different under varying circumstance" (p. 97). Therefore, the Interaction Equivalency theory's first thesis should not be taken literally, which at the surface suggests that regardless of course characteristics, the presence of any of the three interaction types should result in a high level of learning. As a number of above mentioned studies argue, the order of importance for the three student interactions can be different from one type of course to another.

Participants in this study, primarily adult working professionals, considered the interaction between the students and content the primary interaction. Eighty one times during the twelve interviews conducted with the study participants, students noted that the existence of

an interactive content was key to learning from an online course. Todd summed up the points of all of the other participants:

> For me, content was really important. Because based on the time that I wanted to dedicate to this course, I tried to optimize my learning from this course, and optimization for me [meant interacting with the] content.

Partially-based on the Interaction Equivalency Theory (Anderson, 2003), the FICECLC Theory (Anderson et al., 2014) posits that in order for an online student to reach deep levels of learning they have to transition from interacting with other students, the content, and the instructor to a stage of knowledge creation and innovation, they must begin to interact their own knowledge from before the course with their newly found knowledge. A course built on the basis of the Connectivist Learning pedagogy is what the participants in this study loosely labelled as an unstructured course. In an unstructured course, students who belong to an active community of inquiry will collect, generate, aggregate, and distribute knowledge with other students through social media networks (Anderson et al., 2014).

According to Hill and Kop (2008), in a connectivist learning environment, learning occurs when learners build relationship and contribute information to a learning community or node, which itself is part of a larger network. One of the requirements of forming connections are prescribed by Hill and Kop (2008), which involves providing online students with networking and social interaction tools. For the students taking the online course built on the basis of the FICECLC Theory the content, downloadable files, reference links, and example wiki and forum posts were situated in a way to encourage them to research the course topic on their own—above and beyond the seed content provided to them—and to share their findings with their classmates. Despite being provided with access, training, and encouragement to utilize social interaction

tools for discussion and distribution of knowledge among themselves, the students in the experimental group chose not to utilize the social interaction tools made available to them for the purposes of adopting the connectivist learning pedagogy. Donald hypothesized the reason why experimental group of students did not adopt the connectivist learning method of learning despite having access to tools and to encouragement:

> Time management is important to me. I do my course work at the end of night and I want to just get over them and learn as quickly as possible and go to the next topic. I don't want to go to ten different websites to find something that I can find in just one website.

Ferdinand, Bridget, Steven, and Jennifer expanded Donald's narrative by comparing the active learning on the basis of the connectivist learning and learning from an online course with the content provided by the instructor. They pointed to the difference between the learning experiences of two students, one learning how to learn computer programming by watching countless YouTube videos and participating in student forums, as opposed to the other student enrolled in a professional course with a solid path for learning. Todd took their argument a step forward when he asserted:

> I think if the content is good enough, maybe we really don't need an instructor. If for example, you have a course project, then you will need an instructor. I mean you need someone to talk about that project with, you need an instructor. Otherwise, you can take the knowledge of the instructor and put it in videos, in the course content. I mean you can kind of cut out the instructor, I mean omit it.

The PLENK project, as recounted by Kop (2011), was a successful case for implementation of the connectivist learning method. One of the key features of that project was the collaboration of

a large number of highly-invested knowledge seekers in the assembly, dissemination, and aggregation of knowledge related to the topic of the PLENK project. Hill and Kop (2008) refer to learners like those of the PLENK project as members of a learning community. Participants in Kizito's (2016) study, as well as participants in this study did not assume the role of truth seekers, and knowledge creators, due to reasons such as time constraints, the need for more practical and project-based social interactions, and more instructor support and scaffolding. This means that the connectivist learning environment requires learners that are already motivated to contribute to a course and to find solutions on their own. To other types of students, such as those in this study, the ideal content needs to be interactive and engaging. Participants in this study defined engaging content as one which includes short sections (n=15) and is made of multi medium sections (n=14). This study's participants determined that an online course content is engaging and interactive if its content is spread across multiple types of mediums. An ideal course content would have written material, audio and video content, glossary of terms, process maps, projects, discussion boards, images, and simulated live exercise capabilities. Bridget explained how process to learning from a course as:

> Many people are audial. Many people just see things and they capture it, and some are hands-on. I have to do all three. So I have to kind of play around with things, hear them, and see them.

Differences among individuals' learning styles is a well-researched phenomenon. Klinger and Benz (2010) state that neuroscience "clearly indicates that sufficient and sustainable learning is a highly individual process, depending on the individuals background, the lesson's learned, interests, emotions, attitudes, motivation, and more" (p. 705). Baki et al. (2010) report facilitation of learning for most of their students in after providing them with content appropriate

with different learning styles. The addition to the literature by the participants of this study results in making the importance of an online course content dependent on its degree of interactivity and personalization. The customization of online course content is the next qualitative theme.

Kizito (2016) study found that one of the factors required for successful implementation of the FICECLC and connectivist learning theory is an active and supportive instructor. Similarly, participants in this study considered a supportive and knowledgeable instructor key to the learning processes (n=29). Donald described an ideal instructor as a one who has knowledge and experience in the field of the course subject, which can save the student hours by pointing them in the right direction. It can be argued that in the PLENK project (Kop, 2011), which is a case of successful implementation of the connectivist learning theory, a core group of 40 to 60 students took on the role of active and supportive instructors while providing the bulk of direction and content for the course. Nevertheless, the existence of supportive members of the learning community that assumed the role of instructors in the PLENK project, constituted what the participants in this study described as a supportive and active instructor (Hill & Kop, 2008). Edward considered the role of a supportive instructor pivotal to the success of an online course by stating:

> I would say the instructor is the most important element in an online course. Because if any question comes up, he can answer me. What if I have a question about the content? So how would I get the answer to that? What if I don't find the answer despite researching on that? What if I go look it up and there's nothing? The instructor would give me a more specific, clear answer.

The connectivist learning theory is largely silent on the characteristics of the course content, and as such the participants in this study have lend their voice to the theoretical debate concerning the connectivist learning theory. The FICECLC Theory (Anderson et al., 2014) pictures the act of learning primarily carried out by the student. As evident from the comments made by the participants, the preferred provisions of a centralized content and a supportive instructor rather than having to take charge of researching, aggregating, sense making, and presenting the content for themselves. Therefore, the addition to the literature by participants of this research is the dependence of the FICECLC Theory on the type of students admitted to the course. If the students are working professionals, have time constraints, and are not trained and equipped in researching the topic on their own; a course built on the basis of the FICECLC Theory is not an ideal setting for them. This topic will be further explained in the next theme of the qualitative study results.

As Anderson (2009) and Annand (2007) argued, the online student independence and interaction level have an inverse relationship. A student in a self-paced online course has the freedom to choose his/her level of interaction with the content, instructor, and other students if they exist. On the other hand, a learner-paced online student will not be afforded the same level of freedom that a student in a self-paced online course enjoys. Anderson (2009) refers to this balancing act as a pedagogical dance. Therefore, the role of the instructor is critical in creating an environment that does provide the student with freedom of interaction, and yet holds the student accountable against the course objectives. The instructor must refrain from taking over student discussions (Wang, 2014), but at the same time must monitor the student activities in such a way that the students can sense his/her presence and influence. Boris and Reisetter (2004) refer to this as the hidden voice of instructor. Similarly, despite the fact that the participants in

this study considered an interactive content and a supportive instructor as more important than student to student interaction, they were clear about the value they put on their freedom and flexibility. They preferred an instructor who does not take over their conversations in student forums and offers answers after they get to think of alternatives. Nancy summarized other participants' views by stating:

> I think initial student-to-student interaction would be great and then at some point, like, the instructor can come in and fix the mistakes. But give the students an opportunity to solve [exercises], you know, let them apply principles and that help would be a great opportunity to, you know, for us to have a-ha moments, you know? And then maybe the professor could summarize and then provide some review answers for us. But I think an opportunity for the students to do it at, on their own at some point and discuss it or get through it or find the solution would be the best.

Participants in this study referred to this type of instructor presence as the invisible hand of the instructor. Instructors surveyed in a 2010 study concurred that teaching students without providing them with direct instruction assisted students in learning concepts on their own (Baki et al., 2010). Boris and Reisetter's (2004) study found that even though students in their research did not communicate directly and extensively with the instructor, the hidden voice of the teacher through the course content and structure was heard. The more they sensed the instructor's hidden presence through the course content, the higher the value of the course was to them. Participants in this study supported this argument, and believed that an online course instructor needs to actively engage with the students in the beginning of the course and assess their educational needs, so that she can tailor the course content and exercises. Once this phase of the course is completed, the participants in this study preferred to have an instructor that supports

their social interactions on the basis of the course exercises, and allows the students to make mistakes, debate among themselves, and experience the process for developing new knowledge and solutions, before she discloses to them the solutions to the course projects. The discussion presented in the following theme is focused on this type of adaptive learning supported by the invisible hand of the instructor.

Students of the online course built on the basis of the FICECLC Theory and the course not built on the basis of the FICECLC Theory were provided an instructor-led discussion board, and the students of the online course built on the basis of the FICECLC Theory were also provided with social interaction tools of wiki and a student forum. As explained in the quantitative section of Chapter V, no significant difference resulted between the student interaction levels, student performances, and correlations between student interaction and progress for the two online courses. The primary reason for the uniformity of the results between the two groups of students was lack of adoption of social interaction tools. Huang and Shiu (2012) report that searching, arranging, and aggregating suitable content by students can cause distraction and lose of focus on learning objective. Participants in the study argued that the educational value of social interaction is conditional and without a project or case study to discuss, they do not see the value in social interaction (n=23). Additionally, they viewed social media and social interaction as distraction (n=19). Bridget notes:

> I think maybe sixty percent of what's actually put out on social media is fine and I think the other forty percent is just irrelevant, useless information. So if I'm looking at a hundred percent of my time invested in something, why do I want to waste forty percent of my time?

Experimental group members Todd, Veronica, and Peter were interested in participating with other students using the social interaction tools, but as Peter put it, in the absence of group projects to discuss among themselves, there was nothing commendable. Veronica shared an interesting suggestion for a group project that would delegate some of the instructor's role in the creation and distribution of content.

> I was thinking of creating a wiki with all the shortcuts, techniques, and practical segments of the content and videos. Because I was taking notes while watching the videos. I was taking notes: the most important information, because, see, lectures sometimes were 40 minutes, so I don't have time for forty minutes. So I just can look through my notes, and see the important stuff. If other students put important stuff in there [wiki], I don't have to take, maybe hours.

When asked for the reason she did not propose this project to other students or to the instructor during the online course, she responded:

> As I already said. Because, [1] people [are] too busy. Too busy to do that [social learning], and [2] then people do not know what is that for (social learning). [The students have to be told] what is that [social interaction] for? Why do you need that wiki? We already have the discussion board, why do that [other thing]?

Todd echoed similarly:

> I mean, sometimes you create something and you gain [benefit] from that creation, by [receiving] some feedback or something else. But [there] it wasn't any benefit for me to dedicate some time to create a Wiki

Both the FICECLC Theory (Anderson et al., 2014) and the Interaction Equivalency Theory (Anderson, 2003) focus on the impact of student interaction on course success. In this section,

the order of importance of the three student interactions—student to instructor, student to content, and student to student—were examined from the perspective of the participants in this study. According to the participants in this study, the most important interaction in an online course takes place between the student and an engaging and personalized content; the second most important interaction is the interaction between the student and a supportive instructor who knows when to get out of the way and allow the student to experiment on his/her own, and the last interaction in terms of importance is the student to student interaction. Social interaction in an online course has educational value if the topic of discussion involves a case study or project from the course content. As Peter stated, that would constitute something commendable. The personalized course content will be covered in the next theme, and the centrality of course exercises and projects will be discussed in the third and final theme of this study.

Theme Two: Tailored Content

The second major theme of this study is personalization of the course content. As discussed in the previous section, according to the participants of this study, the interaction between student and a personalized and engaging course was considered to be the most essential interaction in an online course. This major theme is comprised of two minor themes of universal rules for personalizing the content, and the appropriate course configuration. The first minor theme involves personalizing the theme in order that the student is provided with knowledge at their level, and the second involves choosing between the two options of a structured and conventional online course an unstructured or Connectivist online course on the basis of student types and course features.

Adaptive learning structures benefit students by providing them with learning experiences based on individual student differences (Huang & Shiu, 2012; Resing, 2013).

Conventional web based environments are criticized, since they provide the same content to all students who have different learning goals and varied learning styles. Research confirms that those who receive customized content are more involved and perform better than students who are provided with one-size-fits-all content (Baki et al., 2014; Davidovic, Trichina & Warren, 2003; Li & Lu, 2012; Nakamura, 2016; Nistor, 2006). The trend for the future is personalization of products and services.

Universal Rules for Personalizing Content. Brown et al. (2015) found that most students whose study choices were applicable and well aligned to their work settings were well motivated to learn. Participants in this study specified that an effective online course would have application-based content (n=25), and the topics of the content would surpass the level of knowledge of the course students (n=31), which, in turn, affords the students to learn new and applicable skills for promoting themselves in their workplace. Among the 12 participants interviewed, eight stated that they had reached deep levels of learning from the course as a result of the course content; three maintained that they did not reach a deep level of learning because the content of the course was not adequately advanced for them. Jennifer summed up the main reason why she and Todd and Peter did not reach a deep level of learning: "It would have been a deep learning experience if I was still working as a financial analyst. It would have been a good learning experience, but that's not what my focus is anymore."

The students viewed the path to deeper levels of learning and increased engagement levels with the course via efforts of the instructor to tailor the content to the students' educational goals (n=20). Due to the fact that the participants in this study defined an interactive content (n=81) as one comprised of small educational segments and application-oriented practice exercises. The instructor does not need to rebuild and compile large segments of content to

accommodate each new class's educational needs. The changes to online course core content will be limited to creation and modification of the course number application oriented exercises.

Student needs analysis has been defined as "the activities involved in gathering information that will serve as the basis for developing a curriculum that will meet the learning needs of a particular group of students." (Brown, 2001, p. 35). Personalization and adaptability of an online course to its students is a key design criteria (Pi-Shan, 2012). Figure 9 (page 94) captures this relationship between the instructor, the students, and the content in the early days of instruction. The instructor will inquire from the students about their background, expected learning outcomes from the course, and study time constraints and will, in turn, tailor the course content in order that the students' educational needs are addressed. The students will, therefore, be able to interact at high levels with the course through the tailored content-based exercises; and discuss possible solutions to those problems in social media channels inside and outside the course. The central point of interaction between the student, content, and instructor therefore would be the exercise-based interaction that is built on the basis of tailored content.

Donald, Todd, Edward, and Peter envisioned a future with intelligent adaptive online courses that would assess the progress of the student by automated tests and release content appropriate to level of the student. Donald found the idea of being able to choose what to learn and what not to learn from a dynamic course appealing. He envisioned the benefits of such a course as:

> A dynamic course would help a lot because then if I don't need a topic, I would just pass it on the video and go to the next one that I think is more useful for my profession or for the future. If I don't see a point to learn something, then, like, if I'm not going to use it, then I won't learn it and it would save time also.

Peter took a step further and described his ideal course as fully automated and modular online. He describes the mechanics of this course:

> To me how you can create a modular content is based on the, the quiz and the projects. Because you need some feedback from the student[s] to drive the student[s] to the next step or the next module. It means if you do not have any feedback from that student you cannot evaluate that person. Because of that I mentioned the quiz and exercise [are] important. Not just for evaluating the student [but] also are important for identifying what the student knows, I mean [if he] has enough knowledge in that part [of the course] or not. For example, if you have a module and after that you have a couple of question[s] later to [in] that module or [have] project[s], if the student passes this [with the] highest score, it means that student has enough knowledge about that part [of the course]. It means most probably, he can go further to the next module, instead of just, taking you know a module with a little bit more complex [than the last] knowledge. It is, they are entangled. Content and questions are tangled into each other. And the feedback from [student's response to] the question gives a feedback to the instructor for the content to choose the next content [for that student].

Donald and others referring to an automated adaptive course described intelligent adaptive learning in which technology creates completely different learning paths for each student (Dreambox Learning, 2012). Because this technology had just entered the commercial space there are no peer reviewed and professional literature available. Available studies primarily exhibit very complex and manual frameworks for creating user-centric adaptive learning systems (Huang & Shiu, 2012; Kunzler, 2012; Li & Lu, 2012; Septáková, 2013). The recommended framework by this study's participants is based on the three main themes of this

study, and is represented in Figure 9 (Page 94). Adaptation of the online course content in this framework is primarily done through customization of the course projects and exercises. The instructor will be in a position to customize the course more easily the longer the course has been offered and adapted to various student types and their educational needs. Responses from participants in this study indicate a strong desire for personalized and applicable online courses, whether the customization of the course is modelled after the framework they proposed, or in the ideal form, expressed by some of them, done completely by the computer and on the fly. This second type of customization of the learning experience is a relatively new (Dreambox Learning, 2012). Because this technology is in its infancy and is in experimentation phase, there are no peer review researches available. The contribution of the participants of this study to the body of knowledge is a simple and collaboration-based framework for customization of online courses. In this model, the instructor and students both play a critical role in tailoring the course to the specific needs of the students.

Course Configuration on the Basis of Student Type and Content Type. The FICECLC Theory (Anderson et al., 2014) is defined as "theoretical and model-building research is designed to bridge the gap between connectivist pedagogical ideas and learning practice, and to provide more specific solutions and guidance to connectivist learning designers" (p. 123). Online courses can be divided into two pedagogical categories; instructive learning and constructive learning (Ati, Benlamri, & Berri, 2003; Duffy & Jonassen, 1991). Adaptive learning belongs to the constructivist learning and has become the subject of research in recent years, due to recent innovations in Web 2.0 technologies (Nakamura, 2016). The key elements of the connectivist learning paradigm are personalization, participation, and productivity (Thiessen, 2014).

Li and Lu (2012) conducted a study and found that students of adaptive online courses preferred to be provided with content and exercise, and preferred this environment to one with only the content. Septáková advocates for small lectures and course assigned to appropriate type of students (Septáková, 2013). A question arises regarding which characteristics of the student should be examined when deciding on design choices for an online course. The literature is divided on what those characteristics are (Brown, Hughes, Keppell, Hard, & Smith, 2015; Pi-Shan, 2012; Huang & Shiu, 2012; McKay & Vilela, 2012; Resing, 2013). McKay and Vilela (2012) argue that the age of student as well as whether the student is a novice learner or advanced learner in the subject of the course are the student characteristics worth examining for the design of the course. Resing (2013) lists students' needs and expertise level as characteristics for consideration for the course designer. Pi-Shan (2012) considers these features to be student learning style, learning efficacy, and self-efficacy. Huang and Shiu (2012) summarize adaptive factors from a number of studies and frameworks as learner abilities, material difficult, learner demographics, and learner's knowledge states. Brown et al. (2015) argue that working professionals experience greater pressure and constraints than young college students, and hence require greater support in their educational experiences.

Participants in this study believed that in addition to the universal personalization principles of application based content (n = 25), tailoring the content to assessed student needs (n = 20). The choice of course configuration system, between instructivist choice in which the content is provided by the instructor and students are instructed versus a connectivist environment in which students are partially or in whole responsible for the content of the course, should be decided on the basis of student type and course subject type. According to the participants in this study, college students are better candidates for connectivist courses and

working professionals because of their time constraints and application oriented educational needs, are better candidates for instructivist type (n = 24). Novice learners are better candidates for instructivist courses and advanced learners are better candidates for connectivist courses (n = 10). Young students are better candidates for a connectivist course, whereas older students are more comfortable with the instructivist type course (n = 8).

Jennifer and Steven considered taking online courses as a paradigm shift when they graduated from a K-12 with little computer-assisted learning technologies. Nancy considered the level of match between a student proficiency with the course subject and the degree the course was applicable to the life of the student as critical to the success of the online student:

> I think with students, you always have your high level students, the kind of people who get it quickly or who have a background or who have had an extensive background in Excel, but they're not the group that are like you. And so they're able to get through the course and everything. But then, I think, it's like you can always learn more, you know, and I wouldn't know how much I've learned until I've actually applied it. And so that's where the relevance of having case studies come in, where am I applying it [the learnings] so that I know that I'm actually experiencing deep learning.

The participants considered the choice of course subject and type another critical factor for determining the choice of the instructivist or connectivist environment. The choice of the complexity of the course subject matter was mentioned 14 times as a determinant, and, a course with a basic subject matter or content better suited to the instructivist environment and a course with a complex subject matter more appropriate for a connectivist learning setting. Other choices discussed where mandatory vs optional courses, with the optional not a good fit for connectivist learning (n = 10), a course with a quantitative subject matter like laws of Physics

compared to a course with a qualitative topic such as criminology is more suited to the instructivist learning environment (n = 7). The participants also believed that an interaction-based course is better suited to the connectivist learning environment whereas a text based course is better suited to the instructivist environment. With respect to the course length, a course with a short duration is not suitable for connectivist learning environments. Peter described the relationship between one of these course subject types and student interactions:

> It kind of gets back to the nature of the course. A more qualitative course that is, you know, that is about, that is built on discussion and interaction, I don't imagine you'd have any problem with social interactions, for example, if your students are learning about, you know, what's going on in the Middle East, for example, and there's a course on, you know, the politics there; there won't be a shortage of opinions, students will be Facebooking, posting, and things like that. Instead of on the other side, if it's a quantitative course, the students are just putting, you know, just crunching numbers, compared to that qualitative course. In that case, there might be a problem because they're just concerned about getting their assignments completed and then unless one person takes the lead, you may have nothing. So, again, [social interaction] is based on the type of course.

Chariker (2012) and McKay and Vilela (2012) discuss the impact of content complexity on choice of learning medium, and Anderson's (2005) study participants stated that they do not favor interacting with other students in social interaction tools if the interaction is not graded or they are pressed for time.

The participants in this study added to the body of knowledge by providing a criteria based on both student type and course features for selection of one of the instructivist or

connectivist learning environments. They also provided their accounts of potential benefits of connectivist learning environment, which was also mentioned in this study as unstructured or connectivist learning, as opposed to structured learning environments—also referred to as instructivist learning in this course. It has to be made clear regardless of whether they choose to take a connectivist or instructivist course, their preference for student, content, and instructor interactions will be universally modelled after the themes from the interviews, as illustrated in Figure 9 (page 94). That is, the content would need to be interactive, the instructor would have to assess the students' needs and customize the content accordingly, the interaction between the students and content would need to be personalized through content based exercises, and social interaction topics of discussion will be exercise-based interactions.

Overall, participants in this study preferred a structured course environment--one with an interactive content provided by the instructor and social interactions mediated by the instructor (n = 62) to a unstructured course environment, which is the environment built on the basis of the FICECLC Theory (n = 34). The reasons they found the structured course environment appealing were high degree of content professionalism and consistency (n = 21), good time management with a structured course (n = 15), low effort required from the students (n = 13), low level of student involvement expected from the students (n = 7), and, easier to measure student progress (n = 6). On the other hand, they expressed the desire to take Connectivist Learning based courses if the following benefits they believed this type of course environment has meets their learnings goals. Those factors were high degree of freedom and self-study for the student (n = 12), joy of unexpected learning (n = 10), high degree of sense of belonging to a learning community (n = 8), and high degree of student involvement expected (n = 4).

A study by Anderson et al. (2014) provides a well-structured account of what would happen if students transition through the learning levels of the FICECLC Theory. Due to the fact that the FICECLC Theory is a theoretical framework, it does not provide a guideline for assigning the appropriate types of students or courses with subjects or features more suited to this type of learning. The available literature on the subject of the adaptive online course is either focusing on the student type, or course features. The participants in this study have added to the knowledge by listing student types and course types most suitable for the FICECLC Theory and those that are not suitable for this learning environment. The following figure summarizes these selection factors:

Figure 10

Selection of Connectivist or Instructivist Learning Environments based of Student Type and Course Features

Instructivist Learning Environment	**Connectivist Learning Environment**
Benefits: • High degree of content consistency, professionalism • Good time management • Low effort required from students • Low level of student involvement expected • Easier to measure student progress	**Benefits:** • Suitable for self-paced learning, affords more freedom to students • Joy of unexpected learning • High degree of sense of belonging to a learning community • High degree of student involvement expected
Suitable for: **Student type:** • Working professional • Novice learner • Older student • Dependent on instructor and content	**Suitable for:** **Student type:** • College student • Advanced learner • Young student • Member of a learning community
Course type: • Basic subject • Optional • Quantitative • Content-based topic • Small-to-medium-size class • Short duration	**Course type:** • Complex subject • Mandatory • Qualitatitive • Interaction-based topic • Large class size • Lengthy

Participants in this study determined that for all online courses the student interactions should be based on the themes represented in Figure 9 (page 94); they also indicated that, for each individual online course, the instructor has to actively assess the educational needs of the students early in the project and customize the course content and exercises. Finally, based on Figure 10 (page 132), the online course designers should set the course configuration to either an instructivist or connectivist environment.

Theme Three: Content-Based Exercise

The quality of most student to student interactions in online courses remain low in terms of critical thinking value and substance (Ertmer et al., 2011; Lang, 2010; Wang, 2014). These posts are simple feedbacks or revised original messages posted in response to other students' posts (Heo, Kim, & You Lim, 2010). Simply giving the student the chance to discuss the content does not lead to higher levels of learning. But when students are prompted to solve a problem by the mean of a case study, they tend to propose and justify solutions (Ertmer et al., 2011). High level student to student interactions are clustered around tangible items such as projects. In those posts, students classify information, negotiate meanings and options, and combine ideas. (Heo et al., 2010). Prior research has shown that success in reaching deep levels of learning is impacted by the type of student interaction questions developer for the course (Condon & Valverde, 2014).

Participants in this study validated these findings and placed a special emphasis on the value of subordinating the course content and student interactions in the course to application based projects. Project-based learning is the subject of many studies (Boss, Suzie, & Krauss, 2014; Brundiers, Van Der Leeuw, Wiek & Xiong, 2014; Brundiers & Wiek, 2013; Cain & Cocco, 2013; Graaff & Kolmos, 2014; Grant & Tamim, 2013). A project-based learning environment is built around the assumption that people learn in a constructive process

environment supported by computer based communication tools (Lang, 2010). Project based learning is to get the user past sharing opinions and information in social student to student interactions and to enable them to create knowledge and negotiate ideas with other students (Heo, Lim, & Kim, 2010). Bob summed up other participants' opinion about the social interactions they had in the online courses by stating:

> I suppose having exercises to do as opposed to answering multiple choice questions and descriptive discussion threads would have been good. And if that was accompanied with produced work as opposed to simply answers or question and answer that would be ideal. The topics were good, the multiple choice questions were good, but just the exercise based learning and the project based learning would have given more room to maneuver, I guess, as far as questions and topics for discussion.

Another point made by the participants concluded that the existence of instructor-supported course projects not only enhanced the quality of social interaction between students but also enabled the students to learn at a deep level because of working on the class projects. Steven described his understanding of this dependency between projects and personal learning:

> I would create some problems or downloadable content that the student could work on at their own pace, to reinforce the concepts. Because I am a learn-by-do person, so even though you had examples in the course, I really didn't feel like there was a constructive set of objectives that I could download and manipulate the data and try out the various things that I learned. I mean, I know that, I think you did say it [in the video lectures] that you [the student] could download the course Excel files and repeat the steps in the lectures. But for myself it would be better if there was, a, I don't know, an actual problem [assignment/exercise to work through]. I know you used the Northwind

> example, which is great, I have seen it before, but, if you could just say here is some sales receipts, you can [practice on them] if you choose to, work through the same process but with slightly different data.

A distinction was made by the participants between exercise-based student interaction and content-based exercise. As covered in the previous theme, the participants believed that a successful online course has to be customized to the educational needs of its students, and part of this process is creation, or modification of the course examples, and additionally course practice projects. The course practice projects have to be extensions or be closely related to the exercises covered in the content. That type of an exercise was referred to as content based exercise (n = 68). Exercise based interaction would be more engaging and effective if is based on those content based exercises. Participants mentioned 31 times that exercise based interaction is needed for effective learning. Donald referred to both of these elements in a short statement:

> I think I would like to have some examples inside the course and some related practices outside the course to learn it more. For an online course, I don't expect to have mandatory homework exercises. I would like to have those exercises as optional homework.

Project-based learning course environments engage students in creation of application based and functioning solutions to problems presented to them. Instead of solving conceptual problems, the graduate students in the Lang (2010) study were commission with design, creation, and delivery of online courses for undergraduate college students (Lang, 2010). This study, and other researches focused on project based learning demonstrated that project based learning requires from students to create original knowledge, complete application based projects, and generate new artifacts (Herring, Hew, & Koh, 2010; Lang, 2010). A distinction has to be made

between project-based learning and problem-based learning, which in the later, the students are expected to solve conceptual problems as opposed to generating artifacts, creating applicable solutions to problems, or producing new knowledge (Abubakar & Arshad, 2015; Chung, Lin, Lu, & Yang, 2010; Chunta & Katrancha, 2010; Grant & Strohfeldt, 2010; Keitlertnapha, Klunklin, Subpaiboongid, Viseskul, & Turale, 2011; Mai & Yeen-Ju, 2016; Riggs & Webster, 2006; Rogal & Snider, 2008). Therefore, project-based learning is more compliant with the principles of the connectivist learning theory as Schoenack (2013) states that connectivist learning environment students create knowledge instead of [just] consuming content.

Herring et al.'s (2010) study demonstrated that students in a project-based online course were characterized by more advanced levels of knowledge construction, and in Heo et al. (2010), project-based students shared more information among themselves, identified areas of disagreements and clarified learning goals, negotiated solutions and co-created knowledge, and experienced having their student to student interactions cluster around tangible items from the project. In comparison, the control group of students, who were not provided with a project-based learning environment, experienced low performing social interactions with most of the students posts made of basic feedback, repeating other students points, and citing information from content (Heo et al., 2010). These findings completely support the main three themes of this study and Figure 9 (Page 94), that social interaction in a project-based online course has higher educational value, and students reach deeper levels of learning and co-create knowledge together.

In a project-based learning environment, the instructor, the content, and the project are all important. Lang (2010) defines the role of the content as for inquiry from the student, and the project by itself as not enough and need the instructor's support. Heo et al. (2010) added the

student to student as another critical interaction and argue that the purpose of project based learning is to improve the level of student learning (Heo et al, 2010).

In Anderson et al. (2014), FICECLC Theory does not discuss use of projects or problems as means for teaching online students. In the connectivist learning paradigm, students create knowledge instead of consuming it. Therefore, project based learning is compatible with the FICECLC Theory, since both have the goal of enabling the student to create new and internalized knowledge.

The three factors of course content, course project, and the interaction between students were discussed by Todd and represented the inter-dynamism of the themes covered in this study:

> If the interaction is just, say [from the instructor]: "interact with each other", I think at least myself [I would] never go and talk to someone else. But if some project, a kind of group question, and the group should answer that question, maybe it is more practical to gather people and not force them, but kind of guide them to interact with each other. It is really important to have a reason for interacting with other students. If I can gain [the knowledge] from the lecture, that means I am done. Otherwise, to want to talk to other student, there should be some really interesting stuff that kind of point to connect people to each other.

The three main themes of this study are represented in Figure 9 (page 94) and state that an effective online course needs to be aligned to the practical needs of its students and afford them project and case studies so that they can solve in groups and generate, distribute, and internalize knowledge instead of being consumers of content.

Conclusions

The research questions examined in this mixed-methods study include:

1. Is there a difference in the level of online students' interactions between students taking an online course built on the basis of the FICECLC Theory (afforded social learning tools), and those taking an online course that was not developed on the basis of the FICECLC Theory?
2. Is there a perceived difference in the success factors between a group of online students completing an online course built on the basis of the FICECLC Theory and another group taking an online course not built on the basis of the FICECLC Theory?
3. Is there a correlation between the implementation of the FICECLC Theory and online course success in comparison to an online course not built on the basis of the FICECLC Theory?

This study's finding conclude that connectivist social interaction in an online course is not a precondition for course success, but an interactive course content and instructor support when oriented to promoting application based course exercises are. The exercise-based interaction between the student, content, and instructor lead to deep learning if the interaction among them are multi directional and centered on content based exercises.

In this mixed-method study, ex post facto data for student-to-content, student-to-instructor, student-to-student interaction, and student progress were examined from an online course built on the basis of the FICECLC Theory and an online course not built on the basis of the FICECLC Theory. There is no evidence to support a significant difference in the levels of student interaction, or student performance between an online course built on the basis of the FICECLC Theory and an online course not built on the basis of the FICECLC Theory. Furthermore, there was no significant difference in the degree of correlation between student

interaction and progress between the online course built on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC Theory.

A series of semi-structured interviews were conducted with a group of volunteer students from the students of the online course built on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC Theory. The shared perception among the participants revealed that adoption of the Connectivist Learning by online students depends on the applicability of the course content and whether the student social interactions are subordinated to practical projects from the course content. The literature is divided on what student or course characteristics should be examined for adaptive course design (Brown et al., 2015; Pi-Shan, 2012; Huang & Shiu, 2012; McKay & Vilela, 2012; Resing, 2013). The voice of the participants adds to the literature when they advocate for a course configuration model that accounts for both student and content types.

Anderson's Interaction Equivalency (2003) posits that in order for an online course to be effective, the students must exhibit a high level interaction level with other students, the course content, and the instructor. Participants in this study overwhelmingly affirmed that in order for an online course to be effective the student has to be afforded an exercise-based interactive content, and engage in social interactions with other students oriented towards the content exercises and supported by the course instructor. This interlocked structure of course interactions is the addition of the participants of this study to the literature, as none of the studies examining the Interaction Equivalency theory (Abrami et al., 2011; Anderson & Miyazoe, 2010a; Anderson & Miyazoe, 2010b; Anderson & Miyazoe, 2012; Anderson & Miyazoe, 2013; Arbaugh, 2005; Armellini & Padilla Rodriguez, 2014; Armellini & Padilla Rodriguez, 2015; Byers, 2010; Hao Ying, 2011; Rhode, 2008;) propose a framework for how to manage the

relationship between the student interactions with other students, the content, and instructor in order to implement a FICECLC Theory.

Finally, the participants strongly asserted that in order for an online course to succeed and allow its students to learn at a deep level and to internalize their learnings, the content of the course must be tailored to students' educational needs. Research concludes that students who receive customized content are more involved and perform better than students who are provided with one-size-fits-all content (Baki et al., 2014; Davidovic et al., 2003; Li & Lu, 2012; Nakamura, 2016; Nistor, 2006). The trend for future is personalization of products and services. The participants in this study believed universal rules for tailoring online courses are interactive course content, small size of content segments, multi medium content.

This study validated the FICECLC Theory and found that the connectivist learning paradigm is not suitable for students that have strict time constraints, are working professionals, or are novice learners. The complex and unstructured learning environment of a connectivist learning environment makes it an ideal choice for college students, students of mandatory courses, younger students, or students interested in researching a topic in great detail and within a flexible learning setting. In addition to this research, Kizito's 2016 study is the only study that has attempted to validate the FICECLC Theory, and similar to this study found that in order to implement the FICECLC Theory and the connectivist learning pedagogy, the online course has to be provided with support from the institution hosting the learning, the instructor has to play a central and supportive role. Participants in both of these studies argued that the reason they did not embrace the connectivist learning pedagogy was time constraints, short duration of course, and unclear educational value of social interaction.

Despite these similarities between the two studies, several differences exist that make the contribution of both of these studies to the body of knowledge unique. The Kizito (2016) study was conducted in a higher education environment with teaching assistants as study participants. In this study, volunteers took two online computer training courses and were not captive audiences like Kizito's study. Additionally, in Kizito's research, student interaction were in both online and face-to-face mediums, whereas in this study the experimental and control groups of students took their courses exclusively in the online modality. The last difference between the two studies is that in Kizito's study, the FICECLC Theory and Ng'ambi's 5 phase Framework were combined and validated, but in this study the FICECLC Theory was validated. Due to the gap in the literature for empirical studies such as Kizito and this research for validation of the connectivist learning pedagogy (Kizito, 2016; Kop, 2011), studies like this are needed so that online course instructional designers and instructors can take concrete steps towards successful implementation of the connectivist learning pedagogy.

Recommendations for Further Research

Online education has been growing in popularity and importance over the past few years (Baki et al., 2014; Castle & McGuire, 2010; Hull & Saxon, 2008; McKay & Vilela, 2012; Nakamura, 2016). Despite the steady growth of online education, course instructor designers have relied on trial and error in order to design and develop online courses that are suitable to their potential students. In the current complex and networked learning environment, new forms of learning paradigms are emerging (Kop, 2011). The connectivist learning paradigm states that learning occurs in a networked environment in which the students are in charge of building networks and, creating and distributing knowledge. Anderson et al. (2014) FICECLC Theory was validated in this mixed study. The recommendation for future study involves conducting a

mixed-method study for implement the themes from Figure 9 (page 94) and comparing a connectivist learning adoption in that environment against a connectivist online course not built on the basis of this study's finding. Given the very limited number of empirical studies about the connectivist learning, the contribution of examining this study's finding for adopting the connectivist learning environment can assist course instruction designer in creating online courses capable of serving a more networked and diverse than the traditional online course students.

In the field of education, there has always been a three-way relationship between the student, the course content, and the instructor. Depending on the emphasis placed on these three types of interaction, different learning pedagogies have been employed (Kop, 2011). The finding of this study is that an interlocked approach to improving an online course interactions has the potential of increasing student involvement with the course, deepen student learning, and simplify personalization of online education. It this therefore recommended that the themes from Figure 9 (page 94) and Figure 10 (page 132) be validated by comparing the adoption rates, student involvement levels, and student performance of two online courses, one not adopting this study's findings and one built on the findings of this study. The benefit of conducting this research is that an online course instruction designer can make informed decisions for course configuration options such as degree of personalization, and level of student to content interaction.

It is recommended that this study be repeated with a larger number of participants in the online course built on the basis of the FICECLC Theory and the online course not built on the basis of the FICECLC Theory. The research findings might be different if the sample size increases and the participants' demographics is more diverse. It is also recommended that in

future iterations of the study, one copy of the course be offered as part as a graded and mandatory educational course, and the other copy of the course be offered as a no credit and optional program. Lastly, participants in this study were very interested in the prospect of learning in dynamic online courses that would deliver personalized online training to each student based on student expertise level with the subject of the course, their time constraints, and educational goals. The new technologies that deliver such learning experiences (Dreambox Learning, 2012) have just entered the market place and hence there are no peer reviewed studies on them. It is recommended that the customization themes discussed in this study be studied against these new technologies.

Anderson and Dron (2011) as well as Kizito (2016) argue that the connectivist learning pedagogy is complex and theoretical in nature, which, in turn, makes it difficult to learn and implement. There is a gap in the literature with respect to empirical studies about the connectivist learning theory. It is, therefore, recommended that a study with two groups of students, one resembling the community of inquiry represented in Kop's (2011) account of a successful implementation of the connectivist learning theory and the other with working professionals with little expertise and background in the subject of the course. By comparing and contrasting these two groups of students against the framework presented in Figure 10 (page 132), the factors that can make a connectivist learning course successful for both groups can be formulated.

Lastly, measuring student progress and scaling the number of students in a connectivist learning environment are two of the challenges noted by scholars (Anderson & Dron, 2011; Kizito, 2016). It is recommended that studies with large number of students with online courses built on the basis of the connectivist learning method be conducted with the goal of studying the

mechanics of scaling this learning pedagogy as well as formulating solutions for better ways to aggregate data generated by learners and for measuring their progress.

Implications for Professional Practice

The field of online learning is rapidly changing. With new communication technologies and affordance of social interaction tools, the online education field is changing. The MOOCs trainings are attracting large number of students and deliver content globally. The challenge, however, is the high rate of drop outs from online classes and the increased complexities of modern day online courses makes the instructional design task for them especially challenging. The practical implication of this research is that it provides the instruction designer with toolkits, which enable them to design the student interaction tools that would benefit the students and result in a learning experience that is personal and generates personal knowledge by the student. Additionally, the connectivism learning paradigm is a relatively new and in this study practical themes from study participants have been provided in order to increase the degree of attractiveness, application, and success of connectivism learning. This study affords the online education practitioner with a course configuration selection framework that can improve course success factor.

Online courses are primarily designed around static content and for collection of student assignments. Despite the interaction options available in online technologies, they are most often used for transmission-based and traditional pedagogies rather than for interactive and collaborative learning (Barzilai & Frank, 2004; Dori, Kali, & Levin-Peled, 2007; Dayan, Kali, & Shamir-Inbal, 2009). With the introduction of social media, web-based communication tools, and exponential growth of the amount of data available to us, the connectivist learning theory has a great potential of becoming the pedagogy of the future. As Siemens (2005a) notes, in an

environment with too much information, the millennials would need a pedagogy more equipped to connect nodes of information available to them, so that they are encouraged and equipped with tools to create and share knowledge outside of the existing formal education boundaries. Despite the great potential envisioned for the connectivist learning pedagogy, it is still considered by many a distinctly philosophical theory (Anderson & Dron, 2011; Hill & Kop, 2008). There is a gap in the literature for studies that have validated this learning theory. Therefore, the frameworks presented in Figure 9 (page 94) and Figure 10 (page 132) are significant contributions to the body of knowledge and are stepping stones for other scholars and online education practitioners to develop and successfully deploy connectivist learning-based online courses.

The next practical implications of this study is that the online course instructor is now equipped with a framework for assessing student needs so that the course content exercises are tailored and used as the basis of student interactions with the content, the instructor, and other students. This project-based learning framework is further enhanced by providing the taxonomy of appropriate content and student types for instructivist and connectivist learning courses. Unlike MOOCs and the theorized connectivist learning pedagogy, the tailored online course built on the basis of the FICECLC and the Figure 9 (page 94) and Figure 10 (page 132) would translate into higher student engagement and deeper learning. As Anderson and Dron (2011) note, a connectivist learning course would need a significantly large student population so that there is always a continued level of activity even when most of the students do not interact with the course regularly. In the absence of such student populations, the connectivist learning environment, has to be scaled down and offered in a more formal teaching setting, with the need for greater instructor involvement so that she can play the role of the central connecting point of

the course. The findings of this study have the potential of bridging the gap between these two extreme scenarios and allowing the instructor to build an online course with elements of the connectivist learning environment on the basis of student and content types, while adhering to the requirements set forth by the environment surrounding the online course.

Lastly, this study has the practical implication of expanding the connectivist learning theory by bringing elements from project-based learning and user-centric adaptive learning systems. An online course instructional designer is now able to quickly build a modular online course with fine grain content, and, with the help of the students within the first few sessions, customize and tailor the course to the educational needs of its students. As addressed in the recommendations for future research, this study is one of many conducted in this knowledge area, but which has the potential of assisting course designers to move one step closer to implementation of the connectivist learning method, which, in turn, allows them to transform their students from consumers of content to innovative thinkers and knowledge creators.

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Appendix A

Ex Post Facto Data

Table A1

Experimental Group Ex Post Facto Data

Dummy ID	Gender	Pre Coure Aptitude Test Score	Age	Race	Content Interaction	Student to Student interaction (Discussion Board)	Student to instructor interaction (Discussion board)	Student to instructor email	Total Student to instructor interaction	Total Base student interaction	Student to student interaction through social interaction tools	Student to instructor interaction through social interaction tools	Total interaction through social interaction tools	Total student interaction (including both base and through social interaciton tools)	Course exam grade	Overall course grade
9229	Female	8	27	White	24	13	8	4	12	49	1	1	2	51	24	97.5
9383	Male	9	41	White	5	0	0	0	0	5	0	0	0	5	18	52.5
3115	Male	16	38	Black	6	0	0	0	0	6	0	2	2	8	19	72.5
6125	Male	20	55	White	21	0	0	0	0	21	0	0	0	21	23	63.75
6387	Male	9	28	Black	4	0	2	0	2	6	0	1	1	7	12	47.5
5575	Male	14	35	White	31	0	2	0	2	33	0	0	0	33	22	77.5
2905	Female	18	37	White	29	5	3	5	8	42	2	0	2	44	21	80
2052	Male	14	23	Asian	15	0	0	1	1	16	4	4	8	24	17	70
7356	Female	12	37	White	2	0	1	3	4	6	0	0	0	6	8	26.25
9270	Female	16	25	Asian	3	0	0	0	0	3	0	0	0	3	0	3.75
7943	Male	9	41	White	9	2	1	0	1	12	0	0	0	12	0	2.5
4260	Male	7	28	Hispanic	1	0	0	0	0	1	0	0	0	1	0	1.25
7764	Male	8	30	Other	2	0	0	0	0	2	0	0	0	2	0	1.25
2890	Male	9	25	Asian	2	0	0	0	0	2	0	0	0	2	0	2.5
8953	Male	7	38	Black	2	0	0	0	0	2	0	0	0	2	0	2.5
4838	Male	14	43	Asian	1	0	0	0	0	1	0	0	0	1	0	1.25
3098	Female	11	24	White	4	0	0	0	0	4	0	0	0	4	0	2.5
5348	Female	13	32	Asian	4	0	0	0	0	4	0	0	0	4	0	2.5
2858	Male	7	40	Black	3	1	0	0	0	4	0	0	0	4	0	6.25
9699	Male	9	43	Asian	1	0	0	0	0	1	0	0	0	1	0	2.5
6244	Female	14	26	White	0	0	0	0	0	0	0	0	0	0	0	0
6491	Female	13	25	Black	0	0	0	0	0	0	0	0	0	0	0	0
8553	Male	12	65	White	0	0	0	0	0	0	0	0	0	0	0	0
6083	Male	18	23	Asian	0	0	0	0	0	0	0	0	0	0	0	0
5289	Male	11	41	Asian	0	0	0	0	0	0	0	0	0	0	0	0
2066	Male	12	43	Asian	0	0	0	0	0	0	0	0	0	0	0	0
6524	Female	6	38	Black	0	0	0	0	0	0	0	0	0	0	0	0
2708	Male	13	35	Black	0	0	0	0	0	0	0	0	0	0	0	0
9658	Male	14	41	White	0	0	0	0	0	0	0	0	0	0	0	0
2614	Female	10	42	Black	0	0	0	0	0	0	0	0	0	0	0	0
8364	Female	9	46	Other	0	0	0	0	0	0	0	0	0	0	0	0
7949	Male	14	38	White	0	0	0	0	0	0	0	0	0	0	0	0
9256	Female	13	38	Black	0	0	0	0	0	0	0	0	0	0	0	0
8877	Female	7	21	Asian	0	0	0	0	0	0	0	0	0	0	0	0
9360	Male	11	20	Other	0	0	0	0	0	0	0	0	0	0	0	0
8259	Female	12	23	White	0	0	0	0	0	0	0	0	0	0	0	0
5975	Female	14	21	Asian	0	0	0	0	0	0	0	0	0	0	0	0
2463	Male	11	48	White	0	0	0	0	0	0	0	0	0	0	0	0
8057	Female	15	49	White	0	0	0	0	0	0	0	0	0	0	0	0
3922	Female	9	43	Asian	0	0	0	0	0	0	0	0	0	0	0	0
8582	Male	7	20	Asian	0	0	0	0	0	0	0	0	0	0	0	0
9197	Male	16	40	Black	0	0	0	0	0	0	0	0	0	0	0	0

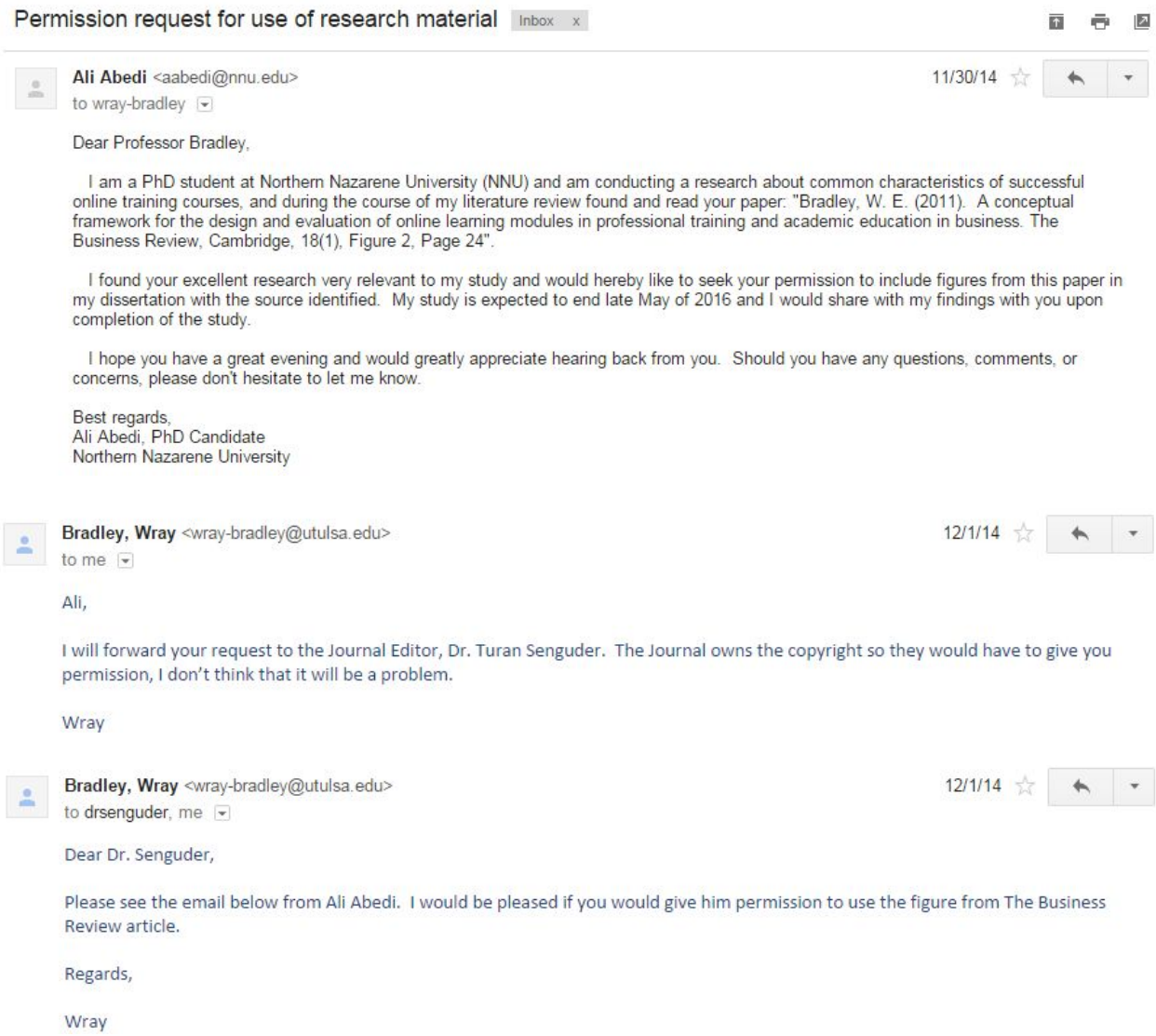
Table A2

Control Group Ex Post Facto Data

Dummy ID	Gender	Pre Coure Aptitude Test Score	Age	Race	Content Interaction	Student to Student interaction (Discussion Board)	Student to instructor interaction (Discussion board)	Student to instructor email	Total Student to instructor interaction	Total student interaction	Course exam grade	Overall course grade
6351	Female	15	23	Asian	13	2	1	0	1	16	20	65
5955	Female	9	42	Black	26	1	3	1	4	31	15	65
8241	Male	10	41	White	9	5	3	2	5	19	17	80
4447	Male	12	24	White	27	6	5	0	5	38	14	72.5
7111	Male	14	32	White	17	4	3	0	3	24	20	87.5
7465	Male	14	46	White	13	4	3	1	4	21	24	87.5
5092	Female	15	33	Asian	6	0	0	0	0	6	13	38.75
9046	Male	17	50	Asian	16	0	0	0	0	16	21	60
9756	Male	11	32	White	7	3	0	0	0	10	17	60
8698	Female	16	48	Hispanic	13	1	1	0	1	15	20	67.5
6298	Female	9	39	White	15	0	0	1	1	16	20	57.5
3883	Male	9	33	Other	5	0	2	0	2	7	5	30
6338	Male	12	29	White	7	0	0	0	0	7	6	21.25
8998	Female	17	59	Black	7	2	0	3	3	12	6	28.75
8224	Female	6	38	Asian	5	0	0	0	0	5	5	2.5
2581	Male	14	64	White	2	0	0	0	0	2	0	2.5
9014	Male	11	29	Asian	2	0	0	0	0	2	0	2.5
2585	Female	8	25	White	3	0	0	0	0	3	0	2.5
3182	Female	10	47	Asian	3	0	0	0	0	3	0	2.5
2195	Female	12	35	White	4	0	0	0	0	4	0	2.5
5109	Male	15	33	White	1	0	0	0	0	1	0	1.25
4343	Male	13	40	Asian	2	2	1	0	1	5	0	1.25
9709	Female	20	28	Hispanic	2	0	0	0	0	2	0	2.5
7033	Male	6	34	White	0	0	0	0	0	0	0	0
7244	Male	19	35	White	0	0	0	0	0	0	0	0
3876	Female	8	57	White	0	0	0	0	0	0	0	0
4436	Female	12	43	Asian	0	0	0	0	0	0	0	0
8742	Male	8	57	White	0	0	0	0	0	0	0	0
7748	Female	10	47	Black	0	0	0	0	0	0	0	0
4105	Male	9	29	Asian	0	0	0	0	0	0	0	0
2384	Female	12	37	White	0	0	0	0	0	0	0	0
9598	Female	7	52	Else	0	0	0	0	0	0	0	0
7770	Male	8	31	Black	0	0	0	0	0	0	0	0
4404	Male	7	25	Black	0	0	0	0	0	0	0	0
2450	Male	10	45	White	0	0	0	0	0	0	0	0
7173	Female	13	37	White	0	0	0	0	0	0	0	0
8671	Male	12	55	White	0	0	0	0	0	0	0	0
2539	Male	15	34	Black	0	0	0	0	0	0	0	0
3685	Male	19	28	Asian	0	0	0	0	0	0	0	0
6580	Female	3	21	White	0	0	0	0	0	0	0	0
4270	Male	10	42	Asian	0	0	0	0	0	0	0	0
8860	Male	8	40	Asian	0	0	0	0	0	0	0	0

Appendix B

Permission Letter for Figure 1: Bradley (2011)



Permission request for use of research material Inbox x

Ali Abedi <aabedi@nnu.edu> 11/30/14
to wray-bradley

Dear Professor Bradley,

I am a PhD student at Northern Nazarene University (NNU) and am conducting a research about common characteristics of successful online training courses, and during the course of my literature review found and read your paper: "Bradley, W. E. (2011). A conceptual framework for the design and evaluation of online learning modules in professional training and academic education in business. The Business Review, Cambridge, 18(1), Figure 2, Page 24".

I found your excellent research very relevant to my study and would hereby like to seek your permission to include figures from this paper in my dissertation with the source identified. My study is expected to end late May of 2016 and I would share with my findings with you upon completion of the study.

I hope you have a great evening and would greatly appreciate hearing back from you. Should you have any questions, comments, or concerns, please don't hesitate to let me know.

Best regards,
Ali Abedi, PhD Candidate
Northern Nazarene University

Bradley, Wray <wray-bradley@utulsa.edu> 12/1/14
to me

Ali,

I will forward your request to the Journal Editor, Dr. Turan Senguder. The Journal owns the copyright so they would have to give you permission, I don't think that it will be a problem.

Wray

Bradley, Wray <wray-bradley@utulsa.edu> 12/1/14
to drsenguder, me

Dear Dr. Senguder,

Please see the email below from Ali Abedi. I would be pleased if you would give him permission to use the figure from The Business Review article.

Regards,

Wray

aabedi@nnu.edu 12/1/14

to Wray, drsenguder

Dear Dr. Senguder,

I would greatly appreciate if your journal gives me the permission to use figures from the following article, with the reference mentioned in my doctoral dissertation. If you have any concerns or questions about my study, please don't hesitate to email me at aabedi@nnu.edu.

Bradley, W. E. (2011). A conceptual framework for the design and evaluation of online learning modules in professional training and academic education in business. The Business Review, Cambridge, 18(1), Figure 2, Page 24

Thanks,
Ali Abedi
PhD Candidate,
Northern Nazarene University

From: "Bradley, Wray" <wray-bradley@utulsa.edu>
Date: Mon, 1 Dec 2014 17:36:05 +0000
To: drsenguder@aol.com<drsenguder@aol.com>
Cc: aabedi@nnu.edu<aabedi@nnu.edu>
Subject: FW: Permission request for use of research material

Dear Dr. Senguder,

Please see the email below from Ali Abedi. I would be pleased if you would give him permission to use the figure from The Business Review article.

Regards,

Wray

aabedi@nnu.edu 12/3/14

to Wray, drsenguder

Dear Dr. Senguder,

I am following up on a request for including figures from an article published by The Business Review, Cambridge in my doctoral dissertation with the figures source mentioned APA style. The details of the article are as following. Please let me know if there is anything I have to do to facilitate the issuance of the permission?

Bradley, W. E. (2011). A conceptual framework for the design and evaluation of online learning modules in professional training and academic education in business. The Business Review, Cambridge, 18(1), Figure 2, Page 24

Best regards,
Ali Abedi
PhD Candidate
Northern Nazarene University
804-549-6145

JAABC <drsenguder@aol.com> 12/3/14

to me

Please send us the part you want to use in your dissertation (only the part you want to use) and the way you want to use. The way you are going to print in your dissertation. We like to use on the paper.

We also need your full name, your institution address (postal), phone, and fax number.

Bes regards,

Dr. Turan Senguder
Dr. Donald Margotta
drsenguder@aol.com

Ali Abedi <aabedi@nnu.edu> 12/4/14

to Wray, drsenguder

Dear Dr. Senguder,

Thanks for the quick response. Please find attached a document with the Figures I am intending to use in my dissertation ((Title: Common Characteristics of Effective Online Training: A Theoretical Discussion and Framework for Online Course Design). In essence I am using Figure 1, 2, and 3 as part of the literature review section that is dedicated to building my study's theoretical framework. The figure's references are listed in the appendix per APA style standards.

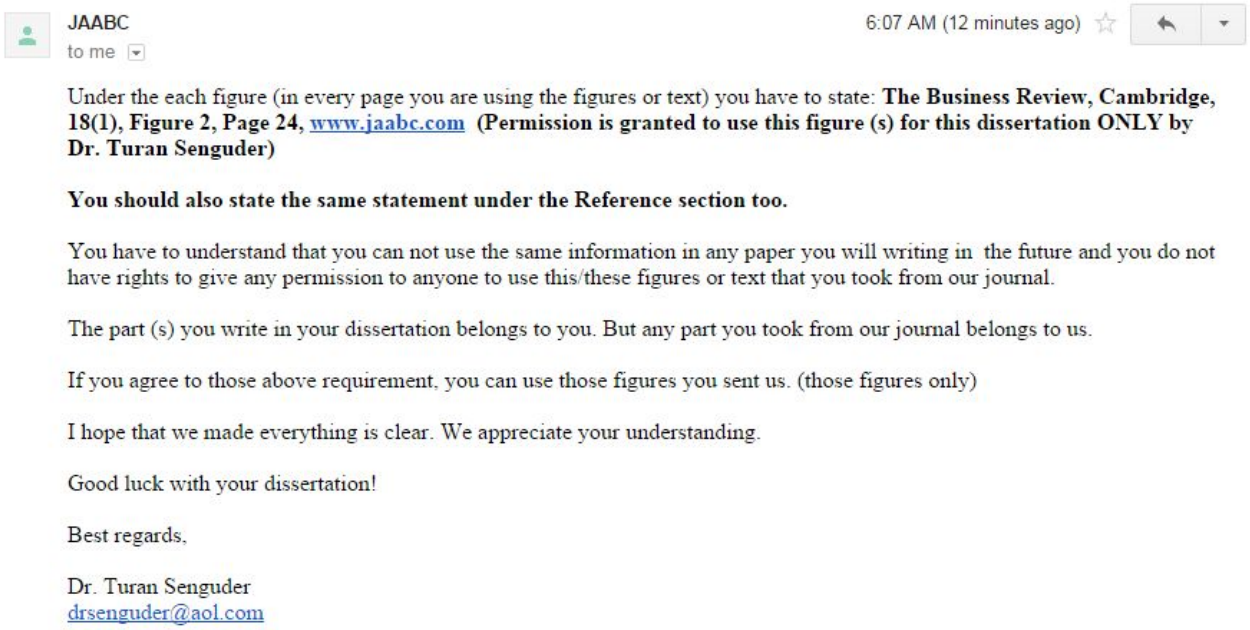
My dissertation is based on a theoretical framework from a 2014 paper by Anderson, Chen, and Wang (2014), and your journal's article is closely related to this theoretical framework, and as such is used to introduce the reader to the model from multiple authors.

I will share my findings with you upon completion of the study, and can send you the dissertation proposal in its current form to answer the question of how the figures are used in greater detail. In short, the figures are referenced in the appendix and full credit is given to the author and your journal (standard practice).

My full name is: Ali Abedi
My institution address is: Northern Nazarene University,
Department of Education
623 S University Boulevard
Nampa, ID 83686
Phone: 1-877-NNU-4YOU or (208) 467-8011
Fax: (208) 467-8645

Should you have any comments, questions, or concerns please don't hesitate to contact me.

Figures 1-3.docx



JAABC
to me

6:07 AM (12 minutes ago)

Under the each figure (in every page you are using the figures or text) you have to state: **The Business Review, Cambridge, 18(1), Figure 2, Page 24, www.jaabc.com (Permission is granted to use this figure (s) for this dissertation ONLY by Dr. Turan Senguder)**

You should also state the same statement under the Reference section too.

You have to understand that you can not use the same information in any paper you will writing in the future and you do not have rights to give any permission to anyone to use this/these figures or text that you took from our journal.

The part (s) you write in your dissertation belongs to you. But any part you took from our journal belongs to us.

If you agree to those above requirement, you can use those figures you sent us. (those figures only)

I hope that we made everything is clear. We appreciate your understanding.

Good luck with your dissertation!

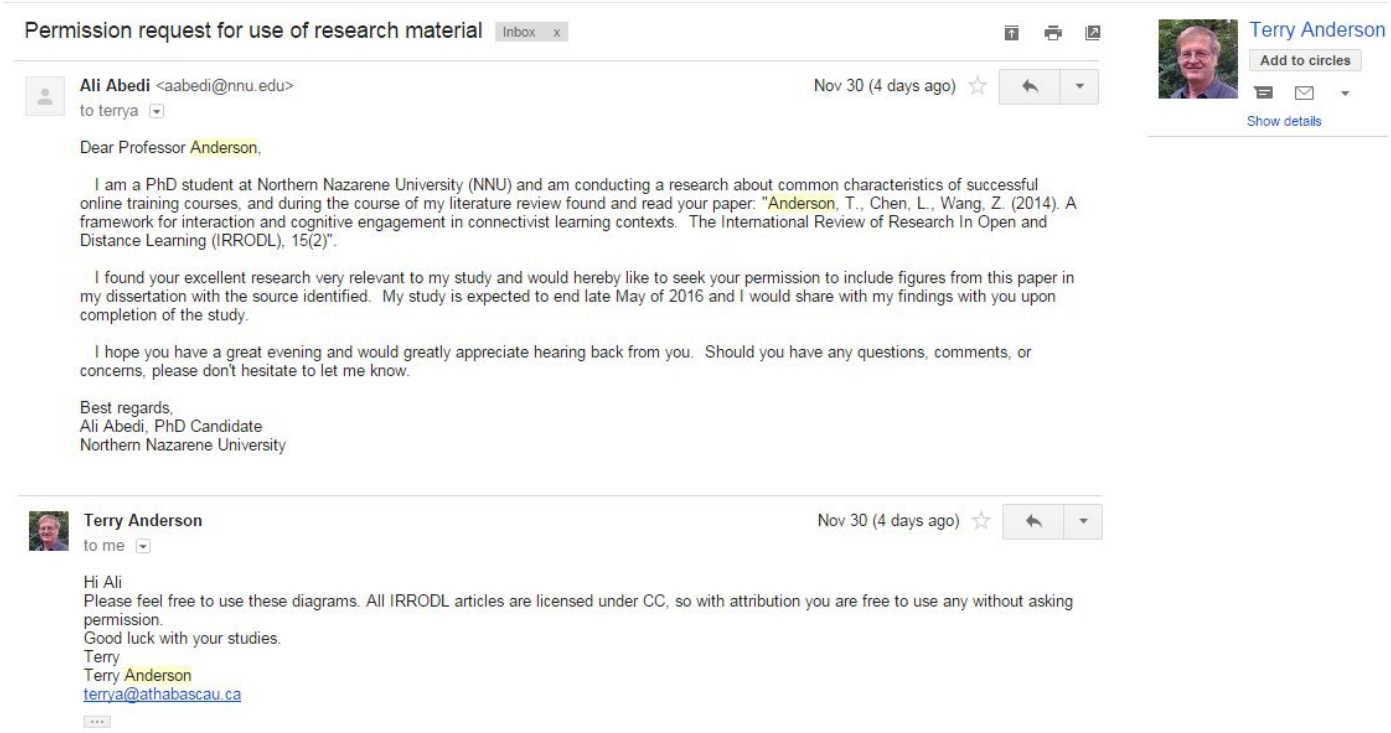
Best regards,

Dr. Turan Senguder
drsenguder@aol.com

Permission is granted to use this figure for this dissertation ONLY by Dr. Turan Sengunder

Appendix C

Permission Letter for Figure 2: Anderson, Chen, and Wang (2014)



Permission request for use of research material Inbox x

Ali Abedi <aabedi@nnu.edu> Nov 30 (4 days ago)
to terrya

Dear Professor Anderson,

I am a PhD student at Northern Nazarene University (NNU) and am conducting a research about common characteristics of successful online training courses, and during the course of my literature review found and read your paper: "Anderson, T., Chen, L., Wang, Z. (2014). A framework for interaction and cognitive engagement in connectivist learning contexts. The International Review of Research In Open and Distance Learning (IRRODL), 15(2)".

I found your excellent research very relevant to my study and would hereby like to seek your permission to include figures from this paper in my dissertation with the source identified. My study is expected to end late May of 2016 and I would share with my findings with you upon completion of the study.

I hope you have a great evening and would greatly appreciate hearing back from you. Should you have any questions, comments, or concerns, please don't hesitate to let me know.

Best regards,
Ali Abedi, PhD Candidate
Northern Nazarene University

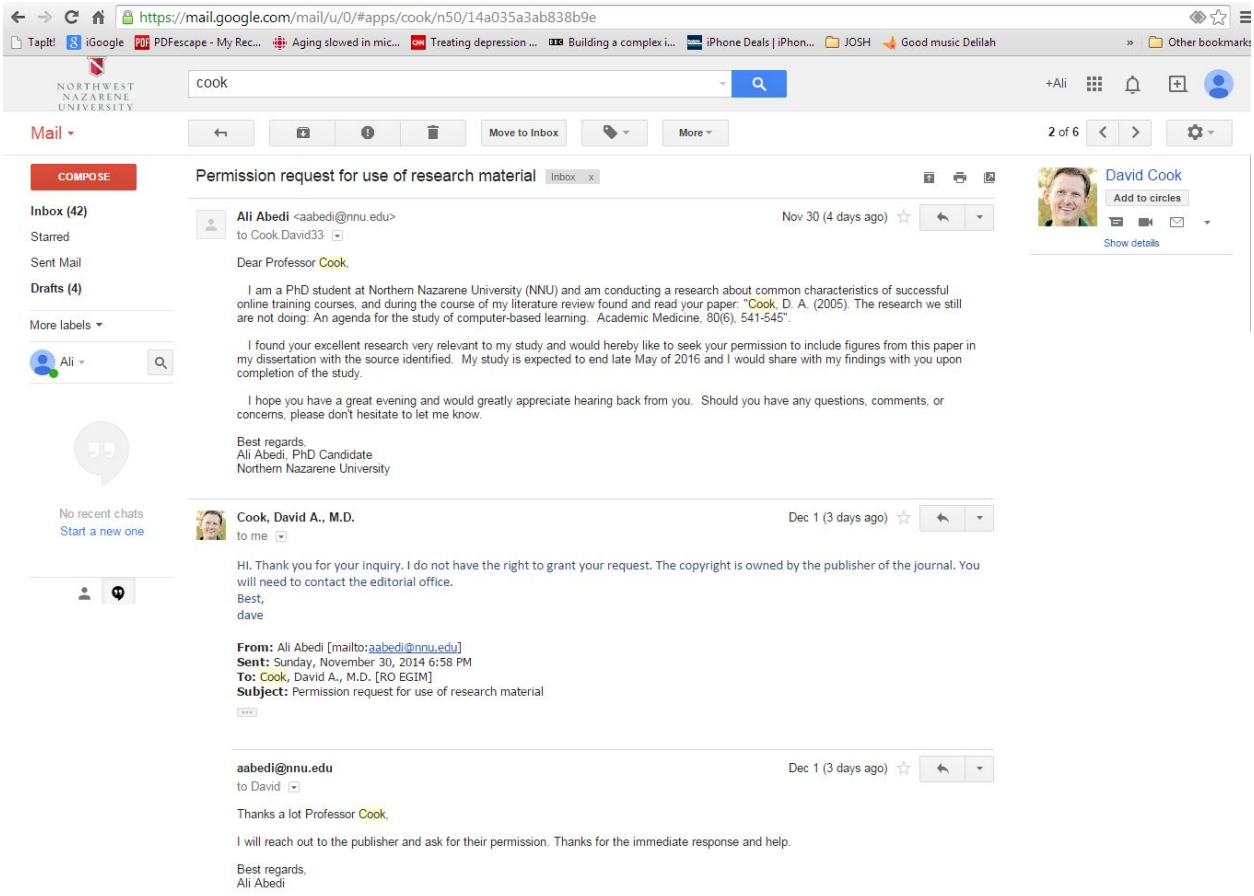
Terry Anderson Nov 30 (4 days ago)
to me

Hi Ali
Please feel free to use these diagrams. All IRRODL articles are licensed under CC, so with attribution you are free to use any without asking permission.
Good luck with your studies.
Terry
Terry Anderson
terrya@athabascau.ca

Terry Anderson
Add to circles
Show details

Appendix D

Permission Letter for Figure 3: Cook (2005)



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Appendix E

Recruiting Letter to Ex Post Facto Data Potential Participants

Dear Potential Participant

Purpose of the study:

This study is being conducted by Ali Abedi PhD candidate, in the Department of Graduate Education at Northwest Nazarene University to investigate factors common in successful online courses. This research seeks to answer this question by comparing the performance of an online course based on the study's theoretical framework of Connectivist Learning and a conventional online course. We appreciate your involvement in helping us investigate how to create more effective and successful online courses for students.

Description of the study procedures and approximate duration of the study:

I would greatly appreciate your completing the demographic questionnaire given in the link below. Since the validity of the results depend on obtaining a high response rate, your participation is very crucial to the success of this study. Your inputs to this study will be as following:

- The following pre-qualifying demographic questionnaire to determine your eligibility for the study.
- A pre-course Excel aptitude test, so that at the end of the course it can be determined if the course has been successful in improving your level of expertise with Excel.
- The assignments and activities typical of an online course (accessing the course content, participation in the discussion board, and the weekly quizzes).
- A post-completion course Excel aptitude test (i.e., the course final exam).

This data collection process will take approximately four weeks to complete, of which three weeks is for the online course of "High Performance Excel – Tips and Tricks for Busy Professionals", and the remaining one week is for the final course exam.

Description of how confidentiality will be assured and the limits to these assurances, if any. Your return of the signed consent form placed in the consent link indicates your consent to participate in this study. Please be assured that your responses will be held in the strictest confidence, and a multi-layer structure has been implemented so that the researcher lacks the visibility to participants' identities, and the course instructor works under strict control of a third party company, with both the instructor and the third party company signed separate non-confidentiality agreements. As soon as I receive the data scrubbed off personal data from the completed course (which has any identifiable information removed from it before hand and replaced with pseudo names), all data from this study will be (stored for the length of three years in a physical disk drive with a password not disclosed to the holder of the disk drive, and physically destroyed after three years. If the results of this study were to be written for publication, or any future research activity, no identifying information will be used.

Anticipated benefits resulting from this study.

The potential benefits to you from participating in the study are:

1) Taking the "High Performance Excel – Tips and Tricks for Busy Professionals" course. This is a short professional course put together by the researcher of this study, who has more than 20 years of experience using Microsoft Excel in various industries. This

course will enable you to use Excel at a higher level of efficiency both in your personal and professional life.

2) Should you complete the course and its final exam, you will be issued a coupon code for a free admission to 30-day online PMP® Preparation Course. This course satisfies the PMP® exam's official project management training requirement. –Note this course will not include printed material such as a book, or posters.
3) Should you complete the course and its final exam, you will be entered in to a draw to win a Flip Video Camcorder.

Contact information.

If you have any questions about this study, you can contact the person(s) below:

Name of Principal Investigator	Name of Supervisor:
---	---
Ali Abedi, PhD Candidate	Dr. Loredana Werth
Northwest Nazarene University	Northwest Nazarene University
Department of Graduate Education	Department of Graduate Education
623 South University Boulevard,	623 South University Boulevard,
Nampa, ID 83686	Nampa, ID 83686
[redacted]	[redacted]
aabedi@nnu.edu	lwerth@nnu.edu

This study has been reviewed and approved by Northwest Nazarene University Human Research Review Committee (HRRC). The HRRC has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns

regarding this study please contact the Investigator or Advisor. If you have any questions regarding your rights as a research subject, please contact Ali Abedi at [redacted].

I hope that you will be able to participate in this study.

Sincerely,

Ali Abedi, PhD Candidate

Northern Nazarene University

Appendix F

Informed Participant Consent Form for Ex Post Facto Study Participants

A. PURPOSE AND BACKGROUND

Ali Abedi, PhD candidate, in the Department of Graduate Education at Northwest Nazarene University is conducting a research study to investigate factors common in successful online courses. This research seeks to answer this question by comparing the performance of an online class built from scratch based on the FICECLC Theory and an online class not built on the basis of this theory as well as having students of the two classes take two online courses as well as completing the pre-class and end-of-class technical aptitude tests.

We appreciate your involvement in helping us investigate how to create more effective and successful online courses for students.

You are being asked to participate in this study because you are a healthy volunteer, over the age of 18.

B. PROCEDURES

If you agree to be in the study, the following will occur:

- You will be asked to sign an Informed Consent Form, volunteering to participate in the study.
- You will be asked to answer questions related to demographics. This should take approximately 5 minutes to complete. This short questionnaire will determine if you qualify for participating in this study.

- On the basis of the demographics questionnaire filled (if you qualify for taking the online class), you will be assigned to the online class of "High Performance Excel – Tips and Tricks for Busy Professionals". The duration of the class is three weeks.
- You will take a pre-course assessment test. This will take about 15-20 minutes. At the completion of this test your enrollment in to the online course of "High Performance Excel – Tips and Tricks for Busy Professionals" will begin.
- At the end of the online course, you will take a post-completion assessment test/final course exam. This will take about 20-30 minutes.

These procedures will be competed over the duration of the online Microsoft Excel education course of "High Performance Excel – Tips and Tricks for Busy Professionals" offered to you for free. The duration of the study will be four weeks. The first three weeks will be for the online Excel class itself, and the fourth weeks will be for taking the course final exam.

C. RISKS/DISCOMFORTS

1. If any part of this process makes you uncomfortable, you are free to decline to answer any questions you do not wish to answer or to stop participation at any time.
2. For the research project, the researchers are requesting demographic information. Due to the makeup of the greater metro Washington DC area population, the combined answers to these questions may make an individual person identifiable. The researcher will make every effort to protect your confidentiality. However, if you are uncomfortable answering any of these questions, you may leave them blank.
3. Confidentiality: Participation in research may involve a loss of privacy; however, your records will be handled as confidentially as possible. No individual identities will be used in any reports or publications that may result from this study. All data

from notes, audio tapes, and flash drives will be kept in a locked d file cabinet and the key will be kept in a separate location. In compliance with the Federal-wide Assurance Code, data from this study will be kept for three years, after which all data from the study will be destroyed (45 CFR 46,117).

D. Data Collection Method

The data collection, instruction in the online classes offered for this study, managing and grading the course assessments, access to classes statistics such as student participation, and grades are performed by a person other than the researcher himself and the data shared with the researcher will be scrubbed of any participant identifying information such as names, student ids, nick name used in the class discussions, student name used in assignments and class discussions, and any other identifying information. Participant names and IDs will be replaced by pseudo names and numbers against a master list before being handed to the study's researcher. The study is administered, managed, and monitored by a third party that has signed a non-confidentiality agreement, and the researcher will never have access to the participants' identity or interact with them directly throughout this study.

The only individual that knows your true identity is the course instructor, and the course instructor works on behalf of a third party company hired by the researcher to perform this study's data collection. The researcher and the instructor do not interact directly, and the researcher is not provided with any data that includes student names and information.

E. BENEFITS

There will be no direct financial payment to you from participating in this study. However, the information you provide may help educators to better understand the factors leading to a successful online course.

F. PAYMENTS

There are no payments for participating in this study. However, those who complete the online course of "High Performance Excel – Tips and Tricks for Busy Professionals" will be provided with a coupon to take the PMP® Preparation Course with Simpetopia, and additionally will be entered in a draw to win a Flip Video Camcorder (in addition to coupon for the free Preparation for the PMP® online course).

G. QUESTIONS

If you have questions or concerns about participation in this study, you should first talk with the investigator. Ali Abedi can be contacted via email at aabedi@nnu.edu, via telephone at [redacted] (C) or Dr. Lori Werth, Faculty Advisor at LWerth@nnu.edu.

Should you feel distressed due to participation in this, you should contact your own health care provider.

H. CONSENT

You will be given a copy of this consent form to keep.

PARTICIPATION IN RESEARCH IS VOLUNTARY. You are free to decline to be in this study, or to withdraw from it at any point. Your decision as to whether or not to participate in this study will have not influence on your present or future status.

I give my consent to participate in this study and agree with the use of the collected data for this and future researches:

Signature of Study Participant	**Date**
Signature of Person Obtaining Consent	**Date**

THE NORTHWEST NAZARENE UNIVERSITY HUMAN RESEARCH REVIEW COMMITTE HAS REVIEWED THIS PROJECT FOR THE PROTECTION OF HUMAN PARTICIPANTS IN RESEARCH.

Appendix G

Pre-Course Excel Aptitude Test

Question No	Question Text	A	B	C	D
1	You need to calculate the sum of cells A1 = 10, A2 = 20, and A3 = 30. What is the correct formula to enter in cell A4?	=SumOf(A1:A3)	=Sum(A1 TO A3)	=Sum(A1:A3)	None of the above
2	How many columns are there in Excel 2010?	1048576	16384	65356	Unlimited
3	Maximum possible zoom in Excel is	10%	200%	400%	1000%
4	Which of the following key/key combinations will move your cursor one cell to the right?	Tab	Enter	Ctl + Tab	Shift + Enter
5	What is the address of the last cell in Excel 2010?	ZZZ999999	IV65536	XFD10486	Unlimited
6	Which column follows immediately after column Z in Excel 2010?	ZA	AA	Z1	A1
7	What is the default extension of file in Excel 2010?	.doc	.ppt	.xslx	.xls
8	Data can be sorted in multiple levels in Excel 2010	TRUE	FALSE		
9	Which statement regarding formatting is true?	You can only change the font type and size for text data	If you want to add decimal points to a number, your only choice is to use the format menu and then choose cells	You can use the autoformat command to create a certain look and then customize it to your individual requirements	When you use a $, it always appears left justified in the cell
10	Header and Footer can be displayed only in ...	Page layout view	Page break view	Normal view	All above
11	Once you go to print preview mode, you either have to print or cancel because there is no way to go back and edit your spreadsheet	TRUE	FALSE		
12	You cannot print worksheet in parts	TRUE	FALSE		
13	$C$13 is example of which type of cell reference?	Relative cell reference	Absolute cell reference	Mixed cell reference	None of the above
14	Which key is used to move between different types of cell references?	Tab	Shift + 4	F4	Enter
15	How will you enter Text in formulas?	Enter text in CAPS	Enter text as normal characters	Enter text in inverted commas	Text cannot be entered in formulas
16	True' argument in VLOOKUP function denotes _____ match	Approximate	Exact		
17	With _____ Excel changes the appearance of your data based on its value	Table formatting	Cell formatting	Conditional formatting	Style formatting
18	Conditional formatting can be applied to text	TRUE	FALSE		
19	You can have more than one rule for a cell or range of cells in conditional formatting	TRUE	FALSE		
20	You can limit the data shown in the worksheet by creating _____	Data table	Data range	Cell reference	Data Filter
21	Filter can be applied to rows as well as columns	TRUE	FALSE		

Question No	Question Text	A	B	C	D
22	An Excel tool with which you can create worksheets that can be sorted, filtered, and rearranged dynamically to emphasize different aspects of your data	Data table	Cell range	Pivot Table	Charts
23	Graphical filter objects in Pivot Table is called _____	Sparkline	Slicer	Pivot Filter	None of the above
24	What is not a type of chart in Excel 2010?	Motion NZ	XY Scatter	Stock	Area
25	Which of the following is a description of the pie chart?	Display the importance of values over time emphasizing the amount of change	Display the individual values for comparison	Display one data series as a whole. Each of its parts represent a percentage of the whole	Show trends over time emphasizing time flow and rate of change

Appendix H

Researcher National Institutes of Health (NIH) Certificate

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Ali Abedi** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 06/09/2014

Certification Number: 1484520

Appendix I

Site Visit Permission Form

This research will be conducted by teaching two groups of students in a test and control environment. Both groups are provided with the exact same training material, one in an online classroom not developed on the basis of a theory, and one group in an online course developed on the basis of the Connectivist Learning theoretical framework.

As discussed with Dr. Werth and Dr. Bankard during the October 17th presentation of the HRRC site approval process, this research will be conducted with students of the training company I own with the brand name of LearningCo (pseudonym). Due to the fact that I will not have undue influence over the students and they will be given full freedom to withdraw from the trainings without any consequences, this arrangement was discussed and agreed upon.

The information for the company and the research to be conducted are:

1) At LearningCo eLearning Website
2) Area of expertise: Project management and IT training
3) Subject of the course: Basic IT training (Microsoft Excel)
4) Geographical area covered: US and Canada
5) Target student count for the online class based on the theoretical framework: 40
6) Target student count for the online class not based on the theoretical framework: 40

Appendix J

Human Research Review Committee Approval

March 11, 2015

Dear Ali:

The HRRC has reviewed your protocol: Protocol #1232015 - Common Characteristics of Effective Online Training: A Theoretical Discussion and Framework for Online Course Design. You received "Full Approval". Congratulations, you may begin your research. If you have any questions, let me know.

Northwest Nazarene University

Melanie Person

HRRC Member

623 S University Blvd

Nampa, ID 83686

Appendix K

Data Collection Vendor Confidentiality Agreement

Title of Research Project: Common Characteristics of Effective Online Training: A Theoretical Discussion and Framework for Online Course Design.

To Principal Researcher:

As an assistant to the research team I understand that I may have access to confidential information about study sites and participants. By signing this statement, I am indicating my understanding of my responsibilities to maintain confidentiality and agree to the following:

- I understand that names and any other identifying information about study sites and participants are completely confidential.
- I agree not to divulge, publish, or otherwise make known to unauthorized persons or to the public any information obtained in the course of this research project that could identify the persons who participated in the study.
- I understand that all information about study sites or participants obtained or accessed by me in the course of my work is confidential. I agree not to divulge or otherwise make known to unauthorized persons any of this information, unless specifically authorized to do so by approved protocol or by the local principal investigator acting in response to applicable law or court order, or public health or clinical need.
- I understand that I am not to read information about study sites or participants, or any other confidential documents, nor ask questions of study participants for my own personal information but only to the extent and for the purpose of performing my assigned duties on this research project.

- I agree to notify the principal researcher immediately should I become aware of an actual breach of confidentiality or a situation which could potentially result in a breach, whether this be on my part or on the part of another person.

[redacted] [redacted]

6/17/2015

Signature Date Printed name

[redacted] 6/17/2015 [redacted]

Date

Signature of Vendor Conducting the Survey and Two Online Courses conducted for the data collection phase of the research

Appendix L

Instructor Confidentiality Agreement

Title of Research Project: Common Characteristics of Effective Online Training: A Theoretical Discussion and Framework for Online Course Design.

To Principal Researcher:

As an assistant to the research team and the instructor delivering two online classes conducted for the data collection phase of this research, I understand that I may have access to confidential information about study sites and participants. By signing this statement, I am indicating my understanding of my responsibilities to maintain confidentiality and agree to the following:

- I understand that names and any other identifying information about study sites and participants are completely confidential.
- I agree not to divulge, publish, or otherwise make known to unauthorized persons or to the public any information obtained in the course of this research project that could identify the persons who participated in the study.
- I understand that all information about study sites or participants obtained or accessed by me in the course of my work is confidential. I agree not to divulge or otherwise make known to unauthorized persons any of this information, unless specifically authorized to do so by approved protocol or by the local principal investigator acting in response to applicable law or court order, or public health or clinical need.
- I understand that I am not to read information about study sites or participants, or any other confidential documents, nor ask questions of study participants for my own

personal information but only to the extent and for the purpose of performing my assigned duties on this research project.

- I agree to notify the principal researcher immediately should I become aware of an actual breach of confidentiality or a situation which could potentially result in a breach, whether this be on my part or on the part of another person

Signature [redacted]

Date 9/21/15

Printed Name [redacted]

Signature of instructor teaching
Two online courses conducted for
The data collection phase of the
research

Appendix M

"High Performance Excel – Tips and Tricks for Busy Professionals" Course Curriculum

1. **Pre-course aptitude test:** In this short assessment test your level of Excel expertise. Students score from the post-completion assessment test against this score will be used to measure your progress in learning Excel. This test will take between 10-20 minutes to complete.
2. **Introduction to Excel:** In this section the building blocks of data management, frequently used cell format settings, key components of an Excel cell, sheet, and file are covered.
3. **Typical applications of Excel:** In this section, typical applications of Excel such as data storage and reporting, charts, calculations, and process automation are covered.
4. **Frequently used features of Excel:** In this section frequently used features of Excel such as vlookup formula, pivot table function, filters & sort, formatting objects, shortcuts, and essential formulas are covered.
5. **Advanced Excel - Part I (Data Management):** In this section the application of Excel as a data management and reporting tool is covered. Concepts such as linking cells and files, connecting to/from other data structures, and data normalization & denormalization are covered.
6. **Advanced Excel - Part II (Macro programming):** In this section, a quick and high-level overview of Excel automation is provided. At the end of this course you will be able to automate simple tasks. This section will get you started on programming with Excel and you can later progress to more advanced levels.

7. **A case study of a well-structured Excel file:** In this section, a case study of a small sales organization is provided and the challenges they are facing with managing their data (customer data, sales data, and expense data). The shortcomings in their existing structure is discussed and then replaced by a well-structured Excel system. These files are for you to keep in your personal and professional needs.
8. **Post completion aptitude test:** This is a graded test to determine how much have you learned from this course. You will get a course completion certificate after passing this exam. This test can take between 45 minutes to an hour to complete

Course grading rubric:

Week 1: 32.5% of the grade

Component	Grade
Lesson 1	1.25%
Discussion Board 1	10%
Lesson 2	1. 25%
Quiz 1 (8 questions)	20%

Week 2: 32.5% of the grade

Component	Grade
Lesson 3	1.25%
Discussion Board 2	10%
Lesson 4	1. 25%
Quiz 2 (8 questions)	20%

Week 3: 35% of the grade

Component	Grade
Lesson 5	1. 25%
Discussion Board 1	10%
Lesson 6	2.5%
Final Quiz (8 questions)	22.5%

Passing grade: 50%

Appendix N

During Course Aptitude Tests (Quizzes)

Question No	Used in Quiz	Question Text	A	B	C	D
1	1	When you copy a formula	Excel erases the original copy of the formula	Excel edits the cell references in the newly copied formula	Excel adjusts the absolute cell references	Excel doesn't adjust relative cell references
2	1	You can edit a cell by	Clicking on the formula button	Double clicking the cell to edit in place or click on the "fx" bar	Selecting Edit > Edit Cell from the menu	None of the above
3	1	A worksheet is a range of	A command used for data modelling	A group of worksheets	A group of cells	C and D
4	1	Which symbol Excel formulas begin with?	=	+	"	(
5	1	Which of the following formulas is not entered correctly?	=10+50	=B7*B1	=B7+14	10+50
6	1	Which one of the following is NOT an attribute of Excel cells?	Format	Face value	Formula	Text format
7	1	Excel treats date and time values as ...	Text entry	Decimal number against base dat	Date and time	None of the above
8	1	Len formula	Returns the position of a ch	Returns a character from another	Returns the length of cell entry	None of the above
1	2	To save a worksheet you:	Click the Save button on the standard toolbar from the menu	Press Ctrl + F5	Click Save in the Data toolbar	Select Edit > Save
2	2	How do you delete a column?	Select the column heading you want to delete and select the Delete Row button on the standard toolbar	Select the column heading you want to delete and select Insert > Delete from the menu	Select the row heading you want to delete and select Edit > Delete from the menu	Right click the column heading you want to delete and select delete from the shortcut menu
3	2	How can you print three copies of a worksheet?	Select Edit > Print and then hit 3 in the Count of Page box	Select File > Print from the menu and type 3 in the Number of copies text box	Click the Print button on the toolbar to print the document then take the print to a copy machine and make two copies	Press Ctrl + P + 3
4	2	Data can be arranged in a worksheet in an easy to understand manner using	Auto formatting	Applying styles	Changing fonts	None of the above
5	2	Getting data from a cell located in a different sheet is called	Accessing	Referencing	Updating	Functioning
6	2	Which one of the following formulas is NOT used to tie data from one table/list to another	vlookup	index	match	countif
7	2	The purpose of using the vlookup formula is to	Aggregate data	Bring data from a reference table on the basis of a lookup value	Rearrange data	Sort data
8	2	Which one of the following statements is NOT true about the filter feature of Excel	Filter and Sort are the same features	Filter can be used to find the cells with no value	Filter can be used to find values that match a range (e.g., sales price less than $10)	Filter can only be used against columns of data

Question No	Used in Quiz	Question Text	A	B	C	D
1	3	How do you select an entire column?	Select Edit > Select > Column from the menu	Click the column heading letter	Hold down the shift key as you click anywhere in the column	Hold down the ctrl key as you click anywhere in the column
2	3	Which one of the following methods can NOT be used to add an image to an Excel sheet?	Import image from a folder by going to Insert --> Illustrations --> Pictures and pointing to the picture's location	By pasting it from an application like Paint or Photoshop	From the Internet by going to Insert --> Illustrations --> Online pictures menu option	By going to Edit --> Pictures --> Import Image menu option
3	3	How can you wrap a cell's content (also known as Wrap Text)?	By hitting Alt + Enter while typing in the cell	By going to the Format menu bar and selecting Fit Cell Text to Size option	By clicking on to the main menu bar --> alignment --> Wrap Text button	None of the other answers
4	3	An absolute cell reference means that ...	When you copy the formula to another cell the type of formula doesn't change	Excel won't allow you to copy the formula to other cells	The result of the formula won't change (it is absolute) even when the referenced cells values change	For example the formula in B10 is = Sum($B$1:$B$9). If you copy the formula to B11 the referenced cells will still be $B$1:$B$9 (absolute referencing)
5	3	Which one of the following formulas can bring back matching values from other tables?	Pivot table	Vlookup	Array formula	Slicer
6	3	You want to bring back the last name of employees to a report on the basis of their employee ID and need exact matches (for instances if employee id 110 is not found, you don't want to get a last name in return). Which one of the following answers are correct?	The address to the table your Vlookup formula is pointing to (reference table) should be an absolute reference so that exact values are returned	The address to the table your Vlookup formula is pointing to (reference table) MUST be a relative reference so that exact values are returned	In the last part of Vlookup you should enter False (e.g. =Vlookup(110,A1:C10, 3, False)	In the last part of Vlookup you should enter True (e.g. =Vlookup(110,A1:C10, 3, True)
7	3	Which one of the following tools can be used to create a copy of your data with a higher level of aggregation (e.g., getting the total count of employees working in Detroit, MI)?	Pivot table	Vlookup	Conditional formatting	None of the other answers
8	3	Which one of the following statements ins true about Excel?	There are no limits to what Excel can do. As long as you can write good formulas...	There are unlimited rows and columns in an Excel file.	Vlookup formula and the pivot table are the same. One of them is more graphical (pivot table) than the other (Vlookup)	You can bring matching values from other tables either through the Vlookup formula or the index and match formulas
9	3	The TEXT formula is one of the most important formulas of Excel because ...	It allows you to change the DISPLAY format without changing the STORED VALUE (e.g., will display 0.5 as 50.000% without changing the 0.5 stored value)	It turns the stored value of your cell into a text	It permanently changes the face value (DISPLAY value) of your cells	None of the other answers

Appendix O

Interview Questions

Please say your name.

Question 1) If you could change any of the following aspects of the course, which ones would you change and why?

1) The interaction between student and course content (lecture)
2) The interaction between student and the instructor
3) The interaction between students:

Which ones were the most critical to your learning, which one was the least?

1) The interaction between student and course content (lecture)
2) The interaction between student and the instructor
3) The interaction between students

Question 2) Your class was provided with wiki and forum communication methods but the class chose to mainly stick to the instructor-led discussion board. Why? [For experimental group students' only]

Question 3) In which of the following courses would you interact more with other students:

1) When a channel of communication with clearly defined rules of interaction is provided to you (and moderated by the instructor)
2) When you are given many choices: tweet, Facebook, wiki, forum, blog, etc. and discussions are initiated and controlled by students?

Question 4) In which one of the following courses would you be more motivated to complete the course and have more opportunities to learn:

1) A course with a specific content structure (like this course)
2) A course where finding and creation of content is up to students?

Question 5) The ultimate goal of the course was for you to have an interaction with yourself, in other words your pre-course knowledge of Excel interact with your new knowledge and have "A-ha" moments. Did you have this experience? Why or why not? What were the factors behind it?

Question 6) Do you think you could not acquire new ideas/knowledge from the course if you could not communicate with other students?

Question 7) A theory claims that creation of truly innovative knowledge by the students depends solely on social-media like interactions in online learning. Do you agree with this claim?

Question 8) Would you learn more in a structured environment where you ca not tell how the next lecture will look like or in an environment like the one this course had?

Question 9) Would you learn more when the interaction is unpredictable (like Facebook) or when it is controlled like the ones we had in the discussion board?

Question 10) What aspect of the course (the instructor, the lecture, the interaction with other students, the course site) helped you or held you back from getting new ideas from the course and reaching a deep learning level?

Question 11) Tell me more about your experience taking the online course and how we can continue to teach well online.

Appendix P

Demographic Questions (Interview)

Please write your name.

_____

What is your age?

_____

Please specific your gender.

_____

Appendix Q

Over 18 informed consent form (Interview)

A. PURPOSE AND BACKGROUND

Ali Abedi, PhD candidate, in the Department of Graduate Education at Northwest Nazarene University is conducting a research study to investigate factors common in successful online courses. This research seeks to answer this question by comparing the performance of an online class built from scratch based on the FICECLC Theory and an online class not built on the basis of this theory as well as having students of the two classes take two online courses as well as completing the pre-class and end-of-class technical aptitude tests.

You are being asked to participate in this study because you are a healthy volunteer, over the age of 18.

B. PROCEDURES

If you agree to be in the study, the following will occur:

1. You will be asked to sign an Informed Consent Form, volunteering to participate in the study.
2. You will answer a set of interview questions and engage in a discussion on your experience taking the "Advanced Excel for Busy Professionals" course. This discussion will be audio taped and is expected to last approximately 60 minutes.
3. You will answer a set of demographic questions on standard paper and pencil. It should take approximately 5 minutes to answer these questions.
4. You will be asked to read a debriefing statement at the conclusion of the interview.
5. You will be asked to reply to an email at the conclusion of the study asking you to confirm the data that was gathered during the research process.

These procedures will be completed at a location mutually decided upon by the participant and principal investigator and will take a total time of about 60 minutes.

C. RISKS/DISCOMFORTS

1. Although unforeseen, it is possible that one or more of the interview questions may make you uncomfortable or upset, but you are free to decline to answer any questions you do not wish to answer or to stop participation at any time.
2. For this research project, the researcher is requesting demographic information. Due to the make-up of Washington's population, the combined answers to these questions will likely ensure that the person is not identifiable. The researchers will make every effort to protect your confidentiality. However, if you are uncomfortable answering any of these questions, you may leave them blank.
3. Confidentiality: Participation in research may involve a loss of privacy; however, your records will be handled as confidentially as possible. No individual identities will be used in any reports or publications that may result from this study. All data from notes, audio tapes, and disks will be kept in a secure location. In compliance with the Federal wide Assurance Code, data from this study will be kept for three years, after which all data from the study will be destroyed (45 CFR 46.117).

D. BENEFITS

There will be no direct benefit to you from participating in this interview. However, the information you provide may help educators to better understand the factors leading to a successful online course.

E. PAYMENTS

There are no payments for participating in this study. However, some students on the basis of their course performance had been entered into a draw, which if awarded a prize will be notified of the prize accordingly.

F. QUESTIONS

If you have questions or concerns about participation in this study, you should first talk with the investigator. Ali Abedi can be contacted via email at aabedi@nnu.edu via telephone at [redacted] (C). You can also contact the Research Supervisor for this study, Dr. Lori Werth, at [redacted] or lwerth@nnu.edu.

Should you feel distressed due to participation in this, you should contact your own health care provider.

G. CONSENT

You will be given a copy of this consent form to keep.

PARTICIPATION IN RESEARCH IS VOLUNTARY. You are free to decline to be in this study, or to withdraw from it at any point. Your decision as to whether or not to participate in this study will have no influence on your present or future status as a student at Northwest Nazarene University.

I give my consent to participate in this study:

_____ _____

Signature of Study Participant **Date**

I give my consent for the interview and discussion to be audio taped in this study:

_____ _____

Signature of Study Participant **Date**

I do not give my consent for the interview and discussion to be audio taped in this study:

_____ _____

Signature of Study Participant **Date**

I give my consent for direct quotes to be used in this study:

_____ _____

Signature of Study Participant **Date**

_____ _____

Signature of Person Obtaining Consent **Date**

I do not give my consent to participate in this study:

_____ _____

Signature of Person Obtaining Consent **Date**

THE NORTHWEST NAZARENE UNIVERSITY HUMAN RESEARCH REVIEW COMMITTE HAS REVIEWED THIS PROJECT FOR THE PROTECTION OF HUMAN PARTICIPANTS IN RESEARCH.

Appendix R

Participant Debrief

Greetings _____

Thank you for your participation in this study. I appreciate you taking the time to respond to the interview questions I asked.

After I have an opportunity to analyze the data, I will email you the results of your specific interview and ask for feedback. Mainly, I want to ensure that I captured the essence of our discussion, accurately portraying our discussion and your thoughts.

Questions

In the meantime, if you have any questions or concerns, Lisa Nolan can be contacted via email at aabedi@nnu.edu , via telephone at [redacted], or by writing: Ali Abedi, [redacted]

Thank you for your participation!

Ali Abedi

Doctoral Student

Northwest Nazarene University

HRRC Application# 1232015

Appendix S

Verbatim Instructions for the Interview

Hi ---

Thank you for your willingness to participate in this study. I appreciate it greatly.

Semi-Structured, Audio- Recorded Interviews

Two semi-structured, audio-recorded interviews will be conducted with each participant. These procedures will be completed at a location mutually decided upon by the participant and the investigator and will take a total time of about 45- 60 minutes.

This process is completely voluntary and you can select to suspend your involvement at any time. You can select to answer questions that are of comfort to you and are not obligated to answer all of the questions.

Do you have any questions or can I clarify anything?

Thank you for your participation.

Appendix T

Member Checking Email

Date

Dear---

I hope that this email finds you well. Thank you for your participation in the study entitled Common Characteristics of Effective Online Training: A Theoretical Discussion and Framework for Online Course Design. I wanted to let you know some of the themes that resulted from the interviews in this particular study (see below). Please let me know if these accurately depicted our conversation. If you have any suggestions, modifications, or questions, please let me know by Friday, March 4, 2013.

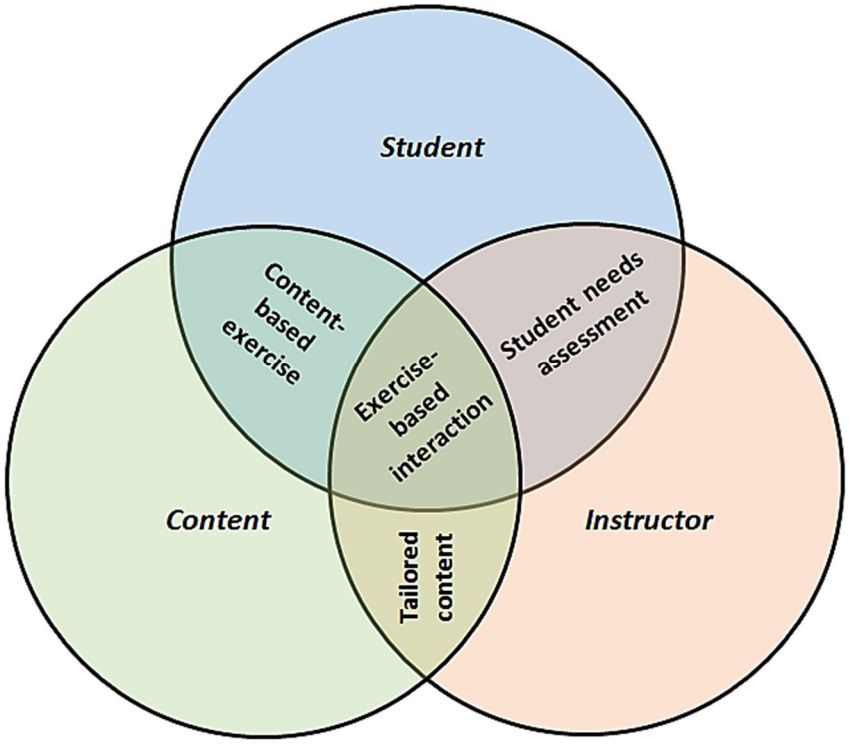
The purpose of this study was to explore the effect of social interactions on student success in an online course.

The guiding research questions in this study were

1. Are there are differences between the level of student interaction between students of an online course provided with social interaction tools and students of an online course not provided with social interaction tools?
2. Are there are any differences between the level of student achievement for students of an online course provided with social interaction tools and students of an online course not provided with social interaction tools?
3. Is there a correlation between student interaction through social interaction tools and student success?

There were many themes that emerged from the interviews that you participated in. After reading, re-reading and coding the interview transcripts, the results showed that social interaction in an online course is not a precondition for course success, but an interactive course content and instructor support when oriented to promoting application based course exercises are. The interaction between the student, content, and instructor would lead to deep learning if the interaction among them are multi directional and centered on content based exercises.

The themes from this study suggest an interlocked relationship between these three types of student interaction of student to student, student to content, and student to instructor. The following figure displays the themes from the interviews:



In this diagram, the three student interaction tights are integrated to increase the level of interaction between the student and the online course and to deepen the learning level for the students.

If these ideas do not reflect your experience or you would like to comment further, please respond to this email or contact me at the number below. Thanks again for participating in my dissertation study. It would not have been possible without you.

Best regards,
Ali Abedi
Doctoral Student
Northwest Nazarene University
aabedi@nnu.edu
Telephone: [redacted]
HRRC Approval# 1232015

Appendix U

Validation of Interview Coded Themes

Date

Dear ----,

I wanted to thank you very much for giving such an excellent interview that now I do not need to conduct the follow up interview (as originally planned) anymore. As previously explained I am sharing with you in this email the themes I picked up from the interview and do need for you to validate them in order to use them in my study. Additionally I have two short questions left from the interview that I would very greatly appreciate getting your short answers for.

Once again: thank you very much for everything.

Part 1) The questions left from the interview (please provide a short answer)

Q1) Does motivation lead to interaction or interaction leads to motivation?

Q2) What role should social media and social learning play in allowing you to succeed in learning from an online course?

Part 2) The themes/answers extracted from our interview. Do you validate these answers? Yes [] No [] (If any answer needs change please comment in ALL CAPS)

Q1) If you could change one thing from the course what would it be and why?

Coded themes from the participant's answers to the question 1 listed

Q2) Which one of the three types of interaction is most important to you (triangle)?

Coded themes from the participant's answers to the question 2 listed

Q3) Why did not students in your class not use the social learning tools made available to them?

Coded themes from the participant's answers to the question 2 listed

Q4) What factors impacted your choice of communication methods with the students or the instructor? And why?

Coded themes from the participant's answers to the question 4 listed

Q5) Which choice of communication environment would you prefer: structured or unstructured?

Coded themes from the participant's answers to the question 5 listed

Q6) What is an ideal course content environment?

Coded themes from the participant's answers to the question 6 listed

Q7) Which type of course content environment would you prefer: structured or unstructured?

Coded themes from the participant's answers to the question 7 listed

Q8) Did you have the experience of reaching deep learning in this course? Why?

Coded themes from the participant's answers to the question 8 listed

Q9) How did you acquire deep knowledge?

Coded themes from the participant's answers to the question 9 listed

Q10) In what ways could you acquire new ideas and knowledge from the course?

Coded themes from the participant's answers to the question 10 listed

Q11) How does social media in an online course impact deep learning?

Coded themes from the participant's answers to the question 11 listed

Q12) Do you think that creation of truly innovative knowledge in an online course is dependent on social interactions among students?

Coded themes from the participant's answers to the question 12 listed

Q13) What do you think the strengths and weaknesses of a structured course system are vs an unstructured course system?

Coded themes from the participant's answers to the question 13 listed

Q14) How does a student-controlled and social-media oriented environment impact your learning vs a structured one?

Coded themes from the participant's answers to the question 14 listed

Q15) What aspects of the course helped you or held you back from getting new ideas from the course?

Coded themes from the participant's answers to the question 15 listed

Q16) Is there anything else she would add/change?

Coded themes from the participant's answers to the question 16 listed

Thanks a lot,

Ali Abedi

Appendix V

Transcriber Confidentiality Agreement

Title of Research Project: Common Characteristics of Effective Online Training: A Theoretical Discussion and Framework for Online Course Design.

To Principal Researcher:

As an assistant to the research team and as the transcriber of the study, I understand that I may have access to confidential information about study sites and participants. By signing this statement, I am indicating my understanding of my responsibilities to maintain confidentiality and agree to the following:

- I understand that names and any other identifying information about the study and its participants are completely confidential.
- I agree not to divulge, publish, or otherwise make known to unauthorized persons or to the public any information obtained in the course of this research project that could identify the persons who participated in the study.
- I understand that all information about study sites or participants obtained or accessed by me in the course of my work is confidential. I agree not to divulge or otherwise make known to unauthorized persons any of this information, unless specifically authorized to do so by approved protocol or by the local principal investigator acting in response to applicable law or court order, or public health or clinical need.
- I understand that I am not to read information about study sites or participants, or any other confidential documents, nor ask questions of study participants for my own

personal information but only to the extent and for the purpose of performing my assigned duties on this research project.

I agree to notify the principal researcher immediately should I become aware of an actual breach of confidentiality or a situation which could potentially result in a breach, whether this be on my part or on the part of another person

Signature	Date	Printed Name
[redacted]	11/13/15	[redacted]
Signature of the transcriber in charge of transcribing the recorded interviews		

Appendix W

Top Ten Frequent Codes from Interviews Explained

Table 17 contains the top 10 frequent codes from interviews. The codes from this table are explained in further in the following list:

1) **Interactive content:** Participants considered a content to be interactive if it used multi medium material, such as text based content, video content, glossaries, summaries of lessons, course agenda, flow charts, diagrams, and study road maps. Multi medium content should not be confused with multimedia content which is referred to a course that uses audio, video, and textual material. The difference between multi medium and multimedia content based on the interviews conducted is an increased level of connectivity between the student and content as opposed to simply providing them in audio, video, and textual formats. Other attributes of an interactive content based on the themes extracted from the interviews were short lectures, slower pace for introductory lessons, fine grain content which means the content is explained in great detail and supported by examples and exercises, and application based exercises and examples provided to students.

   As explained in the above paragraph, participants in the study positioned an interactive content at a higher level of importance than the instructor and social interaction in an online course, and one of the key characteristics of an interactive online course content was the existence of content based exercises. A content based exercise is an exercise that utilizes the concepts thought in the lectures and expands on them so that the student can internalize the knowledge by solving the application-based exercises.

2) **Content-based exercise:** The interaction between the student and the content, as expressed by the participants should be deepened by having the students solve case studies, projects, and exercises that are directly referenced in the lecture and allow the student to internalize the course content. Simulated exercises, expansion of the case studies and examples from the content, and application based group projects were mentioned by the study participants as preferred types of content based exercise.
3) **Structured course environment is preferred:** The FICECLC Theory (Anderson et al., 2014) states that in order for an online learner to reach a deep level of learning, that student has to be exposed to an environment in which the course content is in parts or in whole created by the students, and social interaction among students are mostly through social interaction tools and managed by students and not the instructor. This environment is loosely defined as an unstructured environment. Participants in the study preferred a structured course environment, one which the content is prepared by the instructor and the student interaction is moderated and overseen by the instructor. In their opinion, an interactive and exercise based content that is used as the basis for teaching, instructor to student interaction, and student to student interaction is the primary component of a successful online course and not the existence of social interaction tools in the course, unless social interaction tools are tied to the content through exercise based social interactions.
4) **Tailored content:** In order for an online course to be successful and utilize social interaction in allowing the students to reach deep levels of learning, the content of the course has to be interactive and meet the educational needs of the students. The instructor needs to play an active role early on in the course to engage students and assess

their educational needs and expertise level with the course subject. Once the applications sought by the students is formulated by the instructor, the course content and supporting exercises need to be tailored to the educational needs of the students. The students will engage with the interactive content of the course through the tailored content-based exercises, and use the exercises as the theme of their social interactions.

5) **Instructor support:** Study participants appreciated the role of a supportive instructor and believed that the instructor role is to assess the student needs at the beginning of the course and tailor the content accordingly. Furthermore, the role of the instructor is to comment on student posts in response to their exercise based social interaction posts and mentor them to deep levels of learning.
6) **Social interaction is not a core requirement for deep learning:** Anderson et al. (2014) constructed the FICECLC Theory as a guide for practitioners and researchers to examine and support multiple types of effective interactions (p121). They do not endorse the standard MOOCs education model because they are mainly based on content from and supported by the instructor. Their ideal course environment would be based on student social interaction and is heavily based on student to student interaction. They however, acknowledge that student interaction in this theory is open and extended and is the most complicated type of student interaction because the student has much more choices to interact with such as resources, the content, different social interaction channels, and will be participants in creation and distribution of knowledge (Anderson et al., 2014).
7) **Course structure should be subordinated to student type:** Student types can be broken into two groups: the first group of students are more likely to interact with other students in an online course, students in this group are young, and/or college students, and/or at a

basic level with the course subject. The second group of students are less likely to interact with other students, they are older than the first group, and/or are working professionals, and/or are at advanced levels with the course subject. Course types can be categorized as social interaction friendly and less interaction based courses. Courses have one or more than one of the following traits tend to be more suitable for social interactions: mandatory, qualitative subject, basic subject, lengthy duration, and interaction based subjects. On the other hand courses that have one or more of the following characteristics are less ideal for social interaction activities: optional, professional, quantitative subject, complex subject, short duration, and content based subjects.

8) **Fine grain content:** Participants in the study believed that the lectures provided to students should be short in duration, follow a logical progression, and cover advanced topics related to the subject of the course. A course that goes too quickly through the basics or does not cover advanced topics is not considered a course with a fine grain content.

9) **Course configuration should be subordinated to course type:** Anderson et al. (2014) FICECLC Theory explains in great detail what stages of student to course interaction a student needs to go through in order for the connectivist learning to take place, but they fail to provide practical guidelines for how to construct an environment where students volunteer in creation and distribution of knowledge through social interaction tools. Participants in this study believed that the effectiveness of social interaction tools in an online course is highly dependent on the student type and course type. Anderson et al. (2014) too acknowledge that a social connectivist and unstructured course environment is

not for everyone and do not specify what type of students would be more suited to a social connectivist learning environment. Participants in this study provided insight into the different student and course types that an instructor should be aware of when building an effective online course.

10) **Exercise-based interaction is needed for effective social interaction:** Participants in the study viewed social interaction in online courses, especially student interaction channeled through social interaction tools as a distraction unless the topic of discussion in the student led channels are centered around content based exercises. Students will be able to collaborate in creating new and deep knowledge about the subject of the online course by solving the content-based exercises as group projects and discussing the challenges, findings, and applications of their learnings via social interaction tools.

Appendix XComplete List of Codes from Interview Data

Theme	# of responses
Interactive content	81
Content-based exercise	68
Structured environment is preferred	62
Tailored content	51
Instructor support	49
Social interaction is not a core requirement for deep learning	46
Course structure should be subordinated to student type	42
Fine grain content	40
Course configuration should be subordinated to course type	33
Exercise-based interaction is needed for effective social interaction	31
Content is core	30
Content environment depends on environmental factors	29
Instructor interaction	29
Unstructured environment has benefits	29
Course lacked enough social interaction	14
Hybrid course environment is preferred	9
Facebook is a tool of choice for social interaction	5
Instructor is core	4
Social interaction is core	4
Structured environment leads to deep learning	2
Life challenges held me back from learning more	1