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Massive open online courses (MOOCs) and completion rates: are self-directed adult learners the most successful at MOOCs?

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MASSIVE OPEN ONLINE COURSES (MOOCs) AND COMPLETION RATES: ARE SELF-DIRECTED ADULT LEARNERS THE MOST SUCCESSFUL AT MOOCs?

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by

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

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ABSTRACT

Millions of adults have registered for massive open online courses, known as MOOCs, yet little research exists on how effective MOOCs are at meeting the needs of these learners. Critics of MOOCs highlight that their completion rates can average fewer than 5% of those registered. Such low completion rates raise questions about the effectiveness of MOOCs and whether adults enrolling in them have the skills and abilities needed for success. MOOCs have the potential to be powerful change agents for universities and students, but it has previously been unknown whether these online courses serve more than just the most persistent, self-directed learners. This study explored the relationship between self-directed learning readiness and MOOC completion percents among adults taking a single Coursera MOOC. By examining self-directed learning - the ability to take responsibility for one's own educational experiences - and MOOC completion rates, this research may assist in improving the quality of MOOCs.

A statistically significant relationship was found between self-directed learning and MOOC completion percentages. Those stronger in self-directed learning tended to complete a greater percent of the MOOC examined. In addition, English speaking ability demonstrated a mediating effect between self-directed learning and MOOC completion. Learners indicating a strong ability in speaking English were more likely to be ready for self-directed learning and completed a higher percentage of the MOOC. Compared with those that did not complete MOOCs, however, few additional differences in demographics of adult learners that completed MOOCs were found.

To better understand the skills and experiences needed to be successful in a MOOC, additional research on factors that influence MOOC completion is warranted. If only a minority of strongly self-directed learners can successfully complete MOOCs, then more resources should

be invested into the design and development of MOOCs to meet the needs of many learners. If this does not occur, then MOOC completion rates could continue to suffer and new open education solutions of higher quality may appear, making MOOCs a short-lived phenomenon.

Chapter 1: Introduction

Introduction

Online courses for adult learners have traditionally suffered from lower course completion rates than face-to-face classroom courses (Rovai, 2002). Dropout rates for online university courses have been found to be 10% to 20% higher than traditional college classroom courses (Carr, 2000). Barriers to completion of university and continuing education online courses for adult learners are often linked to feelings of isolation, lack of support from the learning community and instructor, and challenges with persistence (Rovai, 2002). Massive open online courses, called MOOCs, are a new platform and online course structure being used to deliver instruction simultaneously to thousands of learners. Yet, completion rates for MOOCs are not nearly as high as what has been found for similar university classroom or online courses (Watters, 2012a).

There are three unique features of MOOCs that may contribute to the low completion rates and corresponding high enrollment numbers that other online courses offered at universities do not have. First, in terms of cost, MOOCs are free of charge, which removes the barrier that higher education is only available to the wealthy. When examining the universities that offer MOOCs, such as Harvard, Massachusetts Institute of Technology (MIT), and Stanford, it seems likely that MOOC learners now have access to education from Ivy League universities that many may have never thought possible (Pappano, 2012). Second, MOOCs are usually taken asynchronously when individuals have time, making them a flexible education option for working adults, parents, and anyone with a busy schedule. However, MOOCs are still only available for a scheduled period of time. If a leaner registers, but has scheduling conflicts during the MOOC period, then that learner cannot complete the course. Third, MOOCs are open and

accessible to anyone with an Internet connection, making them available to adults located across the globe. Given these three criteria alone, MOOCs may be the beginning to the various challenges facing universities today. However, while these three factors may be some of the reasons why MOOCs are attracting large numbers of registrants, they may also offer insight into why low numbers of learners complete MOOCs.

Though millions of adult learners have registered for MOOCs, there are few empirical studies at this time that examine MOOCs and their value for learning. Critics cannot help but point out that MOOC completion rates can average fewer than 5% of those registered (Kolowich, 2012; Pappano, 2012; Balch, 2013). A recent unofficial study examined enrollment and completion rates of MOOC learners from data made available to the public. This study reported enrollments for MOOCs were typically around 50,000 learners with most MOOCs having completion rates lower than 10% (Jordan, 2013). Such evidence raises questions about the effectiveness of the MOOC learning environment for adult learners, and whether all adults have the skills and abilities needed to succeed within MOOCs.

Different theories exist to explain these low MOOC completion rates. For example, adult learners may find MOOCs challenging because the courses are massive, meaning that one course can contain hundreds of thousands of learners. Because of these enormous class sizes, the design of MOOCs may not allow for a single instructor to direct, guide, or assist the participants, leaving learners to take charge of the learning environment for themselves. Fortunately, self-directed learners are often able to take responsibility for their own learning, and these self-guided learners may not always need the physical presence of an instructor to direct the learning process (Knowles, 1975). However, adult learners who are not familiar with how MOOCs are structured or how to manage their own learning experiences with self-directed learning are likely to

struggle within such environments (Koutropoulos & Hogue, 2012). In one study, some learners expressed the desire for more direction and guidance throughout their MOOC experience (Kop, 2011). Kop (2011) also noted that to be successful at MOOCs participants needed confidence in their abilities, competence with the technology tools, and the capability to take charge of their own learning experience. If MOOCs are not designed to support and motivate learners with varying degrees of self-direction then, given the low threshold for entry compounded with the struggles some may face with these courses, dropping out could be a predicable outcome for the majority of learners (Balch, 2013).

A more thorough investigation of the traits of MOOC adult learners is needed. By studying self-directed learning, new strategies may be identified to increase MOOC completion and learning. Knowing more about those learners that complete MOOCs and those that do not can provide insight into how to improve the design and development of MOOCs so that more adult learners can experience success. MOOCs have the potential to be powerful change agents for universities and adult learners, but these courses should serve more than just the most persistent, self-directed learners.

Background

The creation of MOOCs likely originated from several different forces working together to create a strong need for quality, massive, free, online education. The first force is the desire adults have for continuing education. Every year more adults want to participate in quality education courses than can afford them, or that can gain access to them (Daniel, 1996). The need for higher education is steadily increasing as more adults define themselves as life-long learners who want to continue to participate in quality learning experiences (Knowles, 1980). In addition, as people both live and work longer and change careers, the demand for skill development

through higher education increases (Knapper & Cropley, 2000). Learners across the globe increasingly want to access reputable university courses to obtain a quality education, but location, costs, and scheduling can present substantial barriers. As the demand for higher education by adults increases, MOOCs are one possible solution universities can use to offer their education to adults throughout the world, to help people develop new skills for their careers, and to expand individuals' intellectual and personal networks (Pappano, 2012).

The second force driving the creation of MOOCs may be the inability of many universities to meet the stated needs of adult learners. For decades higher education has been criticized for not evolving to offer non-traditional students more education opportunities. Daniel (1996) predicted that by 2006 one hundred million people would qualify for higher education, and it would not be possible for traditional universities can keep pace with these numbers. This increased interest in higher education is stymied by three critical areas where universities are not serving learners: cost, flexibility, and access (Daniel, 1997). Many believe that MOOCs, which take advantage of different technology tools, may be a catalyst solution to these kinds of problems.

Not only are adult learners' needs changing, but the learning process is evolving as well. The third force that may have influenced the creation of MOOCs is an increase in informal learning among adult learners. Learning and working are now closely linked, so much so that it can be it challenging to distinguish between the two (Siemens, 2005). Technology, especially the Internet, makes it easier than ever to connect with communities and resources online. This technology can support the notion that learning is continual across an individual's lifetime and does not end when formal schooling is completed.

History of MOOCs. The term MOOC originated in 2008 from Siemens and Downes

who were experimenting with opening their online courses at a Canadian university. Initially 25 participants registered and paid for one of Siemens and Downes online courses on connectivism. Yet, when the faculty opened the course to anyone for free - with the understanding the non-paying individuals would not receive credit for completing the course - another 2,300 learners registered to participate (Cormier & Siemens, 2010). Siemens and Downes opened this first course to anyone in hopes of changing the dynamic of what was learned and how it was learned. By inviting more people into the conversation, the instructors wished to gain new perspectives and global viewpoints that the original 25 students would otherwise never have been able to provide. Siemens and Downes not only saw the course as open to anyone, but also wanted the content to be created collaboratively out in the open. This new course structure gave learners a larger role, meaning they had to contribute and direct the course flow, the conversation, and ultimately what was learned (Cormier & Siemens, 2010). Siemens and Downes went on to offer additional MOOCs at their Canadian university using a similar model.

The original MOOCs as taught by Siemens and Downes focused on open teaching and learning, and are now commonly referred to as a connectivist MOOCs or cMOOCs. cMOOCs are one category of MOOC designed and taught based on connectivism learning theory. This learning theory focuses on the idea that knowledge is developed through connections with technology and other individuals. These connections and interactions, both social and neural, take place in many different contexts (Siemens, 2012).

MOOCs were introduced into mainstream education in 2011 when two professors from Stanford University, Thrun and Novig, opened their artificial intelligence course to anyone in the world with access to the Internet. As a result, over 160,000 adult learners registered from 190 different countries making this one of the most attended computer science courses in history

(Rodriguez, 2012). This second category of MOOCs from Stanford is called an xMOOC, or sometimes referred to as an AI MOOC based on the artificial intelligence MOOC offered by Stanford. The xMOOC is the most well known type of MOOC and is usually what is being referred to when discussing MOOCs. Though both types of MOOCs share the same massive, open, online, course distinctions, xMOOCs differ from cMOOCs in that they are not based on connectivist learning theory, but rather are more traditional university courses built from cognitive, behaviorist, and social constructivist learning theories (Rodriguez, 2012).

Within just one year of the AI MOOC emerging, three large MOOC organizations formed known as Udacity, edX, and Coursera. After the success of their MOOC, the faculty from the AI MOOC left Stanford to form the company Udacity to host their own MOOCs (Pappano, 2012). EdX was founded from a partnership between MIT and Harvard University as a way to offer free online courses from these two top universities. EdX claims to host over 370,000 learners in its MOOC offerings. Coursera, currently the largest MOOC platform, boasts over two million registrants. Coursera's model is to partner with universities and provide them the platform and assistance converting their university classroom courses into MOOCs. Coursera is also a for-profit organization started by faculty from Stanford University (Pappano, 2012).

Though there are two main types of MOOCs, both share common traits and features. According to McAuley, Stewart, Siemens, and Cormier (2010), MOOCs are spaces where social networking takes place around a specific topic guided by an expert in that topic while accessing free resources. Yet, MOOCs also have other characteristics that distinguish them from online university courses or online workplace continuing education most adults are familiar with. For example, MOOCs have massive numbers of registrants. Traditionally, online university and workplace courses have been built with a small class size focused on the expertise of an

instructor. Within one MOOC, hundreds of thousands of adult learners can be registered and participating at any one time. With MOOCs, it is not possible to follow traditional course models of development and student engagement. Learners must work independently, engage with the content through technology, and work with their peers to complete a MOOC.

Other unique features of MOOCs are that they are open to all, with information that can be freely accessed, and MOOCs are primarily taken online. MOOCs facilitate spaces for dialogue, interactions, sharing, and creating, which reflects the role of social media spaces found throughout the Internet (McAuley et al., 2010). Many MOOCs contain a course wiki within the platform, or a link directly to a wiki, where learners are encouraged to share and build knowledge. Some MOOCs use other social media spaces such as Twitter as a means for chatting (deWaard et al., 2011). Other MOOCs are also open in that they do not have clearly defined course objectives to work toward. This means the participants can work together within some MOOCs to create content, or influence what topics the courses focus on, though this is more commonly found in cMOOCs.

Additional features of MOOCs include that they typically have no fee for participation, require no pre-requisites, and do not offer formal credit for participation (McAuley et al., 2010). However, on September 6, 2012, Colorado State University announced plans to offer academic credit that is transferable toward a degree with completion of a free Udacity computer science MOOC (Mangan, 2012). For the initial Udacity MOOC offering, 94,000 people registered for this introductory computer science MOOC and almost 98,000 registered to take the second offering. It is important to note that to receive credit, individuals must pay a fee to a testing group and take a proctored exam. This university may be one of the first American universities

to offer college credit for a MOOC, but Udacity claims that other institutions should be following the lead of Colorado State University in the near future (Mangan, 2012).

Offering course credit for MOOCs is one strategy universities hope to use to turn MOOC learners into profits. There are various business models universities are implementing to monetize what is essentially free education. For example, MOOC instructors can promote the sale of their personal texts that compliment their course content. In addition, students can pay to get a certificate of course completion, allowing that they first completed all the requirements of the MOOC. Other MOOCs have developed two different tracks, one for paying learners and another track for free within the same MOOC. Those that pay, get additional perks such as more content, more support, and certificates of completion. However, the question remains if MOOCs will generate profits for universities. Some universities claim that MOOCs cost between $15,000 and $50,000 to develop, while MOOC instructors have reported investing hundreds of hours into development and facilitation of their MOOCs. It is challenging to imagine that many universities will continue to invest such resources in MOOCs unless they begin to turn profits and more learners within MOOCs can successfully complete them (Colman, 2013).

To summarize, MOOCs are a new education phenomena that have spread rapidly into the field of higher education. Many universities already offer some MOOCs and momentum indicates that many new MOOCs are being developed for release. In fact, The New York Times declared 2012 the "Year of the MOOC" (Pappano, 2012) because of the hundreds of millions of dollars are being poured into the platform (Siemens, 2012), the expanding corporate interest in them by companies like Google and Microsoft (Watters, 2012b), and the hundreds of thousands of learners registering for them (Young, 2012). Yet, it seems there has been little regard to how effective MOOCs are at meeting the needs of adult learners (Watters, 2012a).

Questions are being raised about the instructional design of MOOCs, as well as the high attrition rates of adult learners registering for them. In terms of instructional design, some fear that MOOCs take the model of a large lecture hall and place it online using videos of an instructor, and some quizzes, resulting in little student engagement (Davidson, 2012). It appears that the design of all MOOCs may not always be meeting the standards that some would hold MOOCs to with regard to theories of how adults learn and given the capability of technology today. In terms of student completion, not enough focus is being given to why completion rates for MOOCs are only between 5% to 15% (Watters, 2012a). Yet, MOOCs are alleged to be meeting the needs of a new education population, the millions of people across the globe that are not currently being served by traditional university courses (Hockfield & Faust, 2012).

Looking back at the high attrition rates of MOOCs, some challenges that learners face have already been discussed. Yet one area that MOOC providers struggle with is marketing. Some tout a MOOCs' ability to benefit third world countries where people wanting access to education do not have opportunities to attend higher education (Rivard, 2013b). However, the majority of MOOCs are currently developed by western universities and may not be culturally or linguistically appropriate for all learners (Rivard, 2013b). In addition, at the time of writing, less than 35% of the world's population is Internet users (Internet World Stats, 2012). Making sure that MOOCs are marketed to the appropriate target populations is not a simple task, especially when current marketing strategies involve promoting MOOCs through social media, online forums and interest groups, often by the universities themselves that are offering the MOOCs.

If universities are going to continue to spend millions of dollars and begin to offer credit for MOOCs, then these courses should be an effective education solution that many adult learners can complete. However, little is known about what it takes to complete a MOOC and if

MOOCs are designed for different types of adult learners. More information is needed about the skills of those taking MOOCs before they can be deemed apropos for adult learners and universities.

Purpose and Nature of the Study

The purpose of this study was to determine the extent to which, if at all, there was a relationship between the degree of self-directed learning readiness among adult learners and the degree of their MOOC completion. In addition, this study explored the extent to which, if at all, there were differences in the demographics of adult learners that completed MOOCs compared with those learners that did not. Lastly, this study examined the extent to which, if at all, adult learner demographics mediated the relationship between self-directed learning readiness and degree of MOOC completion.

This quantitative study attempted to measure self-directed learning, demographics, and MOOC completion using cross-sectional data collection from two online surveys. MOOC adult learner readiness for self-directed learning was examined using a self-directed learning instrument developed by Fisher, King, & Tague (2001). The percentage of MOOC completion was also collected in a self-reported online survey.

Research Questions

This research study explored the relationship between self-directed learning and MOOC completion percentages among adult learners taking a single Coursera MOOC. The following research questions were answered:

1. To what extent, if at all, was there a relationship between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion?
2. To what extent, if at all, were there differences in the demographics of adult learners that

completed a MOOC compared with those that did not complete a MOOC?

3. To what extent, if at all, did adult learner demographics mediate the relationship between self-directed learning readiness and degree of MOOC completion?

Hypothesis

This research study explored three different hypotheses based on each of the research questions presented. The first hypothesis was that the more competent adult learners were at self-directed learning, the more likely these learners would be to successfully complete a greater percent of the MOOC examined in this study. Course completion is a measure or educational outcome often used to assess quality and effectiveness of an online course (Bonk & Kim, 2006). Low completion rates may be a sign that participants are facing challenges, or that the educational options being provided may not be meeting their needs (California Community Colleges Chancellor's Office, 2012). A survey of online instructors and higher education administrators found that self-regulation of learning by university students was identified as the most important success factors for students of online university courses (Bonk & Kim, 2006). It was expected that adult learners stronger in self-directed learning were more capable and successful in a MOOC because of the characteristics of the MOOC and how it was designed.

In terms of design, MOOCs must be structured for thousands of learners to participate in at the same time. This means the learners interact with technology tools, course content, and other participants within the course, though not necessarily with an instructor. In most MOOCs an instructor is not available to assist the learners, answer questions, or make sure learners are progressing smoothly through the MOOC. As a result, participants must actively manage their own learning, must take initiative and seek help from their peers when needed, and have to motivate themselves through the course. These traits, which a learner would need to progress

through a MOOC, are similar to what Knowles (1975) described for self-directed learners. In addition, most MOOCs do not have pre-requisites or offer an orientation on how to successfully participate in a MOOC, and many MOOCs lack structure or additional strategies used to makes sure the correct learners are enrolled in the course. As they are predominantly designed at the moment, it seems that adults weaker in self-directed learning may struggle in completing some MOOCs (Koutropoulos & Hogue, 2012).

The second hypothesis explored was that those adult learners with previous experience taking a MOOC would be more likely to complete the MOOC examined in this study. One of the demographic questions found on the survey for this research study asked participants to indicate if they had previously taken a MOOC, other than the one for which this study examined. Previous empirical research has found that the experience a learner has with university distance education is related to the likelihood that the learner will complete or drop out of a distance learning course (Parker, 1999). This suggests that the more distance education courses learners have taken, the more likely they are to succeed and complete distance learning courses in the future. In addition, Candy (1991) found that learners may be strong in self-directed learning for topics with which they are familiar, or in contexts that are similar to a prior experience. Also, Eisenberg and Dowsett (1990) and Erhman (1990) found that university students taking online education for the first time did not have all the necessary skills needed to be successful in those courses.

Lee and Choi (2010) conducted a review of research on dropout rates for online courses in higher education. The researchers attempted to identify critical factors that might cause a university student to dropout of an online course. Based on the literature reviewed, the researchers decided not to include demographics such as age and gender as critical to dropout

rates. They found that the literature was inconsistent as to whether relationships exist between demographics and the likelihood of completing distance education courses. However, they did cite relevant experience - specifically, the number of previous courses completed online - as well as several skills that could be linked to self-directed learning such as self-control, motivation, and love of learning, as pertinent to online course completion. The study found higher education students who previously completed online courses and demonstrated traits associated with self-directed learning were more likely to complete subsequent online courses as part of their university education (Lee & Choi, 2010).

Similarly, first time MOOC participants report feelings of being overwhelmed and lost in some of the initial MOOCs offered in 2008 and 2009 (Kop, 2011). Based on this, it seemed reasonable to explore the hypothesis that students with previous MOOC experience would be able to complete a MOOC over those with no previous MOOC experience. For this study, previous MOOC experience was defined for participants as having previously enrolled in and completed some or all of a different MOOC in the past.

The third hypothesis explored in this study assumed that adult learners in their thirties and forties, who are female, with high levels of education, previous MOOC experience, strong English language skills, and with no physical disability or impairment that may interfere with completing an online course, would be stronger self-directed learners and more likely to complete a greater percentage of the MOOC examined in this study. To explore this hypothesis this study collected participant data on several demographics including age, gender, level of education completed, previous MOOC experience, English language ability, and a disability or impairment, in addition to measuring self-directed learning and MOOC completion. The rationales for exploring each of the demographic variables and how they have previously been

found to influence self-directed learning or MOOC completion are explored next.

Age and gender were selected as important variables to measure because self-directed learning readiness has been found to correlate to a person's age and possibly gender in some instances. Reio and Davis (2005) conducted a study that measured individuals' readiness for self-directed learning, age, gender, and ethnicity. The study found that adolescents and young adults scored lowest on the scale for self-directed learning readiness, while those participants in there thirties and forties scored the highest in readiness for self-directed learning. In terms of gender, the study found that younger females scored higher on the self-directed learning readiness scale than younger males of the same age. Other studies have also shown that age and gender are linked to self-directed learning readiness (Long, 2003; Reio, 2004; Liddell, 2008; Guglielmino, 1996).

For the variable education, the level of education completed has also been linked to a person's self-directed learning readiness in some studies. In a study by Guglielmino, Guglielmino, and Long (1987) over 700 American workers provided demographic information and completed the self-directed learning measurement tool developed by Guglielmino (1977). It was found that workers with high levels of education were stronger in self-directed learning than those workers with lower levels of education.

A demographic question in the survey used in the present study asked participants to indicate if they had taken another MOOC in the past. As mentioned previously, studies have found that the experience a learner has with distance education is related to the likelihood that learner will drop out of a distance learning course (Parker, 1999). Specifically, the more distance education courses a person has taken, the more likely this person is to succeed and complete a distance-learning course in the future. Therefore, one might expect a learner with previous

MOOC experience to be more successful within a MOOC than those learners that have never taken one in the past.

Through the first online survey administered learners were also asked to rate their ability to speak and read English. This language information could be critical because MOOCs are open to global learners and Coursera, the host of the MOOC selected for this research study, claims to have registrants from 195 different countries (Lapowski, 2013). However, it is important to note that only around five percent of the world's population identify themselves as native English speakers (Central Intelligence Agency, 2013). Content for the Coursera MOOC used in this study was only made available in English, which could have inhibited some learners from successfully completing all or some of the MOOC. In addition, having a physical impairment or disability could have also interfered with online course completion (Pearson & Koppi, 2002).

Theoretical Framework

The theoretical framework for this research study was adult learning theory, which draws from both andragogy and self-directed learning. As it was a critical component of this study, it was logical to explore where this concept originated to identify a theory. Before andragogy and self-directed learning are discussed, a brief introduction to adult learning theory is provided.

To provide a historical perspective, before adult learning theory emerged it was assumed that both children and adults learned in the same way, meaning that instructional strategies and methods used for children were also appropriate for adults. Yet, educators found that adult learners seemed reluctant to participate in long lectures, drills, quizzes, and tests commonly found in classrooms with children. Adults were searching for something more stimulating and often ended up dropping out of formal education situations that treated them as children (Knowles, 1980).

Up until the 1950s, adult educators were experimenting with changes to instruction for adult learners as they attempted to identify strategies that worked better for more mature students. In 1961, one of the first scientific studies conducted on informal adult learning by Houle (1961) found that there were distinct categories of adult continuing learners: goal-orientated, activity-orientated, and learning-orientated. Goal-orientated learners were said to aim to accomplish a very specific objective, while activity-orientated learners were believed to find meaning in participation; learning-orientated adults were thought to want to acquire new knowledge for the sake of learning (Houle, 1961). This study of adult learners lead Tough (1967, 1971) to identify key characteristics of adult learners that helped shape what is now adult learning theory. These characteristics included adults' need to engage in continuing education outside of formal educational settings, the fact that adults have a unique way of learning new things, and that adults turn to others for help who may or may not be educators on the subject being learned (Tough, 1967, 1971). These and many other studies have led to what is commonly referred to as adult learning theory.

Though there is no one theory that encompasses all known about adult learning, there are two foundational components of how adults learn. The two pillars shaping adult learning theory are andragogy and self-directed learning (Merriam, 2001). First, andragogy will be discussed, followed by a discussion of self-directed learning.

Andragogy, or how adults learn, incorporates characteristics that explain adult learning behavior. For example, as children become adult learners they transition from dependent to self-directed learning. In the process, their life experiences play a larger role in learning, their social roles are linked to readiness to learn, they favor a need for immediate application of new knowledge, and they are more internally motivated, as opposed to externally, to learn (Knowles,

1980). Within andragogy an instructor or teacher is seen more as a guide or resource than a single person with all of the knowledge that is responsible for imparting that information to others. Adult learners are also viewed as having valuable experiences that can be shared with their peers to assist in learning (Knowles, 1980).

Critics of andragogy challenge some of these characteristics of adult learning (Merriam, 2001). For example, children may be taught to be dependent on adults and then are viewed as passive learners. Culture often encourages this dependence into adulthood, which can impact an adult's ability to learn autonomously. If individuals are taught to be passive learners throughout their formal educational years, then this can result in some adults entering a formal education situation with a tendency to revert back to this dependence on the instructor to take charge of the learning process. If these same adults are suddenly expected to learn independently in a formal education setting, anxiety and stress can result (Knowles, 1980).

Self-directed learning refers to the ability to take responsibility for one's own learning without the need or physical presence of an instructor to direct the learning experience (Knowles, 1975). Knowles (1975) found that competent self-directed learners initiate their own learning, diagnose their own needs, create goals, identify resources, choose how to accomplish learning goals, and can even evaluate their progress toward meeting their learning goals. Guglielmino and Guglielmino (2003) also found similar characteristics of self-directed learners. Such characteristics include being independent, persevering through a learning experience, viewing issues as challenges and not obstacles, bringing curiosity and discipline to leaning practices, embracing change, and enjoying learning.

Many different models and tools have been developed to assist students and instructors with the concept. One of the most well known instructional frameworks of self-directed learning

is the Stages of Self-Directed Learning (SSDL) model (Grow, 1991, 1994). This model presents the concept of self-directed learning on a matrix, which allows adult learners to locate their own readiness for self-directed learning. If learners are aware of their own strengths and deficits toward self-directed learning, then these deficits can be linked to a number of instructional strategies aimed at meeting their needs. For example, learners who are strong in self-directed learning should be able to successfully complete independent projects and interact directly with their peers with little guidance from an instructor (Merriam, 2001). However, learners who are not as competent with independent learning will likely need more direction and support to complete the same project.

From this description of self-directed learning it is possible to understand how this principle falls into conflict with traditional models of education in which participants are often told what and how to learn (Knowles, 1980). If the role of a teacher is essentially keeping learners dependent on that one individual for education, then children are being trained to passively receive information throughout their time in school. As a result, (Knowles, 1980) argues that it is less likely these children will grow into adults who are active seekers of education. Instead, an argument could be made that education needs to focus on making learners independent in their inquiry and more autonomous. Individuals exposed to this independent type of education grow to seek out learning experiences, enjoy learning new things, and embrace changes as an opportunity to learn (Knowles, 1980).

The fact of being an adult does not mean one is a self-directed learner has led Knowles and others to view characteristics of self-directed learning and andragogy on a continuum where some adults may fall closer to dependent learning than other adults who are stronger in self-directed learning (Knowles, 1989). In addition, Candy (1991) notes that because a learner is self-

directed in one situation, it should not be assumed that this same learner does not need structure and extra assistance to learn in a different situation or context. In other words, one criticism of self-directed learning competence is that it may change based on the situation at hand.

Though differences do exist in terms of determining who is self-directed and when, it seems likely that adult learners competent in self-directed learning would find success in online learning courses and environments. More than one study has found, through surveying e-learning and adult education professionals in university settings, that one of the most critical characteristics central to the success of online learners is readiness for self-directed learning (Guglielmino & Guglielmino, 2003; Bonk & Kim, 2006). It may be assumed that learners can somewhat quickly grasp the technology used in online courses, but competence in self-directed learning is likely not as easily taught. In addition, being capable in self-directed learning was found to be a more reliable indicator of course completion in a university setting then having other skills such as technology competence (Guglielmino & Guglielmino, 2003).

Self-directed learners do seem to have an advantage when it comes to completing e-learning (Garrison, 2003), also referred to as online courses. Many online courses in higher education and workplaces are self-paced, have opportunities for interaction with peers, and provide additional resources to expand knowledge. Because of the lack of a physical classroom or physical presence of an instructor, learners in online courses must be able to persevere and ask for help if needed. Taking this a step further, it may be possible to draw similar parallels to self-directed learners and MOOCs, which are considered a form of online courses.

Because MOOCs have an open enrollment, this larger class size requires that the content and activities scale for hundreds of thousands of learners (McAuley et al., 2010). Given the massive numbers of registrants in a MOOC, implications exist for how these courses are

designed and developed to make them most effective for all enrolled. If a learner is one of thousands of others in a MOOC, then that individual has to be comfortable taking the initiative to reach out to others for help if needed, to self-organize to find peers with similar needs or interests, and to work independently (McAuley et al., 2010).

It is likely that MOOCs may appeal to self-directed learners because these courses enable individuals to achieve their personal goals of learning, provide a platform for building new skills, and give adult learners another option for staying relevant in a fast-changing world. In other words, MOOCs are a model of participative education in that they offer learners the opportunity to both create and consume knowledge (McAuley et al., 2010). The opportunity for learners to connect with others and build rich networks of peers with whom to learn is one of the greatest benefits a learner can have within a MOOC (Siemens, 2012). Researchers believe that the personal and professional connections formed within MOOCs have the potential to endure long after a MOOC ends (McAuley et al., 2010). Yet, some of these benefits of MOOCs may be challenging for learners not competent in self-directed learning.

As an example of this kind of challenge, Mackness, Mak, and Williams (2010) examined the learning experiences of participants in one of the first cMOOCs offered in 2008. In the study, instructors were hoping to move from a traditional, structured online course to an open network based on self-directed learning. Though learners of the MOOC cited the importance of autonomous learning for the course, in the end, the participants of this MOOC expressed a lack of confidence, and requested more structure and guidance be provided throughout the cMOOC.

Therefore, the idea that to be successful in a MOOC, adult learners need to be comfortable with self-directed learning and must be proactive in the learning process (Koutropoulos & Hogue, 2012) should be explored. Kop (2011) clearly outlined that within

cMOOCs, adult learners must take on the role of organizing their time, selecting activities, trying out new tools, and setting goals, where these activities would traditionally be done by an instructor in another learning context. When surveying participants of a cMOOC, it was noted that some learners felt overwhelmed by the number of participants and resources available. Though some participants flourished in the independent learning environment, others indicated a desire for more directions and coordination to assist them with the cMOOC (Kop, 2011).

From these few studies on MOOCs, it may be that MOOCs as currently designed are not the ideal learning environment for all adult learners. Another indicator of the challenges adult learners face in MOOCs is their low course completion rates. As stated previously, completion rates for MOOCs often average between five to 15 percent, which is lower than what is typically found in other types of higher education online courses (Watters, 2012a). Since course completion rate is one measure that can be used to assess the effectiveness of a course and student success (Grandzol & Grandzol, 2010), additional research is necessary to learn more about the adults that take MOOCs and if they have the skills needed to persevere through these courses as currently designed.

Operational Definitions

The following are the operational definitions found throughout this study.

Self-directed learning is a key principle of adult learning theory and can be defined as the ability to take responsibility for one's own learning such as identifying a learning deficit, outlining learning goals, implementing a plan for learning, tracking learning progress, and evaluating learning outcomes (Knowles, 1975). Readiness for self-directed learning has been identified as one of the key characteristics needed for university students to succeed in online courses (Guglielmino & Guglielmino, 2003; Bonk & Kim, 2006). For this study, registrants of a

MOOC completed an online survey called the Self-Directed Learning Readiness Scale (Fisher et al., 2001) to measure their readiness for self-directed learning).

MOOC completion can be defined as the percentage of required activities within a MOOC that an individual completes. This percentage can range from 0% to 100%, and was estimated by the participants of this study based on the required activities each person completed within the MOOC. All MOOC registrants that completed the Self-Directed Learning Readiness Scale were asked to estimate their MOOC completion through a second online survey, which was then used for data analysis.

One of the demographic questions included with the administration of the Self-Directed Learning Readiness Scale asked respondents to choose their reasons for registering for the Disaster Preparedness MOOC, which was used as the setting for this research study. Though respondents could select the option "other" and write in a response, no qualitative data analysis was conducted. In reviewing the written responses, it was clear that many of the explanations fit into categories that were already provided as options.

Key Terms

Included here are some of the key terms found throughout this research study.

MOOCs are massive, open, online courses that take place around a specific topic guided by an expert in that topic, while learners are able to access free resources on the subject presented in the course. MOOCs are a new type of online course that appeared in 2008, and typically have no fee for participation, require no pre-requisites, and often do not offer formal credit for participation (McAuley et al., 2010). The MOOC for this research study was located on the Coursera platform. Coursera is one of the most popular organizations that offers MOOCs,

and currently Coursera claims to have over three million registrants taking its MOOCs (Lapowski, 2013).

Andragogy, literally translated, means the art of teaching adults. Andragogy is identified as one of the key principles of adult learning theory. However, the principles of andragogy are increasingly being applied to a variety of learners in many different situations. Though originally identified as how adults learn, andragogy is now often viewed as a list of learner characteristics that may be applied to learners of all ages, which differs from the more traditional concept pedagogy. Some characteristics of learners involved in andragogical teaching include moving from dependent learning to independent learning, accumulating rich life experiences that can be used as a resource in learning situations, readiness to learn being linked to social roles, and the need to immediately apply new knowledge (Knowles, 1980).

The "adult learner" is another important term to define. Adults are those that have taken on what society may identify as adult roles, such as a parent or spouse, and are often those that perceive themselves as responsible for their own lives (Knowles, 1980). This research study only examined adult MOOC participants with a least some English-reading ability. For the purposes of this study, only adult learners of the MOOC researched were invited to participate. Age and English-reading ability were used to identify these participants. To accomplish this, age was collected as part of the demographic data measured within the first online survey administered to the MOOC registrants. Further, as the informed consent and survey questions were presented in English, only those over 18 years old with at least basic English-reading skills were invited to participate. Participants of the study selected their age based on categories that began with 18 because this is the age an individual is typically considered an adult in the United States ("U.S.

Legal, Inc.," n.d.). The age categories available for selection on the survey then followed the same age range distributions used by the United States Census Bureau (2012).

Importance of the Study

Throughout 2012, higher education institutions found themselves experimenting with learning technologies, contemplating how best to present content online, and restructuring the student learning process. The result is that various universities now offer massive, open, online courses called MOOCs. Within two years of their introduction to mainstream audiences, millions of dollars have been spent on developing MOOC platforms and courses (Siemens, 2012), and hundreds of thousands of people have registered for MOOCs (Young, 2012). Yet, there is little research on MOOCs and whether or not these courses are effective for adult learners (Watters, 2012a). If universities intend to continue funding for these free courses, it would seem important to improve course completion rates and demonstrate that adult learners can succeed in MOOCs.

It is important to note that MOOC completion rates may be lower than other online university courses because MOOCs may not be designed for all adult learners and the content selected may not always be appropriate for the MOOC environment. This study was one small step toward learning more about MOOCs, the individuals that register for them, and what types of learners were able to persevere and complete MOOCs. From the data collected, it is possible to estimate what additional support and design features could assist adult learners in completing MOOCs. Knowing more about the MOOC audience may also inform universities in making policy decisions for resource allocation, MOOC design decisions, and decisions regarding what kinds of classroom courses to offer as MOOCs.

Workplaces may also take a more central role in the MOOC phenomena in the future because there is substantial data being collected about MOOC participants. Companies could

benefit from this data by learning about what types of learners are both taking and completing MOOCs. For example, a company may decide to hire an individual with a specific technical expertise taught in a MOOC offered by MIT or Stanford. The company could request data on all of the registrants of the MOOC that successfully completed the course on the specified topic for hiring purposes (Popenici, 2012). Thus, this study begins to offer a glimpse into what kinds of learners are taking and completing MOOCs, which may also be of interest to companies in the future.

Limitations

There were several known limitations for this study. To begin, MOOCs are a relatively new phenomenon and few empirical studies on these online courses exist at this time. For this specific study, given the time and financial constraints of the researcher, only one MOOC platform was used to select subjects for this study. In addition, only one MOOC within this platform was used for the study, yet the researcher attempted to include as many registrants of that MOOC in the study as possible. This inclusion of numerous registrants gave the researcher a larger pool of subjects, yet was still limited to one MOOC and one MOOC platform, as well as the typical problems of generalizability from studies involving voluntary participation (Eysenbach & Wyatt, 2002).

It is important to highlight that MOOCs are also limited by the people that register for them. This means that many in the mainstream population may never have heard of MOOCs as MOOC promotion and advertisement at this time seems somewhat limited. Only those that know about MOOCs, where these MOOCs are located, and how to register for them were able to participate in this study.

Subjects for this study were also limited to adult learners, with at least a basic understanding of English and English-reading ability, and that registered for a MOOC on a single MOOC platform. The first online survey that measured readiness for self-directed learning and demographics of participants was administered at the start of the MOOC, while the second online survey used to capture MOOC completion estimated by those that completed the first survey, was sent two months following the end of the MOOC. It was also possible for learners to join the MOOC after its start date, meaning some participants of the MOOC may not be offered the initial online survey and therefore will not be able to self-select into the study. In addition, contact information for some of the participants of these MOOCs may change making it challenging to email all MOOC learners asking them to participate in this study. Also, the second survey asking for estimates of the MOOC completion was not sent until two months following the close of the MOOC. Originally, the researcher was expecting to access the MOOC completion data directly from the learning management system used to host the MOOC. However, this data was not made available to the researcher as planned and second survey was administered online asking participants to estimate their MOOC completion.

Another limitation for this study was that the scale used to measure self-directed learning was a self-reporting scale, and study participants were asked to self-report their MOOC completion percent as well. This means the data collected relies on the truthfulness of the learners completing both surveys as accurately as possible. To temper this, the informed consent information included with the first survey asked subjects to answer the questions thoughtfully.

This study focused on registrants of one MOOC -- Disaster Preparedness -- that was only offered in English. Yet, there were learners registered for this online course who likely were challenged by reading the English text in forums or listening to the video audio in English as

transcripts were not available. Offering a course only in English may have inhibited some learners' ability to complete the MOOC selected for this research study.

Another limitation of this study worth noting is that learners with physical impairments and disabilities may have needed to use adaptive technology or tools to complete the MOOC selected for this research study. With much of the content provided in text and in video, those with visual or audio impairments may have struggled to complete the course, though the specifics for this were not examined in this study.

A final limitation of this study is that the researcher is limited to a certain amount of questions on the survey. The instructor of the MOOC used for this study asked the researcher to minimize the burden placed on students to respond to surveys. As a result, the first survey administered contained only eight demographic questions and the scale used to measure self-directed learning, while the second, survey contained just four questions that asked participants to estimate their MOOC completion percentage.

Assumptions

This study relied on several assumptions when it was conducted. It was assumed that the MOOC adult learners were at least 18 years old, had at least a basic understanding of English, responded to both of the online surveys in a truthful and meaningful way, and that the respondents understood each question asked on the survey. Another assumption was that the tool used to measure self-directed learning readiness was a valid and reliable tool for measuring self-directed learning readiness within a MOOC learning environment.

Chapter Summary

Chapter 1 provided an overview of why this research study was needed and the detail of how this study unfolded. With all of the changes occurring in higher education, MOOCs are a

relatively new education solution that may or may not be able to meet the needs of universities, adult learners, and instructors. MOOCs have the potential to bring well-known universities to a global audience and provide life-long learners with numerous opportunities to continue their education in a flexible, convenient format. However, as stated previously, a more thorough investigation of MOOCs is needed since little research has been conducted on this learning environment to determine if it is an effective learning solution. Nevertheless, the data that has been previously collected highlights that the completion rates for MOOCs are less than stellar. The high drop out rates of MOOC participants could indicate that there are issues underlying these online courses that need to be addressed.

By studying the relationship between self-directed learning and MOOC completion percents, new strategies may be identified to lower drop out rates by MOOC participants. Knowing more about adult learners that complete MOOCs and those that do not can provide insight into how to improve the design and development of MOOCs so more adult learners can be successful. MOOCs have the potential to be powerful change agents for universities and adult learners, but these courses should serve more than just the most persistent, self-directed learners.

Chapter 2: Review of the Literature

Overview

As more MOOCs are developed and offered, universities find adult learners continue registering for these courses in the thousands. Because MOOCs have only been part of American university offerings for approximately two years, little research exists on the effectiveness of these online courses. This research study examined self-directed learning readiness and one of the key measures attributed to learner success, course completion rates (Bonk & Kim, 2006). In terms of MOOC completion rates, the numbers are often described as questionable, with only around 5% to 15% of participants persevering and completing MOOCs they register to take (Watters, 2012a). It is important to know more about the participants of MOOCs and if learner characteristics such as being a self-directed learner influence completion rates. If more is known about the adult learners that persist and complete MOOCs, as compared to those that do not complete MOOCs, then steps can be taken to improve MOOCs for many different types of learners, especially those not strong in self-directed learning. Studies have found that matching a learner's readiness for self-directed learning to the proper educational delivery method can lead to optimal learning outcomes (Grow, 1991). More information is needed about MOOC completion rates and the learners that take these courses if MOOCs are to prevail and be a successful educational offering for years to come.

To better understand the variables of self-directed learning and completion rates it is necessary to review the literature that has lead to the hypothesis that learners strong in self-directed learning were the most likely to complete a greater proportion of a MOOC. This literature review covers the concept of self-directed learning through the lens of adult learning theory. Specifically, included in this literature review are sections covering self-directed learning

definitions, terms, models, and measures commonly found throughout the research on adult learning theory. Next, self-directed learning studies are explored within the different contexts of the workplace, universities, and online learning environments. Also researched is the idea of self-directed learning as policy, self-directed learning and its relationship to academic success, and attrition in online learning environments. Finally, the open education movement and existing studies on self-directed learning in MOOCs are reviewed. Through this review of the literature it becomes clearer that learners strong in self-directed learning may be more likely to succeed in online learning contexts such as MOOCs, than those learners not as strong in self-directed learning.

Conceptual Framework: Adult Learning Theory

The conceptual framework selected for this research study was adult learning theory because within this theory the concept of self-directed learning is found. Self-directed learning can be traced back to research and writing on adult learning theory (Merriam, 2001). The concept of how adults learn began to be formally studied in America in the 1920s. One of the earliest writers of adult education was Lindeman who wrote the book, *The Meaning of Adult Education* (1926). Lindeman brought to the forefront ideas of informal learning for adults throughout their lifetime as well as situational learning that happened in the contexts found in everyday adult life (Knowles, 1980). Lindeman's text highlighted ideas that education should be built around the adult learner's needs, as opposed to being developed around content or a specific subject. Lindeman also expressed the importance of life experience, and the individual differences of all adults in terms of their abilities and self-directedness.

In 1928 another book reporting research on adult learning was published by Thorndike, Bregman, Tilton, and Woodyard. The research studies from this text, conducted by behavioral

psychologists, focused on determining if adults could learn. Early research on adult learners often concluded that the memories and skills of older adults were not equivalent to younger adults, leading some to find that at the end of formal education, adults had fulfilled their capacity for new knowledge. However, several of these adult learning studies were later proven incorrect. It was shown that many of the older adults who participated as subjects in these early studies had few years of formal education and had low skill levels. Therefore, when compared to the younger adults participating in the studies, the older adults appeared less capable of obtaining new knowledge (Merriam, 2001). Lorge (1944) was able to prove that when given enough time to learn something new, usually up until the year of seventy, age was not a factor in the ability of adults to learn. Schaie and Willis (1986) also disproved early notions of adult intelligence declining with age. These researchers found that intelligence is fairly stable throughout adulthood.

In 1961, one of the seminal scientific studies was conducted on adult learners by Houle. In this study, Houle interviewed 22 adults and identified three distinct categories of adult continuing learners. The first category identified is the goal-orientated learner. This describes an adult learner who is focused on accomplishing a very specific objective, and therefore is learning throughout the process of accomplishing the goal. The second category Houle identified is the activity-orientated learner. These adult learners find meaning in learning through participation. The third category identified is learning-orientated. These learners want to acquire new knowledge for the sake of learning, and enjoy the learning process (Houle, 1961). This study was critical in that it identified specific characteristics of adult learners, and validated that adults successfully learn informally, outside of a formal education space, without the assistance of an instructor. In addition, though Houle did not use the term self-directed learning in this study, the

concept was implied and helped to legitimize research on self-directed learning in the future (Brockett & Donaghey, 2005).

Houle preceded two other researchers that greatly influenced adult learning research. Those two researchers were Tough and Knowles, and both were graduate students of Houle at the University of Chicago. Tough went on to identify additional characteristics of adult learners that helped shape what is now adult learning theory. These characteristics include ideas such as adults needing to engage in continuing education outside of formal educational settings. Tough also found that adults have unique ways of learning new things, and these unique learning traits should not be ignored by instructors. In addition, Tough uncovered the fact that adult learners turn to others for help who may or may not be educators on the subject being learned (Tough, 1967, 1971). The studies by Houle, Tough, and others also supported the notion that adults could successfully learn (Merriam, 2001). With a new focus on adults, this began the development of the knowledge base specific to adult learning, and established adult education as a professional field (Knowles, 1980).

Though adult education was being treated as a systemic entity in the 1920s, it was still being addressed with the models of pedagogy at this time. Yet questions were emerging regarding adults and their learning styles versus those of children. Gradually educators were finding that adult learners seemed reluctant to be part of long lectures, drills, quizzes, and tests. These learners were searching for something more, and often ended up dropping out of education that instilled the same instructional methods on them they were given as children (Knowles, 1980). For years it was assumed that children and adults learned in the same way meaning that instructional strategies and methods used for children would also work equally well with adults.

In the 1970s, it was Knowles, the second graduate student of Houle that introduced American research to the concept of andragogy, which was an acknowledgment that adults learn differently than children. Through research of adult education it was shown that adults have unique attributes that shape their educational growth and development (Knowles, 1980). However, Andragogy is much more complex than this one idea, leading some to identify it as a philosophy (Pratt, 1993), and others to label it as a prescribed set of guidelines for adult educators (Merriam, 1993). Knowles began what is still an active field of research by adult educators to explore andragogy as part of adult learning theory (Knowles, Holton, & Swanson, 2011). Though there is no one theory or principle that captures all the pieces of how adults learn, two key components of adult learning theory emerged. These components are andragogy and self-directed learning. These two foundational principles have remained critical to adult learning theory over time and are explored next.

Andragogy: The First Pillar of Adult Learning Theory

As stated in the preceding paragraphs, Knowles proposed a new way to distinguish adult learning from how children learn called andragogy. The term of andragogy originated in Germany in the 1800s to distinguish education of adult workers from children in school (Savicevic, 1998). Knowles (1980) originally based andragogy on several unique learning characteristics of adults. These adult learner characteristics include a transition from dependence to self-directedness, life experiences that play into learning, social roles linked to readiness to learn, a need for immediate application of new knowledge, and internal motivation (Knowles, 1980). Andragogy also includes the idea that adults have led rich lives that provide them with many years of experiences, which should play a role in their education and define who they are as individuals. It is experiences throughout life that make adults a valuable resource to other

learners, and adult learners should be used to guide and assist other adults in the learning process. In terms of teaching, andragogy labels the teacher as a guide or resource for the adult learner. This is a different perspective from pedagogical models that describe teachers and instructors as having all of the knowledge in a subject with the role of imparting that information to adult learners (Knowles, 1980).

From these assumptions about adult learning, Knowles developed a structure for adult education. This structure stated that adults be treated with respect and as equal contributors with teachers. Knowles also outlined that adults should be given control of their learning and should be expected to plan and direct, or at least assist in, their own learning experiences (Merriam, 2001).

In the 1970s and 1980s questions about the definition and usefulness of andragogy were debated. Adult educators wanted to know if andragogy was a theory or perhaps a principle to follow in the classroom. For example, Davenport and Davenport (1985) questioned the possibility of andragogy as a theory because it was described in many different ways by multiple researchers in the field. For example, Hartree (1984) suggested andragogy should only be a set of principles of what adult learners should strive to be. In 1989, Knowles agreed that andragogy was only a framework or start to a theory that outlined how learning should be structured and how adults behave when learning.

Another criticism of andragogy at this time was the implication that it only applied to adults. Researchers and educators pointed out that the characteristics of adult learners, as defined by andragogy, might not always apply to all adults. For example, some adults are dependent learners, while there are children who are independent learners. Some adults can be externally motivated, while some children have a range of life experiences that may help them learn. As a

result of these types of criticisms, Knowles created a continuum to describe andragogy. This continuum began with teacher-directed learning and ended with student-directed learning. It was acknowledged that an individual can be placed on the continuum and different instructional strategies and preferences would then be appropriate for that individual based on where the person was on the continuum. Yet, the placement of an individual on the continuum also may depend on the context of the situation. This need for more information about a learner's situational context is another critique of andragogy continuing today (Merriam, 2001).

During the 1990s critics of andragogy were quick to point out their concerns with the research of Knowles. These researchers highlighted that andragogy at this time focused only on the individual. To be an adult learner, Knowles believed that the characteristics of independence, individuality, and personal experiences were critical. However, there is no mention of influences from culture, society, or social structures on adults. Grace (1996) pointed out that Knowles described andragogy in the late 1960s when individual experience was a trend throughout society and this may have influenced Knowles' description and research. If the field of adult learning does not take into consideration society and organizations that adults function within, it cannot be effective for educators (Grace, 1996).

Andragogy was also questioned at this time because it merely provided guidelines for adult education, and it does not fully attempt to account for how adults learn (Pratt, 1993). Yet, Merriam (2001) reminded critics that there is no single learning theory or learning model that encompasses everything of how adults learn. Since adult learning research began almost a hundred years earlier, the debate of how to define learning continues (Knowles, 1980; Merriam, 2001).

Countries also seem to differ on their philosophies and beliefs of the term andragogy. In some European countries andragogy is a discipline of pedagogy, while in other countries andragogy and pedagogy fall under the same umbrella of education science. Other countries also view andragogy as its own discipline. In Britain and the United States andragogy commonly refers to adult education as a field of practice with guiding principles on how adults and children behave in educational situations (Merriam, 2001), but this varies depending on the country.

More recently, definitions and labels for andragogy continue to be debated. Henschke (1998) views andragogy as a scientific discipline that can be used to study all aspects of teaching and learning. While, Pastuovic (1995) argues against andragogy as a scientific discipline and believes instead that it is a technological function of what is known about the psychology and sociology of adult learning. Mezirow (1991) described andragogy as the process educators use to enable adults to become self-directed learners, with the comparison of andragogy being similar to transformation theory.

Regardless as to how andragogy is defined, as a theory, model, or framework, it continues to be one of the foundational bases of adult learning theory. Another foundational area that greatly shapes adult learning theory is self-directed learning, which is introduced in the next section.

Self-Directed Learning: The Second Pillar of Adult Learning Theory

In the late 1960s and early 1970s, as andragogy was being introduced to adult educators, self-directed learning was thrust into the education field as another model for distinguishing adult education from that of educating children. Houle's (1961) study of 22 adult learners, as described previously, is believed to be one of the seminal studies of self-directed learning. As stated, Houle grouped adult learners into three distinct categories of goal-orientated, activity-

orientated, and learning-orientated. The adult that was categorized as learning-orientated was classified as wanting to learn for the sake of learning, which fits well with descriptions of self-directed learners. Though Houle did not directly use the term self-directed learning in this original study, it was implied and helped to legitimize research of this concept (Brockett & Donaghey, 2005).

Knowles (1975) is credited as an early contributor to self-directed learning. With the text *Self-Directed Learning*, Knowles described the concept and explained to adult educators how to develop self-directed learners. Knowles defined self-directed learners as those that take the initiative to plan, organize, and conduct their own learning. These individuals complete these kinds of learning tasks usually without the assistance of others, are able to set their own learning objectives, and can locate the resources and materials needed to learn. Self-directed learners are also able to evaluate their learning progress and outcomes. Knowles also reasoned that self-directed learners may learn more and to a greater extent then reactive and passive learners that depend on others. He also believed that self-directed learners were likely more motivated and as a result retained more new knowledge than passive learners.

Knowles also felt that there was an increasing pressure on students to take on more responsibility for their learning as they matured and passed on to more advanced grade levels in the school system. Because of this pressure, self-directed learning was a critical skill to develop in children, and Knowles feared that students who did not evolve into self-directed learners would eventually experience frustration and anxiety during the learning process. Because of this belief Knowles did not think that education was meant to impart knowledge, but to develop the skill of inquiry throughout the education process (Knowles, 1975).

From what has been presented so far, it should be clear that Knowles was one of the original advocates for the development of self-directed learners. He believed education should be a lifelong process, making it critical that children and adults understand how to learn and develop skills of self-directed learners (Knowles, 1980). Unfortunately, Knowles noted that children are taught to be dependent on adults and often viewed as passive learners. Culture may also encourage this dependence into adulthood. If individuals are taught to be passive learners throughout their formal educational years, then adults entering a formal education situation have a tendency to revert back into this dependence allowing an instructor to take charge of their learning. If adults are suddenly expected to learn autonomously in a formal education setting, then this may be challenging for some.

Based on the concerns Knowles expressed, self-directed learning is often in direct conflict with traditional models of education where students are told what to learn. As a result, many believe education should focus on making learners independent in their inquiry and more autonomous as learners. Adults should be actively participating in their own educational activities, but if children are taught to passively receive information throughout their time in school, it is less likely these children will grow into active seekers of education (Knowles, 1980).

Throughout his work on self-directed learning, Knowles strived to enable self-directedness in learners and adult educators by giving them tools, tips, and strategies through his writings. Throughout his publications, for example, Knowles can be found outlining a five-step model of self-direction. The first step is determining learning needs, the second is formulating those needs, the third is identifying the resources needed to meet the needs, the fourth step is selecting the appropriate strategies, and finally, the fifth step is assessing the outcomes (Smith,

2002). Knowles was an educator that was continuously looking out for the development of both learners and other educators.

Though Knowles described self-directed learning and put it into practice, Tough (1967, 1971) conducted the first research study on the topic. In this study, Tough interviewed 66 adults that were identified as learning informally. Through in-depth interviews, Tough uncovered the varied backgrounds, of his diverse set of subjects. The adults were described as being part of self-planned learning and this was a large component of each person's life. Through the study, Tough learned that the adults he studied had self-directed learning practices that were intentional, systemic, and done outside of the classroom without an instructor. This detailed research on an extensive number of adult learners marked a significant beginning into research of self-directed learning (Merriam, 2001).

Another early, yet impactful study to the area of self-directed learning was the work of Guglielmino's (1977) study that resulted in the development of the Self-Directed Learning Readiness Scale (SDLRS). This scale was developed to measure an individual's attitudes, abilities, and characteristics resulting in a measure of that person's readiness to engage in self-directed learning. Over the last 30 years, this instrument has been used by hundreds of organizations and more than 300,000 adults have taken Guglielmino's SDLRS making this the most frequently implemented self-directed learning measure available (Guglielmino & Associates, 2013).

Several outcomes are also associated with the early focus on self-directed learning. In 1986, Long brought together thought leaders in self-directed learning and created the International Self-Directed Learning Symposium. This event continues today and hosts researchers in the field of self-directed learning and has been running for over 28 years

(International Society for Self-Directed Learning, 2013). In addition, educational institutions have been involved in offering self-directed learning initiatives. For example, in 1969, the Open University of England was established. This university has incorporated critical self-directed learning principles into its offerings (Hiemstra, 1994), and is known as the worlds first distance teaching university. Currently, the university has more than 240,000 students enrolled (The Open University, 2013). Similar principles that have guided The Open University, which caters to adult learners with self-directed principles, can be linked to the organizations that offer MOOCs. The ideas from self-directed learning such as adult learners want to continuously learn, make their own decisions about their learning plans, and seek out learning opportunities that meet their needs, fits well with the learning context of MOOCs. The Open University of England has found success with these adult learners, which may explain some of the success with MOOCs. This connection between self-directed learning and MOOCs is covered in more depth later in this literature review. The next section reviews common self-directed learning definitions and terms to provide a better understanding of this concept.

Self-directed learning definitions and terms. A key concern with the study of self-directed learning results from the multiple definitions and terms used to describe this concept. Creating even more confusion is the fact that many of the learning phrases encountered in the literature that are related to self-directed learning are often used interchangeably (Hiemstra, 1994). Kasworm (1983) was one of the first researchers to highlight the confusion surrounding defining self-directed learning believing that self-directed learning can be a belief, a behavior, or state of being. This definition confusion led to two schools of thought surrounding self-directed learning. The first being that self-directed learning is an instructional method to be used by faculty or learners themselves, and the second is that self-directed learning is part of one's

personality to be developed (Brockett & Hiemstra, 1991). The two are linked in that methods can be selected and used based on an individual's comfort level with self-directed learning. However, Brockett and Hiemstra (1991) suggested there were also two dimensions of self-directed learning. The first dimension is the process that an individual uses to assume responsibility for learning and that instructional methods support the individual throughout the learning process. The second dimension is as a personality trait and it relates to a person's desire for taking charge of the learning experience. While these different definitions and beliefs of self-directed are somewhat related, there is no one agreed upon way to view self-directed learning.

These are also various terms that can cause confusion because their meanings are closely related or intertwined with self-directed learning. Terms such as self-education, autonomous learning, independent study, and self-planned learning for example, are often found in studies related to self-directed learning (Brockett & Hiemstra, 1991) and reviewed next. Self-education can be referred to as education without an instructor present, where self-directed learning is considered a life-long learning perspective, meaning an individual continues to function as a learner throughout life. However, it could be said that self-education is likely a subset of the broader term, self-directed learning, where autonomous learning occurs when individuals can identify their own learning needs and put a plan in place to meet those needs (Moore, 1980, *as cited in* Brockett & Hiemstra, 1991). Hiemstra (1994) noted that self-directed learning does not mean one is learning in isolation, yet, autonomous learning is linked to independence in activity and decision-making. Tough's (1979) study focused on self-planned learning. This is where learners are in control of decision-making and planning for their learning, which is also in alignment with self-directed learning. Distinctions between these terms can be challenging.

To add another definition, Candy (1991) defines self-directed learning as encompassing four different dimensions. The first dimension is personal autonomy, the second is self-management, the third is learner control, and the fourth is independent pursuit of learning. Hiemstra (1994) lists seven different characteristics that clarify and define self-directed learning. The first is that learners can become empowered to take on a greater role in their learning. The second feature is that self-directed learning is a continuum that exists in every person or situation to some degree. Third, self-directed learning does not mean that learning will take place in isolation of others. The fourth feature is that those strong in self-directed learning are able to transfer their learning from one situation to another. Fifth, is that self-directed learning involves many different activities such as work groups, reading, forums, and writing. The sixth feature is that instructors act more as role models or facilitators during self-directed learning, and lastly, educational institutions are looking to support self-directed learning through initiatives such as open learning.

Throughout research, though questions and concerns about self-directed learning remain, when examining different thought leaders on the topic, many seem to agree that self-directed learning is a personal attribute of learners where the individual takes the primary responsibility and initiative in the learning process (Stockdale & Brockett, 2011). Though there are many definitions and views of self-directed learning found throughout the adult learning research, Knowles (1975) is the most widely cited and his definition is used for this research study. Knowles said,

> In its broadest meaning, 'self-directed learning' describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning,

choosing and implementing appropriate learning strategies, and evaluating learning outcomes. (p. 18)

Along with the varied terms and definitions used to describe self-directed learning, the literature also highlights the fact that researchers hold different viewpoints on how to approach self-directed learning. Some of the most common viewpoints on self-directed learning are highlighted next.

Views of self-directed learning. Just as the definition of self-directed learning can be confusing, views of self-directed learning also vary. For the humanistic view, one goal of self-directed learning is to develop adults into self-directed learners. An example of this is the model Personal Responsibility Orientation (PRO) of self-directed learning. Through the PRO model, educators can teach learners to be responsible for their own learning and to be proactive in their learning (Merriam, 2001). A second goal within the humanistic view of self-directed learning is to develop transformational learning, which is how adults make meaning of their experiences, which can then be used to help adults learn (Mezirow, 1991). As an example, Mezirow and Associates (2000) believed it is critical for adult learners to develop knowledge of one's self to better understand personal needs and wants. This knowledge of self is beneficial toward becoming a self-directed learner.

Another view of self-directed learning is that this concept can be used for developing social action within individuals (Merriam, 2001). A study by Andruske (2003) examined the projects of women on welfare. The researcher followed 23 single mothers on welfare for four years. The study found that as the women began to take control of their lives and to make positive changes, the women became more self-directed. Through the self-directed learning projects given to the women in the program, it was noted that the women gained valuable skills

that transferred to the personal control of their own lives. Andruske argued that women on welfare need opportunities, such as the program she studied provided, to participate in meaningful projects where they can showcase their skills as independent learners.

Those that study self-directed learning are often divided on how to focus research on self-directed learning. Initial research of self-directed learning looked at describing self-directed learning and proving that adults could be self-directed learners. From this, self-directed learning research has evolved into model building, measurement, ethics, and clarifying the nature of self-directed learning. Models and measures of self-directed learning are explored next.

Models of self-directed learning. As stated previously, scholars of self-directed learning seemed to focus either on self-directed learning as a process, or self-directed learning as an attribute of the individual. Models of self-directed learning were developed to better define self-directed learning and focus future research efforts (Song & Hill, 2007). Early models of self-directed learning described this concept as a linear process that began with dependent learning and moved through a continuum to independent learning. The application of these models was systemic in that they started with diagnosing needs and then moved to evaluating outcomes. Into the 1990s research on self-directed learning focused on model building and assessing self-directed learning of adult learners. These models were less linear and took into account more than simply the learner, but also the learning context and learning content. Outlined in the remainder of this section are some of the critical self-directed learning models developed.

Grow's Staged Self-Directed Learning Model (Grow, 1991, 1994) is a model created for instructors to strengthen self-directed learning attributes in students. The model suggests that learners move through four stages of self-directed learning and that instructors can assist, or hinder, students through the stages based on the methods of instruction selected at each stage

(Grow, 1991). An appropriate selection of teaching strategy matches learners' self-directed learning needs, or stage, and as a result moves learners to more advanced stages of self-directed learning. The stages of the model start with dependent learners, moving to interested, then to involved, and then finally to self-directed learners. According to the model, dependent learners require more hands-on teaching direction and are likely comfortable with lectures as a teaching strategy. In later stages, independent learners are shown to thrive with projects that are loosely facilitated by an instructor.

To use the model, instructors first must determine a student's readiness for self-directed learning. Readiness for self-directed learning is equated to the instructional strategies that would match the student's ability. Second, the instructor works at moving the student toward self-directedness. Grow noted that mismatches can occur when a student finds need for direction in a situation and the instruction given is non-directive. Using a matrix, students can identify their place on the matrix, which tells them how ready they are for self-directed learning. The model shows where directive teaching methods may be appropriate as opposed to facilitative methods based on the dependence and needs of the learner (Grow, 1991; Wiley, 1983).

Grow (1991) also explained how a mismatch between a student's needs and the selected teaching strategy can result in frustration and anxiety for learners. In a study by Hersey and Blanchard (1988), college students were selected into an experimental course where the students would start in dependent learning roles and be moved throughout the course into self-directed learning roles. Throughout the semester the instructor used strategies and took on the characteristics of each stage of the model. By the final stage and toward the end of the semester, students were planning and leading discussions while the instructor was more of a consultant for

these student-directed activities. The students in this experimental course were found to be more successful than those students in the control course (Hersey & Blanchard, 1988).

To summarize, the Staged Self-Directed Learning Model works from the notion that self-directed learning can be taught and must be encouraged. It cannot be assumed that children will grow into self-directed learners. The model can be used to assist instructors in planning their entire semester to gradually move students into roles of self-directed learning and match their teaching strategies with student needs (Grow, 1991).

Another well-known self-directed learning model was developed in 1991 by Brockett and Hiemstra. This model is referred to as the PRO Model. As previously mentioned, PRO stands for personal responsibility orientation. At the core of the model is the idea that learners can take control of their actions and must then take ownership for the decisions they make during the learning process (Hiemstra, 1994). Self-directed learning is seen as an instructional process centering on learners' abilities to assess their own learning needs, gather the resources needed to meet those needs, and assess their own learning progress and achievements (Brockett & Hiemstra, 1991).

The model has two parts. The first is a focus on the process of self-directed learning. This process means the individual is taking personal responsibility for the learning process. The second component of the model is the goal of self-directed learning, meaning an individual must have a desire or need to assume responsibility for the learning process. Both the process and personal characteristic components of self-directed learning are combined within this model. The learning context does come into the model as well. A circle drawn around the elements of the model is used to indicate a need to consider all components as well as the context of the learning activity. The model recognizes that an ideal learning situation occurs when learning processes

provide the opportunity for self-directed learning and the learners have the inclination to accept the responsibility in that situation (Hiemstra, 1994). It is noted that the contextual component of this model limits its use to policy and education institutions (Song & Hill, 2007). For example, one study using the PRO model examined self-directed learning within the context of a museum. Using the PRO model as a framework, the study interviewed 16 museum attendees from four different museums that were attending a self-guided exhibit. Some museum attendees showed a need for more direction from within the exhibit and approached the content in a linear path, while other attendees needed little direction and chose random perspectives for viewing and learning. It was discovered that learners in the museum were able to use the resources provided and take charge of their own learning needs within the exhibit, all displaying some degree of self-direction, just in different levels of strength. Museums are challenged to be able to adapt their exhibits to the needs of these different learners (Banz, 2009).

Another model frequently referred to by self-directed learning scholars is Garrison's dimensions in self-directed learning model (1997). One unique attribute of this model is that it includes cognition and motivation as dimensions, which were not previously included in other models. The model describes self-directed learning as an attribute of the individual as well as an approach to learning, and defines self-directed learning as having three dimensions. The first dimension is self-management, the second is self-monitoring, and the third dimension is motivation. These three dimensions work closely together and must be in direct alignment to indicate a learner is self-directed. Each dimension is described in more detail here.

Self-management includes control over external activities such as establishing learning goals, managing resources, and the ability to obtain support. This process reflects the degree to which a learner is able to shape the learning process by considering what is available and what

the learner is able to do with what is available. Specific elements of self-management include being proactive, pacing, and responding to feedback. This process can be described as task control and involves the learner as well as the instructor (Garrison, 1997). Studies that examined preference for structure for example, reflect the process of self-management.

Garrison's second dimension is self-monitoring or the degree of responsibility the learner assumes for the entire learning process. Garrison (1997) emphasized that self-monitoring requires both cognitive and meta-cognitive processes and refers to a learner's ability to make meaning of the learning event by integrating new ideas and concepts. According to Garrison (1997), self-monitoring refers to thinking about what is being learned and reflecting upon what might be missing from the learning event in order to better understand what is being learned. Self-monitoring and self-management are closely tied and the two cannot be separated (Garrison, 1997).

Garrison (1997) explained that motivation, the third dimension, has two forms. The first form of motivation is described as a person's commitment to learning. The second form of motivation is a person's ability to continue with a task. An example of the first form of motivation would be the choice to pursue an advanced degree at a university. The second form of motivation would be that once in that degree program, the learner must accomplish and learn many skills to earn that degree. According to Garrison (1997), motivation reflects the value one sees in the learning event. None of the three elements presented by Garrison (1997) can exist in isolation. For self-directed learning to occur, all three dimensions must be present.

The final model to be reviewed was developed by Candy (1991) and encompasses two domains for self-directed learning. One of the key focuses of Candy's model is on the learning context. A common critique of many self-directed learning models and measures is that they do

not take into account the context of where the learning is taking place. Candy's model is one that attempts to address this concern.

The model has two contextual domains. The first domain is the control over learning within an institutional setting. Candy (1991) suggested looking at learning control on a continuum to determine if the learner is in charge of the content, instructional methods used, and objectives of the learning. Within this institutional setting, it is likely either the learner or the instructor that is making the decision. Candy (1991) suggested looking at this part of the model as a sliding scale where either the learner or instructor has the control and it changes based on the instance. At one end of the continuum would be learner control and the other is the instructor that is making the decisions. Under teacher control are methods such as such as lecture and lessons, but at the opposite end is learner control with independent study. Instructors and students can move through the continuum based on what the learning needs are.

The second dimension is control of learning outside of the institutional setting, called autodidaxy. Candy (1991) defines autodidaxy as self-instructional situations, and the continuum in this second dimension of the model is how much assistance the learner needs. The learner may assist or seek out expertise or help with locating resources or modeling behavior, but the primary responsibility stays with the learner. At the far end of the continuum in this second dimension, again, is independent study where the learner does not require or seek out help from others.

Candy's (1991) model represents how learners can develop self-directed learning in institutional settings, as well as in informal learning contexts. An educational goal for instructors would likely be to move students within a classroom to the level that they are learning independently within the organization, but then are able to direct their own learning processes outside of the institution.

Though each of the models presented here are unique, they all further the field of study by assisting adult educators and learners with describing self-directed learning and designing education to develop self-directed learners. The next critical piece of self-directed learning research is a description of the instruments used to measure self-directed learning. The three most common measures of self-directed learning are presented next.

Measures of self-directed learning. The models of self-directed learning have been used to describe and explain self-directed learning in systematic ways. Another important element of study within the field of self-directed learning is the instruments used to measure this concept. Just as there are several different models available, multiple measures of self-directed learning have been developed making it one of the most widely studied components of adult learning theory. Three of these instruments will be reviewed in more detail here. The first is one of the leading measures used for self-directed learning and is the Oddi Continuing Learning Inventory (OCLI) (Oddi, 1984). The second is the most well-known and widely used measure of self-directed learning called the Self-Directed Learning Readiness Scale (SDLRS) by Guglielmino (1977). The third is an alternative to Guglielmino's SDLRS developed by Fisher, King, and Tague (2001), and was the instrument used for this research study.

The OCLI is an instrument created to describe the personality characteristics of self-directed learners (Oddi, 1986). The instrument is based on different dimensions of self-directed learning and was developed into a 24-item questionnaire. The instrument assumes that self-directed learning is a personality trait that can be strengthened and developed within individuals (Oddi, 1986). The research that led to the development of the instrument enabled Oddi to identify three broad dimensions of self-directed learning. These three dimensions are proactive versus reactive drive, cognitive openness versus defensiveness, and commitment to learning

versus an aversion toward learning. The items of the survey measure individuals on these three dimensions. The instrument was initially found to have reliability and stability (Oddi, 1986) and other studies indicate similar results when using this instrument (Hemby, 1998; Six, 1989).

The most prevalent self-directed learning instrument used today was developed by Guglielmino (1977). This instrument was originally called the Self-Directed Learning Readiness Scale and has more recently been named the Learning Preference Assessment (LPA). The SDLRS/LPA measures the attitudes, skills, and characteristics of learners and their ability to manage their own learning. According to Guglielmino (Guglielmino & Associates, 2013), more than seventy thousand adults have taken the SDLRS/LPA making it the most widely used measurement for self-directed learning available.

To develop the instrument, a Delphi survey was conducted over three rounds with experts in self-directed learning. The experts identified the characteristics critical for self-direction in learning. From the Delphi, the survey items were written and administered to 307 subjects. Results of testing the survey revealed a validity score of .87 for the original survey. From this original study, 58 Likert-style items were developed to measure the degree to which people perceive themselves as having the skills and attitudes of self-directed learners. The total number of items on the scale were then divided into eight factors of self-directed learning. These eight factors are openness to learning opportunities, self-concept as an effective learner, initiative and independence in learning, informed acceptance of responsibility for one's own learning, love of learning, creativity, future orientation, and the ability to use basic study and problem-solving skills (Brockett & Hiemstra, 1991).

Though widely used, the SDLRS/LPA is not without its critics. This instrument has been shown to have inherent problems with construct validity and reliability. This inconsistency in

results is likely due to the challenges with replicating the findings of the original research consistently. Researchers have continuously noted problems replicating the original study's findings (Field, 1989, 1991; Straka, 1995; Straka & Hinz, 1996). The replication for this instrument is likely difficult given the large number of factors the survey measures (Field, 1989, 1991; Straka & Hinz, 1996). In addition, researchers have noted the high cost associated with using the instrument as a valid reason for not using the instrument (Fisher et al., 2001). Despite the concerns identified for the SDLRS/LPA, the instrument has greatly contributed to the study of self-directed learning and continues to be used by researchers today (Brockett & Hiemstra, 1991).

The third instrument examined is also used to measure self-directed learning readiness and was the measure implemented for this study. Based on critiques of the SDLRS/LPA, Fisher et al. (2001) developed an alternative scale to measure self-directed learning readiness. These researchers described readiness for self-directed learning as the degree to which learners are willing to take control of their own learning needs.

The purpose of developing this alternate scale was to create a reliable and valid instrument to measure self-directed learning readiness. To develop the instrument, the researchers used a reactive Delphi technique to determine content validity and the items of the scale. Next, the scale was administered to 201 undergraduate nursing students to determine validity and internal consistency. Unlike the SDLRS/LPA, which measures eight factors associated with self-directed learning, this alternate scale was broken into three factors. The first factor is self-management, the second is desire for learning, and the third is self-control. Each of these constructs was estimated using Cronbach's coefficient alpha and each scored more than .80, which was deemed acceptable for internal consistency (Fisher et al., 2001). Though

originally developed for nursing students, content and questions relating to nursing were removed so the measure could be administered to other populations.

This instrument is also called the Self-Directed Learning Readiness Scale (SDLRS) (Fisher et al., 2001). This SDLRS consists of 40 self-directed learning statements that individuals must rank the frequency with which each statement applies to them. Each of the 40 statements on the survey uses the same five-point Likert scale as an answer option. Those taking the survey must respond to each statement by selecting their frequency of agreement as never, seldom, sometimes, often, or always. To determine an individual's score of self-directed learning readiness, a total of one is assigned when participants answer never, two points are given when participants answer seldom, three points are assigned when participants answer sometimes, four points when participants answer often, and five points every time participants select always. A minimum of 40 points is possible, with a maximum score of 200 points achievable. An individual that scores above 150 is considered to be ready for self-directed learning methods (Fisher et al., 2001). To view the SDLRS in its entirety, go to Appendix A.

Smedley (2007) used the SDLRS to assess the self-directed learning readiness of student nurses in their first year at a university in Australia. The findings of this research were then compared to the original findings of Fisher et al. (2001). Smedley ended up with similar results, with a mean of one hundred and fifty also being the normally distributed score identified in both studies. In addition, the SDLRS has been used for several dissertations, and in online learning contexts for other universities (Nikitenko, 2009). Finally, researchers have found preference for this survey over the SDLRS/LPA because it measures fewer constructs and that there is no cost for using the SDLRS (Fisher et al., 2001).

The SDLRS (Fisher et al., 2001) was selected for this study because of its reliability and validity in testing, its availability, and free cost. This instrument was used to measure the readiness for self-directed learning of the registrants in a MOOC as part of this research study. To learn more about the SDLRS used for this research study, several examples of research using this instrument are reviewed along with some of the constructs measured by the SDLRS in the next section.

Studies using the SDLRS and its constructs. As stated previously, the SDLRS (Fisher et al., 2001) used as the instrument for this study measures three factors it identifies as being comprehensive indicators of self-directed learning readiness. The first factor is self-management, the second is desire for learning, and the third is self-control. These three constructs, along with studies that use this SDLRS can be found throughout research conducted on self-directed learning. Not only is it important to reflect on the three constructs and their importance for self-directed learning research, but also the specific studies that use the instrument developed by Fisher et al. (2001).

Stewart (2007) conducted a study with engineering university students to determine if a relationship existed between a student's readiness for self-directed learning and problem-based learning (PBL) approaches. Stewart administered the same SDLRS that will be used for this study to 40 engineering students in an Australian university master's of engineering program. The instrument measured all three factors identified, namely self-management, desire for learning, and self-control. Stewart (2007) found that students rated as ready for self-directed learning were also successful at achieving PBL. In addition, readiness for self-directed learning was a key indicator for higher levels of learning within the PBL environment (Stewart, 2007).

Kocaman, Dicle, and Ugur (2009) also used the SDLRS for a longitudinal study that examined the readiness for self-directed learning of nursing students at a university in Turkey. Over four years, undergraduate nurses completed the SDLRS at five different times to measure their changes in readiness for self-directed learning throughout the program. Scores for each of the self-directed learning factors used with this scale, self-management, desire for learning, and self-control, significantly increased over the four years. Through the use of a learner-centered teaching approach, PBL, self-directed learning skills of the nursing students significantly developed. Comments at the beginning of the program indicated students were overwhelmed and uncertain about self-directed learning methods such as independent study and discovery learning. However, by the end of the four years, students reported being confident and committed about self-directed learning. The program made the development of self-directed learning skills an explicit goal for students, and the students reported feeling supported by faculty throughout this process. The study showed that self-directed learning skills can be developed, but when students are suddenly placed into situations of self-directed learning, they may not be successful.

In another study, Kek and Huijser (2011) measured the self-directed learning readiness of students and teachers at the International Medical University in Malaysia. This university also adopted PBL as its teaching methodology to develop deeper learning and skill development in students, and began the program by measuring student readiness for self-directed learning using the SDLRS. The studied revealed that over time, in classrooms where teachers employed a student-focused teaching approach, the students were more likely to use self-directed learning strategies. In addition, students that were more connected with their peers at the university and engaged in the classroom also scored higher for self-directed learning readiness by the end of the program than those students who were not connected and engaged. This study concluded that

making sure students are supported by their peers and instructors is also critical for success in self-directed learning situations.

In addition to the studies that measure self-directed learning readiness using the SDLRS, some have also examined specific constructs identified in the SDLRS. For example, the first SDLRS construct of self-management, is one of the three psychological constructs that supports Garrison's (1997) model of self-directed learning. Self-management is when learners are able to control of the tasks that must be accomplished to achieve their learning goals. For example, a learner may search for, find, and read an article needed, or may identify the appropriate expert to ask a question. All of these would be considered self-management learning tasks. The other side of self-management is when the learner can maintain an appropriate relationship with an instructor that is collaborative. In a study conducted by Abd-El-Fattah (2010) over 100 undergraduate students located in Egypt were given the Self-Directed Learning Aptitude Scale (Garrison, 1997) to measure their readiness for self-directed learning based on Garrison's model for self-directed learning. The study found that self-management was a critical factor in determining the level of responsibility a student was able to take ownership of during the learning process. For example, if students perceived they had control over the learning environment, what is referred to as self-management, then those students were willing to take more responsibility and were more motivated throughout the learning process. In addition, self-management was a strong predictor of academic success for students in this study. The study found that when learners take charge of the education environment, understand what they need to accomplish, and then execute their plans, they are more likely to perform well on learning tasks (Abd-El-Fattah, 2010). Though Abd-El-Fattah (2010) did not use the same scale that will be used

for this study, this study did show how critical the construct of self-management is to predicting a learner's ability for self-directed learning tendencies and academic success.

Though the SDLRS has not been used as extensively as Guglielmino's SDLRS/LPA (1977), it is still a valid instrument that continues to be administered throughout self-directed learning research. To uncover even more about self-directed learning, the next two sections cover self-directed learning in different contexts. The first section examines how self-directed learning can be an effective learning method and trait for employees in the workplace. The second section focuses on studies of self-directed learning as policy in community colleges and universities. Both of these sections highlight the importance of developing self-directed learning for more than just success in a classroom.

Self-directed learning in the workplace. Self-directed learning is more than just a process for learners and educators in the classroom. Workplaces are also aware of the benefits self-directed learning can have at an organizational level. Employee education and learning are necessary for organizations to remain competitive in a global economy, and self-directed learning is one of the tools organizations can use to remain effective in a competitive economy. As Tough (1978) noted, informal learning is the primary way that adults and employees learn, not through formal training sessions held in the workplace. Because self-directed learning can greatly assist an organization, it is up to the organization to provide conditions that support and encourage self-directed learning (Park, 2009). Foucher and Tremblay (1993) determined there are three critical components of self-directed learning that employees need in the workplace. Those three components are initiative, planning, and autonomy. Employees can control their initiative, but they may not always have direct control over planning learning, deciding what to learn, and determining when to learn in the workplace.

To better understand the organizational conditions that facilitate self-directed learning, Baskett (1993) examined more than 22 different organizations and interviewed their employees. The researcher wanted to know the conditions under which self-directed learning occurred in workplaces, how to enhance conditions for self-directed learning within an organization, and the opportunities organizations can use to increase self-directed learning in the workplace. In the end, 10 organizational enhancers for self-directed learning were identified. The 10 factors were advocating for continuous improvement, increasing individual involvement, maintaining personal responsibility, creating compatibility between employee and organizational values, producing effective organizational communications, providing organizational support for employee risk-taking, developing teamwork among employees, and valuing a culture of innovation. Baskett (1993) determined that organizational support for each of these factors is needed for employees to be truly successful self-directed learners in the workplace.

Park (2009) indicated that if a workplace can create a climate and policy of a learning organization, then these are the organizations where self-directed learning will take place. The term "learning organization" was made popular by the American scientist Peter Senge (1990), and there are several common characteristics of learning organizations. Those characteristics are a desire for organizational change, recognition for learning, effective communication, the ability to take risks, and effectively managing human resources. When an organization supports and actively participates in self-directed learning activities, it becomes more likely that this organization can develop into a learning organization (Confessore & Kops, 1998). It may be that learning organizations and self-directed employees are strongly linked.

To test the relationship between self-directed and learning organizations, Park (2009) administered the SDLRS/LPA developed by Guglielmino (1977) to employees of three

companies in South Korea. In addition, each organization was examined for characteristics of a learning organization. The organizational factor of information sharing was directly related to employee scores on the SDLRS/LPA. It was determined that an organizational climate built around knowledge sharing was critical for nurturing self-directed learning in the workplace. Park (2009) concluded that organizations should create policies and implement practices that encourage and enable information sharing and skill sharing to better employees and the success of the organization overall.

In another study of learning organizations, Guglielmino and Guglielmino (1994) found that an organization's training and development department cannot meet the continued demands employees face for learning and problems-solving. Within unprecedented growth in information and technology, it has been a struggle for formal learning opportunities to keep pace with employee needs, and learning organizations are one solution to address some of the education demands placed on employees. Learning organizations support employees in becoming self-directed learners, ones that take responsibility for planning and meeting their learning needs and then sharing their knowledge with others in the organization.

Another benefit self-directed learning can have on organizations is employee performance. Studies have found that self-directed learning readiness is linked to job performance as well. Guglielmino, Guglielmino, and Long (1987) conducted a study with over 750 employees working at a large facility for AT&T within the United States. The researchers recognized that business and industry continuously rely on the self-directedness of their employees to remain competitive. To better understand this, the researchers wanted to find out if a relationship exists between self-directed learning readiness and job performance. The subjects of the study were composed of managers and non-managers, and the study examined the degree

of change, creativity needed, and problem solving required to perform these different positions. The AT&T employees were also administered the SDLRS/LPA developed by Guglielmino (1977), and several interesting findings resulted. One finding was that outstanding employees in positions that required high levels of creativity had higher scores on the SDLRS/LPA than other employees. Another finding was that employees in positions that required high-degrees of problem-solving skills also had higher SDLRS/LPA scores than others. Finally, employees with the highest levels of education completed scored higher on the SDLRS/LPA as well. The researchers concluded that employees strong in self-directed learning were likely to be the most successful in work positions that required creativity and problem-solving.

The United States Military is another organization that recognizes the importance of self-directed learning. The military increasingly requires high levels of cognition and decision-making that are developed through continuous learning (McCausland & Martin, 2001), and the United States Military Academy is committed to the goal of developing leaders that can respond to changes and make effective decisions. The text, *Educating Army Leaders for the 21st Century* (United States Army, 1998) calls for military leaders to be self-directed learners that continuously expand their knowledge. The military has made this assertion based on the data gathered by researchers that continually support a relationship between job performance and readiness for self-directed learning. Another reason for the military to develop self-directed learning skills is because of their expansive use of online education. According to Gabrielle, Guglielmino, and Guglielmino (2006) the United States Army is one of the largest providers of distance learning in the world. In a later section of this chapter, there are descriptions of several online learning studies that found self-directed learning was critical to being successful in online learning environments.

Increasingly, organizations are recognizing that self-directed learning is a critical skill for employees to develop. This means that community colleges and universities should be developing self-directed learning skills in their students who in turn will be future employees. One way that colleges and universities can do this is through the use of education policy.

Self-directed learning as policy in universities and community colleges. For self-directed learning to permeate throughout the education system, this process should begin with policy. Wilcox (1996) noted that self-directed learning is continually referenced as a skill needed for students and that faculty ask students to take more responsibility for their own learning in higher education. However, self-directed learning is often a missing concept when it comes to university teaching. Knapper and Cropley (2000) advocated that principles of adult education should be taught in higher education institutions to prepare adults when leaving the university to continue to be lifelong learners when their formal education experiences end. Wilcox (1996) conducted interviews and surveys with faculty at a Canadian university to determine if faculty supported self-directed learning in higher education classrooms. The survey results showed that the majority of university faculty did not support self-directed learning and of those that did, their own practices were not always inline with self-directed learning instructional approaches. In terms of barriers to using self-directed learning instructional methods, the faculty indicated that the demands of the university to focus on assessment and procedure often inhibited their ability to use self-directed learning approaches with students. Though self-directed learning is often cited as being critical for employees and students in higher education, it is not always a skill given priority to be developed in the higher education system.

Wilcox (1996) offered a number of explanations for the reason university faculty do not always foster self-directed learning in their students. For example, instructors may not be aware

of how to develop self-directed learning opportunities for students, and their goals for using self-directed learning in the classroom may be limited by conditions required by the university. Wilcox also discussed solutions to these concerns such as creating campus-wide awareness about self-directed learning for instructors. Yet, universities are often too rigid in mandating what is taught and how to allow for self-directed learning methods in the classroom. Before self-directed learning can be a reality, universities should allow students more control over the learning process and this climate then could be reflected in the classroom.

Though some higher education faculty are able to incorporate self-directed learning into their classrooms, many struggle to accomplish this. A university policy that supports self-directed learning teaching methods is one strategy that may be considered to enable higher education institutions to develop self-directed learners. As highlighted in previous studies, self-directed learning is a critical skill not only in university settings but in the workplace as well.

Another situation that seems to benefit from the self-directedness of learners is success in online learning. The next section of this literature review examines self-directed learning studies within the context of online learning.

Self-directed learning traits in online learning contexts. Another context that is critical to review is how self-directed learners perform in online learning contexts such as university courses, continuing education, and workplace learning. Given that this research study measured the self-directed learning readiness of learners participating in an online university course, specifically a MOOC, it is valuable to review the literature for studies that have looked at self-directed learning in similar learning environments. From the literature it is clear that studies have focused on the traits that learners need to be successful in online learning or how the context of

online education impacts self-directed learning. This section first looks at traits of online learners and then at the context of online learning.

Several studies within the literature have found that self-directed learning, or one of the many traits related to self-directed learning, can have an impact on the success of online learners (Dillon & Gabbard, 1998). Though not directly related to self-directed learning, prior knowledge or experience with online learning environments is often cited as being critical for online learning success. However, a learners' ability to manage and control the learning process has also been noted as critical in online learning environments. The management and control of the learning process can be traced directly to self-directed learning. Unfortunately, examining learner attributes in online learning environments is a critical part of adult learning research that has not kept pace with all of the new technology-supported learning environments that continue to appear. Hartley and Bendixen (2001) noted that various online learning environments such as online courses, discussion boards, and online spaces where learners interact and collaborate rely on the active engagement of learners to build new knowledge in these spaces. These researchers looked specifically at the individual attribute of self-regulation, which they described as one's ability to use their cognitive skills to plan and monitor learning activities, and determined that self-regulation was a critical skill needed to mediate success in these types of online learning environments. Their results were inline with other researchers that have concluded that online learning environments tend to give more control to learners during the online education process (Garrison, 2003).

The traits critical for self-directed learning seem like they would be related to learner success in online environments given that learners are often expected to take on a larger role in managing their own learning and monitoring the learning process. Dabbagh and Kitsantas (2005)

conducted a study to identify the specific online learning tools and strategies that could be used to support and develop self-directed learning skills such as goal setting and self-monitoring in online university courses. The researcher hypothesized that tools and strategies available in online formats such as discussion forums, chat, email, quizzes, and group assignments could be implemented to support and assist in developing skills critical to online environments. To conduct their study, the researchers surveyed 65 United States college students and found that the different strategies and tools used in online learning courses did support different skills. For example, subjects in the study explained that collaborative tools and communication tools assisted in their ability to set goals and seek help from their peers. Scaffolding helped the subjects develop skills in seeking assistance and evaluating learning. Specifically, subjects identified resources such as assigned readings and assignment rubrics as critical to their success in developing these skills as well. The researchers recommended that instructors be more strategic about planning and designing online environments to support the development of skills needed to successfully complete online university courses (Dabbagh & Kitsantas, 2005). Instructors cannot assume that all learners will have fully developed self-directed learning skills and leave their learning success to chance. Learners need to be supported and provided opportunities to develop and enhance their self-directed learning abilities.

The context of online learning is receiving more attention and some self-directed learning scholars have noted that learners may have different levels of self-direction based on the learning context (Candy, 1991). For example, learners may be strong in self-directed learning in the classroom with a teacher present, but may perceive themselves as less self-directed in an online classroom environment. In a qualitative case study by Vonderwell and Turner (2005), pre-service teachers were interviewed about self-directed learning while they participated in an online

technology course as part of their university education. During the data collection, subjects explained how the online learning environment enabled them to become more autonomous in their learning because they were expected to take a more active role in the online course than they usually played in a traditional classroom. As a result, the researchers concluded that online learning could place an increased demand for self-directed learning on those participating in online education. Three implications overall for online learning were made based on this study. The first implication was that online learning environments give students more control over what, when, and how they learn. The second implication was that learners take responsibility for their own motivation throughout the learning process. The third and final implication was that online education can increase the responsibility and initiative of students given their role within the online learning environment. Overall, Vonderwell and Turner (2005) determined that to be successful in online learning environments, participants must be prepared for their role as active learners.

Though several studies have indicted that self-directed learning is a valuable trait for online learning contexts, more information is needed about the relationship between online education and self-directed learning (Song & Hill, 2007). Song and Hill (2007) developed a model for understanding self-directed learning in an online learning context. The model takes into account the personal attribute of self-directed learning, the process of self-directed learning, and the online learning context. The personal attribute referred to the motivation a person has to take on and continue throughout the learning process and the responsibility for learning. The process of self-directed learning referred to the time when the learner takes control of and manages the learning activity from planning to evaluation. Context included all of the environmental factors that influence self-directed learning.

For an example of how this model works, consider how online course design decisions have a direct impact on the level of self-directed learning needed to successfully complete a course. If an online course is asynchronous, then learners likely need to be strong in self-directed learning for decisions about when, where, and how to learn. Support provided in the online learning environment is another important contextual piece to consider. For example, strong support from an online instructor requires less self-directed learning from participants. Song and Hill (2007) explain that the learning context will influence the way learners plan, manage, and evaluate their learning, and can influence how motivated learners are throughout the process. The model is useful for thinking about the design of online learning environments and the role of the instructor. However, little research has been conducted where this model is applied in practice. More studies are needed to better understand self-directed learning traits and their relationship with online learning contexts.

One theory worth exploring about the relationship between online learning environments and self-directed learning is that online courses may pose challenges to learners that have fewer skills and capabilities in self-directed learning. For example, university students may have delayed responses and access from instructors so they may have to rely on their peers for feedback or information. Yet, it can be challenging to know if a peer is providing the correct information. In addition, online learners, for example in the workplace, may struggle with identifying the best resources for information. Having to research, investigate, critique, and make judgments about information is difficult for many when there are numerous online venues to research. Learners may also face challenges with motivation. Another challenge is that it is easier for participants of online education to procrastinate or become disengaged in the learning process. Learners in online environments must also manage their own progress as the instructor

cannot easily observe where all learners are in the process. All of these challenges can result in an unsuccessful learning experience. Song and Hill (2007) concluded that not only were personal attributes of self-directed learning, and the process of self-directed learning critical to the success of online learners, but the online learning context itself was also a key consideration.

Long (2003) determined that transitioning adults into independent learning roles needed for online learning can be challenging as many adults may prefer traditional teaching formats. Other barriers to adults achieving success in online learning environments could include learners who have had limited opportunities for self-directed learning in formal learning situations, negative experiences with self-directed learning in the past, and courses that have failed to relate the learning goals with a learner's personal interests. Long (2003) also noted that even though adults may continuously be engaged in self-directed learning in informal settings, when expected to do the same in a formal class or online environment say for continuing education, they may resist. The design of the online environment is critical to making sure learners discover they can be successful self-directed learners in these contexts (Long, 2003).

To succeed in online course environments, learners should possess skills in self-directed learning such as self-management, self-control, and a desire to learn (Fisher et al., 2001). Self-directed learning is a pillar of online education in that self-directed learning includes self-paced learning strategies, independent study, individualized learning plans, and self-instruction, (Caffarella, 1993) which are some of the key characteristics needed to complete online courses. The type of learner-centered approach used in online learning can be effective because it requires learners to proactively participate resulting in deeper learning of material. Though it seems there is a positive relationship between self-directed learning traits and success in online learning

environments, more research is needed. The next section further examines how self-directed learning is linked to learning success.

Self-directed learning and academic success. One critical piece of this study was the relationship between a learner's readiness for self-directed learning and this learner's ability to complete a MOOC. Course completion is just one of many factors that can be examined to determine an individuals academic success in a learning environment (Bonk & Kim, 2006). Yet, when reviewing studies for relationships between academic success and self-directed learning, the results are mixed. Some of these studies are presented here.

Savoie (1979) conducted a study to explore the relationship between self-directed learning readiness and course grades. The context of this study was several traditional continuing education courses taken over time by 152 nurses. To measure the nursing students' readiness for self-directed learning, the researcher administered the SDLRS/LPA developed by Guglielmino (1977) prior to each course. Next, the nursing students' grades were collected and analyzed along with their readiness scores. In this study, Savoie (1979) found a positive relationship between self-directed learning readiness and course grades.

However, the next study did not find a similar relationship. Harriman (1990) reviewed the grades and course completion rates of students enrolled in a community college telecourse program. As part of this study 170 students were given the SDLRS/LPA developed by Guglielmino (1977) to determine their readiness for self-directed learning. The students' scores were then analyzed along with completion rates and grades. Overall, these community college students scored higher in self-directed learning readiness than the average adult scores. Yet, no significant relationship was found between self-directed learning readiness and course completion or grades.

Hsu and Shiue (2005), were interested in the relationship between success of distance learners and self-directed learning. Believing that to be successful in distance learning courses requires the same characteristics found in self-directed learning, these researchers administered the SDLRS/LPA developed by Guglielmino (1977) to 126 Taiwanese undergraduate students enrolled in an international relations course. Half of the research subjects were enrolled in the traditional classroom version of the course, while the other half of the subjects were enrolled in the online version of the same course. It was found that both groups scored equally well in terms of grades for the course. In other words, the online students were equally as successful as their traditional student counterparts. The study results also showed a strong relationship between scores on the SDLRS/LPA and distance learning student academic achievement. This means that students strong in self-directed learning readiness were more likely to achieve a higher grade in the distance learning course, where in the traditional class, SDLRS/LPA scores were not found to be related to academic success.

Chou (2012) examined 48 undergraduate engineering students' self-directed learning abilities for an online learning task. The students were enrolled at a university in Taiwan and were all majoring in electrical engineering. Chou hypothesized that students scoring higher in self-directed learning readiness would perform better on the online learning task, and this relationship was found to be correct.

In another study conducted by Pachnowski and Jurczyk (2000) the results were not as clear. The researchers wanted to determine if self-directed learning characteristics correlated with student success in online courses at a large midwestern university in the United States. The study used student grades as the definition of course success. The SDLRS/LPA (Guglielmino, 1977) was administered and 17 students completed the survey. Data regarding student habits,

attitudes, and technical expertise were also obtained from the online course instructors as well as final student grades. Results for this study indicated that self-directed learning readiness was not a good predicator of student success in an online course. Instead, the researchers found that the instructor's perceptions of student attitudes, habits, and technical skills were the best indicators of student success in the online courses.

Studies that researched the relationship between self-directed learning and academic success are certainly mixed. Though it seems likely that self-directed learning traits would assist learners, many factors may influence this relationship such as course design, instructional methods, teacher support, peer engagement, and more. Self-directed learning may also be influenced by demographics. For example, this study examined the age, gender, and highest level of education completed by MOOC adult learners, which were then compared to self-directed learning readiness and MOOC completion data. Research that examines these variables and their relationships with self-directed learning readiness are reviewed in the next section.

Self-directed learning and demographics. As mentioned, demographic data was measured as it related to self-directed learning. This study's demographics related to self-directed learning included age, gender, and highest level of education completed. To begin, age was selected as an important variable to measure because self-directed learning readiness has been found to correlate to a person's age, though studies vary.

Reio and Davis (2005) conducted a study that measured an individual's readiness for self-directed learning, age, gender, and ethnicity. The study found that adolescents and young adults scored lowest on the scale for self-directed learning readiness, while those participants in their thirties and forties scored the highest in readiness for self-directed learning. In terms of gender, the study noted that younger females scored higher on the self-directed learning

readiness scale than younger males of the same age. Other studies have also shown that age and gender are linked to self-directed learning readiness (Long, 2003; Reio, 2004).

In a study by Liddell (2008), the researcher explored the self-directed learning readiness of women executives of non-profits. The 22 women who participated in the study scored well above average for scores on the SDLRS/LPA (Guglielmino, 1977). In another study by Guglielmino (1996), 19 top female executives were administered the SDLRS/LPA and these subjects had the highest mean score of any sample tested up to that time. Both of these studies suggest that readiness for self-directed learning may be a common trait found among women executives (Liddell, 2008). As a result, this research study will collect both age and gender from the MOOC participants.

To learn more about the education experience of participants, level of education completed is another important demographic to examine. Level of education completed has been linked to a person's score on the SDLRS/LPA in several studies. In a study by Guglielmino, Guglielmino, and Long (1987) over 700 American workers provided demographic information and completed the SDLRS/LPA. It was found that workers with greater levels of education scored higher on the SDLRS/LPA than those workers with lower levels of education. Brockett (1985) measured the self-directed learning readiness of over 64 adult learners and found that those adult learners who had completed more years of formal education tended to score higher on the SDLRS/LPA. The same study as mentioned earlier in this section conducted by Liddell (2008) concluded that women with the highest levels of education also scored the highest on the SDLRS/LPA as well. Lastly, (Oliveira, Silva, Guglielmino, & Guglielmino, 2010) measured the self-directed learning readiness of workers in Portugal as compared to workers in North American research studies, and found that level of education completed was significantly related

to scores on the SDLRS/LPA. Meaning, the more formal education a worker had completed, the higher the score for self-directed learning readiness. However, in this final study on workers, self-directed learning readiness was not related to age or gender.

To conclude, different demographics have been found to be related to self-directed learning readiness. The strongest associations have been found between self-directed learning readiness and level of education completed, with mixed results when it comes to gender and age.

The other key variable examined in this research study, besides self-directed learning readiness, was MOOC completion. To begin reviewing the research on MOOC completion, online learning environments in universities are reviewed. Completion or, the opposite, attrition is another variable that is often used to measure academic success in online learning environments. The next section examines studies of attrition in online learning contexts provided from universities.

Attrition in Online Learning Environments

Unfortunately, attrition rates for online learning initiatives are often greater than traditional, face-to-face classes. Some studies show that attrition rates for online undergraduate college courses are 10% to 20% higher than those of traditional courses (Carr, 2000). Many reasons have been documented for possible causes of the higher attrition rates in online courses. Some of those reasons include learners registering for courses for knowledge and not completion, and the physical separation from other students, which can lead to feelings of isolation and lack of motivation to complete an online course (Rovai, 2002). As online learning opportunities become a more popular solution for universities to provide and learners to select, it is reasonable that improving completion rates within online courses would be a goal of those offering these courses.

Sitzman (2010) studied the attrition rates of 479 adults taking an online course in the workplace. Those adults that were asked to self-regulate their learning process, had attrition rates 17% lower than those adults that were not asked to self-regulate their learning. The self-regulation questions and techniques also increased test scores by five percent. Sitzman (2010) claimed that having online learners self-regulate during their online learning can result in an increased return-on-investment for organizations offering online education. Though Sitzman (2010) did not specifically link self-regulation to self-directed learning, self-regulation is often linked to self-directed learning. In the study by Hartley and Bendixen (2001) previously cited in this chapter, the researchers examined the individual attribute of self-regulation and defined it as one's ability to thoughtfully and deliberately plan and monitor the learning process. Planning and monitoring the learning process are often included in definitions of self-directed learning.

Patterson and McFadden (2009) also studied attrition rates in online courses. Their study compared attrition in online college courses to those of traditional college courses at a university in the southern United States. The study concluded that online course students were more likely to drop out than those students taking traditional classroom courses. The only additional variable that was significant was age. Older students were more likely to dropout from both online and traditional courses. However, in this study, academic success was not related to dropout rate in the online courses.

In graduate level courses at West Texas A&M University, Terry (2001) studied the relationship between online course attrition rates and then compared this to face-to-face courses. Terry (2001) found mixed results with this study. Some online courses in areas such as accounting, economics, and marketing had attrition rates comparable to the traditional classroom version. However, Terry (2001) determined that online courses in business statistics and finance

had significantly higher attrition rates than the same traditional classes.

Nash (2005) took a different approach to studying attrition rates. This researcher surveyed community college students to determine the reasons they dropped out of online courses. The subjects' number one reason for not completing an online course was time management. Students indicated they had difficulty managing their time throughout the semester, and this meant they had to drop the online course. Students also expressed issues with the difficulty of the assignments, directions being too vague, and not having access to assistance in the online environment when they needed it. All of these reasons led to high attrition rates.

One of the benefits of online courses in higher education is that these courses provide education opportunities that are flexible, inclusive, and allow for improved communication without prejudice. However, these same online courses, if not designed and developed for all students, can pose obstacles to completion for students with disabilities (Pearson & Koppi, 2002). For example, within an online course text may be used extensively, which can be challenging to read by students with visual impairments. As another example, audio or video is often used in online courses, which can be challenging for students that cannot hear the audio or see the video. In addition, online courses are being offered to global audiences that may not be fluent in the language the course is offered. Language has historically been a barrier for students participating in open distance learning environments (Van den Branden & Lambert, 1999).

Unfortunately, guidelines for developers that should assist in overcoming these kinds of accessibility barriers are often complex to understand and challenging to implement (Pearson & Koppi, 2002). This can mean it is the students that are left with courses that cannot easily be completed. If students have negative experiences with online education, then these students' perceptions of online courses are likely not positive, which can lead to them dropping out of

future online courses (Carr, 2000). To better understand some of the completion barriers learners face while taking MOOCs, this research study will examine specific characteristics of individuals such as their English language ability and disabilities that may interfere with online course completion. Better understanding the barriers learners face, should allow for better online course design and development.

Another critical point to discuss is that an increase in dropout rates negatively impacts universities from a quality and financial viewpoint (Angelino, Williams, & Natvig, 2007). Coming up with solutions to attrition in online education is likely critical to the future success of online education initiatives. According to Angelino, Williams, and Natvig (2007) after reviewing the literature regarding online courses and attrition, there are four primary strategies recommended to decrease attrition rates in online courses. The first is engaging students in the learning process, using learner-centered approaches to education, developing a sense of community, and providing learners access to support throughout the online course. All of these strategies should provide learners more control and support throughout the course.

One online education initiative that is receiving increased attention because of high attrition rates is the MOOC. MOOCs have reported attrition rates as high as 95%, meaning that only around five percent of the registrants completed all the course requirements (Watters, 2012a). Beginning to research these online course environments is critical to understanding the traits of those taking MOOCs and if instructional methods can be applied to MOOCs to increase completion rates. Increasing completion rates of MOOCs is one strategy that may be needed to ensure that this type of education option remains available for learners across the globe wishing to take advantage of quality education for little to no cost.

In an attempt to learn more about MOOCs and completion rates, this study examined the

hypothesis that those strongest in self-directed learning were more likely to complete a higher percent of a MOOC. The next section reviews the few MOOC studies that include references to learner traits related to self-directed learning, and also explores the connection between MOOCs and the open education movement.

The Open Education Movement, MOOCs, and Self-Directed Learning

This section considers a possible relationship between the open education movement, MOOCs, and self-directed learners. Hiemstra (1994) believed that from the attention and research given to adults as self-directed learners, organizations have had to re-imagine how they design and develop adult education opportunities, and as a result, institutions have developed open learning initiatives, online learning offerings, individualized study programs, and other innovate education solutions for self-directed adult learners. Though self-directed learners may be some of the thrust for expansions in open education, there are many challenges that higher education is facing that open education may be a solution for.

For example, there are more potential students than could ever be taught in traditional higher education settings, making alternative education options necessary. Another challenge is that learning is a lifelong process that adults are continuously involved in, which does not stop after graduation. These learners continuously desire access to quality education, which may not always be available. Another challenge is that the cost of attending a university to obtain a degree remains out of reach for many, making free education a valuable commodity. In addition, adult learners want flexible ways to learn that fit into their busy life-styles. These and other challenges have perpetuated the demand for open education, which can be defined as education that is flexible, allows greater access, and gives learners choices. More specifically, open

education is made visible and accessible for a large community to harness and reflect on (Iioyoshi & Kumar, 2008).

From the open education movement educational material and resources from universities are now more freely available than ever on the Internet. These same organizations and universities are also working on open education projects and initiatives collaboratively. Open initiatives sponsored by the Organization for Economic Co-operation and Development (OECD) and UNESCO have been developed in an attempt to create open education solutions to meet some of the learning challenges already outlined (Iioyoshi & Kumar, 2008).

Characteristics of the open education movement include opening up content, empowering all people through education, equality in access to information, and inviting all to participate (Iioyoshi & Kumar, 2008). These are similar characteristics to MOOCs. For example, MOOCs give a global, massive audience access to education that they may otherwise never have been able to afford. Yet, it is important to note that many involved in the offering of MOOCs may be interested in developing new revenue streams for cash-strapped institutions. Some institutions offer MOOCs as part of the open education movement, yet other organizations are looking to eventually make a profit from MOOCs (Yuan & Powell, 2013). Though links can be made between the open education movement and MOOCs, some questions remain about the current state and longevity of MOOCs.

Similar principles that have guided the Open University, which caters to adult learners with self-directed principles, can be linked to the organizations that offer MOOCs. The ideas from self-directed learning such as adult learners want to continuously learn, make their own decisions about their learning plans, and seek out learning opportunities that meet their needs, fit well with the learning context of MOOCs. Many MOOCs lack a familiar structure, and an

instructor is rarely, if ever, available, making MOOCs similar to self-directed learning environments (Yuan & Powell, 2013).

To learn more about the relationship between self-directed learning and MOOC environments more research is needed. In addition, more information is needed to determine if MOOCs support those strong in self-directed learning as well as those weaker in self-directedness. MOOC platforms such as Coursera leave the design and development of each MOOC primarily up to the instructor or University offering the MOOC, which leaves quality to chance. To further highlight how this can be an issue, a correlation was found to exist between self-directed learning readiness and the structure of a learning environment. Wiley (1983) conducted a study of university students and administered the SDLRS/LPA (Guglielmino, 1977). The study showed that individuals that score low in terms of readiness for self-directed learning preferred a more structured learning environment when given a self-directed learning project. In another study, O'Kell (1988) was able to match an individual's readiness for self-directed learning with instructional strategies. For example, those with low scores of readiness for self-directed learning preferred instructor-led discussions and lectures to independent project work. If only the strongest self-directed learners can successfully complete MOOCs, then more time and effort should likely be invested into the design and development of MOOCs to meet the needs of many learners. If this is not done, MOOC completion rates could continue to suffer and new open education solutions of higher quality may appear, making MOOCs a short-lived solution.

Self-directed learning and open education have long been linked. Tuman (1988) discussed the fact that learning in open environments requires complex skills that not everyone has an opportunity to develop. Tuman believed that self-direction should be explicitly taught,

otherwise open education will only be useful for the strongest self-directed learners (Tuman, 1988).

The final studies in this section focus specifically on MOOCs. To review what a MOOC is again, the courses are massive given that hundreds of thousands of participants may be registered for one MOOC at the same. MOOCs are considered open not only because they are free of charge, but also because the participants are expected to contribute openly and create new knowledge within the MOOC. Lastly, these learning experiences are courses because MOOCs have instructors or facilitators that create a framework around a topic or theme that takes place in a specified timeframe. In addition, another criteria that makes MOOCs unique is that learners are expected to be independent, take charge of the learning process, and to manage their learning and contributions to meet their own learning needs (Tschofen & Mackness, 2012).

In one of a handful of research studies on the new online initiative of MOOCs, Kop (2011) highlighted that MOOCs give learners an open, online learning environment. Yet, the researcher cautioned educators to learn more about these open learning environments and suggested that not all learners are going to have a quality learning experience when taking a MOOC. According to Kop (2011), cMOOCs place the instructor in the role of facilitating the learning process. The MOOC is therefore learner-centered and new knowledge is not passed from the instructor to learners, but knowledge is created when learners interact with resources distributed throughout the Internet. One of the key challenges the researcher highlighted to this type of learning context is that learners are expected to be self-directed. In a traditional course the instructor sets the learning goals, objectives, timelines, and evaluates the learning progress. In a MOOC, learners are expected to take on these responsibilities themselves. Learners cannot

depend on an instructor to assist them in the learning process but are expected to be autonomous within a MOOC.

Kop (2011) surveyed participants, observed behaviors, and conducted focus groups on two cMOOCs held in 2010. The study revealed that those participants that had not engaged in this type of MOOC previously reported feeling overwhelmed and confused with the learning environment and process. In terms of self-directed learning, some participants enjoyed the autonomy provided by the MOOC and felt that the instructors or facilitators were equal contributors with the participants within the MOOC. Kop (2011) believed the participants of the MOOC were split on their comfort of the course. Half of the MOOC participants were comfortable being in control of their learning experience, and the other half indicated more support and direction would have been greatly appreciated. Kop (2011) concluded that for MOOCs to be successful, especially the cMOOCs, learners must be self-directed and that there are conditions that can be created within MOOCs to encourage and assist learners through the course. For example, support provided by peers and instructors, and developing a sense of community within the MOOC would likely enable and encourage a learner within a MOOC.

In a study of MOOC participants by Mackness, Mak, & Williams, (2010) again some participants in the MOOC struggled with the lack of structure with the learning environment and some indicated a need for more guidance during the MOOC. Tschofen and Mackness (2012) suggested that participants may struggle and facilitators may get frustrated with participants of MOOCs for a variety of reasons. One reason may be that MOOCs require participants to be autonomous meaning learners must be in control and make their own learning choices. This autonomy could be an uncomfortable position for many that come from more traditional education backgrounds.

Another reason MOOCs may be challenging for learners is because learners are supposed to be, and are encouraged to be, autonomous and self-directed in the learning environment, yet, the learners are participating in an online course which requires connections, structure, and support to be completed properly. Mackness et al. (2010), suggested that MOOCs are a paradox for learners in that the more MOOCs are designed for independent learning, the more learners must rely on each other to complete the MOOC. The researchers found that participants had a tendency to fall back on traditional methods of learning such as group formation to get them through the MOOC. More research is needed to find the ideal balance between open learning environments such as MOOCs, and structure and support.

Kop and Fournier (2010) conducted another study of a cMOOC to examine Bouchard's four-dimensional model of learner control. The researchers identified time management, goal setting, and a person's availability to participate in learning as three critical factors that influenced learners' abilities to participate in the MOOC. Participants cited reviewing resources critically and being able to learn actively with an open mindset as challenges they faced during the MOOC. The researchers concluded that participants of MOOCs should not have an aversion to risk or change if they are to be successful in MOOCs.

McAuley et al. (2010) argued that MOOCs may be challenging for participants because they break the participants' traditional notion of what it means to be in a course. For example, the roles of instructor and student are not what may be expected, and this could be stressful to those experiencing a MOOC for the first time. Within a MOOC a learner takes on the responsibility for the learning goals and how the goals will be achieved. As a result, the researchers suggested that the high attrition rates in MOOCs occurred because participants did not understand the role they would have to play in the MOOC, and they likely did not have the

academic experience or appropriate background to work within the MOOC. As a result, learners may dropout of MOOCs. Yet, even though not every participant completes all the MOOC requirements, this may not have been their goal and they likely still learned something from the experience.

One of the key questions answered in the McAuley et al. (2010) study was what skills are needed by participants of MOOCs. The researchers identified that MOOCs are self-guided because there are thousands of participants in each MOOC. Successful MOOC participants therefore should be self-starters that can collaborate, make decisions, and take charge of the learning process. Another research question explored in this study was to identify the factors that limit learner participation in MOOCs. The researchers noted that those participants most comfortable in traditional learning environments are likely to struggle in MOOCs. The researchers suggested that learners new to MOOCs will likely find their first MOOC challenging because of the lack of support and scaffolding offered (McAuley et al., 2010).

In a study by Saadatmand and Kumpulainen (2012) open learning environments, including MOOCs, were examined to determine what it was like to participate in these kinds of learning environments. The findings of the research identified that participants must be self-organized given the huge amount of information, resources, and possibilities available to learners. In these learner-center contexts such as MOOCs, participants were determined to be in control of what and how to learn. Though self-directed learning was not mentioned as a specific skill, terms used to describe and define self-directed learning were identified as critical to success.

In a study by Fini (2009), the researcher examined participants taking one of the first cMOOCs held in 2008. Participants of the study were small in number for a MOOC, only 83

completed the study survey. Of those learners that participated, 46% indicated that English was not their native language, yet only one individual indicated that English language difficulties was a reason for not completing the MOOC, and only one person identified technical difficulties for not completing a MOOC. More research is needed to determine for larger populations of MOOC takers if language and technical issues that could result from physical disabilities or impairments may be factors that inhibit completion. This research study collected data on both English language ability and possible issues resulting from physical disabilities or impairments to explore if these factors may interfere with MOOC completion.

To summarize, at this time MOOCs are only one single solution to the challenges that higher education is currently facing. However, if more learners are not able to successfully meet the goals of a MOOC, it is likely that other open education initiatives may provide a better education alternative and MOOCs may not continue to exist. On the other hand, MOOCs should be viewed as a starting point to motivate universities into new educational opportunities, and to further innovate and develop meaningful open education for global learners. In addition, MOOCs could be the beginning of new policies, business models, and teaching practices for higher education, which are all in need of change (Yuan & Powell, 2013).

Chapter Summary

Self-directed learning remains a viable means of study as part of adult learning theory (Merriam, 2001), and regardless of criticism, self-directed learning is one of the most studied and practiced areas within adult education (Brockett & Donaghy, 2005). As new learning contexts such as MOOCs appear within higher education, from the literature review, it is logical to examine these online courses and their relationship with self-directed learners.

This research study examined the hypothesis that those most competent in self-directed learning were the most likely to successfully complete a greater proportion of a MOOC. The focus of this study came from the extremely high drop out rates that MOOCs are experiencing, and the link between online course success and self-directed learning. From the literature review several studies identified the skills learners need to complete online courses such as self-management, self-control, and a desire to learn (Fisher et al., 2001). Self-directed learning is a pillar of online education in that self-directed learning includes self-paced learning strategies, independent study, individualized learning plans and self-instruction (Caffarella, 1993), which are some of the key characteristics needed to complete online courses.

Though self-directed learners can participate in many different types of education environments, they prefer autonomous learning experiences (Grow, 1991). Grow (1991) even suggested strong learners who are self-directed may not need a teacher at all. Characteristics of MOOCs seem to fit nicely with these self-directed learners. MOOC participants have little to no contact with an instructor, are responsible for their own learning experience, must create their own plan for success, and must motivate themselves to complete all the MOOC requirements. The results of this research study did indicate there was a connection between those strong in self-directed learning and their success in MOOCs.

Because MOOCs have only been part of American university offerings for approximately two years, little research exists on the effectiveness of these online courses. If more is known about the adult learners that persist and complete MOOCs, as compared to those that do not complete MOOCs, steps can be taken to improve MOOCs for many different types of learners, especially those not strong in self-directed learning. Studies have found that matching a learner's readiness for self-directed learning to the proper educational delivery method can lead to optimal

learning outcomes (Grow, 1991). More information is needed about MOOC completion and the learners that take these courses if MOOCs are to prevail and be a successful educational offering for many years to come.

Chapter 3: Methods

Overview

This chapter provides an in-depth look at the research methods used to study the relationship between adult learners' readiness for self-directed learning and MOOC completion percents. To accomplish this, the research subjects and population are described, along with the instrument that was used to measure the identified variables. Also included in this chapter is a description of the approach used to gather and analyze data collected for this study.

As stated previously, the purpose of this study was to determine the extent to which, if at all, there was a relationship between the degree of self-directed learning readiness among adult learners and the degree of their MOOC completion. In addition, this study explored the extent to which, if at all, there were differences in the demographics of adult learners that completed MOOCs compared with those learners that did not. Lastly, this study examined the extent to which, if at all, adult learner demographics mediated the relationship between self-directed learning readiness and degree of MOOC completion. From this purpose came the following research questions:

1. To what extent, if at all, was there a relationship between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion?
2. To what extent, if at all, were there differences in demographics of adult learners that completed a MOOC compared with those that did not complete a MOOC?
3. To what extent, if at all, did adult learner demographics mediate the relationship between self-directed learning readiness and degree of MOOC completion?

Research Approach

Using quantitative research methods this was a relational study with a single-group design, resulting in a non-experimental study. Participants registered for a single Coursera MOOC titled Disaster Preparedness were invited to participate in the study. Coursera was selected as the MOOC platform for this study because it was one of the largest providers of massive online courses (Young, 2013) offering over 200 MOOCs on more than 20 different subjects ("The big three," 2012). In addition to its large MOOC offering, Coursera has two and half million registrants taking its MOOCs (Morrison, 2013). Such a popular MOOC provider seemed ideal to reach a large MOOC audience for this study.

To summarize the data gathering for this study, descriptive statistics were calculated to provide the general characteristics of each variable studied, and these calculations are displayed in simple graphic summaries to highlight the basics of the study. Inferential statistics like correlations and analysis of covariance (ANCOVA) were used to determine if relationships existed between the variables of the study (Trochim, 2006).

Phenomena Investigated

Several variables were examined in this study including self-directed learning readiness, MOOC completion percents, and the demographic variables of age, gender, highest level of education completed, previous MOOC experience, reason for taking the course, English language ability, possible interference with course completion from a disability or impairment, and reasons for not completing this course. Each of these variables is described in more detail here. The independent variable in this study was an individual's readiness for self-directed learning methods, which was measured using a self-directed learning instrument administered through the first self-reporting online survey. From this first survey participants answered 40

questions and then were assigned a score between 40 and 200 based on their responses. This score indicated their readiness for self-directed learning.

The dependent variable for this study was MOOC completion percent, which was self-reported through an online survey sent to those who completed the first survey. All the study participants were asked to estimate their completion percents from zero to 100 once the MOOC ended.

Eight mediating variables surrounding adult learner demographics were collected from the first self-reporting online survey given to the MOOC registrants, and one final demographic variable from the second survey, to provide a better understanding of the study participants and determine if there was a relationship between any of these variables and self-directed learning readiness or MOOC completion. The mediating variables examined in this study were participant age, gender, highest level of education completed, previous MOOC experience, reason for taking the course, English language ability, possible interference with course completion from a disability or impairment, and reasons for not completing this course.

Data Sources and Levels of Measurement

Two primary sources of data were used to measure the variables identified. For the independent variable of self-directed learning readiness and the majority of participant demographic data, an online self-report survey was emailed to all the adult learners registered for the Coursera MOOC titled Disaster Preparedness. The second source of data was the second online self-report survey emailed to those registrants that completed the first survey. This second survey was used to collect the course completion percentages from each participant in the study, and their reasons for not completing the course. This completion data was gathered once the MOOC had commenced. Each of these data sources is explained in more detail in this section.

The first data source was a scale of measurement called the SDLRS and was developed by Fisher et al. (2001). According to the survey developers, readiness for self-directed learning reflects the degree of control a student is willing to assume for learning. Therefore, an instructor can implement methods of instruction that are conducive to an individual's self-directed learning readiness score. Although the SDLRS was originally developed for use with undergraduate nursing students, the items specific to nursing were removed by the developers, making the survey applicable to numerous groups (Fisher et al., 2001).

The developers of the SDLRS wanted to create a reliable and valid instrument to measure self-directed learning readiness. The instrument was developed through a reactive Delphi technique. To determine the scale's validity and internal consistency, a pilot test was conducted where the scale was administered to 201 undergraduate nursing students. Based on the initial Delphi interviews, the 40 statements on the scale were broken into three factors. Those factors were self-management, desire for learning, and self-control. Each of these factors was estimated using Cronbach's coefficient alpha and each construct was above .80, which was determined to be acceptable for internal consistency (Fisher et al., 2001).

The final outcome was that the SDLRS consists of 40 self-directed learning statements that an individual must rank as to the frequency with which each statement applies to that individual. As an example of a self-directed learning statement, the sentence, "I enjoy studying", is found on the scale. Each of the forty statements on the survey use the same five-point Likert scale as an answer option. Those taking the survey must respond to each statement by selecting their frequency of agreement as never, seldom, sometimes, often, or always. To determine scores of self-directed learning readiness, a total of one point is assigned when participants answer never, two points are given when participants answer seldom, three points are assigned when

participants answer sometimes, four points are assigned when participants answer often, and five points are assigned every time participants select always to a self-directed learning statement from the SDLRS. A minimum total of 40 points is possible, with a maximum score of 200 points achievable making this an interval variable. Everyone scoring 150 or above was considered to be ready for self-directed learning methods (Fisher et al., 2001). Participants of this study that responded to all 40 statements on the SDLRS were assigned a score from 40 to 200. To view the SDLRS in its entirety, go to Appendix A.

The demographic data needed for this study was collected as part of the first self-report survey containing the SDLRS questionnaire administered online. In addition to the 40 SDLRS statements, the first eight questions of the survey were used to capture participant demographics and most were categorical variables, with gender, previous MOOC experience, and disability or impairment being dichotomous nominal, and age, highest level of education completed, reason for taking the course, and English language ability, being categorical nominal variables. To view these eight demographic questions and the SDLRS statements and responses as they appeared online to participants, view Appendix B.

The first demographic asked participants to select their age category. This study focused on adult learners, so the age categories began at 18 because this is the age an individual is typically considered an adult in the United States, though this does vary by state ("U.S. Legal, Inc.," n.d.). The age categories then followed the same age range distributions used by the United States Census Bureau (2012). As a result, this study has categorical selections for the variable of age. For the second demographic variable gender, the values of male and female were used. When measuring the third variable of highest level of education completed, again, categorical selections were available. Participants selected from primary school, secondary school, high

school or General Education Development (G.E.D.), associate's degree, bachelor's degree, master's degree, Ph.D. or doctorate. The fourth variable was previous MOOC experience. Previous MOOC experience was defined for participants as having previously enrolled in and completed some or all of a different MOOC in the past. This variable was measured using the values of yes or no. The fifth variable was an individual's reason for choosing to enroll in the MOOC selected for this study. Participants of the study had a list of options they chose from. The sixth and seventh variables were asking participants to indicate their level of English ability. The first question asked about English speaking ability and the second question asked about English literacy ability. Category selections for these English language questions were taken from the report titled *Validity of Global Self-Ratings of ESL Speaking Proficiency Based on an FSI/ILR-Referenced Scale* (Wilson, 1999). Within the informed consent information given to participants, a basic understanding of English and English-reading ability were required to participate in the study as the informed consent information and survey questions were written in English. The last variable to be measured was whether or not an individual had a disability or physical impairment that could interfere with course completion. Respondents had the option to select yes, no, or prefer not to say, for this question.

To measure the dependent variable, the percent of MOOC completed, data from a second online self-reporting survey was used. From the first survey, each participant provided a unique Coursera identification number, which was an email address. Using this email address, all participants were sent the second survey to self-report their completion data from zero to 100 and also to determine how many participants successfully completed all the MOOC requirements. The second survey asked participants to estimate the percent of course completed from zero to 100 percent, making this an interval variable. This second survey also asked the study

participants to indicate their reasons for not completing the MOOC, if applicable. The results from the second online survey were then matched to each individual respondent's results from the first survey.

Timeframe of Data Collection

The timeframe of data collection for this study began as the MOOC was being held and used two methods of data collection. Prior to the MOOC start date of August 26, 2013, the demographic questions and the SDLRS statements were entered into the secure online survey tool Qualtrics. By using this online survey platform, the researcher ensured a secure data collection method that only the researcher had access to. Once the survey was developed, a link to the survey was embedded in an email and sent to the Disaster Preparedness MOOC participants. Within the week of August 26th, 2013, the start date of the MOOC, a link to the informed consent information, demographic questions, and SDLRS was emailed to all MOOC registrants.

To read the exact text of the informed consent, go to Appendix C. Those learners registered for the MOOC should have understood by reading and agreeing to the informed consent information, and answering the questions in the online survey, they were agreeing to participate in the study and understood the purpose of the study. By not agreeing to participate, registrants were opting out of the study.

The Disaster Preparedness MOOC was scheduled to run over six weeks. For the six weeks of the MOOC, the study participants were working through the MOOC or ended their participation in the MOOC. Ideally, the second survey to collect the completion percents would have been sent immediately following the close of the MOOC, the week of October 7th.

However, given a change in data collection methods, the second survey was sent just over two months after the end of the MOOC, in December 2013.

The rational for this research study was not complex. Coursera was selected as the MOOC platform because it was one of the largest providers of massive online courses (Young, 2013) and few research studies have been conducted on Coursera MOOCs. Next, the registrants of a single Coursera MOOC were selected for this study given the limitations of the researcher's time and access. To get permission to survey participants of this one MOOC, the researcher contacted all of the MOOC instructors that were registered to teach MOOCs beginning in late August to early October, and only one instructor agreed to allow the survey to be sent. As a result, the Disaster Preparedness MOOC was the only MOOC made available to the researcher.

Population

This study had a single population of adults, defined as those 18 and older, with at least a minimal ability to read English, registered for the MOOCs on the Coursera platform. As of early 2013, more than two and a half million people were registered for one or more of the over 200 MOOCs offered at Coursera. Of those registered with Coursera, approximately 28% were located within Europe and 35% lived in North America. From this population, 80% have college degrees, and half of this group has formal education beyond a bachelor's degree (Morrison, 2013). Based on these general statistics of Coursera MOOC participants, the population for this study was identified. It was estimated that between 20,000 and 50,000 adults would register for the Disaster Preparedness MOOC. Approximately 21,000 did register. From this group it was estimated that the majority of registrants would have college degrees and be located within the United States.

Sampling Method

The sample for this study was drawn from a single Coursera MOOC called Disaster Preparedness, which began on August 26, 2013 and ran for six weeks. All registrants of this MOOC were invited to participate in this study making this a census since the researcher was not sampling the population. This means that participants of the study were not selected randomly and all were invited to participate in the study. Unfortunately, this type of sampling can result in the subjects not being representative of the population, but is a common method used in research (Trochim, 2006). By choosing not to complete the SDLRS and eight demographic questions within the first online survey, the MOOC participants were opting out of this study.

Sample

Exactly 21,912 individuals registered for the Disaster Preparedness MOOC used as the context for this study. Based on the Coursera course management system data collected for a similar Coursera MOOC, approximately 8% of the MOOC registrants were expected to respond to the first survey emailed during the first week of a MOOC. This percent was achieved as 1,977 survey responses were completed. In addition, an incentive of a $100 Amazon gift card was offered to increase participation in the study. All MOOC registrants who completed the online survey had the opportunity to opt in to the random drawing for the gift card. The random drawing was conducted by the researcher after the course ended the week of October 7th, 2013. This gift card was described as a strategy used to entice registrants to participate in the study. Based on the research of Grant and Sugarman (2004), this type of incentive is considered ethical because the risk of participating in the study was low, the incentive was not coercive or manipulative, and the incentive did not manipulate others by asking them to do something they may find aversive. Based on this analysis, though the incentive was ethical, research was still

conflicting about whether or not a gift card truly influenced additional registrants to participate in a study who otherwise would not have participated (Grant & Sugarman, 2004). The opportunity to enter the drawing for the gift card was explained to the MOOC registrants in the informed consent form they received as part of the study. This informed consent form is available for review in Appendix C.

Once the first survey responses were downloaded from Qualtrics into Excel, each respondent that opted into the random drawing was assigned a number from 1 to the total number of survey respondent that opted in to the drawing. The number 1 was assigned to the first survey respondent that opted in; the number 2 was assigned to the second survey respondent that opted in, and so on. Each number was written on a small piece of paper and inserted into a bowl. The researcher chose one piece of paper from the bowl. The number on the paper determined the gift card winner. The researcher then looked up the number written on the paper to determine the email for that survey respondent. The researcher will then go to Amazon and purchase a $100 gift card to be delivered via email from Amazon. The researcher included a message with the online card explaining that the individual was the randomly selected recipient of the $100 Amazon gift card chosen for completing the study survey. The gift card recipient received the emailed gift card the week of October 7th. The researcher also notified the course instructor that a recipient was randomly selected for the $100 gift card. The researcher did not expose the identity of the gift card recipient and will never directly email the recipient.

Human Subjects Considerations

This study attempted to meet or exceed all human subject considerations as outlined by the Internal Review Board (IRB) for the organization overseeing this research. There were 11 areas that IRB ensured were covered to guarantee ethical research was being conducted. Each of

these areas was addressed. The first area was informed consent. This meant that all registrants of the MOOC were told about the risks of participating in the study, procedures for participating in the study, and must consent to participate (Trochim, 2006). To meet the informed consent requirement, within the email sent to all MOOC registrants was a link to Qualtrics which outlined a description of the self-directed learning readiness survey along with a description of the study, the risks associated with participating in the study, how confidentiality would be maintained, an individual's right not to participate in the study, and explanation of the random drawing to be conducted for the Amazon gift card. Individuals were asked to give their consent to participate in the study by clicking they agreed to participate and answering the online survey questions. To view the informed consent information that was placed in Qualtrics prior to the survey questions, view Appendix C.

The second area to be addressed for IRB approval was making sure that participants of the study understand they were voluntary participants. Within the informed consent text, it was stated that completion of the online survey was voluntary and no negative consequences resulted if the MOOC registrant chose not to complete the survey. Participants choosing to click the link to access the informed consent and survey questions were told that they may skip any questions on the survey they were not comfortable answering, and may end the survey at anytime without negative consequences.

The third area to address for IRB was confidentiality. Participants were informed that their responses for the study would be kept confidential. No personally identifiable or private information collected from the study will ever be disclosed. Data collected from both surveys will only be shared in the aggregate. In addition, at any point during the study, only the researcher had access to the individual survey results. The researcher will keep both survey

responses on a secure computer hard drive for at least five years. These files are password protected and after five years the data will be destroyed. Those that chose to complete the survey can contact the researcher for a copy of the aggregate survey results as indicated in the informed consent form.

The fourth area addressed for IRB approval was that of anonymity. Anonymity of participant identity was a more challenging principle to maintain than confidentiality (Trochim, 2006), and could not be applied to this study. Participants in this study could be identified by their unique Coursera identification numbers and Coursera logins, which were the registrants' email addresses and were collected on the first online survey distributed. This identification information was necessary to match the survey results to the participants' MOOC completion percent, collected in the second survey. In addition, because the researcher was offering an incentive for participating in the study, which participants could opt in to, a winner of the $100 Amazon gift card was randomly selected by the researcher, and this individual was notified of the prize through email. Each of these factors meant that participation in the study was not anonymous.

The fifth area addressed for IRB approval was risk of participation. Risks to those participating in this study was minimal. In terms of physical risks, taking both surveys should not have resulted in extreme pain, physical discomfort, illness, or injury, though it could have resulted in fatigue or boredom. Social-economic risk was also minimized. Participant responses will be kept confidential and no individual will be singled out based on a response, which should minimize or eliminate social embarrassment. Also, the winner of the gift card was not publicized, but was contacted privately. There were no economic risks associated with participating in this study. Another risk to consider was legal risk, which was minimal. All

copyright and proper authority were obtained for this study by the researcher. Participants did not face any negative risks that could have impacted their behavior while participating in the study. Psychological risk was also minimal. There was little psychological risk associated with completing the survey, though participants may have felt some increased psychological pressure to complete the MOOC once they were aware their MOOC completion percents would be part of the study. However, only the researcher of this study had access to the SDLRS scores, and self-reported MOOC completion percents. Again, the study information will only be made public in aggregate form.

The sixth area to be addressed for IRB was the benefit of participating in the study. There was little to no benefit to the subjects or community by participating in this study. One possible benefit was that one participant of the study that opted in to the random drawing would receive a $100 gift card from Amazon. Participants could also request to get a copy of the study results from the researcher to learn more about the aggregate data and implications.

Finally, the remaining five concerns for IRB were addressed. The seventh area to be addressed for IRB approval was site approval. This approval involved gaining the appropriate permissions needed to conduct the study. The researcher obtained written approval to conduct the study from the Disaster Preparedness MOOC instructor. This permission is located in Appendix E. The researcher also received permission to send a second email and survey link to the registrants that agreed to participate in the study originally. This permission from the faculty can be see in Appendix F.

The eighth area needed for IRB approval was to describe how deception toward study participants was avoided. To avoid any deception, the research plan and description of the study were clearly explained to MOOC registrants in the informed consent information. View

Appendix C for the exact wording used in the informed consent information. The ninth area needed for IRB approval was remuneration. Remuneration can be described as an incentive given to individuals to increase their likelihood of participating in the study (Grant & Sugarman, 2004). For this survey, all the MOOC registrants that completed the online survey and opted in to the random drawing through the informed consent, were entered into a drawing for a $100 Amazon gift card. One participant of the study that opted in was selected at random and given the gift card. This was the only type of remuneration used in this study. The tenth section to be addressed for IRB was conflict of interest. As currently designed, the researcher of this study did not benefit financially from conducting this study and should therefore not be in conflict with the goals and outcomes of the study. No one else involved in this study, such as the MOOC instructor, was in any conflict of interest for this study either. The final area to review for IRB approval was copyright clearance. Written permission for the researcher to use the SDLRS (Fisher et al., 2001) was obtained from one of the original developers of the scale and can be found in Appendix D. The other questions were demographic questions that were developed by the researcher of this study. These demographic questions are available for review in Appendix B. The second survey asked participants to estimate their course completion and can be viewed in Appendix G. These survey questions were also developed by the researcher of this study.

Instrumentation

Two surveys were used to gather data directly from MOOC registrants for this study. The first quantitative self-report questionnaire was administered online and contained two parts. The first part of the online survey focused on the collection of participant demographic data and the second part of the survey was a scale used to measure a person's readiness for self-directed learning methods called the SDLRS (Fisher et al., 2001). The second quantitative self-report

questionnaire was also administered online and collected completion percents. The remainder of this section focuses on describing the SDLRS found in the first survey.

The SDLRS by Fisher et al. (2001) was developed from the self-directed learning work of Guglielmino, Chickering, and Knowles to address researchers' concerns with the original SDLRS/LPA developed by Guglielmino in 1977. Though Guglielmino's (1977) scale is by far the most widely used instrument to measure self-directed learning readiness, researchers have expressed concerns with its validity (Field, 1989; Candy, 1991), the inability of researchers to replicate the original study findings, (Field, 1989, 1991; Straka & Hinz, 1996), problems with obtaining access to the scale, and the cost of using the SDLRS/LPA. Therefore, Fisher et al. (2001) believed there was a strong enough need for a more accurate and reliable SDLRS and developed an alternative to the Guglielmino scale.

This SDLRS (Fisher et al., 2001) can be viewed in its entirety in Appendix A. This SDLRS has 40 statements developed to measure the self-directed learning factors of self-management, desire for learning, and self-control. For each of the 40 statements, people must assess how frequently each statement applies to them. For example, the statement "I am self-disciplined" appears on the scale. Those that take the SDLRS make their frequency decisions for each statement by choosing from five responses of never, seldom, sometimes, often, and always. Each response is associated with a point value. The response never equals one point, seldom equals two points, sometimes equals three points, often equals four points, and an always response equals five points. This point system allows an individual to score between 40 and 200 points on the scale. Any score above 150 points indicates readiness for self-directed learning methods (Fisher et al., 2001).

To develop the SDLRS, a pilot test was conducted using nursing undergraduate students (N = 201). Though the scale was originally developed for nursing students, the questions specific to nursing were removed by the original developers. Based on the pilot, the internal consistency reliability for each component score was estimated using Cronbach's alpha. For the self-management component of self-directed learning readiness, a total of 13 questions were scored at .86. The component desire for learning has a total of 12 questions on the scale and scored .85. Lastly, the self-control component has 15 items on the scale and scored .83. The Cronbach coefficient for all the questions totaled .92. The scores in the pilot study were normally distributed (Fisher et al., 2001). Smedley (2007) was able to replicate the scales mean of 150 in another study. Based on the pilot, and replication of the pilot results in other studies, the SDLRS by Fisher et al. (2001) is considered to be a valid and reliable scale.

Data Collection Procedures

Coursera is one of the leading providers of MOOCs and was selected as the MOOC platform for this study. Only two years old, Coursera is a for-profit organization that offers more than 200 MOOCs in over 20 subjects such as math, science, and education ("The big three," 2012). Partnering with top universities has enabled Coursera to register over two and a half million people to take their free massive courses online (Morrison, 2013). Coursera is also aggressively expanding by adding new universities to its partnership list to pursue a more global audience. For example, in early 2013 Coursera announced it will add 29 new universities to its existing 33 partners, with many of these new universities being located outside of the United States (Rivard, 2013a). In addition, Coursera is pursuing college credit for some of its MOOCs as a way to differentiate itself from other MOOC providers and to earn revenue from student proctored testing needed for this credit.

Of the MOOCs offered at Coursera, the researcher had access to the Disaster Preparedness MOOC. This MOOC focused on preparing for disasters, mitigating the effects of disasters, and disaster planning. No specific background was required to participate in this MOOC, and all learners were welcome to register and participate. The MOOC was six weeks in length and it was estimated that participants would have two to four hours of work associated with this MOOC each week. This was the first time this MOOC was offered. The MOOC began on August 26, 2013, and had 21,912 registrants.

The instructor of this MOOC provided approval to allow the study to be conducted with the participants of the Disaster Preparedness MOOC. To view this permission, go to Appendix E.

To administer both surveys, the demographic data questions and SDLRS were entered into the online survey tool Qualtrics by the researcher. By using this secure online survey platform, it ensured that no one except the researcher had access to the online survey data collected. The survey results were then exported by the researcher into an Excel file.

The first survey data collection took place over a six-week period, which was the length of the MOOC. During the first week of the MOOC beginning August 26th, 2013, all registrants received an email from the Disaster Preparedness Course Team that included the link to the informed consent information and online survey within Qualtrics. The instructor then sent a follow-up email to all participants encouraging non-respondents to participate in the study. This second email was sent to all participants the week of September 9, 2013 and again contained the link to Qualtrics with the informed consent information, and online survey questions. On October 7, 2013 the MOOC closed and the first survey closed as well. The online survey responses from Qualtrics were then downloaded into an Excel file. The recipient of the $100 Amazon gift card was randomly selected from the study participants that opted in to the drawing

and was notified by the researcher through email that the gift card could be claimed through Amazon online. To gather the completion percents from the 1,977 participants that responded to the first survey, a second online survey was sent on December 11, 2013. A reminder to complete the second survey was sent two days later, but only to the non-respondents. On December 15th, the second survey was closed, as 583 subjects had responded. The SDLRS scores from the first survey were then matched with MOOC completion percents from the second survey, for data analysis using SPSS software.

Summarization of hypotheses and constituent variables. As stated previously, this research study explored three different hypotheses. The first hypothesis was that the more competent adult learners were at self-directed learning, the more likely these learners were to successfully complete a greater percent of a MOOC. Based on this hypothesis, there were two variables measured through this study. First, self-directed learning readiness was measured using the Fisher et al. (2001) SDLRS. Using this measure, learners were given a score from 40 to 200. The second variable, MOOC completion percent, was measured from the self-reported data from the second survey. Participants were asked to estimate their course completion from zero to 100. This percentage of completion was matched with each participant's SDLRS score. From the hypothesis, the researcher expected that those that scored higher on the SDLRS would also have completed a greater percent of the MOOC.

Refer to Table 1 titled Measures for Hypothesis 1 for a summary of this first stated hypothesis, variable names, data collection instruments, and level of measurements.

Table 1

Measures for Hypothesis 1

Hypothesis 1	Variable name	Instrument name	Level of measurement
Adult learners scoring high in self-directed learning readiness were likely to complete a higher percent of a MOOC.	1a. Self-directed learning readiness 1b. MOOC completion percent	1a. SDLRS 1b. Online survey	1a. Interval level for self-directed learning readiness scores from 40 to 200 1b. Interval level for MOOC percent complete from zero to 100

The second hypothesis was that adult learners with previous experience taking a MOOC were more likely to complete a MOOC. Previous MOOC experience was important to consider because it may influence a person's comfort level and expectations of a MOOC. MOOC learners have reported feelings of stress and being overwhelmed when taking MOOCs, and have indicated preferences for more guidance and structure in their MOOC experience. Being overwhelmed and needing more guidance in an online course may be linked to low MOOC completion rates (Mackness et al., 2010). Again, to obtain MOOC completion percents, data were gathered from the second survey. Participants were asked to estimate if they completed the MOOC requirements or did not complete the MOOC requirements. This completion status was then matched with each participant's demographic data. Though other demographics were collected as part of this research study, from the review of the literature, the researcher expected that those with previous MOOC experience were more likely to have completed the MOOC than those without previous MOOC experience.

Refer to Table 2 titled Measures for Hypothesis 2 for a summary of the second stated

hypothesis, variable names, data collection instruments, and level of measurements.

Table 2

Measures for Hypothesis 2

Hypothesis 2	Variable name	Instrument name	Level of measurement
Adult learners with previous MOOC experience were more likely to complete a MOOC.	2a. Previous MOOC experience 2b. MOOC completion status	2a. Online survey 2b. Online survey	2a. Dichotomous nominal level for previous MOOC experience 2b. Dichotomous nominal level for MOOC completion

The third hypothesis was that adult learners in their thirties and forties, who were female, with high levels of education, previous MOOC experience, strong English language skills, and with no physical disability or impairment that may interfere with completing an online course, were stronger self-directed learners and more likely to complete a greater percent of a MOOC. Based on this hypothesis, there were seven demographic variables that were measured. The demographic data was collected in the same online survey that contained the SDLRS. In terms of age, studies have found that adult learners in their thirties and forties score higher in self-directed learning readiness (Reio & Davis, 2005). For gender, results are often mixed, however, some studies have found females, at times, score higher in self-directed learning readiness (Reio & Davis, 2005; Guglielmino, 1996; Liddell, 2008). For highest level of education completed, study results indicate that having higher levels of education do result in higher scores for self-directed learning readiness (Guglielmino et al., 1987; Brockett, 1985; Oliveira et al., 2010). As stated previously, prior MOOC experience may be linked to higher MOOC completion percents. The researcher also expected that MOOC participants with strong English language skills, and with

no physical disability or impairment that may interfere with completing an online course, would have higher SDLRS and complete a greater percent of the MOOC.

Again, self-directed learning readiness scores were measured using the SDLRS (Fisher et al., 2001) and MOOC completion percents were gathered from the self-reported data from the second survey. Participants estimated their course completion from zero to 100. From the hypothesis, the researcher expected that adult learners in their thirties and forties, who were female, with high levels of education, previous MOOC experience, strong English language skills, and with no physical disability or impairment that may interfere with completing an online course, would have higher scores in self-directed learning readiness and have higher MOOC completion percents.

Refer to Table 3 titled Measures for Hypothesis 3 for a summary of the third stated hypothesis, variable names, data collection instruments, and level of measurements.

Table 3

Measures for Hypothesis 3

Hypothesis 3	Variable name	Instrument name	Level of measurement
Adult learners in their thirties and forties, who are female, with high levels of education, previous MOOC experience, strong English language skills, and with no physical disability or impairment that may	3a. Age 3b. Gender 3c. Highest level of education completed 3d. Previous MOOC experience	3a. Online survey 3b. Online survey 3c. Online survey 3d. Online survey 3e. Online survey 3f. Online survey 3g. Online Survey	3a. Categorical nominal level for age 3b. Dichotomous nominal for gender 3c. Categorical nominal level for highest level of education completed (continued)

Hypothesis 3	Variable name	Instrument name	Level of measurement
interfere with completing an online course, had higher scores in self-directed learning readiness and higher MOOC completion percents.	3e. English speaking ability 3f. English literacy ability 3g. Disability or impairment 3h. Self-directed learning readiness 3i. MOOC completion percent	3h. SDLRS 3i. Online Survey	3d. Dichotomous nominal for previous MOOC experience 3e. Categorical nominal level for English speaking 3f. Categorical nominal level for English literacy 3g. Dichotomous nominal level for disability or impairment 3h. Interval level for self-directed learning readiness scores from 40 to 200 3i. Interval level for MOOC percent complete from zero to 100

Data preparation. To obtain the raw data for this study, two sources of data were accessed. The first source was the SDLRS scores collected in the online survey tool called Qualtrics. The participants' eight demographic responses and SDLRS scores were exported into an Excel file from Qualtrics. Next, the MOOC completion percents were gathered from the self-reported data from the second survey. Participants were asked to estimate their course completion from zero to 100 percent. Each file was securely stored on the researcher's computer hard drive and was password protected. Exporting the raw data into Excel files meant it was in a compatible format to use with SPSS statistical software for analyzing the data.

On the first online survey, participants were also asked to enter their Coursera email address so that their SDLRS score could be matched to their MOOC completion percent gathered in the second survey. The data from both surveys was reviewed for accuracy by scanning the raw data. The researcher also reconciled the survey data and MOOC completion percents to ensure that only the completion percents for the second survey participants were used, which can be done by matching the Coursera email addresses.

Descriptive and inferential statistics. To begin data analysis, the first step was to calculate the SDLRS scores for each participant. Forty numbers were added within excel to get a score between 40 and 200. Subjects were then assigned their overall readiness for self-directed learning score. Next, MOOC completion percents were examined. Participants were sorted by percents from zero to 100, and into MOOC completers and non-completers.

The two data analysis techniques used for this study were descriptive statistics and relevant inferential statistics. Descriptive statistics were used to describe each of the variables in the study. Inferential statistics, on the other hand, were used to determine if relationships existed between any of the variables collected in the study (Trochim, 2006).

As part of descriptive statistics, a univariate analysis was conducted for each of the variables in this study. This meant the distribution, the central tendency, and the dispersion of each variable was calculated. The distribution provided a range of frequency of the values or variable. Central tendency included the calculations of mean, median, and mode. The mean, or average, showed the average SDLRS score. The median is the middle score of all of the participants and was used for MOOC completion percents and the SDLRS scores. The most frequently occurring value is the mode. This was valuable for both the SDLRS scores and MOOC percent complete. For dispersion, both the range and standard deviation were calculated

for the SDLRS score and MOOC completion percents. Range is the number between the highest and lowest value, and standard deviation describes the dispersion of numbers in more detail. All of these calculations were used to satisfy the assumptions required for inferential analysis, by determining that the data came from a normally distributed population and were free from systemic errors (Trochim, 2006).

Inferential statistics answered the study's research questions. The first research question was, "To what extent, if at all, was there a relationship between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion?". The null hypothesis was that there was no relationship between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion. The alternative hypothesis was there was a relationship between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion. This study used the most common level of significance, .05, to scrutinize the data. Next, an analysis was conducted using the statistical software SPSS to ascertain the probability level also called the *p*-value. If the *p*-value was less than .05, then the null hypothesis was rejected. If the *p*-value was equal to or greater than .05, then the null hypothesis was not rejected. To calculate the *p*-value, the statistical analysis of a correlation was performed to compare the two variables, which were both measured as numerics at the interval level. Finally, for this first research question direct reporting of the Pearson product-moment correlation coefficient (Pearson's *r*) was used for an indication of effect size.

The second research question was, "To what extent, if at all, were there differences in demographics of adult learners that completed a MOOC compared with those that did not complete a MOOC?". To answer this research question, each of the first eight demographic variables that are part of this research study were asked in a sub-question. The first variable was

gender and the question was, “To what extent, if at all, was there a difference in the gender of adults that completed a MOOC compared with those adults that did not complete a MOOC?” The null hypothesis was, there was no difference in the gender of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternative hypothesis was, there was a difference in the gender of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, gender, was an attribute at the dichotomous nominal level, and the dependent variable, MOOC completion, was an attribute at the dichotomous nominal level.

The second variable was age and the question was, “To what extent, if at all, was there a difference in the age of adults that completed a MOOC compared with those adults that did not complete a MOOC?” The null hypothesis was, there was no difference in the age of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternative hypothesis was, there was a difference in the age of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, age, was an attribute at the categorical nominal level, and the dependent variable, MOOC completion percent, was an attribute at the dichotomous nominal level.

The third variable was highest level of education completed and the question was, “To what extent, if at all, was there a difference in the level of education completed of adults that completed a MOOC compared with those adults that did not complete a MOOC?” The null hypothesis was, there was no difference in the level of education completed of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternative hypothesis was, there was a difference in the level of education completed of adults that

completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, level of education completed, was an attribute at the categorical nominal level, and the dependent variable, MOOC completion percent, was an attribute at the dichotomous nominal level.

The fourth variable was previous MOOC experience and the question was, "To what extent, if at all, was there a difference in previous MOOC experience of adult learners that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in previous MOOC experience of adult learners that completed a MOOC compared with those adults that did not complete a MOOC. The alternative hypothesis was, there was a difference in previous MOOC experience of adult learners that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, previous MOOC experience, was an attribute at the dichotomous nominal level, and the dependent variable, MOOC completion percent, was an attribute at the dichotomous nominal level.

The fifth variable was reason for enrolling in the MOOC and the question was, "To what extent, if at all, was there a difference in reasons adults have for enrolling in the MOOC of those that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in reasons adults have for enrolling in the MOOC of those that completed a MOOC compared with those adults that did not complete a MOOC. The alternative hypothesis was, there was a difference in reasons adults have for enrolling in the MOOC of those that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, reasons for enrolling in a MOOC, was an attribute, and the dependent variable, MOOC

completion percent, was an attribute at the dichotomous nominal level. Though respondents to this survey question could select the option "other" and write in a response, no qualitative data analysis was conducted for this question.

The sixth variable was English speaking ability and the question was, "To what extent, if at all, was there a difference in the English speaking ability of adults that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in the English speaking ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternative hypothesis was, there was a difference in the English speaking ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, English speaking ability, was an attribute at the categorical nominal level, and the dependent variable, MOOC completion percent, was an attribute at the dichotomous nominal level.

The seventh variable was English literacy ability and the question was, "To what extent, if at all, was there a difference in the English literacy ability of adults that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in the English literacy ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternative hypothesis was, there was a difference in the English literacy ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, English literacy ability, was an attribute at the categorical nominal level, and the dependent variable, MOOC completion percent, was an attribute at the dichotomous nominal level.

The eighth variable was disability or impairment and the question was, "To what extent, if at all, was there a difference in the disability or impairment of adults that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in the disability or impairment of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternative hypothesis was, there was a difference in the disability or impairment of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, disability or impairment, was an attribute at the dichotomous nominal level, and the dependent variable, MOOC completion percent, was an attribute at the dichotomous nominal level. Lastly, for the second research question, Cohen's D was used for an indication of effect size.

The third research question was, "To what extent, if at all, did adult learner demographics mediate the relationship between self-directed learning readiness and degree of MOOC completion?" To answer this research question, each of the eight demographic variables that were part of this research study were asked in a sub-question. The first variable was gender and the question was, "To what extent, if at all, did gender mediate the relationship between self-directed learning readiness and degree of MOOC completion?" The null hypothesis was, gender did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternative hypothesis was, gender did mediate the relationship between self-directed learning readiness and degree of MOOC completion. The appropriate statistical analysis was multivariate analysis of covariance (MANCOVA), which is an extension of analysis of covariance (ANCOVA). MANCOVA was needed because there were two dependent variables, self-directed learning readiness and MOOC completion, and control of the independent variable,

gender, was needed.

The second variable was age and the question was, “To what extent, if at all, did age mediate the relationship between self-directed learning readiness and degree of MOOC completion?” The null hypothesis was, age did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternative hypothesis was, that age did mediate the relationship between self-directed learning readiness and degree of MOOC completion. The appropriate statistical analysis was MANCOVA. MANCOVA was needed because there were two dependent variables, self-directed learning readiness and MOOC completion, and control of the independent variable, age, was necessary.

The third variable was level of education completed and the question was, “To what extent, if at all, did the level of education mediate the relationship between self-directed learning readiness and degree of MOOC completion?” The null hypothesis was, the level of education did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternative hypothesis was, the level of education did mediate the relationship between self-directed learning readiness and degree of MOOC completion. The appropriate statistical analysis was MANCOVA. MANCOVA was needed because there were two dependent variables, self-directed learning readiness and MOOC completion, and control of the independent variable, level of education completed, was necessary.

The fourth variable was previous MOOC experience and the question was, “To what extent, if at all, did previous MOOC experience mediate the relationship between self-directed learning readiness and degree of MOOC?” The null hypothesis was, previous MOOC experience did not mediate the relationship between self-directed learning readiness and degree of MOOC. The alternative hypothesis was, previous MOOC experience did mediate the relationship

between self-directed learning readiness and degree of MOOC. The appropriate statistical analysis was again MANCOVA. MANCOVA was used because there were two dependent variables, self-directed learning readiness and MOOC completion, and control of the independent variable, previous MOOC experience, was necessary.

The fifth variable was reason for enrolling in the MOOC and the question was, "To what extent, if at all, did a reason for enrolling in the MOOC mediate the relationship between self-directed learning readiness and degree of MOOC?" The null hypothesis was, a reason for enrolling in the MOOC did not mediate the relationship between self-directed learning readiness and degree of MOOC. The alternative hypothesis was, a reason for enrolling in the MOOC did mediate the relationship between self-directed learning readiness and degree of MOOC. The appropriate statistical analysis was again MANCOVA. MANCOVA was used because there were two dependent variables, self-directed learning readiness and MOOC completion, and control of the independent variable, reason for enrolling in the MOOC, was necessary.

The sixth variable was English speaking ability and the question was, "To what extent, if at all, did English speaking ability mediate the relationship between self-directed learning readiness and degree of MOOC?" The null hypothesis was, English speaking ability did not mediate the relationship between self-directed learning readiness and degree of MOOC. The alternative hypothesis was, English speaking ability did mediate the relationship between self-directed learning readiness and degree of MOOC. The appropriate statistical analysis was again MANCOVA. MANCOVA was used because there were two dependent variables, self-directed learning readiness and MOOC completion, and control of the independent variable, English speaking ability, was necessary.

The seventh variable was English literacy ability and the question was, "To what extent,

if at all, did English literacy ability mediate the relationship between self-directed learning readiness and degree of MOOC?" The null hypothesis was, English literacy ability did not mediate the relationship between self-directed learning readiness and degree of MOOC. The alternative hypothesis was, English literacy ability did mediate the relationship between self-directed learning readiness and degree of MOOC. The appropriate statistical analysis was again MANCOVA. MANCOVA was used because there were two dependent variables, self-directed learning readiness and MOOC completion, and control of the independent variable, English literacy ability, was necessary.

The eighth variable was disability or impairment and the question was, "To what extent, if at all, did a disability or impairment mediate the relationship between self-directed learning readiness and degree of MOOC?" The null hypothesis was, a disability or impairment did not mediate the relationship between self-directed learning readiness and degree of MOOC. The alternative hypothesis was, a disability or impairment did mediate the relationship between self-directed learning readiness and degree of MOOC. The appropriate statistical analysis was again MANCOVA. MANCOVA was used because there were two dependent variables, self-directed learning readiness and MOOC completion, and control of the independent variable, disability or impairment, was necessary. Lastly, for the third research question, Cohen's D was used for an indication of effect size.

Chapter Summary

Using quantitative research methods this was a relational study with a single-group design, resulting in a non-experimental study. Participants registered for a single Coursera MOOC, titled Disaster Preparedness, were invited to participate in the study to explore the relationship between self-directed learning readiness and MOOC completion. Data were

collected using two online surveys. The first survey administered the SDLRS (Fisher et al., 2001) and the second survey asked participants to estimate their MOOC completion percents. The demographic variables of age, gender, education completed, previous MOOC experience, reasons for enrolling in the MOOC, English language ability, disability or impairment, and reasons for not completing the course were also measured.

The relationships between these variables were analyzed using descriptive and inferential statistics such as correlations, chi-square analysis, and MANCOVA. This data analysis, results, and recommendations for this research study are presented in the final two chapters.

Chapter 4: Results

MOOCs are a new education phenomena that have rapidly entered into higher education. Today, there are numerous universities already offering MOOCs and momentum indicates more MOOCs are being planned for release in the near future (Pappano, 2012). Unfortunately, little research has been conducted on MOOCs, meaning their effectiveness is being questioned. If universities are going to continue to develop MOOCs, then these types of online courses should be a reliable education solution that many adult learners can complete. However, little is known about what it takes to complete a MOOC and if MOOCs are even designed for different types of adult learners. More information is needed about those that take MOOCs and their ability to complete or not complete this type of online education.

By studying self-directed learning, which is the ability to take responsibility for one's own learning (Knowles, 1975), learning strategies may be identified to increase MOOC completion rates. Knowing more about the self-directed learning traits of adult learners that complete MOOCs, and the traits of those adults that do not complete MOOCs, could provide insight into how to improve the design and development of MOOCs.

The purpose of this study was to determine to what extent, if at all, there was a relationship between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion. In addition, this study collected data on the demographics of those taking MOOCs in order to better understand these learners, why they take MOOCs, and then why they do not complete MOOCs. As previously stated, MOOCs continue to suffer from low completion rates when compared to other online courses offered by universities. By learning more about those that take MOOCs and their completion rates, strategies will be explored in Chapter 5 that may improve completion.

This chapter presents the data gathered from the research study participants and the results of the analysis of the data. To start, the data collection process is described, and then the descriptive statistics for each variable reported is presented. Using this data, each research question is described and analyzed. Finally, the chapter ends with additional findings that may be of interest to the purpose of this study, as well as a summary of the statistically significant results.

Data Collection Methods

The researcher had access to all of the registrants of the Disaster Preparedness MOOC offered through the University of Pittsburgh and hosted on Coursera, the largest MOOC platform (Pappano, 2012). In order to participate in this research study, individuals registered for the MOOC indicated they were at least 18 years old, with a minimal ability to read and understand English. All 21,912 registrants of the Disaster Preparedness MOOC were invited to participate in the study, and told that participation in the study was voluntary and had no impact on their experience taking the MOOC. The instructor of the MOOC did not know who agreed to participate in the study, as individual results were confidential.

To collect the research data, an initial online survey was built in Qualtrics, a secure online survey platform. The instructor of the MOOC distributed the link to the survey to all the MOOC registrants on the third day of the MOOC, and then again emailed the same link two weeks later. This first online survey consisted of eight demographic questions and the 40 questions that comprise the Self-Directed Learning Readiness Scale (SDLRS), used to measure a person's readiness to take charge of the learning process (Fisher et al., 2001). To view this first online survey, go to Appendix B.

The MOOC began on August 26, 2013, and ran for six weeks. The survey remained

accessible to all the registrants throughout the six-week course. On October 7, 2013, the MOOC officially closed, and the online data collected from the first survey was exported from Qualtrics to a Microsoft Excel spreadsheet. For this first survey, 1,977 of the MOOC registrants, 9%, completed all of the survey questions. The survey was set up to require completion of all questions before it could be submitted. These study participants also agreed to allow their MOOC completion percents to be downloaded from Coursera and matched with their demographic information and their SDLRS scores calculated from the first survey. However, after working with the university to obtain the completion percents following close of the Disaster Preparedness MOOC in October, the university declined to provide the completion percents as originally planned for the study.

In order to obtain similar data that was planned for as part of this study, a new data collection method was implemented. A second online survey (see Appendix G) was developed in Qualtrics. This survey had only four questions, which asked the study participants if they completed the MOOC, which activities in the course they completed, their MOOC completion percent, and indicate their reason or reasons for not completing the MOOC. This second survey was emailed to the 1,977 original study subjects that had already agreed to participate in the study. The first email containing a link to the second survey was sent on December 9, 2013. A reminder email with a link to the survey was sent again to those that had not already responded on December 11, 2013.

The survey was closed on December 14, 2013 and the new data was downloaded from Qualtrics into a Microsoft Excel spreadsheet. For the second survey, 583 of the original 1,977 participants completed the four questions, yielding nearly 3% participation in the study by the original 21,912 MOOC registrants. The original survey results of demographics and SDLRS

scores were then matched to the self-reported MOOC completion percents collected in the second survey. For the statistical analysis conducted, the software SPPS was used. Only data from the 583 subjects was analyzed unless otherwise stated.

Summary of Study Participants

Using a sample size calculator, it was estimated that, with a confidence level of 95%, a confidence interval of five and population of 21,912, that the minimum sample size needed was 378. Given 583 MOOC registrants participated in this study, the results should be a representative sample of the Disaster Preparedness MOOC registrants, though they cannot be declared a representative sample of all adult learners that take MOOCs. To learn more about the 583 study participants, descriptive statistics were calculated for the eight demographic questions collected through the first online survey (see Table 4).

Of the study participants, 47% were male and 53% were female. Age categories of the participants began at 18 and went up to 84 years old. To break the age categories down further, 17% were 18 to 29 years old, 24% were 30 to 39, 23% were 40 to 49, 23% were 50 to 59, and 13% were 60 to 84 years old. None of the respondents indicated an age of 85 years or older. The average age category for a participant was 40 to 44 years old. In terms of education, participants were asked to indicate their highest level of education completed. For high school, 17% indicated this was their highest level of education, while 11% indicated an associate's degree, 34% a bachelor's degree, 29% a master's degree, and 7% a Ph.D. or doctorate. Of those participating in the study, 71% had previously enrolled in and completed some or all of a different MOOC, while only 29% were taking a MOOC for the first time. The majority of survey respondents were proficient in speaking English, 72%, and English literacy, 75%. Lastly, 95% of survey

respondents indicated they did not have a disability or impairment that would interfere with their ability to successfully complete the online course.

Table 4

Study Participant Demographics

Variable	*n* and percent
Gender	
• Male	273 (46.8%)
• Female	310 (53.2%)
Age	
• 18 to 19 years old	2 (0.3%)
• 20 to 24 years old	35 (6.05%)
• 25 to 29 years old	64 (11%)
• 30 to 34 years old	78 (13.4%)
• 35 to 39 years old	63 (10.8%)
• 40 to 44 years old	70 (12%)
• 45 to 49 years old	64 (11%)
• 50 to 54 years old	60 (10.3%)
• 55 to 59 years old	74 (12.7%)
• 60 to 64 years old	35 (6%)
• 65 to 74 years old	37 (6.3%)
• 75 to 84 years old	1 (0.2%)
• 85 years and over	0 (0%)
Education	
• Secondary/Middle School	5 (0.9%)
• High School/GED	101 (17.3%)
• Associate's Degree	65 (11.1%)
• Bachelor's Degree	198 (34%)
• Master's Degree	174 (29.8%)
• Ph.D./Doctorate	40 (6.9%)
Previous MOOC Experience	
• Yes	415 (71.2%)
• No	168 (28.8%)

(continued)

Variable	n and percent
English Speaking Ability • Proficient • Advanced • Moderate • Low • None	 418 (71.7%) 78 (13.4%) 78 (13.4%) 9 (1.5%) 0 (0%)
English Literacy Ability • Proficient • Advanced • Moderate • Low • None	 438 (75.1%) 94 (16.1%) 49 (8.4%) 2 (0.3%) 0 (0%)
Disability or Impairment • Yes • No • Prefer not to say	 19 (3.3%) 552 (94.7%) 12 (2.1%)

Also part of the first online survey, participants were asked to select the reasons they chose to enroll in the Disaster Preparedness MOOC. Respondents could choose as many responses as applied. The two most popular reasons chosen were, "to gain specific skills to do my current job better" (28%) and "a curiosity about the online course" at (26%). However, 60% indicated that another reason was responsible for their registration in this specific MOOC. Participants had the option to select "other" and type in a more specific response. These responses were reviewed and most that typed in a response indicated a curiosity about the subject matter or felt the content would assist them with their current positions, which reflects the two most popular options already highlighted. For the complete list of reasons the participants enrolled in the MOOC, view Table 5.

Table 5

Reasons for Enrolling in the MOOC

Variable	*n* and percent
Reasons for Enrolling in MOOC	
• Skills for current job	163 (28.4%)
• Skills for new job	82 (14.1%)
• It was recommended	35 (6%)
• Professor	9 (1.5%)
• Univ. of Pittsburgh	29 (5%)
• Knowledge for degree	21 (3.6%)
• Curiosity	149 (25.6%)
• Other	352 (60%)
• None of these	27 (4.6%)

Self-Directed Learning Readiness

The first online survey contained the 40-question assessment used to measure a person's readiness for self-directed learning, called the SDLRS (Fisher et al., 2001). This scale measures one's ability for readiness to take charge and manage educational experiences. Scores of the SDLRS can range from 40 points, the lowest possible score, to 200 points, the highest score possible. All participants who scored 150 and over were said to be ready for self-directed learning according to Fisher et al. (2001). Those that scored less than 150 on the SDLRS were categorized as not being ready for self-directed learning.

All 583 study participants completed the 40 questions of the SDLRS and a cumulative score was calculated for each participant. For the SDLRS scores, the average score was 165.62, the mean score. The standard deviation of scores was 16.149. The most common score in the data, the mode, was a score of 166, and the number in the middle of the data set, the median, was 165. The range was found to be 100, with the lowest or minimum score being 100 and the highest score being 200. Based on these numbers, the scores formed a roughly bell-shaped curve.

See Figure 1 for a bar chart that represents the frequency of each score and the number of participants that obtained each score.

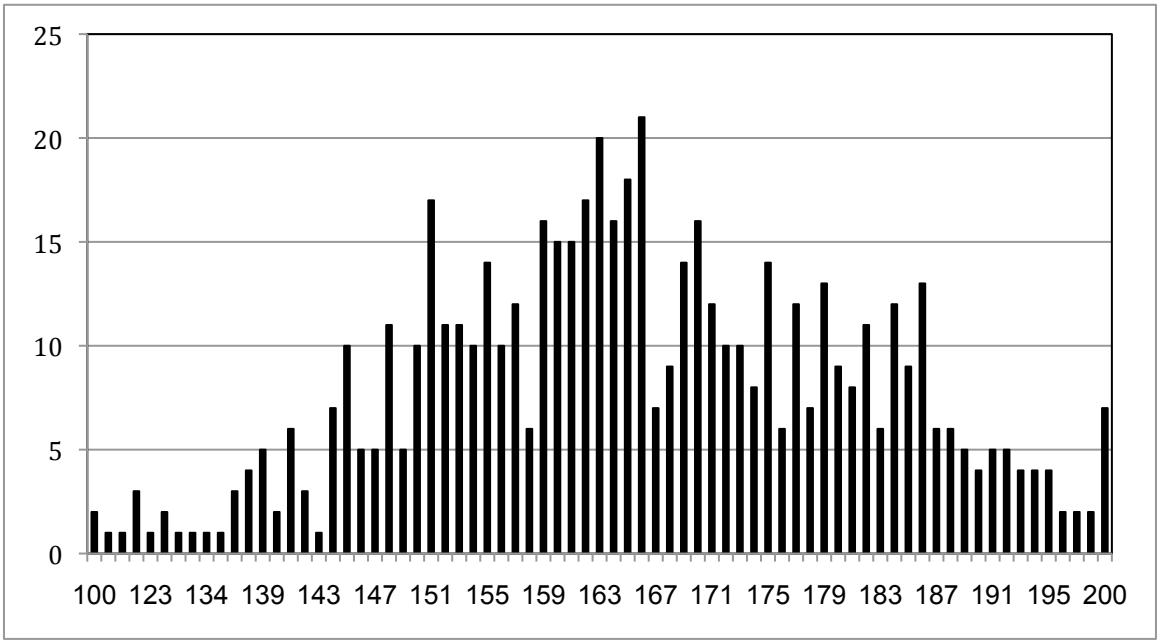

Figure 1. SDLRS scores

In addition, the participants were divided into two groups, those considered "ready" for self-directed learning strategies and those "not ready" for self-directed learning. Based on the data, 81% of the participants fell into the "ready" category. While 13% of the study participants were grouped "not ready". The mean score of those "ready" for self-directed learning was 169.80 and the mean score of those "not ready" was 139.84.

MOOC Completion Percents

Given the change in the data collection method, participants of the study were asked to estimate the percent of the MOOC they completed. Participants were given three opportunities to estimate their MOOC completion on the second survey. Ideally, all three of these questions would have been answered with data directly downloaded from the Coursera LMS, but instead, participants were asked to estimate their MOOC completion. Again, 583 participants completed this four-question survey. The first question asked participants if they completed all the MOOC

requirements by passing all six quizzes and completing the final project. All participants in the study responded and 61.2% indicated they completed all the MOOC requirements, 37% estimated they did not complete the MOOC requirements, and 1.7% were not sure if they completed all the requirements.

The second question asked participants to select the individual MOOC requirements that were successfully completed. Again, 61% indicated they completed the final project, which was the final required component of the MOOC. This percent matched the 61% that indicated they completed all the MOOC requirements in the first survey question. For an overview of MOOC requirements completed as indicated by the first two survey questions, view Table 6.

Table 6

MOOC Requirements Completed

Variable	*n* and percent
Completed all requirements? • Yes • No • Not Sure	 357 (61.2%) 216 (37%) 10 (1.7%)
Completed Week 1 Quiz • Yes • No	 488 (83.7%) 95 (16.3%)
Completed Week 2 Quiz • Yes • No	 469 (75.4%) 114 (18.3%)
Completed Week 3 Quiz • Yes • No	 447 (76.7%) 136 (23.3%)

(continued)

Variable	n and percent
Completed Week 4 Quiz • Yes • No	 423 (72.6%) 160 (27.4%)
Completed Week 5 Quiz • Yes • No	 407 (69.8%) 176 (30.2%)
Completed Week 6 Quiz • Yes • No	 400 (68.6%) 183 (31.4%)
Completed Final Project • Yes • No	 355 (60.9%) 228 (39.1%)
Completed No Components • Yes • No	 81 (13.9%) 502 (86.1%)

The third question on the survey instructed participants to estimate the percent of the MOOC they completed. Completion could range from 0% to 100%. The mean, or average completion percent indicated, was 70.98%. The standard deviation was calculated to be 37.980. The most common percent of completion indicated, the mode, was 100%, and the number in the middle of the data set, the median, was 99%. The range was 100, with the lowest or minimum percent indicated 0% complete, and the highest end of the range being 100% complete. See Figure 2 for a pie chart representing the percent of completion grouped from 0% to 49% complete (26.40%), from 50% to 99% complete (22.70%), and those that estimated 100% of the course requirements were completed (50.90%). Note on the chart that 297 respondents, or 50.90%, indicated they completed 100% of the course. This completion percent was slightly lower than the 60% that indicated in the first two questions that they completed all the MOOC

requirements. When reviewing the raw data, there were several participants that indicted they completed the MOOC on the first survey question, that they completed the final project, but then only estimated they completed 90% of the MOOC requirements, for example.

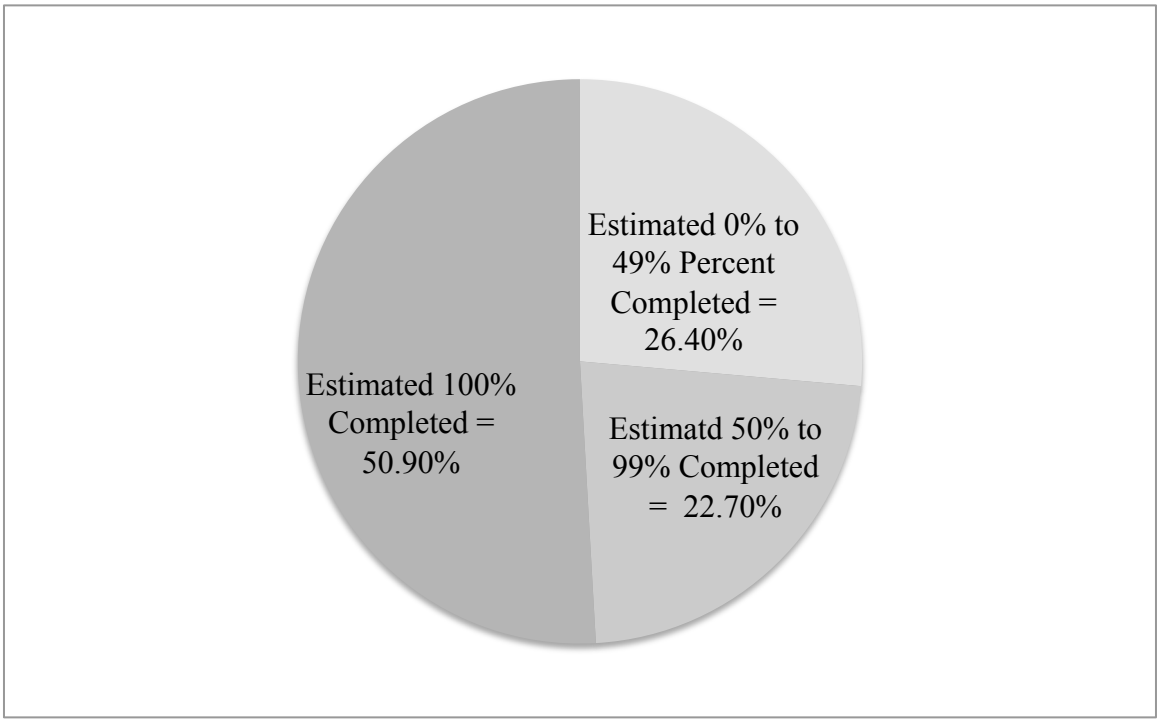

Figure 2. MOOC completion percents

To summarize the data collected on MOOC completion, for the first survey question, approximately 61.2% of the study participants indicated they completed all of the MOOC requirements, for the second survey question, 60.9% estimated they completed the final project, and for the third survey question, 50.9% estimated they completed 100% of the MOOC requirements. These were only estimates, but they appear inflated for MOOC learners in general, and specifically for those that registered for the Disaster Preparedness MOOC on Coursera. Of the 21,912 registrants for the MOOC, in reality only 1,475 completed all the MOOC requirements, approximately 7%. The 7% completion, while typical for a MOOC, was not represented in the data collected, as around 60% of the study participants indicated they

completed all the requirements. Figure 3 compares the estimated MOOC completion for each of the three survey questions.

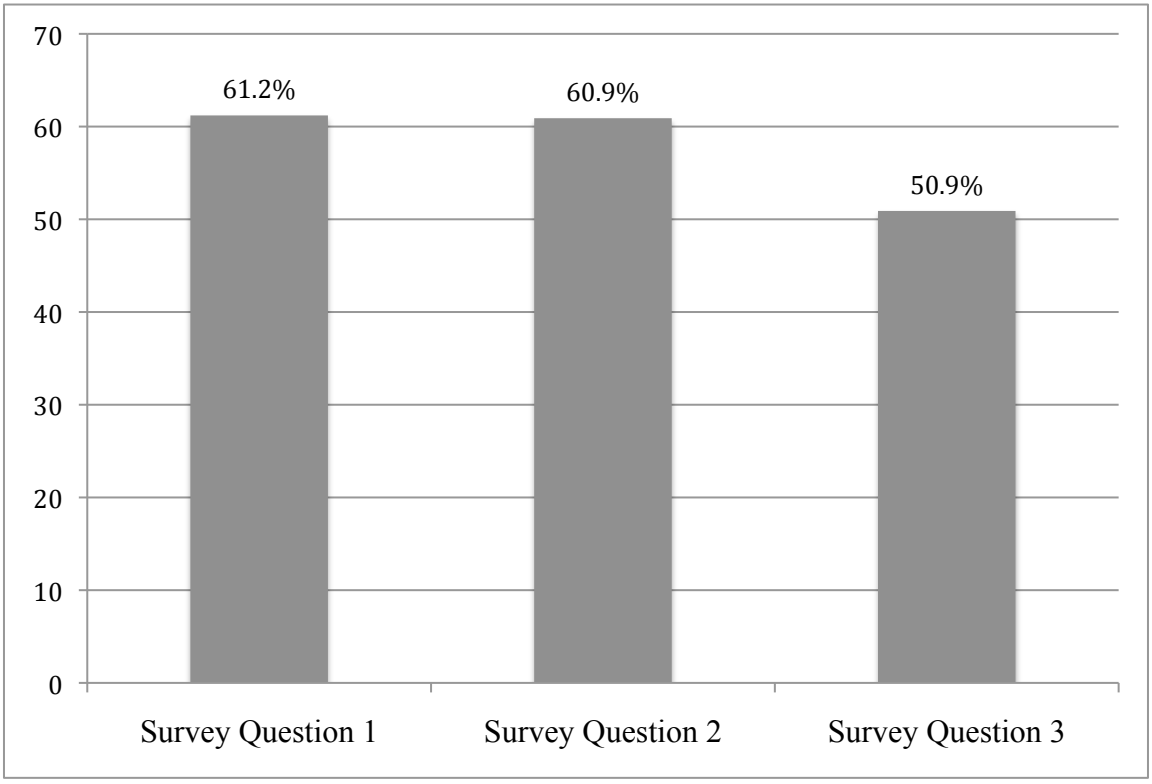

Figure 3. Three survey questions for estimated MOOC completion

For the final question of the second online survey, participants chose the reasons, if any, they did not complete the Disaster Preparedness MOOC. Respondents could choose as many responses among the 12 options as they believed applied. The three most selected reasons were time constraints, 28%, all the information needed was obtained, 9.3%, and the choice other, 14.8%. The other choice allowed participants to write in responses. These responses were reviewed and participants wrote about events that interfered with their completion such as having a baby, they also wrote that they were not comfortable completing the final assignment, and participants indicated that all the information they required was obtained. Many of the responses

written would likely fit into the choices provided. View Table 7 for a list of the choices and the percents assigned to each.

Table 7

Reasons for Not Completing the MOOC

Variable	*n* and percent
Reasons for Not Completing MOOC	
• Time constraints	175 (30.0%)
• Got all information needed	58 (9.9%)
• Content not what expected	39 (6.7%)
• Challenging to navigate	8 (1.3%)
• Language was a barrier	10 (1.7%)
• Technical problems	13 (2.2%)
• Assignments increasingly hard	10 (1.7%)
• No college credit offered	7 (1.2%)
• Did not feel comfortable	16 (2.7%)
• Course requirements unclear	6 (1.0%)
• Needed more assistance	2 (0.3%)
• Other	86 (14.8%)

Research Question 1. The first research question examined the relationship between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion. The first hypothesis was that the more competent adult learners were at self-directed learning, the more likely these learners were to successfully complete a greater percent of a MOOC. Based on this hypothesis, the two variables measured were self-directed learning readiness scores and MOOC completion percentages (taken from the self-reported data collected from the first and second surveys).

This study used a 0.05 level of significance to conduct inferential analysis. The analysis of the two numeric variables was conducted using the statistical software SPSS to ascertain the probability level also called the *p*-value. A correlation and then regression was used to answer the first research question, "To what extent, if at all, was there a relationship between the degree

of self-directed learning readiness of adult learners and the degree of their MOOC completion?". The null hypothesis was that there was no relationship between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion. The alternate hypothesis was there was a relationship between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion.

The correlation coefficient *r* for the relation between SDLRS scores and student's percent of MOOC completion was $r = 0.175$ with a p-value < 0.001. Taylor (1990) found that correlation coefficients with 0, indicating a low to weak relationship, and 1, a strong relationship - where $r = 0.175$ indicated a low or weak relationship. As such, the relationship between SDLRS scores and percent of MOOC completion was a low or weak positive relationship. Pearson correlation was 0.175, which was a small effect size, but was statistically significant at the 0.01 level, making it possible to use SDLRS scores to predict the percent complete of a MOOC.

Based on a scatter plot graph, (see Figure 4) a linear regression was selected where SDLRS scores (IV) and MOOC completion percents (DV) resulted in a small, positive correlation between the variables. *R*-squared, the coefficient of determination or variation of the regression, is 0.031. Closer to 1.0 would be a "perfect" *R*-squared as it is the proportion of variance of the regression between the variables. This meant that 3.1% of the variation in students' perceived MOOC completion percent (DV) was accounted for by the variation in SDLRS scores (IV).

Table 8

Correlation of Percent of MOOC Completed and SDLRS Scores

Criterion (DV)	Predictor (IV)	*p*-value	*r*	R^2
Percent Completed	SDLRS Score	0.001**	0.175*	0.013

Note. * statistically significant at $p < 0.01$. ** $p < 0.001$

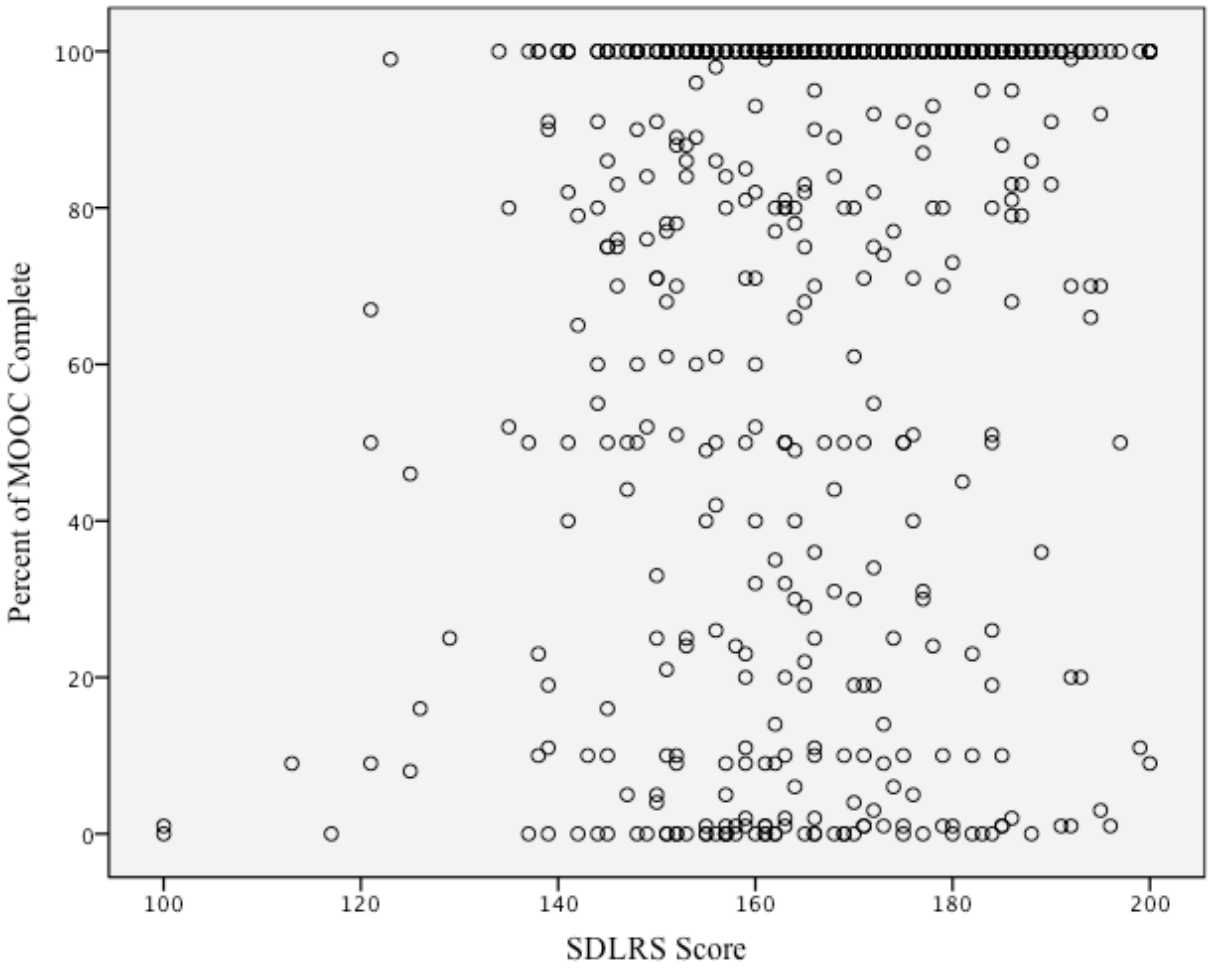

Figure 4. Scatter plot graph of SDLRS scores and percent of MOOC completed

The box and whisker plot in Figure 5 highlights the range of MOOC completion percents, while Figure 6 visually represents the participant SDLRS scores. Several outliers were indicated

for SDLRS scores, but the data were visually examined and nothing unusual was noted for those respondents, and they were left in the analysis. Both visuals highlight the skewness of the results.

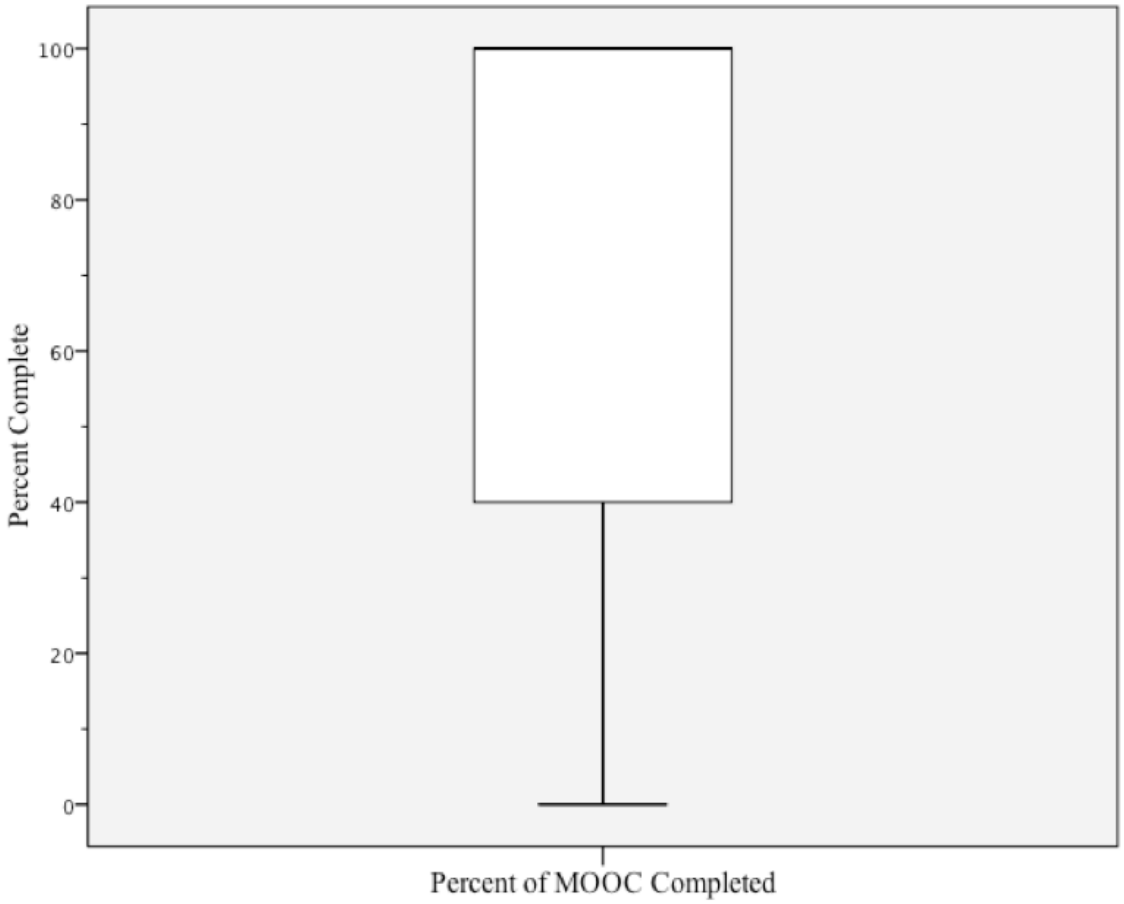

Figure 5. Percent of MOOC completed

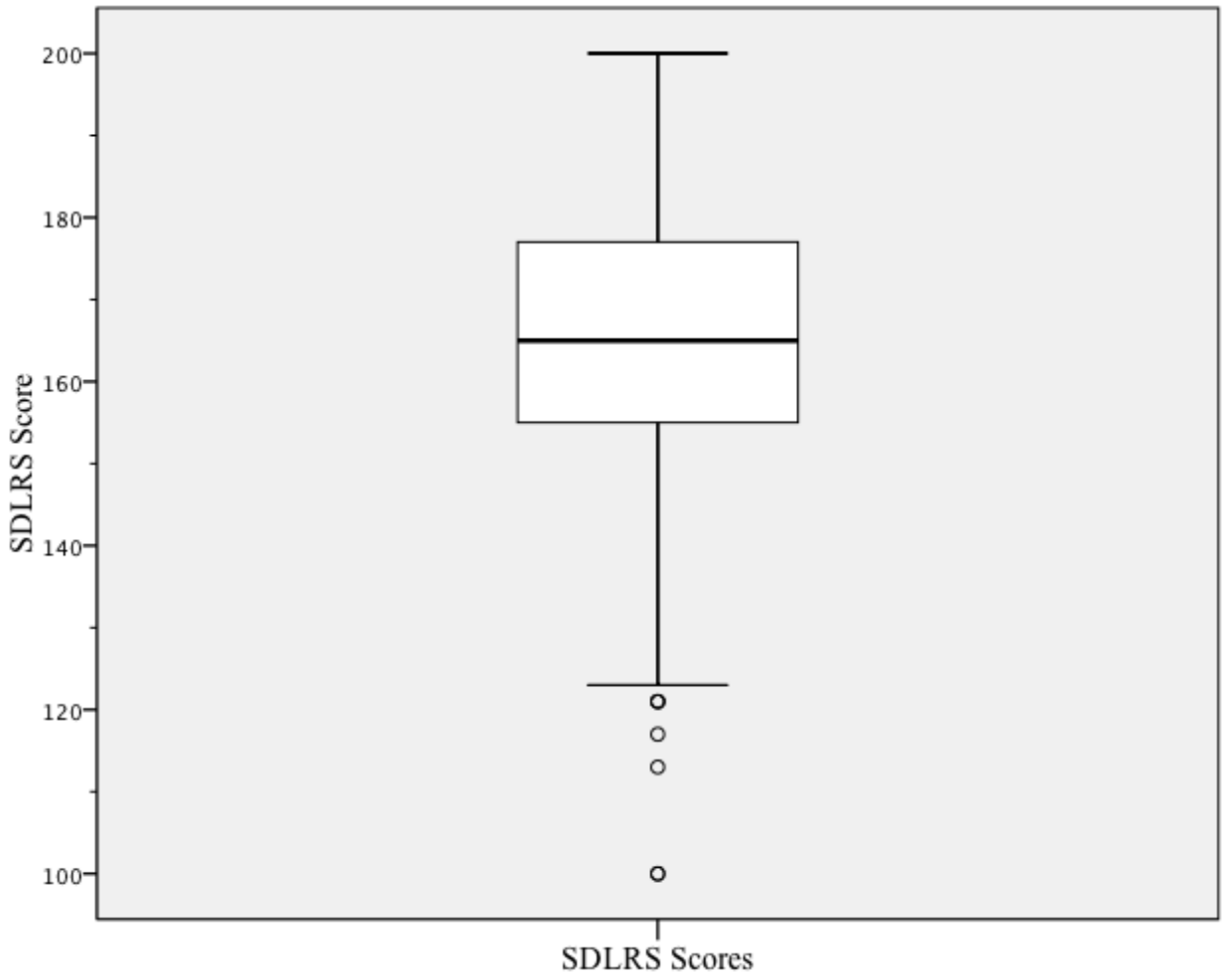

Figure 6. SDLRS scores

To summarize, the first hypothesis was not rejected as it was found that a statistically significant relationship, though with a small effect size, existed between readiness for self-directed learning and MOOC completion percent. In other words, those with greater SDLRS scores completed more of the MOOC requirements.

Research Question 2. The second research question examined the extent there were differences in demographics of adult learners that complete a MOOC compared with those that do not complete a MOOC. The second hypothesis was that adult learners with previous experience taking a MOOC were more likely to complete a MOOC. Previous MOOC experience

was important to consider because it could have influenced a person's comfort level and expectations of a MOOC, possibly giving those with prior knowledge of MOOCs an advantage in completing the MOOC. Again, to determine the MOOC completion groups, participants were asked to self-report if they completed the MOOC requirements on the second online survey. The MOOC completion groups were matched with each participant's demographic data. To answer this research question, each of the first eight demographic variables that were part of this research study were asked in a sub-question even though not all demographics were expected to directly impact MOOC completion. The results are reported here.

The first independent variable was gender and the associated research question was, "To what extent, if at all, was there a difference in the gender of adults that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in the gender of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternate hypothesis was, there was a difference in the gender of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, gender, was an attribute at the dichotomous nominal level, and the dependent variable, MOOC completion, was an attribute at the dichotomous nominal level. Regarding the output of the chi-square, 1 cell had an expected count of less than 5, meaning the results may not have been reliable. However, according to Cochran (1952) because less than 20% of the table cells had expected frequencies of less than 5, a chi-square test was still an acceptable test in this case. For gender, setting alpha at 0.05, the *p*-value obtained of 0.062 indicated that the null hypothesis should not be rejected. For gender, there was no difference in the gender of adults that completed MOOCs compared with those adults that did not complete MOOCs.

The second independent variable was age and the associated question was stated as, "To what extent, if at all, was there a difference in the age of adults that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in the age of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternate hypothesis was, there was a difference in the age of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, age, was an attribute at the categorical nominal level, and the dependent variable, MOOC completion, was an attribute at the dichotomous nominal level.

The results of the chi-square showed that the cell count assumptions were violated (Cochran, 1952). The output of the chi-square resulted in more than 20% of the cells having fewer than 5 actual and expected counts. This violation resulted given that fewer than 2% (n = 10) of all respondents indicated they were "not sure" about their MOOC completion, while the remaining 98% of respondents indicated either "yes" they completed the MOOC, or "no" they did not complete all the MOOC requirements. This low response rate for the "not sure" category of completion caused several of the chi-square results in this study to be questioned, including this one. First, the chi-square analysis was run with the 10 records that indicated they were "not sure" of their MOOC completion, and the results of this first chi-square analysis were questionable. For age, setting alpha at 0.05, the p-value obtained of 0.037 indicated that the null hypothesis should be rejected. Therefore, there was a difference in the age of adults that completed MOOCs compared with those adults that did not complete MOOCs. However, this result was likely invalid given that more than 20% of the cells had fewer than 5 actual and expected counts. This analysis was then run again without the category of "not sure". To do this,

the “not sure” responses were examined and because these responses indicated they completed less than 50% percent of the MOOC in the third survey question, the 10 records were coded as “no” they did not complete the MOOC and the chi-square analysis was run a second time. For this second chi-square analysis, less than 20% of the table cells had expected frequencies of less than 5, meaning a chi-square test was likely an acceptable test in this case. Setting alpha at 0.05, the *p*-value obtained of 0.350 indicated that the null hypothesis should not be rejected. The result was there was no difference in the age of adults that completed a MOOC compared with those adults that did not complete a MOOC.

The third independent variable was highest level of education completed and the associated research question was, “To what extent, if at all, was there a difference in the level of education of adults that completed a MOOC compared with those adults that did not complete a MOOC?” The null hypothesis was, there was no difference in the level of education of adults that completed MOOCs compared with those adults that did not complete MOOCs. The alternate hypothesis was, there was a difference in the level of education of adults that completed MOOCs compared with those adults that did not complete MOOCs. The appropriate statistical analysis was a chi-square because the independent variable, level of education, was an attribute, and the dependent variable, MOOC completion, was an attribute at the dichotomous nominal level. The output of the chi-square resulted in more than 20% of the cells having fewer than 5 actual and expected counts. It is important to highlight that fewer than 2% ($n = 10$) of all respondents indicated they were “not sure” about their MOOC completion, while the remaining 98% of respondents indicated either “yes” they completed the MOOC, or “no” they did not complete all the MOOC requirements. This low response rate for the “not sure” category of completion caused several of the chi-square results in this study to be questioned, including this one. First,

the chi-square analysis was run with the 10 records that indicated they were "not sure" of their MOOC completion. For highest level of education, setting alpha at 0.05, the *p*-value obtained of 0.097 indicated that the null hypothesis should not be rejected. The result was there was no difference in the highest level of education completed of adults that completed MOOCs compared with those adults that did not complete MOOCs. However, this result may be invalid given that more than 20% of the cells had fewer than 5 actual and expected counts. This analysis was then run again without the category of "not sure". The "not sure" responses were examined and were coded as "no" they did not complete the MOOC. For this second chi-square analysis, less than 20% of the table cells had expected frequencies of less than 5, meaning a chi-square test was likely an acceptable test in this case. Setting alpha at 0.05, the *p*-value obtained of 0.074 indicated that the null hypothesis should still not be rejected. The result was there was no difference in the level of education of adults that completed MOOCs compared with those adults that did not complete MOOCs.

The fourth independent variable was previous MOOC experience and the associated research question was, "To what extent, if at all, was there a difference in the MOOC experience of adults that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in the MOOC experience of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternate hypothesis was, there was a difference in the MOOC experience of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, previous MOOC experience, was an attribute at the dichotomous nominal level, and the dependent variable, MOOC completion, was an attribute at the dichotomous nominal level. Regarding the output of the chi-square, 1 cell had

an expected count of less than 5, meaning the results may not be reliable. However, according to Cochran (1952), because fewer than 20% of the table cells had expected frequencies of less than 5, a chi-square test was an acceptable test in this case. For previous MOOC experience, setting alpha at 0.05, the *p*-value obtained of 0.179 indicated that the null hypothesis should not be rejected. The result was there was no difference in the MOOC experience of adults that completed a MOOC compared with those adults that did not complete a MOOC.

The fifth independent variable was English speaking ability and the associated research question was, "To what extent, if at all, was there a difference in the English speaking ability of adults that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in the English speaking ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternate hypothesis was, there was a difference in the English speaking ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, English speaking ability, was an attribute, and the dependent variable, MOOC completion, was an attribute at the dichotomous nominal level. The output of the chi-square resulted in more than 20% of the cells having fewer than 5 actual and expected counts. Given that fewer than 2% ($n = 10$) of all respondents indicated they were "not sure" about their MOOC completion, this likely caused the actual and expected cell counts to be less than 5. First, the chi-square analysis was run with the 10 records that indicated they were "not sure" of their MOOC completion. For English speaking ability, setting alpha at 0.05, the *p*-value obtained of 0.203 indicated that the null hypothesis should not be rejected. The result was there was no difference in the English speaking ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. However, this

result may be invalid given that more than 20% of the cells had fewer than 5 actual and expected counts. This analysis was then run again without the category of "not sure". The "not sure" responses were examined and were coded as "no" they did not complete the MOOC. For this second chi-square analysis, less than 20% of the table cells had expected frequencies of less than 5, meaning a chi-square test was likely an acceptable test in this case. For English speaking ability, setting alpha at 0.05, the *p*-value obtained of 0.046 indicated that the null hypothesis should be rejected. The result was there was a difference in the English speaking ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. Cramer's *V* was used to determine the effect size where 0 is independence and 1 is a strong association. This meant that 11.7% of the variation in students' MOOC completion status (DV) was accounted for by English speaking ability (IV).

Table 9

Chi-square of MOOC Completion and English Speaking

Criterion (DV)	Predictor (IV)	*p*-value	Cramer's *V*
MOOC Completion	English Speaking	0.046	0.117

The chart shows the relationship between MOOC completion and English speaking ability with the 10 records for "not sure" combined with the "no" records.

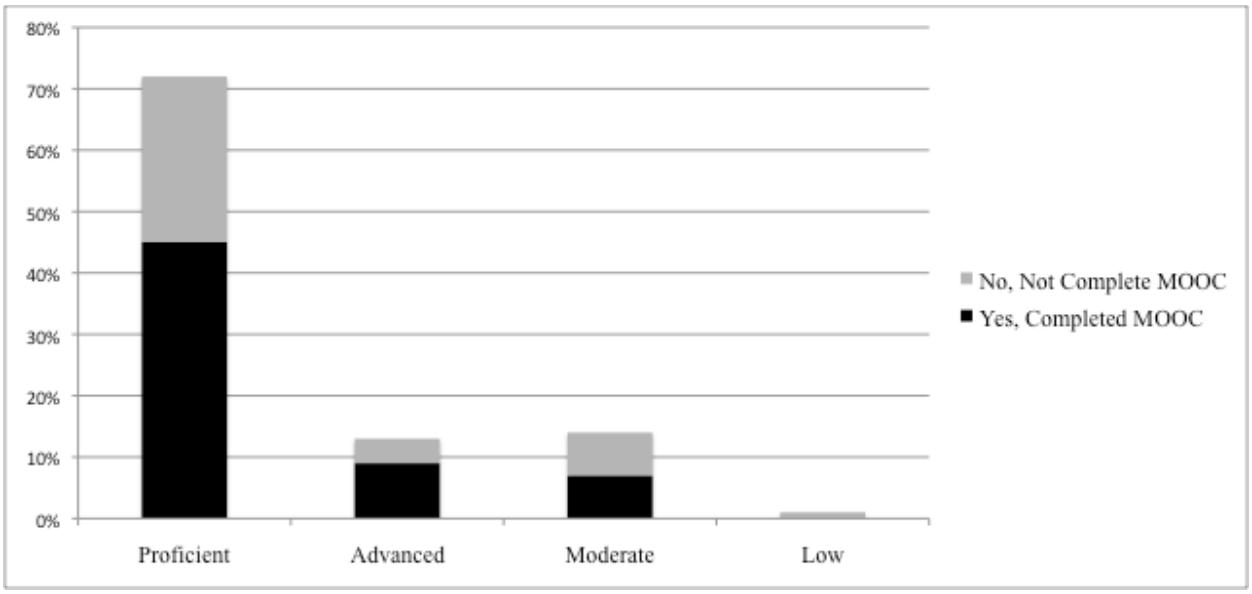

Figure 7. MOOC completion categories and English speaking ability

The sixth independent variable was English literacy ability and the associated research question was, "To what extent, if at all, was there a difference in the English literacy ability of adults that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in the English literacy ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternate hypothesis was, there was a difference in the English literacy ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, English literacy ability, was an attribute, and the dependent variable, MOOC completion, was an attribute at the dichotomous nominal level. The output of the chi-square resulted in more than 20% of the cells having fewer than 5 actual and expected counts. Given that fewer than 2% (n = 10) of all respondents indicated they were "not sure" about their MOOC completion, this likely caused the actual and expected cell counts to be less than 5. First, the chi-square analysis was run with the 10 records that indicated they were "not sure" of their MOOC completion. For English literacy ability, setting

alpha at 0.05, the *p*-value obtained of 0.330 indicated that the null hypothesis should not be rejected. The result was there was no difference in the English literacy ability of adults that completed a MOOC compared with those adults that did not complete a MOOC. However, this result may have been invalid given that more than 20% of the cells had fewer than 5 actual and expected counts. This analysis was then run again without the category of "not sure". The 10 "not sure" records were coded as "no" they did not complete the MOOC. For this second chi-square analysis, less than 20% of the table cells had expected frequencies of less than 5, meaning a chi-square test was likely an acceptable test in this case. For English literacy ability, setting alpha at 0.05, the *p*-value obtained of 0.138 indicated that the null hypothesis should not be rejected. The result was there was no difference in the English literacy ability of adults that completed a MOOC compared with those adults that did not complete a MOOC.

The seventh independent variable was disability or impairment and the associated research question was, "To what extent, if at all, was there a difference in the disability or impairment of adults that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in the disability or impairment of adults that completed a MOOC compared with those adults that did not complete a MOOC. The alternate hypothesis was, there was a difference in the disability or impairment of adults that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, disability or impairment, was an attribute, and the dependent variable, MOOC completion, was an attribute at the dichotomous nominal level. The output of the chi-square resulted in more than 20% of the cells having fewer than 5 actual and expected counts. Given that fewer than 2% ($n = 10$) of all respondents indicated they were "not sure" about their MOOC completion, likely caused the

actual and expected cell counts to be less than 5. First, the chi-square analysis was run with the 10 records that indicated they were "not sure" of their MOOC completion. Setting alpha at 0.05, the p-value obtained of 0.335 indicated that the null hypothesis should not be rejected. The result was there was no difference in the disability or impairment of adults that completed MOOCs compared with those adults that did not complete MOOCs. However, this result may have been invalid given that more than 20% of the cells had fewer than 5 actual and expected counts. This analysis was then run again without the category of "not sure". These 10 "not sure" records were coded as "no" they did not complete the MOOC. For this second chi-square analysis, less than 20% of the table cells had expected frequencies of less than 5, meaning a chi-square test was likely an acceptable test in this case. For disability or impairment, setting alpha at 0.05, the *p*-value obtained of 0.515 indicated that the null hypothesis should not be rejected. The result was there was no difference in the disability or impairment of adults that completed a MOOC compared with those adults that did not complete a MOOC.

The eighth independent variable was reason for enrolling in the MOOC and the associated research question was stated as, "To what extent, if at all, was there a difference in reasons adults have for enrolling in the MOOC of those that completed a MOOC compared with those adults that did not complete a MOOC?" The null hypothesis was, there was no difference in reasons adults have for enrolling in the MOOC of those that completed a MOOC compared with those adults that did not complete a MOOC. The alternate hypothesis was, there was a difference in reasons adults have for enrolling in the MOOC of those that completed a MOOC compared with those adults that did not complete a MOOC. The appropriate statistical analysis was a chi-square because the independent variable, reasons for enrolling in a MOOC, was an attribute, and the dependent variable, MOOC completion percent, was an attribute at the

dichotomous nominal level. Though respondents to this survey question could select the option "other" and write in a response, no qualitative data analysis was conducted for this question.

Each option respondents could select as the reason they enrolled in the MOOC was analyzed in a separate chi-square. The only response that resulted in a statistically significant association between variables was, "someone I know recommended this course to me". Regarding the output of this chi-square, 1 cell had an expected count of less than 5, meaning the results may not be reliable. However, according to Cochran (1952) because fewer than 20% of the table cells had expected frequencies of less than 5, a chi-square test was likely an acceptable test in this case. Given the analysis, the chi-square cell count assumptions were met, and the Pearson's Chi-squared test was used where p-value = 0.024. Setting alpha at 0.05, the p-value obtained of 0.024 indicated that the null hypothesis should be rejected. Therefore, there was a difference in reasons adults have for enrolling in the MOOC of those that completed MOOCs compared with those adults that did not complete MOOCs. The direction of difference between enrolling because the MOOC was recommended and MOOC completion did not have a specified direction because it was a two-sided tail. For the effect size, Cramer's $V = 0.024$ was referenced and was a small effect size. This meant that 2.4% of the variation in students' MOOC completion status (DV) was accounted for by enrolling because someone recommended the MOOC (IV). In addition, an independent T-test was conducted to break the data into two groups in order to be able to calculate Cohen's D effect size. The Cohen's D effect size = -0.2, and was also categorized as a small effect size.

Table 10

Chi-square of MOOC Completion and Recommended

Criterion (DV)	Predictor (IV)	*p*-value	Cramer's *V*	Cohen's *D*
MOOC Completion	Recommended	0.024	0.024	-0.2

The chart for the relationship between MOOC completion and enrollment in the MOOC because it was recommended is shown in Figure 8. Note that only 29 study participants indicated they completed the MOOC and took it because it was recommended, while 328 participants completed the MOOC but did not enroll because it was recommended.

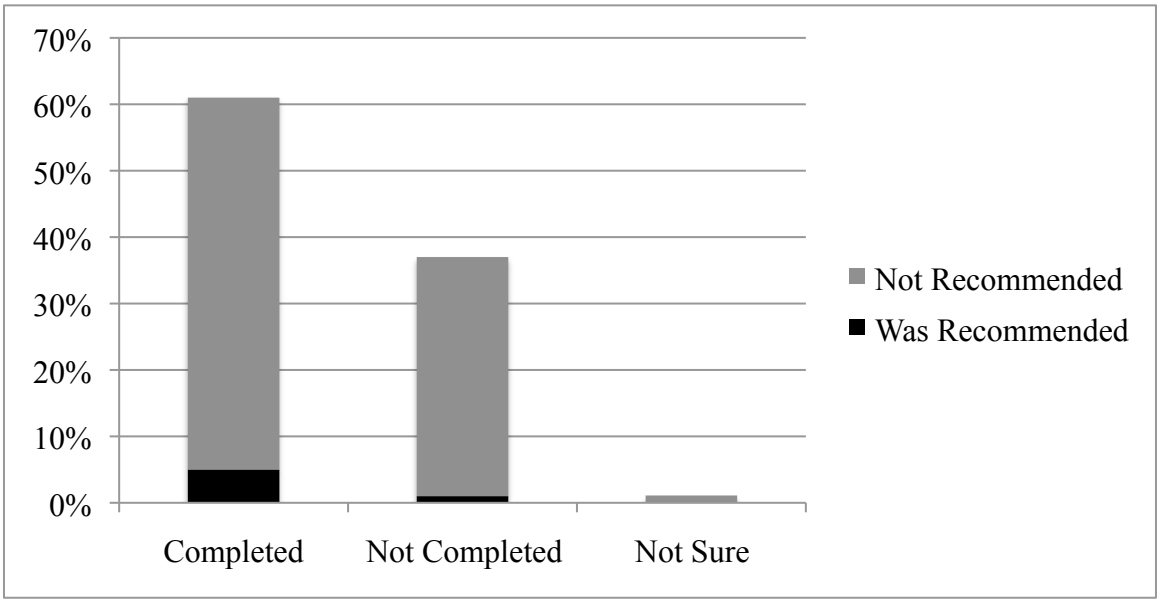

Figure 8. MOOC completion and enrolled because it was recommended

To summarize, the second hypothesis was not found to be true. Previous MOOC experience and MOOC completion status were not associated. Instead, English speaking ability and having the MOOC recommended by someone you know were associated with MOOC completion status.

Research Question 3. The third research question examined the mediating effects of adult learner demographics on the relationship between self-directed learning readiness scale scores and degree of MOOC completion. The third hypothesis was that adult learners in their thirties and forties, who are female, with high levels of education, previous MOOC experience, strong English language skills, and with no physical disability or impairment that may interfere with completing an online course, would have higher scores in self-directed learning readiness and higher MOOC completion percents. Again, self-directed learning readiness scores were measured using the SDLRS and MOOC completion percents were gathered from the self-reported data from the second online survey. Participants estimated their MOOC completion from zero to 100%.

This third research question was analyzed using the statistical method of MANCOVA. This method provided an analysis of variance for MOOC completion percent (DV) and SDLRS score (DV) by one or more factor variables or covariates. The interactions between factors as well as the effects of individual factors were investigated and reported here.

The first independent variable was gender and the associated research question was stated as, "To what extent, if at all, did gender mediate the relationship between self-directed learning readiness and degree of MOOC completion?" The null hypothesis was, gender did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternate hypothesis was, gender did mediate the relationship between self-directed learning readiness and degree of MOOC completion. The analysis for percent of MOOC completed resulted in p-value = 0.222. The analysis for SDLRS score resulted in p-value = 0.902. Setting alpha at 0.05, both p-values obtained indicated that the null hypothesis should not be rejected. Therefore, gender did not mediate the relationship between self-directed learning readiness and

degree of MOOC completion.

The second independent variable was age and the associated research question was stated as, "To what extent, if at all, did age mediate the relationship between self-directed learning readiness and degree of MOOC completion?" The null hypothesis was, age did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternate hypothesis was, that age did mediate the relationship between self-directed learning readiness and degree of MOOC completion. The appropriate statistical analysis was MANCOVA because there were two dependent variables, self-directed learning readiness scores and MOOC completion percent, and control of the independent variable, age, was necessary. The analysis for percent of MOOC completed resulted in *p*-value = 0.103. The analysis for SDLRS score resulted in *p*-value = 0.003. Setting alpha at 0.05, the *p*-value obtained for SDLRS score indicated that the null hypothesis should be rejected. Age did have a mediating effect on SDLRS score, but not on degree of MOOC completion. To measure the size of this effect, partial *ETA*-squared was used given the number of different variables. Partial *ETA*-squared = 0.047 for SDLRS score, which was a small effect size.

Table 11

MANCOVA of MOOC Completion Percent, SDLRS Score, and Age

Factor	Criterion (DV)	*p*-value	Partial *ETA*-squared
Age	Percent Complete	0.103	0.029
	SDLRS Score	0.003	0.047

Figure 9 shows the relationship between SDLRS score and age using a box and whisker plot. Several outliers were identified, but nothing out of the ordinary was found when these records were visually examined.

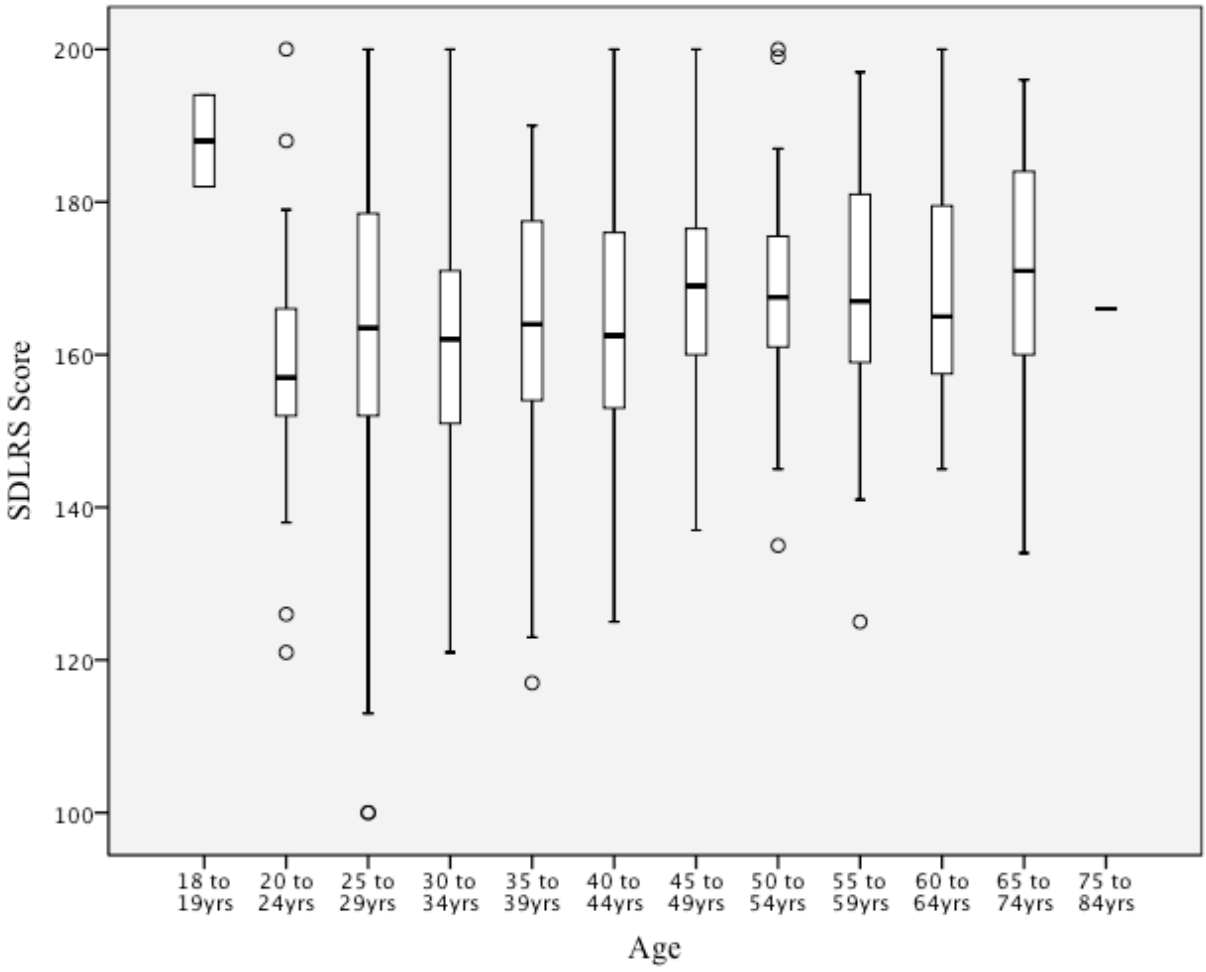

Figure 9. SDLRS score and age

The third independent variable was highest level of education completed and the associated research question was stated as, "To what extent, if at all, did highest level of education completed mediate the relationship between self-directed learning readiness and degree of MOOC completion?" The null hypothesis was, the highest level of education completed did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternate hypothesis was, the highest level of education completed did mediate the relationship between self-directed learning readiness and degree of MOOC

completion. The appropriate statistical analysis was a MANCOVA. MANCOVA was needed because of the two dependent variables, self-directed learning readiness and MOOC completion percent, and control of the independent variable, highest level of education completed. The analysis for percent of MOOC completed resulted in *p*-value = 0.280. The analysis for SDLRS score resulted in *p*-value = 0.185. Setting alpha at 0.05, both *p*-values obtained indicated that the null hypothesis should not be rejected. Therefore, highest level of education completed did not mediate the relationship between self-directed learning readiness and degree of MOOC completion.

The fourth independent variable was previous MOOC experience and the associated research question was stated as, "To what extent, if at all, did previous MOOC experience mediate the relationship between self-directed learning readiness and degree of MOOC completion?" The null hypothesis was, previous MOOC experience did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternate hypothesis was, previous MOOC experience did mediate the relationship between self-directed learning readiness and degree of MOOC completion. The appropriate statistical analysis was again MANCOVA. The analysis for highest level of education completed resulted in *p*-value = 0.227. The analysis for SDLRS score resulted in *p*-value = 0.743. Setting alpha at 0.05, both *p*-values obtained indicated that the null hypothesis should not be rejected. Therefore, MOOC experience did not mediate the relationship between self-directed learning readiness and degree of MOOC completion.

The fifth independent variable was English speaking ability and the associated research question was stated as, "To what extent, if at all, did English speaking ability mediate the relationship between self-directed learning readiness and degree of MOOC completion?" The

null hypothesis was, English speaking ability did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternate hypothesis was, English speaking ability did mediate the relationship between self-directed learning readiness and degree of MOOC completion. The appropriate statistical analysis was again MANCOVA. The analysis for percent of MOOC completed resulted in p-value = 0.020. The analysis for SDLRS score resulted in p-value < 0.001. Setting alpha at 0.05, both p-values obtained indicated that the null hypothesis should be rejected. Therefore, English speaking ability did have a mediating effect on percent of MOOC completed and SDLRS score. To measure the size of this effect, partial *ETA*-squared was used given the number of different variables. Partial *ETA*-squared = 0.017 for percent of MOOC completed and partial *ETA*-squared = 0.032 for SDLRS score, which was a small effect size for both.

Table 12

MANCOVA of MOOC Completion Percent, SDLRS Score, and English Speaking

Factor	Criterion (DV)	p-value	Partial *ETA*-squared
English Speaking Ability	Percent Complete	0.020	0.017
	SDLRS Score	0.001*	0.032

Note. * $p < 0.001$

Figure 10 indicates that proficient and advanced English speakers also completed the greatest percent of a MOOC.

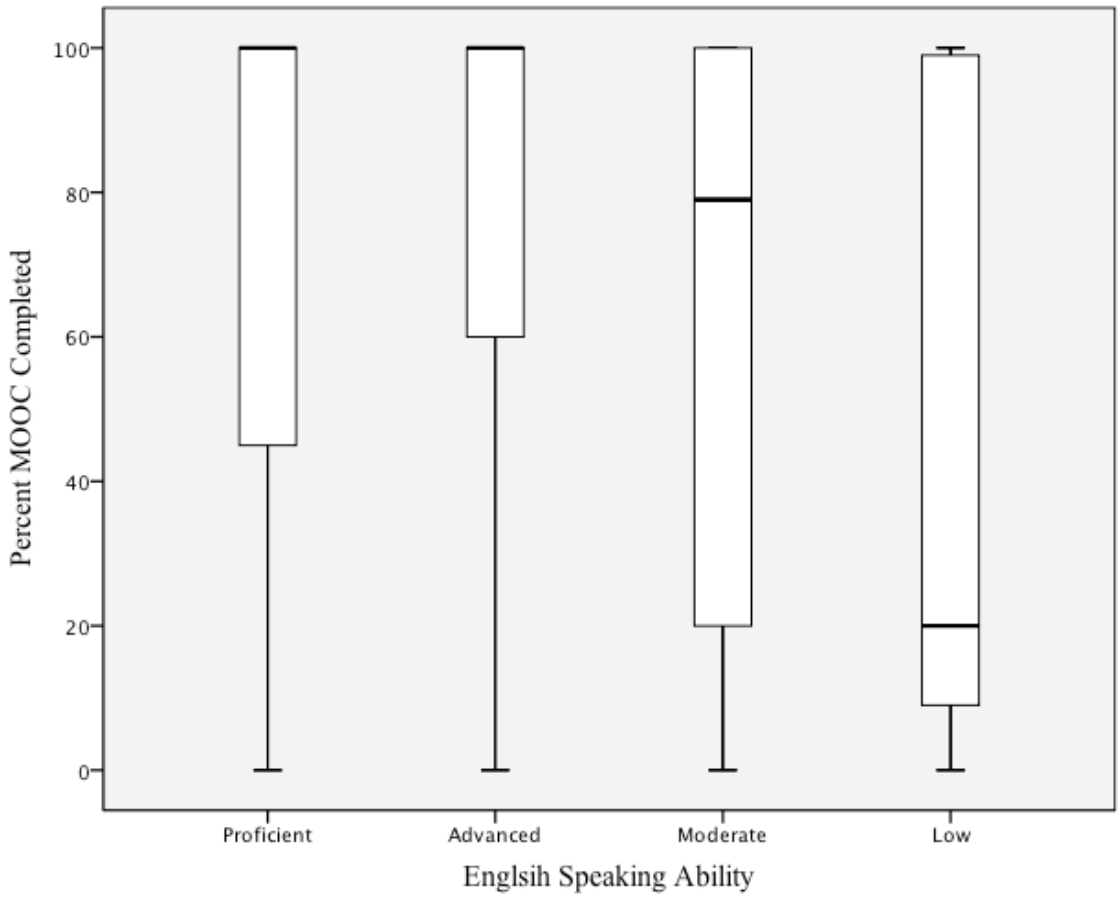

Figure 10. MOOC completion percent and English speaking ability

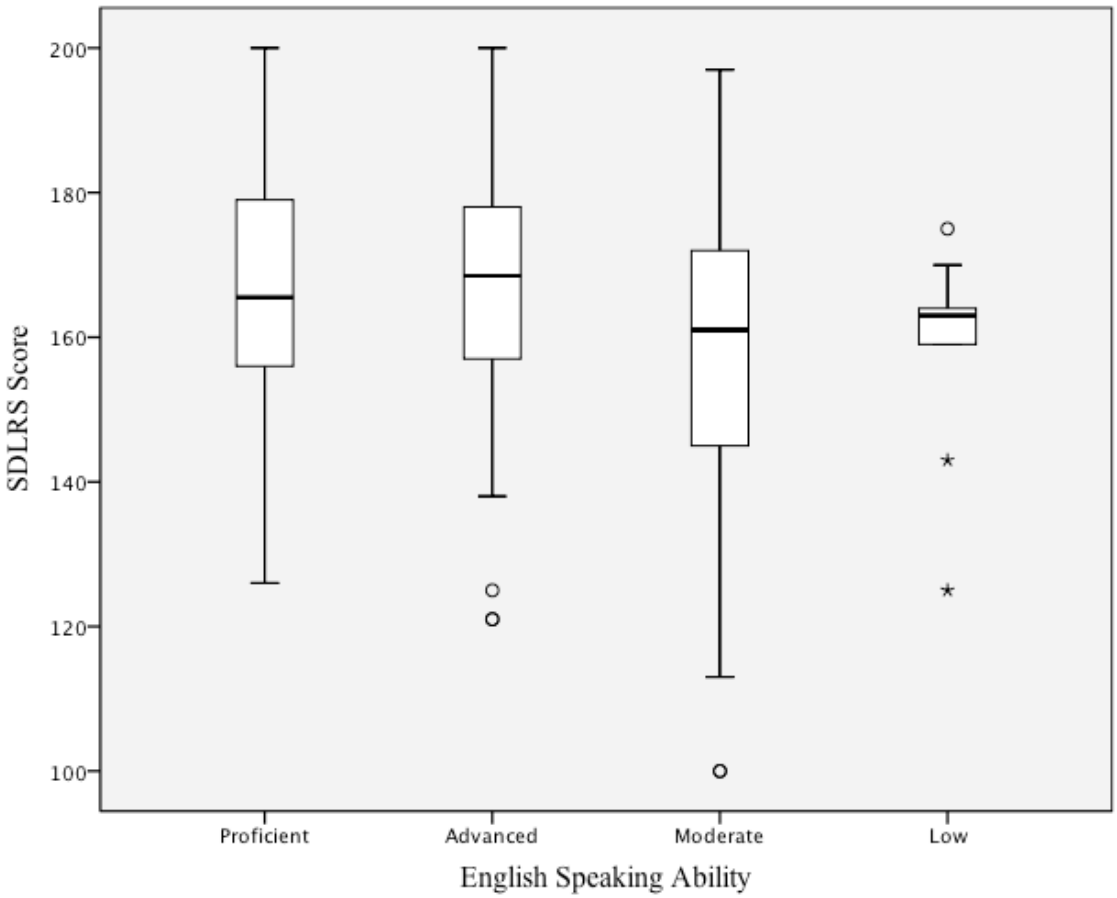

Figure 11. SDLRS score and English speaking ability

The sixth independent variable was English literacy ability and the associated research question was stated as, "To what extent, if at all, did English literacy ability mediate the relationship between self-directed learning readiness and degree of MOOC completion?" The null hypothesis was, English literacy ability did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternate hypothesis was, English literacy ability did mediate the relationship between self-directed learning readiness and degree of MOOC completion. The analysis for percent of MOOC completed resulted in *p*-value = 0.470. The analysis for SDLRS score resulted in *p*-value = 0.001. Setting alpha at 0.05, only the *p*-value obtained for SDLRS score indicated that the null hypothesis should be rejected. Therefore, English literacy ability did not have a mediating effect on both percent of MOOC

complete and SDLRS score. To measure the size of the effect between SDLRS score and English literacy ability, partial *ETA*-squared was used given the number of different variables. Partial *ETA*-squared = 0.027 for SDLRS score, which was a small effect size.

Table 13

MANCOVA of MOOC Completion Percent, SDLRS Score, and English Literacy

Factor	Criterion (DV)	*p*-value	Partial *ETA*-squared
English Literacy Ability	Percent Complete	0.470	0.014
	SDLRS Score	0.001	0.027

The box and whisker plot in Figure 12 shows that those proficient and advanced in English literacy ability had the highest SDLRS scores.

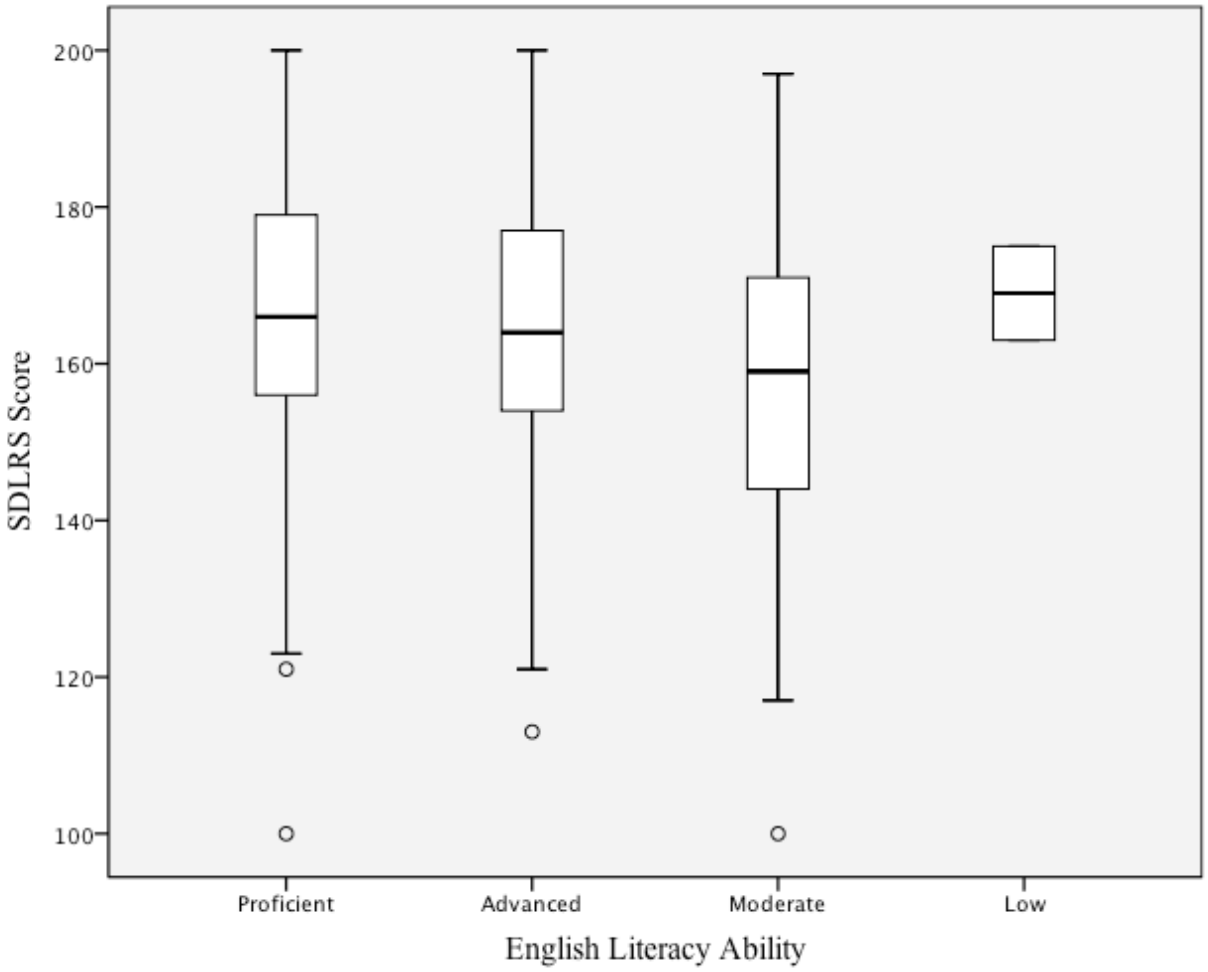

Figure 12. SDLRS score and English literacy ability

The seventh independent variable was disability or impairment and the associated research question was stated as, "To what extent, if at all, did a disability or impairment mediate the relationship between self-directed learning readiness and degree of MOOC completion?" The null hypothesis was, a disability or impairment did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternate hypothesis was, a disability or impairment did mediate the relationship between self-directed learning readiness and degree of MOOC completion. The analysis for percent of MOOC completed resulted in *p*-value = 0.671. The analysis for SDLRS score resulted in *p*-value = 0.001. Setting alpha at 0.05,

only the *p*-value obtained for SDLRS score indicated that the null hypothesis should be rejected. Therefore, a disability or impairment did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. Partial *ETA*-squared = 0.026 for SDLRS score, which was a small effect size.

Table 14

MANCOVA of MOOC Completion Percent, SDLRS Score, and Disability

Factor	Criterion (DV)	*p*-value	Partial *ETA*-squared
Disability	Percent Complete	0.671	0.001
	SDLRS Score	0.001	0.026

The box and whisker plot in Figure 13 illustrates that those without a disability or impairment that could interfere with course completion had the highest SDLRS scores.

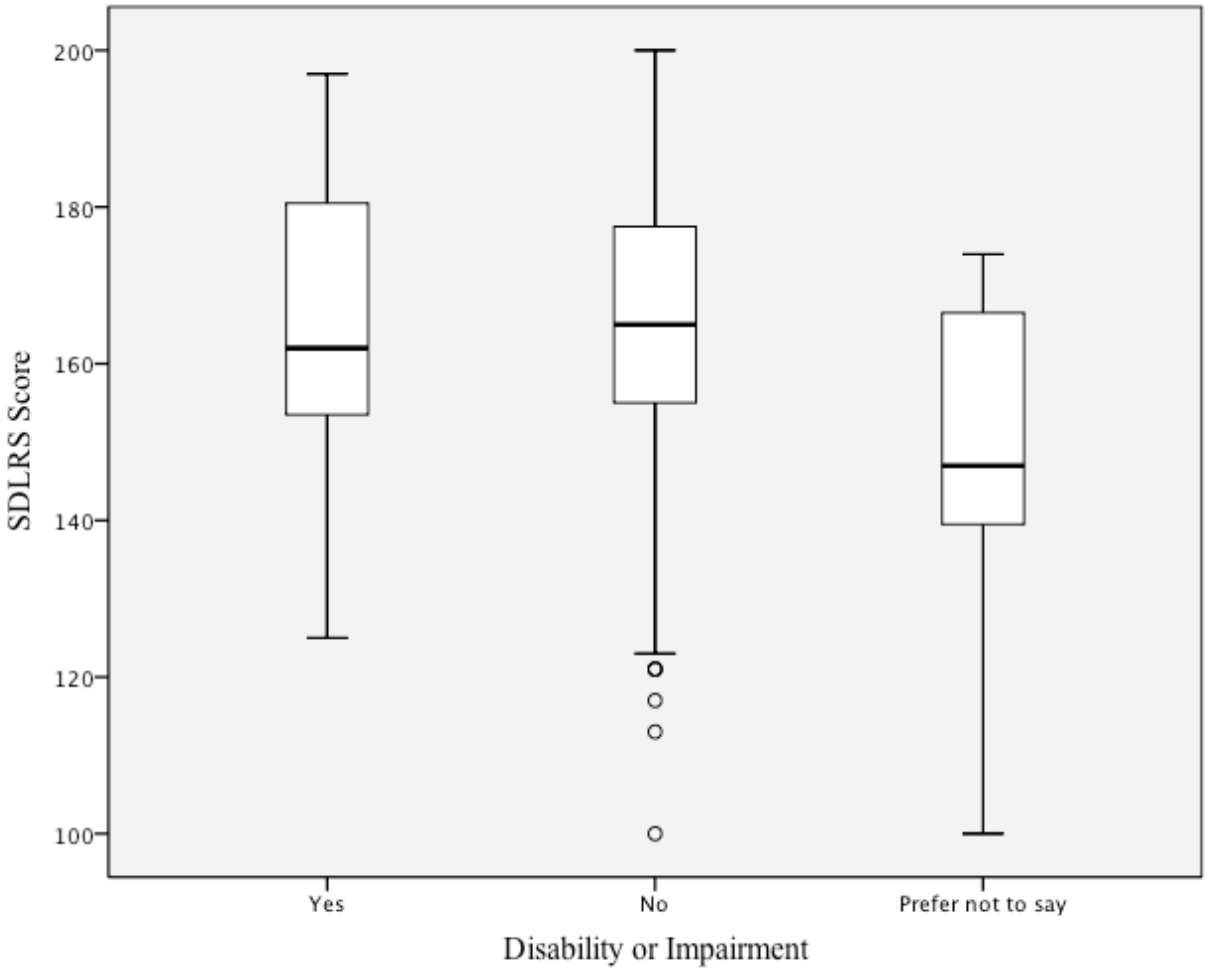

Figure 13. SDLRS score and disability or impairment

The eighth and final independent variable was reason for enrolling in the MOOC and the associated research question was stated as, "To what extent, if at all, did a reason for enrolling in the MOOC mediate the relationship between self-directed learning readiness and degree of MOOC completion?" The null hypothesis was, a reason for enrolling in the MOOC did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. The alternate hypothesis was, a reason for enrolling in the MOOC did mediate the relationship between self-directed learning readiness and degree of MOOC completion. Each option respondents could select as the reason they enrolled in the MOOC was analyzed in a

separate MANCOVA. Two responses resulted in a statistically significant association between variables. The first response was, “gain specific skills to do my current job better”. The analysis for percent of MOOC completed resulted in *p*-value = 0.103. The analysis for SDLRS score resulted in *p*-value = 0.026. Setting alpha at 0.05, only the *p*-value obtained for SDLRS score indicated that the null hypothesis should be rejected. Therefore, gain specific skills to do my current job better, did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. Partial *ETA*-squared = 0.026 for SDLRS score, which was a small effect size.

Table 15

MANCOVA of MOOC Completion, SDLRS Score, and New Skills

Factor	Criterion (DV)	*p*-value	Partial *ETA*-squared
New Skills	Percent Complete	0.103	0.103
	SDLRS Score	0.026	0.026

The box and whisker plot in Figure 14 shows that those that enrolled in the MOOC to gain new skills had slightly higher SDLRS scores on average.

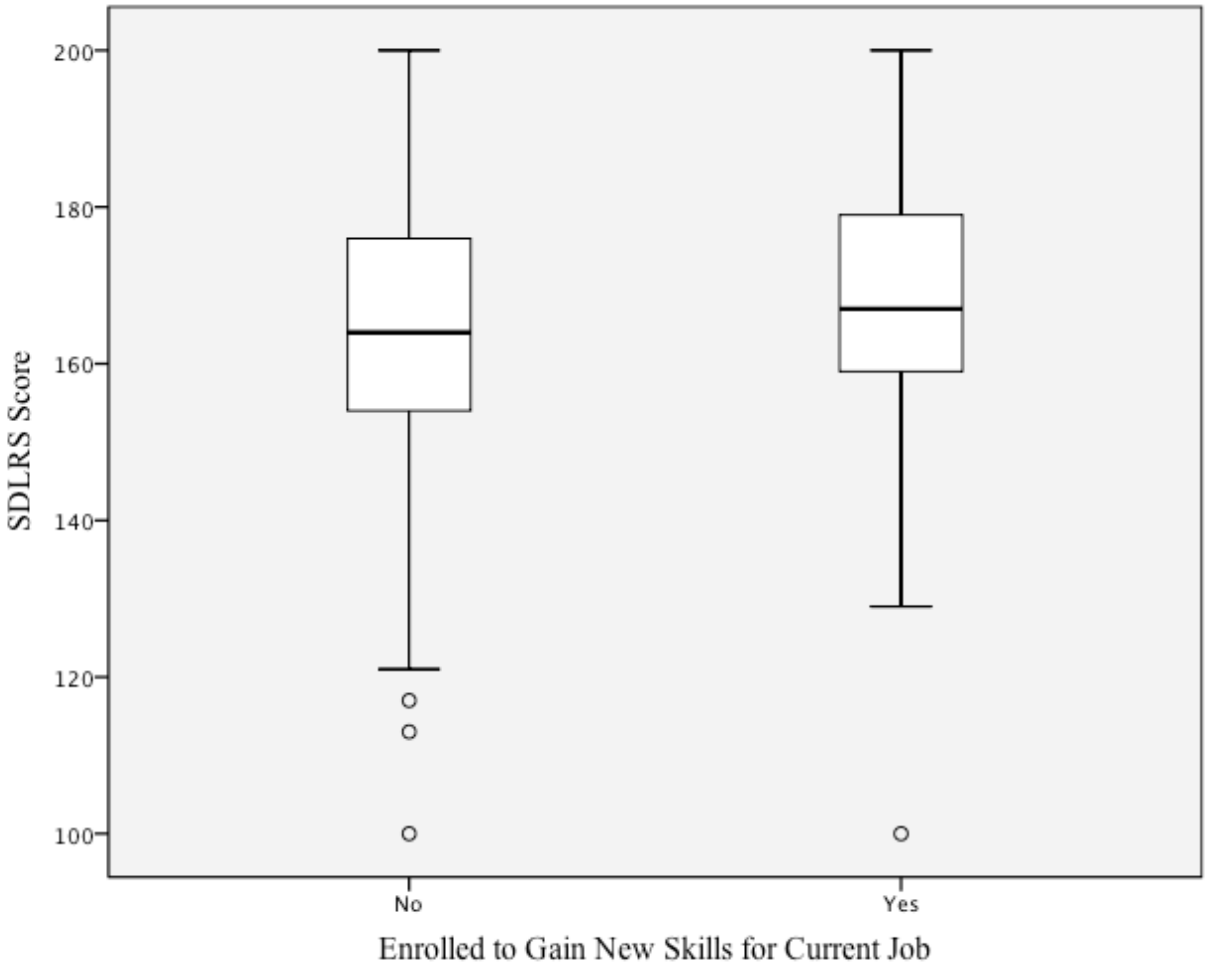

Figure 14. SDLRS score and enrolled to gain new skills for current job

The second response to also result in a statistically significant association was, "I wanted to take a course offered by the University of Pittsburgh". The analysis for percent of MOOC completed resulted in *p*-value = 0.296. The analysis for SDLRS score resulted in *p*-value = 0.030. Setting alpha at 0.05, only the *p*-value obtained for SDLRS score indicated that the null hypothesis should be rejected. Therefore, taking a course offered by the University of Pittsburgh, did not mediate the relationship between self-directed learning readiness and degree of MOOC completion. Partial *ETA*-squared = 0.008 for SDLRS score, which was a small effect size.

Table 16

MANCOVA of MOOC Completion Percent, SDLRS Score, and University

Factor	Criterion (DV)	*p*-value	Partial *ETA*-squared
University	Percent Complete	0.296	0.002
	SDLRS Score	0.030	0.008

The box and whisker plot in Figure 15 shows that those that enrolled in the MOOC because it was offered by the University of Pittsburgh had slightly higher SDLRS scores.

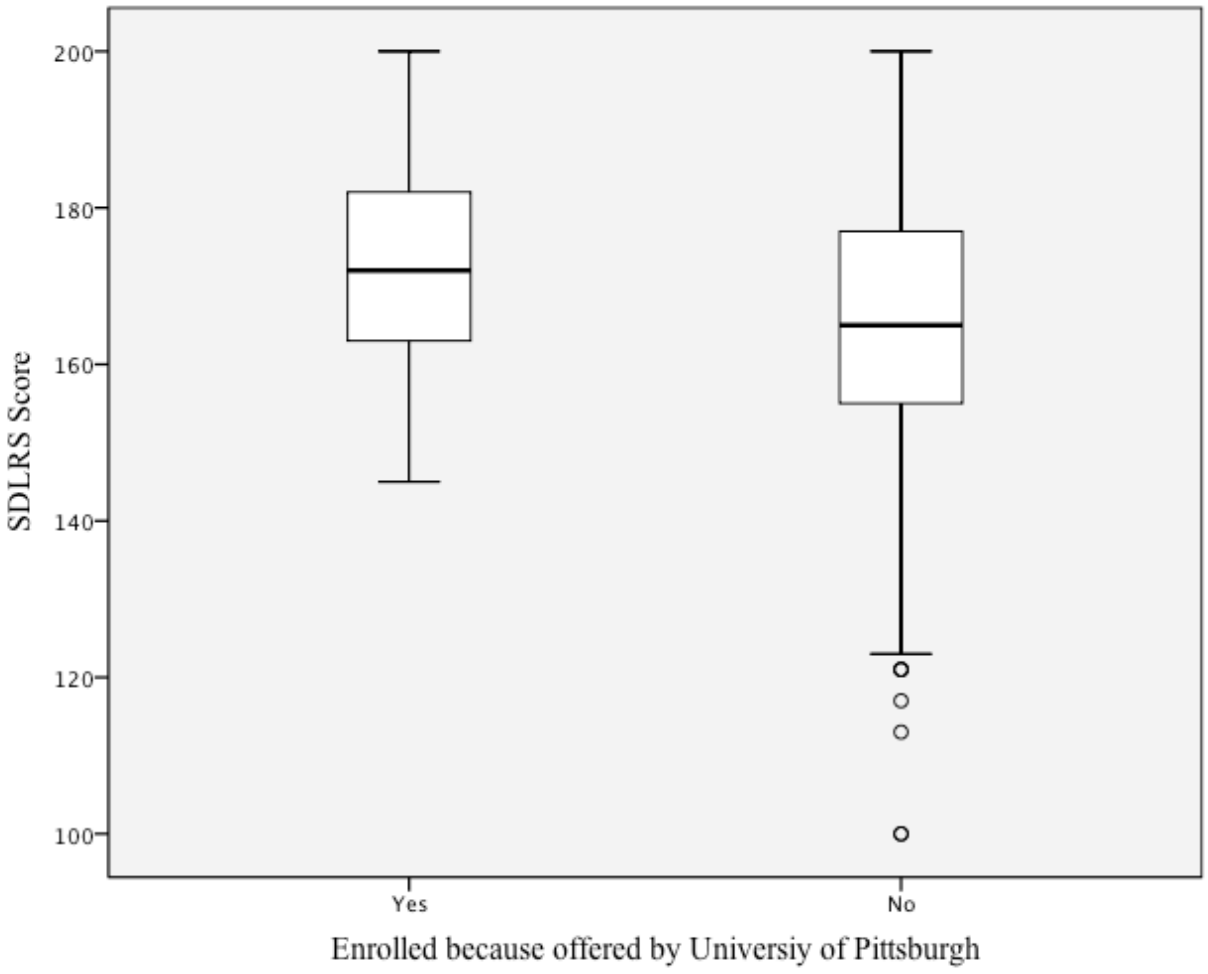

Figure 15. SDLRS score and enrolled because the offered by university

After reviewing the results of the analysis conducted for the third research question, it is clear that not all the variables predicted in the third hypothesis were statistically significant. The third hypothesis was that adult learners in their thirties and forties, who are female, with high levels of education, previous MOOC experience, strong English language skills, and with no physical disability or impairment that may interfere with completing an online course, will have higher scores in self-directed learning readiness and have higher MOOC completion percents. The only variable that had a statistically significant mediating effect between both percent of MOOC completed and SDLRS score was English speaking ability. Those that rated themselves proficient or advanced in English speaking were found to have higher SDLRS scores and completed a larger percent of the MOOC than those that rated themselves as moderate or low, in English speaking ability. However, other variables, English literacy, disability, age, taking the MOOC to gain new skills, and taking the MOOC because it is from the University of Pittsburgh, all showed statistically significant relationships within SDLRS scores. In the next section, the relationships of these other variables and SDLRS scores were further examined.

Other Findings

After examining the data collected for this study, it was apparent that several other findings may have been of interest to the purpose of this study. For example, an ANOVA was conducted to test whether adult learners that scored high in self-directed learning readiness were more likely to complete a MOOC. The question was, "To what extent, if at all, was there a relationship between the degree of self-directed learning readiness of adult learners and MOOC completion status?". The null hypothesis was that there was no relationship between the degree of self-directed learning readiness of adult learners and MOOC completion status. The alternate

hypothesis was there was a relationship between the degree of self-directed learning readiness of adult learners and MOOC completion status.

An ANOVA was calculated using SDLRS scores (DV) and MOOC completion status (IV). This resulted in a p-value < 0.001. Setting alpha at 0.05, the p-value obtained indicated that the null hypothesis should be rejected. Therefore, there was a relationship between the degree of self-directed learning readiness of adult learners and MOOC completion status. Given the ANOVA analysis, the means were statistically significant. The average SDLRS score for MOOC completers was 167.99, and the average for those that did not complete the MOOC was a SDLRS score of 161.53. When looking at effect size, SDLRS scores accounted for 10% of variability in MOOC completion. The Cohen's D effect size was calculated as 0.40, which was near a moderate effect size. To summarize, the relationship that adult learners that score high in self-directed learning readiness were more likely to complete a MOOC was found to be statistically significant.

Table 17

ANOVA of SDLR Scores and MOOC Completion Status

Criterion (DV)	Predictor (IV)	p-value	Cohen's D
MOOC Completion Status	SDLRS Score	0.001*	0.40

Note. *p < 0.001

To better visualize this finding, Table 18 displays that the majority of participants indicated completing 100% of the MOOC requirements and had a higher mean SDLRS score than those that indicated they did not complete the MOOC.

Table 18

Mean SDLR Scores and MOOC Completion Status

MOOC Completion Stats	Mean of SDLRS Score	*n* and percent
• Yes	• 167.99	• 357 (61%)
• No	• 161.53	• 216 (37%)
• Not Sure	• 169.1	• 10 (2%)

Next, demographic differences were examined for the variable ready for self-directed learning. The question posed was, "To what extent, if at all, were there differences in demographics of adult learners taking MOOCs that were ready for self-directed learning compared with those that were not ready for self-directed learning?" To answer this research question, all study participants were broken into the group "ready" for self-directed learning, or placed in the group "not ready" for self-directed learning. Those scoring 150 and above on the SDLRS were placed in the group labeled "ready" for self-directed learning, those scoring less than 150 were labeled "not ready". A chi-square was conducted for all eight demographic variables, and one variable was found to have statistically significant results.

The statistically significant finding was for the independent variable English speaking ability and the question was, "To what extent, if at all, was there a difference in the English speaking ability of adult learners taking MOOCs that were ready for self-directed learning compared with those that were not ready for self-directed learning?" The null hypothesis was, there was no difference in the English speaking ability of adult learners taking MOOCs that were ready for self-directed learning compared with those that were not ready for self-directed learning. The alternate hypothesis was, there was a difference in the English speaking ability of adult learners taking MOOCs that were ready for self-directed learning compared with those that

were not ready for self-directed learning. The appropriate statistical analysis was a chi-square because the independent variable, English speaking ability, was an attribute, and the dependent variable, self-directed learning status, was an attribute at the dichotomous nominal level. Regarding the output of the chi-square, 1 cell had an expected count of less than 5, meaning the results may not have been reliable. However, according to Cochran (1952) because less than 20% of the table cells had expected frequencies of less than five, a chi-square test was likely an acceptable test in this case.

Setting alpha at 0.05, the *p*-value obtained of $p < 0.001$ indicated that the null hypothesis should be rejected. Therefore, there was a difference in the English speaking ability of adult learners taking MOOCs that were ready for self-directed learning compared with those that were not ready for self-directed learning. To determine the effect size, Cohen's *D* was calculated as -0.40, which was categorized as a small to moderate effect size. In other words, the more proficient in English speaking a person indicated, the more likely that person was categorized as ready for self-directed learning.

Table 19

Chi-square of Self-Directed Learning Status and English Speaking

Criterion (DV)	Predictor (IV)	*p*-value	Cohen's *D*
SDLRS Status	English Speaking Ability	0.001*	-0.40

Note. *$p < 0.001$

Figure 16 shows that the majority of participants were ready for self-directed learning regardless of speaking ability.

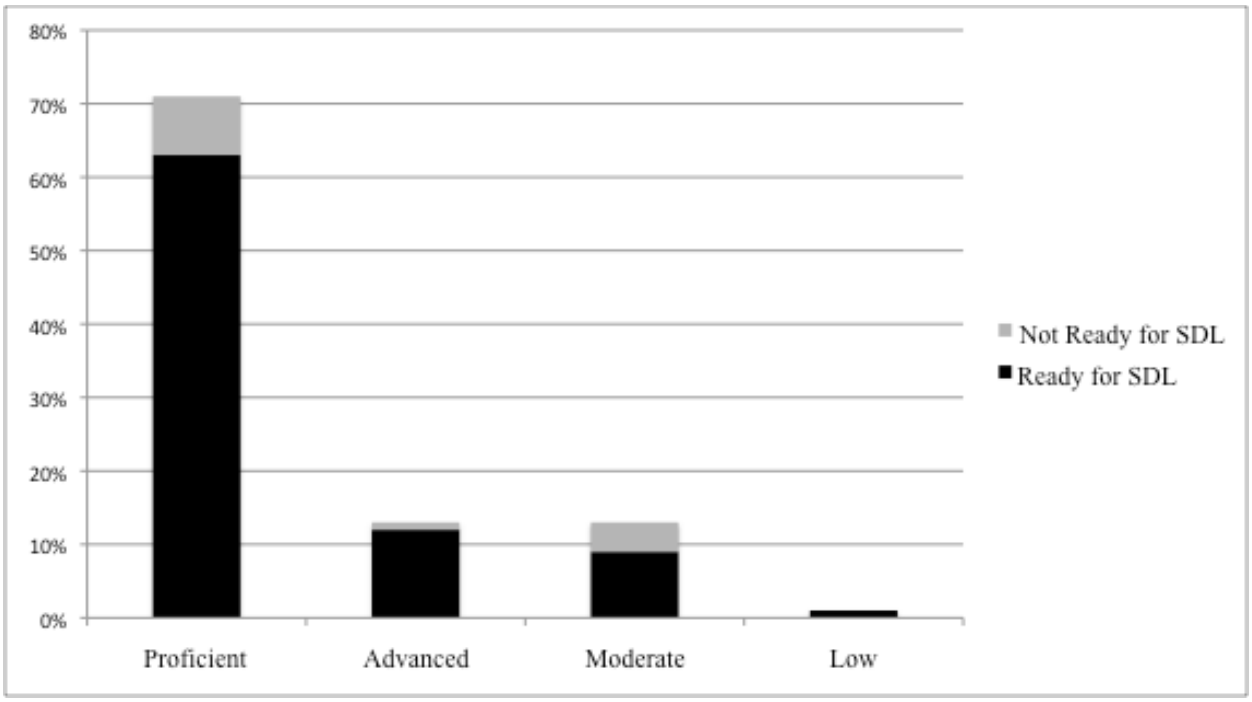

Figure 16. Self-Directed learning status and English speaking ability

This statistically significant relationship was found using a chi-square analysis to examine the relationship between the participant demographics and readiness for self-directed learning status. Those ready for self-directed learning were found to have strong abilities in English speaking.

Chapter Summary

In summary, correlations, chi-square, ANOVA, and MANCOVA were used to explore relationships between self-directed learning, MOOC completion, and demographics of those taking MOOCs. From the results of the analysis a statistical significance was found between higher scores on the SDLRS and higher MOOC completion percents, as well as those that completed 100% of the MOOC. This was tested via research question one, and an additional question posed in other findings. Both questions led to results that indicated there was a statistically significant relationship between the degree of self-directed learning readiness of

adult learners and the degree of their MOOC completion, or completion status, though the effect sizes were small to near moderate.

For the second research question, it was found there were few differences in demographics of adult learners that completed MOOCs compared with those that did not complete MOOCs. It was hypothesized that those with previous MOOC experience would be more likely to complete a MOOC, and this was found not to be a statistically significant relationship. However, some variation in students' MOOC completion status was accounted for both by their English speaking ability and if someone known to the learner recommended the MOOC. Both of these findings were small effect sizes.

For the third research question, only the variable English speaking ability had a mediating effect between both SDLRS scores and MOOC completion percent. If a learner indicated a proficient or advanced ability in speaking English, then that person was more likely to score higher on the SDLRS and tended to have a higher percent of the MOOC completed.

Lastly, in terms of other findings, when examining whether the participants were ready for self-directed learning or not ready, one variable was found to be statistically significant. Those participants with proficient or advanced English speaking abilities tended to be more ready for self-directed learning. All the statistically significant variables found in this chapter and their relationships are explored further in Chapter 5.

Chapter 5: Discussion

Though millions of adult learners have registered for MOOCs, there are few empirical studies that examine MOOCs and their value for learning. Critics of MOOCs highlight that completion rates often average fewer than 5% of those registered for MOOCs (Kolowich, 2012; Pappano, 2012; Balch, 2013), and many different theories exist to explain these low completion rates. For example, adult learners may find MOOCs overwhelming because the courses are massive, meaning that one course can contain hundreds of thousands of learners. Because of these enormous class sizes, the design of MOOCs may not allow for a single instructor to direct, guide, or assist the participants, leaving learners to take charge of the MOOC online learning environment for themselves. Fortunately, self-directed adults are often able to take responsibility for their own learning and these self-guided learners may not always need the physical presence of an instructor to direct their learning process (Knowles, 1975). However, adult learners who are not familiar with how MOOCs are structured or how to manage their own learning experiences through self-directed learning, may struggle within a MOOC (Koutropoulos & Hogue, 2012). From this, one might hypothesize that those strong in self-directed learning may be able to more successfully complete a MOOC.

To explain this hypothesis, this study explored the relationship between self-directed learning readiness and MOOC completion among adult learners taking a single Coursera MOOC in the fall of 2013. Through two online surveys administered by the researcher, the participants completed the SDLRS developed by Fisher et al. (2001) to measure readiness for self-directed learning, and self-reported their MOOC completion percent. Data was also collected on the MOOC participants to uncover their reasons for registering for the MOOC as well as their reasons for not completing the MOOC. After conducting the data analysis, several key findings

were identified. First, and most importantly, a statistical significance was found between higher scores on the SDLRS and higher MOOC completion percents, as well as those that completed 100% of the MOOC. Though the effect sizes were small to near moderate, there were statistically significant relationships between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion, or their MOOC completion status. Second, English speaking ability was a variable that found statistical significance with MOOC completion status, as well as had a mediating effect between both SDLRS scores and MOOC completion percent. Third, those participants with proficient or advanced English speaking abilities tended to be more ready for self-directed learning. One finding that did not materialize after analyzing the data was the expectation that those with previous MOOC experience would be more likely to complete the MOOC. These results and others are discussed in more detail in this chapter.

This final chapter also presents the conclusions and implications of the study research questions to learn more about the study participants' readiness for self-directed learning, MOOC completion percents, as well as other findings of interest. In addition, this chapter covers the generalization of results, limitations, alternative explanations for findings, utility of results, and recommendations for future research.

Research Question 1: Conclusions

The first research question was, "to what extent, if at all, was there a relationship between the degree of self-directed learning readiness of adult learners and the degree of their MOOC completion?". The hypothesis was that the more competent adult learners were at self-directed learning, the more likely these learners were to successfully complete a greater percent of a MOOC. Based on this hypothesis, the two variables measured were self-directed learning

readiness scores and MOOC completion percents. From the hypothesis, the researcher expected that those that scored higher on the SDLRS would have completed a greater percent of the MOOC.

The first hypothesis was supported and it was found that a significant relationship, though small effect size, existed between readiness for self-directed learning and MOOC completion percent. In other words, those with greater SDLRS scores completed more of the MOOC requirements. Support for this hypothesis can be found in research that highlighted the autonomy learners face while taking a MOOC and that these learners were expected to be self-directed (Kop, 2011; Bonk, Lee, Sheu, & Kou, 2013). The results of the SDLRS (Fisher et al., 2001), which measured self-management, desire for learning, and self-control, seemed to indicate that these were the skills needed to successfully complete the MOOC studied. Several studies indicated that self-directed learning, or one of the many traits related to self-directed learning, had an impact on the success of online learners (Dillon & Gabbard, 1998). For example, Garrison (2003) found that online learning environments gave more control to learners as compared to traditional learning environments. Assuming MOOCs would offer the opportunity for this same kind of control, to be successful in a MOOC, one might conclude that participants would need to be able to manage their own progress through the MOOC, stay motivated throughout the experience, and work independently to complete the MOOC. Kop (2011) concluded that to be successful at MOOCs, learners participating in these educational experiences should be self-directed. Yuan and Powell (2013) also believed that motivation for learners could be an issue as they started and then had to persevere to complete a MOOC. From this study, as well as the literature, it seemed being ready for self-directed learning, and thus having a strong desire to learn, should have assisted learners in completion of MOOCs.

Successful MOOC participants may need to be self-starters that can collaborate, make decisions, and take charge of the learning process. The studies referenced here supported the finding that those stronger in self-directed learning were more successful at completing the MOOC identified for this study.

Implications. This section discusses the implications for individual learners, MOOC designers, and the universities offering MOOCs based on the findings of the first hypothesis. First, more opportunities for developing self-directed learning skills should be considered. Given that self-directed learners may be more successful at MOOCs, it seems logical to examine whether or not all learners are being prepared to participate in educational contexts such as MOOCs. If the traditional role of a teacher is keeping learners dependent on that one individual for education, then children are being trained to passively receive information throughout their time in school. As a result, some argue that it is less likely these children will grow into adults who are active seekers of education (Knowles, 1980). Instead, an argument could be made that education needs to focus on making learners independent in their inquiry and more autonomous. This could be done by implementing teaching strategies and methods, such as those referenced in the field of andragogy. Individuals exposed to this independent type of education grow to seek out learning experiences, enjoy learning new things, and embrace changes as an opportunity to learn (Knowles, 1980).

If higher education continues to develop offerings such as MOOCs, then developing independent and autonomous learners may need to be a priority. Adults should be actively participating in their own educational activities, and as more non-traditional students emerge, there need to be educational opportunities for them such as MOOCs. For example, the highest ranked reason the study participants indicated for wanting to take the MOOC in this study was to

develop new skills. Adult learners that want to enhance their careers and build new skills need opportunities to access education solutions that are affordable and flexible. MOOCs are one option that adult learners are seeking out to fill their educational needs. Those wanting to learn from MOOCs may need assistance in developing their self-directed learning skills to be successful at MOOCs.

Throughout Chapter 2, several self-directed learning models were presented that could be used to develop the skills critical to becoming a self-directed learner. Knowles (1975) designed a five-step model of self-direction that could be implemented by instructors to instruct students on self-directed learning. The first step is determining learning needs, the second is formulating those needs, the third is identifying the resources needed to meet the needs, the fourth step is selecting the appropriate instructional strategies, and finally, the fifth step is assessing the outcomes (Smith, 2002). Another model that could be used to develop self-directed learning skills is Grow's model. Grow's Staged Self-Directed Learning Model (Grow, 1991, 1994) was created for instructors to strengthen self-directed learning attributes in students. In this model, an appropriate selection of teaching strategy is matched to a learner's self-directed learning needs, or stage, and as a result, the learner can advance through the stages of self-directed learning. The stages of the model start with dependent learners, moving to interested, then to involved, and finally to self-directed learners. According to the model, dependent learners require more hands-on teaching direction and are likely comfortable with lectures as a teaching strategy. In later stages, independent learners are shown to thrive with projects that are loosely facilitated by an instructor. To summarize, Grow's Staged Self-Directed Learning Model works from the notion that self-directed learning can be taught and must be encouraged. Finally, Candy's (1991) model represents how learners can develop self-directed learning in institutional settings, as well as in

informal learning contexts. An educational goal for instructors would likely be to move students within a classroom to the level that they are learning independently within the organization, but then are able to direct their own learning processes outside of the institution.

To summarize, each of these models places learners on a continuum that begins with dependent learning and ends with independent learning. Providing students with opportunities for autonomous learning and applying the appropriate teaching strategies along the continuum, can enable students to grow into self-directed learners. Finally, instructors could rely more on teaching strategies usually reserved for adults, such as implementing self-guided projects, when working with younger learners to better prepare them for self-directed learning experiences. As more opportunities for learning, such as MOOCs appear in higher education, developing individual skills of self-directed learning should become more of a priority.

The second implication is for those designing MOOCs. If adults that are strong in self-directed learning are succeeding, then it may be that those not self-directed are struggling with MOOCs. Different design strategies could be applied to MOOCs to offer those requiring more assistance, additional opportunities to be successful. For example, MOOCs lack structure and must be designed for thousands of learners, which limits student access to the instructor. This is a very different model than traditional higher education courses (Yuan & Powell, 2013). Again, for those strong in self-directed learning, this learning context may be an ideal learning environment. However, for those not comfortable with self-directed learning, they may feel overwhelmed and need more access to content experts or assistance moving within the MOOC. Studies have found that matching a learner's readiness for self-directed learning to the proper educational delivery method can lead to optimal learning outcomes (Grow, 1991). One idea is for MOOC designers to offer different delivery options for learners or build more structured options for those that may

need extra assistance and guidance. A few changes, even something as simple as an online MOOC orientation, an online syllabus or road-map for completion, may allow more types of adult learners to be successful at MOOCs. Another suggestion may be to have facilitators available to those taking MOOCs. These facilitators, though not content experts like instructors, perhaps could be experts in taking MOOCs and offer guidance in MOOC completion.

Another strategy that could be useful is for MOOC designers to document and apply specific online course development standards or criteria to ensure that MOOCs meet minimum standards of quality. For example, Johnson and Aragon (2003) identified seven criteria that all online learning environments should meet. These criteria include addressing the individual needs of learners, motivating learners, providing opportunities for engagement, and more. Following specific standards such as these could enable designers to more consistently develop quality MOOCs that can be taken and completed by many different types of learners.

The third implication is at the university level. Universities that offer MOOCs need to be aware of who is taking their MOOCs and who is successfully completing them. MOOCs were originally intended to drive down the costs of higher education for students by providing quality education online for free. If universities are going to continue to invest in MOOC development, then they may eventually require higher completion rates. For example, if the business model for MOOCs is to be self-sustaining, then one opportunity for making money is to charge a fee for obtaining a course completion certificate (Yuan & Powell, 2013). As data continues to show, the majority of learners are not completing MOOCs, which should be a cause for concern when trying to build a sustainable business model for universities such as the one in this study. In addition, if learners continue to register for MOOCs, but not complete them, then platforms of MOOCs like Coursera may have to look for new sources of income such as charging for

registration or requesting higher fees from the universities that are hosting MOOCs on their platforms.

An opposing view to increasing MOOC completion rates should also be discussed. As this study noted, it is critical to understand the reasons a learner is enrolling in a MOOC in order to better know how to best meet that person's learning needs within the educational context. Participants in this study indicated they wanted to learn new skills for their current jobs, 28%, or develop their skills for a future job, 14%. Very few, only around 4%, selected they were taking the MOOC as part of working toward a degree. The fact that learners are out to gain new skills may translate into lower MOOC completion rates because the incentive to complete academic requirements of a course may not be needed (Kolowich, 2014). With over 70% of the participants in this study already having a bachelor's, master's, or doctorate degree, it may be unlikely that these attendees felt compelled to complete all the MOOC requirements. These learners may simply access a MOOC to get at the content found within the course. This idea could cause one to reconsider measuring MOOC effectiveness through completion rates. Universities may need to reassess how they define successful MOOCs based on the needs of the audiences taking their MOOCs.

While the results for this first hypothesis indicated that those strong in self-directed learning may be successful at MOOCs, unfortunately one may find that those not strong in self-directed learning will not be successful at MOOCs. Implications to consider include long-term investment in developing self-directed learning skills, designing MOOCs so that many learners can be successful, and focusing how universities view MOOCs, not as a marketing tool, but as a sustainable business model for many different types of adult learners.

Research Question 2: Conclusions and Implications

The second research question was, "to what extent, if at all, were there differences in demographics of adult learners that completed a MOOC compared with those that did not complete a MOOC?". The hypothesis was that adult learners with previous experience taking a MOOC were more likely to complete a MOOC. Previous MOOC experience was important to consider because it was assumed to influence a person's comfort level and expectations of a MOOC. MOOC learners have reported feelings of stress and being overwhelmed when taking MOOCs, and have indicated preferences for more guidance and structure in their MOOC experience (Mackness et al., 2010). Therefore, having previous experience within a MOOC environment was assumed to be an important indicator of completion.

Several studies have found that the experience a learner has with university distance education is related to the likelihood that the learner will complete or drop out of a distance learning course (Parker, 1999). This means that the more distance education courses a person has taken, the more likely this person is to succeed and complete a distance-learning course in the future. In addition, Candy (1991) found that learners may be strong in self-directed learning in an area in which they are familiar, or in contexts that are similar to a prior experience. Also, Eisenberg and Dowsett (1990) and Erhman (1990) indicated that university students taking online education for the first time did not have all the necessary skills needed to be successful in their courses. In a study by Lee and Choi (2010), the researchers conducted a review of studies on dropout rates for online courses in higher education. The researchers attempted to identify critical factors that might cause a university student to dropout of an online course. The researchers indicated relevant experience, specifically the number of previous courses completed online, as pertinent to online course completion, as well as several skills that could be linked to

self-directed learning such as self-control, motivation, and love of learning. The study found that those students in higher education with previous online course completion and having traits associated with self-directed learning were more likely to complete an online course as part of their university education (Lee & Choi, 2010).

From these studies and others, the researcher expected those with previous MOOC experience to be more successful at completing the MOOC, than those without previous MOOC experience. To answer the second research question, the study participants were broken into dichotomous groups of MOOC completers and non-completers. From the data, 71% of the participants indicated they had previous MOOC experience, while only 29% stated they had no previous experience taking MOOCs. The first question on the second survey asked participants to indicate if they completed the MOOC. All participants in the study responded, and 61.2% indicated they had completed all the MOOC requirements, 37% estimated they did not complete the MOOC requirements, and 1.7% were not sure if they completed all the requirements.

When examining the results of the data analysis, no significant relationship was found between previous MOOC experience and MOOC completion status. In a study by Shih, Munoz, and Sanchez (2006), students' previous experience with online tools was measured with their experiences in an undergraduate online classroom. The researchers determined that regardless of previous experience with online tools, participants rated the online course as a positive learning experience. In other words, previous MOOC experience may or may not have been helpful when it came to completing the specific MOOC in this study.

Several different possibilities were considered to explain this finding. One explanation was that the number of registrants that self-reported completing the MOOC was inflated. Of the 21,912 registrants for the MOOC, in reality only 1,475 completed all the MOOC requirements,

approximately 7%. The 7% completion, while typical for a MOOC (Yuan & Powell, 2013), is not represented in the data collected, as over 60% of the study participants indicated they completed all the requirements. Again, more than 60% indicated they completed the final project, which was the final required component of the MOOC. This validates the 60% that indicated they completed 100% of the MOOC requirements. It may be that those participants that completed the MOOC were the ones that participated in the study, or that these participants overestimated their completion. It is important to consider that since only 2.7% of the total MOOC registrants participated in this study, the results of this research question may have been due to self-selection. Another explanation for the lack of previous MOOC experience being significant was that the specific Coursera MOOC identified for this study could have been intuitive for learners to complete, and no previous experience was necessary. Therefore, there may be a relationship between previous MOOC experience and MOOC completion. Additional research using other MOOCs is needed to determine if this finding is an outlier of the research.

Even though prior MOOC experience was not statistically significant, all the demographic data collected for this study was analyzed with the two groups, those that completed MOOCs compared with those that did not complete MOOCs. English speaking ability was found to have a significant relationship, with those rating themselves as proficient or advanced in English speaking ability having the highest completion rates. Yet, it should be pointed out that less than 2% of those that participated in this study indicated English language was a barrier to completion. Other explanations, therefore, may be responsible for the significant relationship that was found between English speaking ability and MOOC completion. For example, within the informed consent information given, participants were required to have some ability with the English language to participate in the study. This may mean that those not

fluent in English could have chosen not to participate, or were not able to participate given the language barrier. The variable English language ability is explored more in the next section.

Several of the studies noted here that individual demographics did not correlate to MOOC completion, but that dropping out of an online course was an individual reason that seemed to differ depending on the specific person (Patterson & McFadden, 2009). For example, the participants of this study indicated that time constraints, 28%, kept them from completing the MOOC. Nash (2005) also concluded the primary reason for not completing an online course was time management. MOOC developers need to be aware that non-traditional students enrolled in MOOCs may struggle with managing the tasks required to complete a MOOC. The idea of what it means to complete a MOOC may need to be re-examined if the same audiences continue to register for MOOCs.

The last significant relationship found for the second research question was the enrollment reason that stated, the MOOC was recommended by someone the learner knew. If participants selected they enrolled in the MOOC because it was recommended by someone they knew, then they were more likely to complete the MOOC. Around 7% of the study respondents indicated that someone they knew recommended the MOOC to them and these registrants then went on to complete the MOOC. Obviously, having a course recommended is valuable for registration, but its effect on persistence through completion needs further study. One explanation for this is that perhaps some of the registrants looking to build new skills had the MOOC recommended by their work supervisors. These employees may have felt obligated to complete the MOOC as part of a work requirement. Another thought is that if a peer recommended the course, then perhaps both learners were taking the MOOC together and they were able to motivate each other to complete all the requirements. More research is needed to

determine if having the MOOC recommended by someone you know is a good indicator for completion.

To summarize, the second hypothesis was not supported. Previous MOOC experience and MOOC completion status were not significant. Instead, the respondent's English speaking ability and having the MOOC recommended by someone you knew were associated with MOOC completion status. More research on additional MOOCs should be conducted to examine different demographics and the motivations of MOOC learners to determine if these two variables are significant outside of this study.

Research Question 3: Conclusions

The third research question was, "to what extent, if at all, did adult learner demographics mediate the relationship between self-directed learning readiness and degree of MOOC completion?". The third hypothesis was that adult learners in their thirties and forties, who were female, with high levels of education, previous MOOC experience, strong English language skills, and with no physical disability or impairment that may interfere with completing an online course, would have higher scores in self-directed learning readiness and therefore have higher MOOC completion percents. Again, self-directed learning readiness scores were measured using the SDLRS and MOOC completion percents were gathered from the self-reported data collected on the second online survey.

All eight demographic variables collected were analyzed against self-directed learning readiness scores and MOOC completion percents. It should be noted that most of the variables in the hypothesis were not found to be significant between self-directed learning and MOOC completion percents. The only variable that had a significant mediating effect between both percent of MOOC completed and SDLRS score was English speaking ability. Those that rated

themselves proficient or advanced in English speaking were found to have higher SDLRS scores and completed a greater percent of the MOOC than those that rated themselves as moderate, low, or with no English speaking ability. Of those that participated in the study, 85% indicated they were proficient or advanced in English speaking.

It is important to note that findings such as those obtained for this study have not always been supported by the literature. For example, in a study by Fini (2009), the researcher examined participants taking one of the first cMOOCs held in 2008. Participants of the study were small in number for a MOOC, only 83 completed the study survey. Of those learners that participated, 46% indicated that English was not their native language, yet; only one individual indicated that English language was a reason for not completing the MOOC. On a similar note, recall that less than 2% of the participants indicated English language was a barrier to completion. Other explanations, therefore, may be responsible for the significant relationship that was found between English speaking ability, SDLRS scores, and MOOC completion percents. Again, the informed consent information given to participants required them to have some ability with the English language to participate in the study. This may mean that those not fluent in English could have chosen not to participate, or were not able to participate given the language barrier. In addition, perhaps this MOOC topic only attracted those speaking English. To better understand the relationship between English speaking ability and MOOC completion, additional research would need to take place.

Lastly, age, disability, English literacy, taking the MOOC to build new skills, and taking the MOOC because it was offered from the University of Pittsburgh were only significant when looking at SDLRS scores, but not MOOC completion percents. The next section reviews the implications for individual learners, MOOC designers, and the universities offering MOOCs

based on the data that supported English speaking ability had a mediating effect between SDLRS scores and percent of the MOOC completed.

Implications. This section discusses the implications for individual learners, MOOC designers, and the universities offering MOOCs based on the findings of the third hypothesis. The first implication is that MOOCs may not be accessible to all learners, especially those that do not speak English. The second implication is that designers of MOOCs may need to develop MOOCs that are more manageable to learners in different cultures, and the third implication is that universities should further examine if they are reaching the intended audiences for their MOOCs.

When MOOCs emerged only a few years ago, there was discussion that this type of education would allow learners from across the globe to access quality education previously not available to them. However, it seems that many of those advocating for MOOCs are already highly educated and comfortable with technology needed to complete an online course (Yuan & Powell, 2013). The data from this study supports this claim. For this study, 71% of participants indicated they had a bachelor's, master's or doctorate degree, and only 2% indicated technical problems interfered with their MOOC completion.

In addition, there are claims that MOOCs are supposed to benefit third world countries where people wanting access to education do not have opportunities to attend a quality university. Yet, the majority of MOOCs are currently developed by western universities and may not be culturally appropriate for all learners (Rivard, 2013b). It may be that MOOCs are only being accessed by those proficient in the English language, or that only those proficient in English can successfully complete them. If MOOCs are being designed by western universities, then these courses are likely best suited for English speaking cultures as well. Those not as

familiar with western ideas and learning practices may not be able to successfully complete MOOCs. A recommendation from this study would be to have MOOC designers consider additional support and instructional strategies to assist learners who are not proficient in the English language. Universities should also consider placing more emphasis on reaching different audiences to include those not proficient in English.

This study highlights the possibility that to be successful at MOOCs, one should likely be advanced or proficient in speaking English and even listening to English given all the instructional videos in many MOOCs. This leaves out a large percent of the world's population that MOOCs were originally targeted to reach. More research should be conducted on those that take MOOCs, with the idea of comparing these results to the audiences not proficient in speaking English. Designers should be aware that all learners are not going to be successful at MOOCs if their culture and language was not considered from the conception of the development of each course.

Unfortunately, guidelines for developers that should assist in overcoming accessibility barriers such as language are often complex to understand and challenging to implement (Pearson & Koppi, 2002). Designers may need training and education on how to design and develop culturally appropriate MOOCs. If learners have negative experiences with online education, then their perceptions of online courses are likely not positive, which can lead to them dropping out of future online courses (Carr, 2000). Better understanding the barriers learners face should allow for more effective online course design and development.

In addition, universities need to carefully design and market MOOCs to their intended audiences. This means that more should be done to design accessible MOOCs and then promote them to non-native English speakers. One recommendation might be for universities to carefully

document their marketing and promotion strategies of MOOCs to make sure that the intended audiences have the knowledge needed to decide which MOOCs they would like to participate in.

In summary, there were several implications surrounding English speakers and their ability to complete MOOCs and obtain high SDLRS scores. Unfortunately, MOOCs may not be accessible to all learners, especially those that are not proficient in the English language. As a result, designers of MOOCs should focus on making MOOCs more accessible, while universities should further examine if they are reaching the intended audiences for their MOOCs.

Other Findings of Interest: Conclusions and Implications

Additional analysis was conducted on the data collected to determine if other findings of interest would be found. For example, the idea that adult learners scoring high in self-directed learning readiness were more likely to complete a MOOC was found to have a near moderate effect size. This finding supported the first research question results that there was a significant relationship between self-directed learning and MOOC completion. When the participants were divided into MOOC completers and non-completers, the completers averaged higher SDLRS scores than the non-completers. This is more evidence that MOOCs may not be designed for all types of learners.

In addition, further analysis was conducted to determine to what extent, if at all, there were differences in demographics of adult learners taking MOOCs that were ready for self-directed learning compared with those that were not ready for self-directed learning. The study participants were broken into two categories, those "ready" and those "not ready" for self-directed learning, and all demographics collected were analyzed. One significant relationship was found. Those proficient or advanced in English speaking were more likely ready for self-directed learning.

The results of this study may hint that learners who are not strong in the English language, may not be successful at MOOCs. However, only a small percent of learners indicated low or no proficiency in speaking English. More information is needed about those taking MOOCs, their backgrounds, and their completion rates. MOOC design and development standards and specific MOOC marketing strategies targeted toward intended MOOC audiences may help to lessen issues such as learner accessibility and low completion rates of MOOCs.

Generalization of Results

It is important to note that each of the findings from this study is only generalizable to the study participants, the 2.7% of the 21,912 registrants of the MOOC used in this study. Study findings therefore cannot be generalized to the remaining 97.3% of registrants that did not participate in this study. Ideally, this research study would have resulted in a clear and focused approach for enabling learners to be more successful at completing MOOCs. However, this study was only a small step toward learning more about MOOC participants and their completion rates. In addition, this was the first research study to implement the SDLRS by Fisher et al. (2001) and then compare these results to MOOC completion percents. Before any broad generalizations can be made to all MOOCs, more data is needed on MOOCs to determine if a relationship existed between SDLRS scores and MOOC completion percents outside of the MOOC used for this study. If a significant relationship did continue to exist between these two variables, then there would be more evidence to suggest that the design and marketing strategies for MOOCs be examined. Design and development standards, quality control policies, as well as marketing plans could help to improve completion rates for MOOC participants. As additional research moves forward on MOOCs, universities should continue to develop and refine MOOCs as opposed to concluding that MOOCs are not an effective education solution.

Limitations of Results

There were several limitations of this study that could have impacted the findings, making generalization of the study results to all MOOC learners improbable. Future researchers should make note of these limitations when trying to obtain similar results found in this study. First, this study focused on registrants of a single MOOC, which limited this study to one MOOC platform as well. The type of MOOC that was used for this study likely attracted a specific type of individual wanting to learn about disasters. The MOOC platform Coursera also appeals to different MOOC participants than other platforms. To understand more about those that participate in MOOCs, different MOOCs on multiple platforms should be researched.

A second limitation is that the MOOC content and instruction was only offered in the English language. Offering the course only in English may have inhibited some learners from registering and therefore eliminated them from this research study. This limitation is closely linked to the third limitation, which is that the MOOC used for this study was limited by the people that registered for it. Self-selection bias occurs when a survey, such as the one used for this study, is offered to a large population, and the study participants are volunteers. This open enrollment to participate makes results from the study more challenging to generalize (Eysenbach & Wyatt, 2002). This could mean that only those individuals comfortable with online education may have participated in the study, which is not representative of the mainstream population.

A fourth, and large limitation of this study, was that all of the data collected was self-reported. Ideally, the participants' MOOC completion percents would have been downloaded from the Coursera learning management system and matched with learners' SDLRS scores. If the researcher had been able to view the learning management system data, then additional

information on participant video views, and posts in the discussion forums could have been obtained for further analysis. However, the completion percents were not made available to the researcher. This change in data collection method required the researcher to send out a second survey to the participants two months after the MOOC had ended. The participants then had to estimate their own MOOC completion percent. In the end, the completion rate reported by the study population, over 60% completion, was significantly higher than the total MOOC registrants' completion rate, just 7%. In addition, though the completion rates reported across the three survey questions were similar, they were not equal. Over 60% of the participants indicated that they completed the MOOC, yet only around 50% indicated they completed 100% of the MOOC requirements. When asking for more specific reporting, participants may have felt less confident about their completion. Given the MOOC ended two months prior to sending the final survey, and learners could no longer access the MOOC in Coursera, self-reporting of completion was likely not accurate. Several reasons for this discrepancy have already been discussed, but this study would need to be conducted again to see if this same discrepancy could be removed.

Alternative Explanations of Findings

Though there were several significant findings in this research study, alternative explanations may be possible for each finding. To start, the finding that a relationship existed between self-directed learning and MOOC completion could have alternative explanations. First, only one MOOC was studied and the participants self-selected into this study. This means that only 2.7% of the total number of those registered for this single MOOC chose to participate in the study. This makes the results difficult to generalize to all that registered for the MOOC. These same participants had to estimate their MOOC completion percent, which may have been inflated. Either the study participants were a large representation of the 7% that completed the

MOOC, or the study participants inflated their completion. In addition, the completion percents were not consistent across the three questions asked on the final survey used to estimate completion. Around 60% of participants estimated they completed the MOOC requirements, but only around 50% indicated they completed 100% of the MOOC. When asked to give an approximate percent of completion, participants were not as confident in their completing all the requirements. Ideally, the researcher would have downloaded the exact completion percents from the learning management system used to track the MOOC participants. From this learning management system data, the researcher may have been able to analyze additional aspects of the course such as posts in the discussion forum or views of each video.

Another explanation for this finding was that only those that were planning on completing the MOOC participated in the first survey, and those that actually completed the MOOC were the most motivated to answer the second survey. The second survey asked the participants to estimate their completion. Again, the researcher should have gotten the exact completion percents from the entire group of learners that completed the first online survey, but this data collection method was not available. Therefore, the result that a significant relationship existed between self-directed learning and MOOC completion would need to be studied further to determine if similar results could be obtained outside of this study.

An alternative explanation should also be considered for the finding that a significant relationship was found to exist between English speaking ability, SDLRS scores, and MOOC completion percents. To begin, the MOOC registrants were asked to have some understanding of English to participate in the study, meaning that some of the MOOC registrants could have eliminated themselves from the study if they were not proficient in English. In addition, both surveys administered as part of this study were only offered in English, which may have kept

learners not proficient in English from participating. Lastly, the course was only delivered in English, which may have discouraged those not fluent in English from even registering. These limitations, specifically for those not proficient in the English language, could have been responsible for the significant relationship found between English speaking ability, SDLRS score, and MOOC completion percents.

A final alternative explanation was considered for the three relationships found between self-directed learning readiness and English speaking, English literacy, and having a disability or impairment. Perhaps one explanation for finding these relationships stems from the notion that only those strong in self-directed learning would even choose to participate in a MOOC. It would be interesting to compare the SDLRS scores of those that take MOOCs with those that do not take MOOCs to see if the audience for MOOCs is already stronger in self-directed learning. The entire MOOC sample of the study, if compared to other adult learners registered for traditional classroom courses, may be found to score higher on the SDLRS. More research on MOOC learners is needed to determine if those that take MOOCs are stronger in self-directed learning than the general population.

Utility of Results

At this time, MOOCs are only one solution to the many challenges that higher education faces. However, if more learners are not able to successfully complete a MOOC, then these education offerings may eventually cease to exist. Therefore, as research on MOOCs begins to flourish, it is important to give the research time to develop, resulting in real solutions that may alter or improve MOOCs.

This researcher prefers to view MOOCs as a starting point that can be used to motivate universities into new educational opportunities, and to further innovate and develop meaningful

open education for global learners. In addition, MOOCs may be the beginning of new policies, business models, and teaching practices for higher education, which are all in need of change (Yuan & Powell, 2013).

Though this study is one of only a handful looking at MOOCs and self-directed learning, it is the first to use the SDLRS (Fisher et al., 2001) in this type of learning context. Beginning to research these online course environments is critical to understanding the traits of those taking MOOCs and if instructional methods can be applied to MOOCs to increase completion rates. By developing effective MOOCs, universities can ensure that this type of open, flexible, free education remains available for learners across the globe. This study is just a small, first-step toward learning more about those that take MOOCs, and how to make MOOCs more effective for learners.

Recommendations for Future Research

Given there were several significant relationships found between variables, future research should continue to examine these same relationships to determine if the results can be generalized to other populations. First, a statistically significant relationship was found to exist between self-directed learning and MOOC completion percents. The SDLRS should be administered to registrants in other MOOCs, and on different platforms. These results should then be compared to the MOOC completion percents, which should not be self-reported, but downloaded from the learning management system. Next, MOOC learner demographic data should be examined to determine if there are variables that have relationships between self-directed learning and MOOC completion.

Second, more data is needed to better understand why learners register for MOOCs and why they do not complete them. It is important to study those learners who are successful and

complete MOOCs, as well as those that do not complete MOOCs. Having a better understanding of the specific point a person leaves a MOOC and knowing why that person left, would be valuable data to collect. This research study found that time constraints was the primary reason a learner did not complete the MOOC. This insight, if confirmed by other researchers, could support the development of new types of MOOCs such as massive, open, online, content, not courses. It may be that some learners are only accessing a MOOC to examine the content and are not interested in taking an actual course. This type of content MOOC focuses on smaller chunks of information that may be easier to complete and then apply (Lue, 2013). In addition, if there were no time constraints on accessing the MOOC materials, non-native speakers of English would have additional time to listen and comprehend videos, and read materials, instead of perhaps rushing to complete content and not fully comprehending the information. New forms of MOOCs, along with other ideas for how best to evolve current MOOCs, should be based on research to meet specific problems that learners have.

Third, it would be interesting to further explore the relationship between MOOC completion and having the MOOC recommended by someone you know. Additional research should be conducted to determine if a learner has a friend or colleague recommend a MOOC, and possibly takes the MOOC with that person, then the learner is more likely to complete the MOOC. If this relationship continues to exist in other MOOCs, then many new strategies could be used to increase the likelihood of completion. For example, invitations to register for MOOCs could be based on getting a personal invite from a friend that is already attending the MOOC. Another idea is that MOOC attendance could be linked to social media where individuals could invite their friends to attend a MOOC. Getting MOOC registrants to recommend and then attend a MOOC with a friend would be an idea worth further study.

By examining more MOOCs, data can continue to be collected to assess whether registrants must be self-directed learners to successfully complete MOOCs. Such high dropout rates as MOOCs show, could begin to negatively impact universities from a quality and financial viewpoint (Angelino et al., 2007). Coming up with solutions to attrition in online education could be critical to the future success of online education initiatives such as MOOCs.

Concluding Remarks

This study explored the relationship between self-directed learning readiness and MOOC completion among adult learners taking a single Coursera MOOC. The hypothesis that the more competent adult learners were at self-directed learning, the more likely these learners were to successfully complete a greater percent of a MOOC, was found to be statistically significant. This finding was supported in the literature, confirming that to be successful in a MOOC, learners were expected to be self-directed (Kop, 2011; Bonk et al., 2013). Given that alternative explanations could have resulted in this significant relationship, additional research is needed to measure the self-directed learning readiness of other MOOC registrants. These results should then be compared to the MOOC completion percents, which ideally would be downloaded from a learning management system, and not self-reported. MOOC learner demographic data should also be examined to determine if there are variables that have statistically significant relationships between self-directed learning and MOOC completion, such as English speaking ability did for this study.

Though some statistically significant relationships between variables were found, other hypotheses were not supported by the findings of this study. For example, the second hypothesis was not supported; previous MOOC experience and MOOC completion status were not statistically significant. The researcher expected that having previous exposure to the MOOC

learning environment would positively impact the ability to complete the MOOC in this study. Therefore, it is recommended that additional research on factors that influence MOOC completion is warranted to better understand the skills and experiences needed to be successful in a MOOC. Lastly, to further improve the completion rates for MOOCs, more information about those that drop out, when they drop out, and why, should be studied. These research results and others can then be compiled to create solutions for improving the effectiveness and therefore the completion rates of MOOCs.

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APPENDIX A

SDLRS Developed by Fisher, King, and Tague (2001)

Scale:
(1) Never (2) Seldom (3) Sometimes (4) Often (5) Always

Statements:

1. I manage my time well.
2. I am self disciplined.
3. I am organized.
4. I set strict time frames.
5. I have good management skills.
6. I am methodical.
7. I am systematic in my learning.
8. I set specific times for my study.
9. I solve problems using a plan.
10. I prioritize my work.
11. I can be trusted to pursue my own learning.
12. I prefer to plan my own learning.
13. I am confident in my ability to search out information.
14. I want to learn new information.
15. I enjoy learning new information.
16. I have a need to learn.
17. I enjoy a challenge.
18. I enjoy studying.
19. I critically evaluate new ideas.
20. I like to gather the facts before I make a decision.
21. I like to evaluate what I do.
22. I am open to new ideas.
23. I learn from my mistakes.
24. I need to know why.
25. When presented with a problem I cannot resolve, I will ask for assistance.
26. I prefer to set my own goals.
27. I like to make decisions for myself.
28. I am responsible for my own decisions /actions.
29. I am in control of my life.
30. I have high personal standards.
31. I prefer to set my own learning goals.
32. I evaluate my own performance.
33. I am logical.
34. I am responsible.
35. I have high personal expectations.
36. I am able to focus on a problem.
37. I am aware of my own limitations.

38. I can find out information for myself.
39. I have high beliefs in my abilities.
40. I prefer to set my own criteria on which to evaluate my performance.

Scoring:
The maximum score is 200 points. Any score above 150 points indicates readiness for self-directed learning methods.

APPENDIX B

Email, Eight Demographic Questions, and Forty SDLRS Statements

Please enter your Coursera Login/ Email address. This is needed to match your survey responses to your online course completion percent. Note that your email will be kept secure and will never be used, shared, or given to anyone.

_____@_____.com

Directions: Next, answer the eight demographic questions here by selecting the most appropriate response.

1. Choose your age group.
   - o 18 to 19 years
   - o 20 to 24 years
   - o 25 to 29 years
   - o 30 to 34 years
   - o 35 to 39 years
   - o 40 to 44 years
   - o 45 to 49 years
   - o 50 to 54 years
   - o 55 to 59 years
   - o 60 to 64 years
   - o 65 to 74 years
   - o 75 to 84 years
   - o 85 years and over

2. Select your gender.
   - o Male
   - o Female

3. Choose your highest level of education completed.
   - o Primary / Elementary School
   - o Secondary / Middle School
   - o High School or G.E.D.
   - o Associate's Degree
   - o Bachelor's Degree
   - o Master's Degree
   - o Ph.D. / Doctorate

4. Have you previously enrolled in and completed some or all of a different massive open online course (MOOC) in the past?
   - o Yes
   - o No

5. Why did you choose to enroll in the **Disaster Preparedness** online course? *Choose all that apply.*

- □ Gain specific skills to do my current job better
- □ Gain specific skills to get a new job
- □ Someone I know recommended this course to me
- □ I wanted to take a course with this particular professor
- □ I wanted to take a course offered by the University of Pittsburgh
- □ Gain knowledge to get my degree
- □ Curiosity about free online courses
- □ Other_____
- □ None of these

6. How would you describe your English speaking ability?

- o Proficient, native English speaker
- o Advanced, near-native proficient
- o Moderate, general proficiency
- o Low, limited opportunities to use English
- o No English speaking ability

7. Which of the following best describes your English literacy ability?

- o Proficient in reading English
- o Advanced, can read English as well as a native
- o Moderate, can read most things in English
- o Low, can read simple text in English
- o None, cannot read English at all

8. Do you have a disability or impairment that may interfere with your ability to successfully complete this online course?

- o Yes
- o No
- o Prefer not to say

Directions: Select the best choice for each of the 40 self-directed learning statements based on the frequency you complete these statements.

1. I manage my time well.

- o Never
- o Seldom
- o Sometimes
- o Often
- o Always

2. I am self disciplined.

- o Never
- o Seldom
- o Sometimes

- Often
- Always

3. I am organized.
- Never
- Seldom
- Sometimes
- Often
- Always

4. I set strict time frames.
- Never
- Seldom
- Sometimes
- Often
- Always

5. I have good management skills.
- Never
- Seldom
- Sometimes
- Often
- Always

6. I am methodical.
- Never
- Seldom
- Sometimes
- Often
- Always

7. I am systematic in my learning.
- Never
- Seldom
- Sometimes
- Often
- Always

8. I set specific times for my study.
- Never
- Seldom
- Sometimes
- Often
- Always

9. I solve problems using a plan.

- Never
- Seldom
- Sometimes
- Often
- Always

10. I prioritize my work.
- Never
- Seldom
- Sometimes
- Often
- Always

11. I can be trusted to pursue my own learning.
- Never
- Seldom
- Sometimes
- Often
- Always

12. I prefer to plan my own learning.
- Never
- Seldom
- Sometimes
- Often
- Always

13. I am confident in my ability to search out information.
- Never
- Seldom
- Sometimes
- Often
- Always

14. I want to learn new information.
- Never
- Seldom
- Sometimes
- Often
- Always

15. I enjoy learning new information.
- Never
- Seldom
- Sometimes
- Often

- Always

16. I have a need to learn.
- Never
- Seldom
- Sometimes
- Often
- Always

17. I enjoy a challenge.
- Never
- Seldom
- Sometimes
- Often
- Always

18. I enjoy studying.
- Never
- Seldom
- Sometimes
- Often
- Always

19. I critically evaluate new ideas.
- Never
- Seldom
- Sometimes
- Often
- Always

20. I like to gather the facts before I make a decision.
- Never
- Seldom
- Sometimes
- Often
- Always

21. I like to evaluate what I do.
- Never
- Seldom
- Sometimes
- Often
- Always

22. I am open to new ideas.
- Never

- Seldom
- Sometimes
- Often
- Always

23. I learn from my mistakes.
- Never
- Seldom
- Sometimes
- Often
- Always

24. I need to know why.
- Never
- Seldom
- Sometimes
- Often
- Always

25. When presented with a problem I cannot resolve, I will ask for assistance.
- Never
- Seldom
- Sometimes
- Often
- Always

26. I prefer to set my own goals.
- Never
- Seldom
- Sometimes
- Often
- Always

27. I like to make decisions for myself.
- Never
- Seldom
- Sometimes
- Often
- Always

28. I am responsible for my own decisions /actions.
- Never
- Seldom
- Sometimes
- Often
- Always

29. I am in control of my life.
- Never
- Seldom
- Sometimes
- Often
- Always

30. I have high personal standards.
- Never
- Seldom
- Sometimes
- Often
- Always

31. I prefer to set my own learning goals.
- Never
- Seldom
- Sometimes
- Often
- Always

32. I evaluate my own performance.
- Never
- Seldom
- Sometimes
- Often
- Always

33. I am logical.
- Never
- Seldom
- Sometimes
- Often
- Always

34. I am responsible.
- Never
- Seldom
- Sometimes
- Often
- Always

35. I have high personal expectations.
- Never
- Seldom

- Sometimes
- Often
- Always

36. I am able to focus on a problem.
- Never
- Seldom
- Sometimes
- Often
- Always

37. I am aware of my own limitations.
- Never
- Seldom
- Sometimes
- Often
- Always

38. I can find out information for myself.
- Never
- Seldom
- Sometimes
- Often
- Always

39. I have high beliefs in my abilities.
- Never
- Seldom
- Sometimes
- Often
- Always

40. I prefer to set my own criteria on which to evaluate my performance.
- Never
- Seldom
- Sometimes
- Often
- Always

APPENDIX C

Informed Consent Information

Massive Open Online Courses (MOOCs) and Completion Rates: Are Self-Directed Adult Learners the Most Successful at MOOCs?

Dear Disaster Preparedness Online Course Registrant,

You are being invited to participate in a research study to explore the relationship between self-directed learning and massive open online course (MOOC) completion. Please read through the information here so you can make an informed decision about participating in this study. At the end of this informed consent information, indicate if you would like to participate or not by choosing the appropriate statement.

My name is Amanda Schulze and I am a doctoral student at Pepperdine University under the supervision of Dr. Doug Leigh. The paragraphs here contain all the information you need to confidently participate in this research study. If you have any questions about participating in this study, please email me at Amanda.Schulze@pepperdine.edu.

The purpose of this study is to determine if there is a relationship between strong self-motivated learners, called self-directed learners, and the percent of an online course, known as a MOOC, completed by an individual. By learning more about who participates in MOOCs, these online courses can be better designed to support and assist participants such as yourself in working through and completing this type of online course.

To conduct this research, a short online survey has been created. The first eight questions of the survey are directed at learning more about the demographics of those that choose to participate in the study. The remaining questions on the survey measure respondents' readiness for self-directed learning. If you choose to complete the online survey, you are also indicating

that you will participate in the second half of this research study. This means at the completion of the Disaster Preparedness online course on October 7, 2013, your course completion percent will be downloaded from the Coursera course management system and matched with your survey responses. In order to match your responses to your completion percent, you will be asked to provide your Coursera email address. Please know that you email address will never be used or shared with anyone and is only used to identify your completion percent.

The online survey for this study contains 48 close-ended questions. The entire survey should take you less than 15 minutes to complete. Please answer each question thoughtfully and to the best of your ability. However, if at any time you feel uncomfortable with a question you may stop participating and close the survey without penalty. As an incentive for your participation in this study, you have the opportunity to opt in to a random drawing for a $100 Amazon gift card. If you decide to opt in to the drawing *and* complete the survey questions, you will be entered into the drawing where one winner of the Amazon gift card will be chosen at random the week of October 7th and will receive the online gift card directly from Amazon via email. Check the box here if you would like to be entered into the Amazon gift card drawing:

- ❑ Yes, I give my permission to participate in the random drawing for an Amazon gift card.

All adult learners that are currently registered for this Disaster Preparedness Coursera online course are being asked to participate in this study. Please keep in mind that participants of this study must be at least 18 years old, and since this consent letter and the survey questions are written in English, some English-reading ability is also necessary. However, whether or not you choose to participate in this study is not related to your experience with this online course. Participation in this study is purely voluntary and there are no negative consequences for

choosing not to participate. It is important to know that if you select to participate in this study, any personal data you provide and the data collected on the survey will remain confidential.

Note that participating in this study comes with minimal risks. In terms of physical risks, taking the survey should not result in pain, physical discomfort, illness, or injury, though it could result in mild fatigue or boredom. Psychological risk is also minimal, though some of you may feel some increased psychological pressure to complete the online course because your course completion will be part of the study. However, only the researcher of this study will have access to the online survey results, and the study information will only be made public in aggregate. Any of your personal information collected through the online survey will not be shared or revealed, and will be kept secure by the researcher. All your information is completely confidential. In the case of a breach of confidentiality, all measures will be taken to fix any problems and you would be contacted if your data were to be compromised. Know that the researcher will keep both the individual survey responses and online course completion data on a secure computer hard drive for five years upon completion of the study. After this time the data will be destroyed.

Though there are no specific benefits to participating in this study, if you would like to access the aggregate results of the study you may email the researcher at Amanda.Schulze@pepperdine.edu and indicate your interest in obtaining the complete results. A second possible benefit is that one participant of this study who opts in to the drawing will be randomly selected to receive a $100 Amazon gift card. One winner of the Amazon gift card will be chosen at random the week of October 7th and will receive the gift card directly from Amazon via email.

If you choose, you may print this informed consent information from your computer screen and keep it for your records. Otherwise, you may email Amanda.Schulze@pepperdine.edu for a copy of this informed consent information. For concerns regarding this study, contact the researcher's dissertation chair Dr. Doug Leigh at Doug.Leigh@pepperdine.edu, and for questions concerning the protection of subjects in this study, contact the Pepperdine graduate school GPS IRB administrator Veronica Jimenez at Veronica.Jimenez@pepperdine.edu.

Thank you for taking the time to consider participating in this study.

Directions: Indicate if you would like to participate in this study, or not participate, by choosing the appropriate statement here. If you choose to participate, then you will be automatically directed to the survey questions.

- o I have read the foregoing information, I am 18 years of age or older, have at least a minimal ability to read and understand English, and give my consent to participate in this study.
- o I choose NOT to participate in this study.

APPENDIX D

Permission to use the SDLRS from the Instrument Developer Dr. Tague

Dissertation student seeking permission to use the Self-directed Learning Readiness Scale for Nursing Education

A Schulze <aschulze2001@yahoo.com>
Reply-To: A Schulze <aschulze2001@yahoo.com>
To: "aschulze2001@gmail.com" <aschulze2001@gmail.com>

From: Grace Tague <grace.tague@sydney.edu.au>
To: A Schulze <aschulze2001@yahoo.com>
Sent: Sunday, February 10, 2013 1:22 AM
Subject: RE: Dissertation student seeking permission to use the Self-directed Learning Readiness Scale for Nursing Education

Amanda,

Thank you for your email. You can certainly use this scale as part of your research. It will be fine with Murray Fisher.

Kind regards,

Grace

****

Grace Tague
Course Co-ordinator,
Pain Education Unit, PMRI
Ph: +61 2 9463 1528
Fx: +61 2 9463 1050
Email: grace.tague@sydney.edu.au

From: A Schulze [aschulze2001@yahoo.com]
Sent: Sunday, 10 February 2013 4:39 AM
To: Grace Tague; Murray Fisher
Subject: Dissertation student seeking permission to use the Self-directed Learning Readiness Scale for Nursing Education

Dear Dr. Tague and Dr. Fisher,

I am a doctoral student at Pepperdine University in the area of learning technologies. My research focus is examining the relationship between course completion rates and adult learners' readiness for self-directed learning.

I am writing to you both for permission to use the 40-item Self-directed Learning Readiness Scale for Nursing Education developed in 2001 by Fisher, King, and Tague. If you could formally give me your permission to use the survey via email, I would greatly appreciate it.

Thank you for considering my request to use your survey for my dissertation research. Please let me know if you need additional information.

Sincerely,

APPENDIX E

Permission to Access MOOC Subjects

----- Forwarded Message -----
From: "Beach, Michael D" <beachm@pitt.edu>
To: A Schulze <aschulze2001@yahoo.com>
Sent: Thursday, May 2, 2013 7:29 AM
Subject: RE: Request for Permission to Access MOOC Registrants

Amanda,
As we discussed in our phone conversation, I agree to let you access my registrants for my online MOOC concerning preparedness for a short survey and at the completion of the course. As noted, this is contingent on IRB approval from Pepperdine University.
I look forward to working with you.
Mike

Michael Beach DNP, ACNP-BC, PNP
Assistant Professor
Acute Care Nurse Practitioner
Coordinator 2nd Degree Accelerated Program
University of Pittsburgh School of Nursing
412-624-9654 office
740-632-0442 cell

From: A Schulze [mailto:aschulze2001@yahoo.com]
Sent: Wednesday, May 01, 2013 3:49 PM
To: Beach, Michael D
Subject: Request for Permission to Access MOOC Registrants

Dear Mike,

APPENDIX F

Permission to Send a Second Survey to the MOOC Study Participants

On Wednesday, November 20, 2013 11:14 AM, "Beach, Michael D" <[redacted]> wrote:
Amanda,
You definitely have my permission to contact the participants of my MOOC who agreed to be part of your study for a second survey. I hope all goes well.
Mike Beach

Michael Beach DNP, ACNP-BC, PNP
Assistant Professor
Acute Care Nurse Practitioner
Coordinator 2nd Degree Accelerated Program
University of Pittsburgh School of Nursing

APPENDIX G

The Second Survey for Course Completion

Below are the additional online survey questions that will be distributed to the 1,977 study participants.

Question 1: Did you complete all the requirements for the Disaster Preparedness online course hosted on Coursera?

Remember, to fully complete the Disaster Preparedness course you must have passed all 6 weekly quizzes and submitted the final project obtaining an 80% score or better. You can also log into the Coursera website and check the Your Courses page to see if you earned a completion certificate for this course.

- ○ Yes
- ○ No
- ○ Not sure

Question 2: Which of the following course requirements did you successfully complete? *Check all that apply.*

- ☐ Week 1 Quiz
- ☐ Week 2 Quiz
- ☐ Week 3 Quiz
- ☐ Week 4 Quiz
- ☐ Week 5 Quiz
- ☐ Week 6 Quiz
- ☐ Final Project
- ☐ None of these

Question 3: What percent of the Disaster Preparedness course requirements do you estimate you completed? *Slide the marker to indicate your percent completed.*

A passing score of 80% correct or better was required for all graded assignments. Use these categories to help you estimate your percent completed:

- *0% = Did not achieve passing scores on any quizzes or the final project*
- *1% to 25% = Achieved passing scores for 1 to 2 quizzes*
- *26% to 50% = Achieved passing scores for almost all quizzes*
- *51% to 75% = Achieved passing scores for all quizzes and completed some of the final project*
- *76% to 99% = Achieved passing scores for all quizzes and completed most or all of the final project*
- *100% = Achieved passing scores for all quizzes and the final project*

Slide the marker to your Percent Completed:
0% 100%
∏

Question 4: If you *did not* complete 100% of the Disaster Preparedness course requirements, which of these choices most closely describes the reason you did not complete the course? *Check all that apply.*

- ☐ Time constraints
- ☐ I got all the information I needed
- ☐ The content was not what I was expecting
- ☐ I found it challenging to navigate through the course
- ☐ Language was a barrier
- ☐ Technical problems
- ☐ Assignments became increasingly difficult
- ☐ No college credit was offered
- ☐ I did not feel comfortable fully participating
- ☐ The course requirements were not clear
- ☐ I needed more assistance from peers or the instructor
- ☐ Other _____

APPENDIX H

IRB Exemption Notice August 6, 2013

PEPPERDINE UNIVERSITY

Graduate & Professional Schools Institutional Review Board

August 6, 2013

Amanda
Schultze
[redacted]

Protocol #: E0713D04
Project Title: Massive Open Online Courses (MOOCs) and Completion Rates: Are Self-Directed Adult Learners the Most Successful at MOOCs?

Dear Ms. Schultze,

Thank you for submitting your application, *Massive Open Online Courses (MOOCs) and Completion Rates: Are Self-Directed Adult Learners the Most Successful at MOOCs?,* for exempt review to Pepperdine University's Graduate and Professional Schools Institutional Review Board (GPS IRB). The IRB appreciates the work you and your faculty advisor, Dr. Doug Leigh, have done on the proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations (45 CFR 46 - http://www.nihtraining.com/ohsrsite/guidelines/45cfr46.html) that govern the protections of human subjects. Specifically, section 45 CFR 46.101(b)(1) states:

> (b) Unless otherwise required by Department or Agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:
>
> **Category (1) of 45 CFR 46.101**, Research conducted in established or commonly accepted educational settings, involving normal educational practices.

In addition, your application to waive documentation of consent, as indicated in your Application for Waiver or Alteration of Informed Consent Procedures form has been approved.

Your research must be conducted according to the proposal that was submitted to the

IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit a **Request for Modification Form** to the GPS IRB. Because your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the GPS IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the GPS IRB as soon as possible. We will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the GPS IRB and the appropriate form to be used to report this information can be found in the *Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual* (see link to "policy material" at http://www.pepperdine.edu/irb/graduate/).

Please refer to the protocol number denoted above in all further communication or correspondence related to this approval. Should you have additional questions, please contact Veronica Jimenez, GPS IRB

6100 Center Drive, Los Angeles, California 90045 ▪ 310-568-5600

Manager at gpsirb@peppderdine.edu. On behalf of the GPS IRB, I wish you success in this scholarly pursuit.

Sincerely,

Doug Leigh, Ph.D.
Chair, Graduate and Professional Schools IRB

cc: Dr. Lee Kats, Vice Provost for Research and Strategic Initiatives Ms. Alexandra Roosa, Director Research and Sponsored Programs Dr. Doug Leigh, Graduate School of Education & Psychology

APPENDIX I

IRB Exemption Notice December 6, 2013

PEPPERDINE UNIVERSITY

Graduate & Professional Schools Institutional Review Board

December 6, 2013

Amanda
Schulze
[redacted]

Protocol #: E0713D04-AM1
Project Title: Massive Open Online Courses (MOOCs) and Completion Rates: Are Self-Directed Learners the Most Successful at MOOCs?

Dear Ms. Schulze:

Thank you for submitting your application, *Massive Open Online Courses (MOOCs) and Completion Rates: Are Self-Directed Learners the Most Successful at MOOCs?*, for exempt review to Pepperdine University's Graduate and Professional Schools Institutional Review Board (GPS IRB). The IRB appreciates the work you and your faculty advisor, Dr. Doug Leigh, have done on the proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations (45 CFR 46 - http://www.nihtraining.com/ohsrsite/guidelines/45cfr46.html) that govern the protections of human subjects. Specifically, section 45 CFR 46.101(b)(1) states:

> (b) Unless otherwise required by Department or Agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:
>
> **Category (1) of 45 CFR 46.101,** Research conducted in established or commonly accepted educational settings, involving normal educational practices.

In addition, your application to waive documentation of consent, as indicated in your **Application for Waiver or Alteration of Informed Consent Procedures** form has been **approved**.

Your research must be conducted according to the proposal that was submitted to

the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit a **Request for Modification Form** to the GPS IRB. Because your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the GPS IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the GPS IRB as soon as possible. We will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the GPS IRB and the appropriate form to be used to report this information can be found in the *Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual* (see link to "policy material" at http://www.pepperdine.edu/irb/graduate/).

Please refer to the protocol number denoted above in all further communication or correspondence related to this approval. Should you have additional questions, please contact Michelle Blas, Director of Student Success at gpsirb@peppderdine.edu. On behalf of the GPS IRB, I wish you success in this scholarly pursuit.

Sincerely,

Thema Bryant-Davis, Ph.D.
Chair, Graduate and Professional Schools IRB

cc: Dr. Lee Kats, Vice Provost for Research and Strategic Initiatives Ms. Alexandra Roosa, Director Research and Sponsored Programs Dr. Doug Leigh, Faculty Chair