ABSTRACT

Rochelle R. Newton, MASSIVE OPEN ONLINE COURSES AND COMPLETION RATES: DOES ACADEMIC READINESS AND ITS FACTORS INFLUENCE COMPLETION RATES IN MOOCS? (Under the direction of Dr. Crystal Chambers). Department of Educational Leadership, November 2016.

With the increase in the cost of an education and the flat employment rate, many institutions and students are looking to online learning to solve this academic dilemma. Online education is thought to be a low-cost academic alternative to brick and mortar courses. Massive Open Online Courses (MOOCs) goals include issues of equity in higher education, the rising costs of a college education, and funding concerns. MOOCs can be taken from anywhere as long as the participant has a computer and access to the Internet is available. Also, traditional MOOCs do not require any financial commitment and do not have academic prerequisites or an admissions process. Completion rates among learners taking MOOCs are low, begging the question of whether they actually address matters of escalating college costs and higher education equity. The purpose of this study is to explore whether academic readiness in the context of the likelihood the learner completing the course.

This study focuses on one component of the many factors in MOOCs - the likelihood of course completion and academic readiness. Academic readiness in MOOCs is not a requirement, but a component that may determine whether a learner has the tools needed to complete a MOOC. Academic readiness suggests a level of knowledge and cognitive abilities necessary to understand the course content and to navigate the course technologically. Theories addressing structural elements within MOOCs include Clow's funnel of participation, behaviorism, and constructivism. Of

these theories, constructivism provides the theoretical framework for understanding learners' abilities and willingness to learn in the study.

This quantitative study attempts to evaluate the likelihood of course completion and the factors that may influence these outcomes using secondary data from Duke's MOOC pre- and post-course surveys. Logistic regression analysis with the dependent variable (a learner completes a Duke's MOOCs) and the independent variables (academic readiness and its factors – college degree; age; race; gender; previous experience with course subject, course level – beginner, intermediate; or advanced; and STEM or non-STEM) will be used to estimate the likelihood that these variables will encourage learners to complete MOOCs or understand why learners do not.

MASSIVE OPEN ONLINE COURSES AND COMPLETION RATES: DOES ACADEMIC READINESS AND ITS FACTORS INFLUENCE COMPLETION RATES IN MOOCS?

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Rochelle Newton

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MASSIVE OPEN ONLINE COURSES AND COMPLETION RATES: DOES ACADEMIC READINESS AND ITS FACTORS INFLUENCE COMPLETION RATES IN MOOCS?

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CHAPTER 1: INTRODUCTION

Massive Open Online Courses (MOOCs) are without cost to those who enroll. Many thought they would address some of the equity and funding concerns in higher education. Learners can take these courses from anywhere in the world if they have a computer and access the Internet. Long considered a low-cost academic alternative to brick and mortar courses, traditional MOOCs do not require any financial commitment or disclosure of the learner's academic ability or intention. With the increasing educational costs and the flat employment rate, many institutions and students expect online learning to solve their academic dilemmas. As a result, online enrollment growth far exceeded that of overall higher education. The National Center for Education Statistics reports that one out of every four students had taken an online course in the fall of 2012 (Haynie, 2014a).

Online education, especially MOOCs, has its issues. In the MOOC name, the word open can mean many things. MOOCs are available to anyone anywhere. Open in one part of the world may mean something very different than it means to someone elsewhere. The first premise is of "open for all". MOOCs are available for anyone to enroll or open education. Anyone can participate in these MOOCs if they have a computer and Internet access. That anyone can participate is the very basic definition of open for traditional MOOCs. These MOOCs are offered by traditional institutions and do not offer credit. The second premise is "open content". Open content means the course content is open to anyone to modify. Open content courses are courses available for redesign and are more likely Connectivist MOOCs or cMOOCs. The third premise is "open access". Open access requires minimal requirement for entry. Open access

institutions are popular outside of the United States. Most traditional MOOCs combine premise one and three and some are beginning to consider offering credit. Open access has implications for fully online courses (Hatzipanagos & Gregson, 2015). With few guidelines or standards across MOOC courses and little to no requirements for participation, learners are likely to leave the course for a variety of reasons, but academic preparedness may be the greatest of these. Even when the institution pushes the online learning envelope, the learner may be unable to determine from the course description the course academic rigor, which may vary from beginner, intermediate, or advanced level course. The reliability and usability of the technology are a prevailing issue in online learning. In addition to institution-specific issues are student-specific issues, such as student learning styles, comfort with technology, and feelings of isolation. The objective of this study was to answer a single question: does academic readiness impact the likelihood of learner success in completing the course in MOOCs?

Background of the Study

In 2008, the term MOOC was coined by David Cormier as a result of a course created by George Siemens and Stephen Downes called Connectivism and Connective Knowledge, where 25 learners paid for the course and another 2,300 non-university online students enrolled (Tamburri, 2012). These connectivist MOOCs (cMOOCs) were completely online, free, open source (the participants can change the content), and synchronous (Flynn, 2013). With advances in technology, cMOOCs would soon fall behind a new type of MOOC. As early as 2006, the Khan Academy offered online instructional modules offered free of cost, although not known as MOOCs at the time. Higher education entrepreneurs saw the potential. In 2011, Sebastian Thrun and his

fellow colleagues, founded Udacity, and offered an on-campus (30 on-campus students enrolled) and online (160,000 learners from 190 countries enrolled) course titled Introduction to Artificial Intelligence. As a result, the first official MOOC was born (Flynn, 2013). Coursera (a for-profit MOOC provider, founded in 2012) began working with Stanford and other universities offering traditional MOOCs (Young, 2012). Growing from 17 partners in 2012 to 142 in 2016, and in 28 countries and more than 1,800 courses, Coursera has become a dominant provider of MOOCs for elite institutions in higher education (Coursera, 2016a). MOOCs and their providers continue to evolve. MIT and Harvard founded edX in 2012 (edX, n.d.a.). Since its original beginnings, Udacity has moved away from the traditional education market and is concentrating on nano degrees and skill training (Udacity, 2016).

While MOOCs pervaded higher education at an alarming rate (Pappano, 2012), they were suffering an onslaught of negative attention specifically in the popular media. Enrollments in MOOCs were in the thousands; completion rates were below 7% according to a 2013 study (Parr, 2013). Unlike traditional on-campus courses where students achieved a credential such as a degree, MOOC learners who completed could earn a certificate of achievement. “Coursera, one of the largest MOOC providers, developed a program to provide students with verified credentials as a record of their MOOC performance. Such credentials help students convey achievements in MOOCs to future employers and academic programs” (Maas, Heather, Do, Brandman, Koller, & Ng, 2013, p. 1). Those who study completion rates determine the value of completion rates by those who earn a certificate, a function of dividing the number of certificate earners by the total number of course registrants (Harvardx, 2014a). As seen in Table

1, completion rates vary across courses and institutions but are strikingly low. By way of comparison, the average completion rate of traditional higher education institutions is 38% in four years and 58% in six years for full-time students enrolled at a four-year institution; rates also lauded as low (Velez, 2014). MOOC completion rates are well below this figure. Much of the literature regarding completion rates and retention in MOOCs focuses on the behavior or motivation of the participants.

MOOCs serve a large number of participants globally. Coursera alone enrolled 25 million people, with 2.1 million (8.4%) completing their course(s). Regarding demographics, MOOCs tend to enroll learners who are young, well-educated, employed, and from developed countries (Christensen, Steinmetz, Alcorn, Bennett, Woods, & Emanuel, 2013). Of Coursera's participants, "approximately 80% had, at least, a bachelor's degree, 60% were employed full-time, 60% came from developed countries, were taking the MOOC to advance their careers" (Zhenghao, Alcorn, Christensen, Eriksson, Koller, & Emanuel, 2015, para. 1). MOOCs originally proclaimed to democratize education. However, those who most needed a reduction in the cost of education were not enrolling in MOOCs. (Christensen et al., 2013). Much of the research regarding traditional MOOCs indicate learners who complete MOOCs are seeking to enhance a skill, increase knowledge for a career, or have a specific goal or purpose (Zhenghao et al., 2015).

Learners enrolled in MOOCs typically are not subjected to an admissions process or any other measures of learner academic ability as students are who enroll in a traditional institution or online course. Academic readiness is a known issue in traditional education. "Every year in the United States, nearly 60% of first-year college

Table 1

MOOC Completion Rates by Provider

Provider Name	Number of Courses	Number of Learners	Completion Rates
Coursera	1,800	17,648,307	10% (Coursera Blog, 2016)
edX	864	More than 5 million	6% (edXOnline, 2016)
Udacity	50	1.6 million	60% (Udacity blog, 2016)

students discover that, despite being fully eligible to attend college, they are not academically ready for postsecondary studies" (National Center for Public Policy and Higher Education and the Southern Regional Education Board, 2010, p. 1). Online education models such as MOOCs add to the academic readiness equation because they expect the learner to have some a priori knowledge of online learning methods and to be independent (University of North Florida, 2016).

Statement of the Problem

In the present study, I seek to understand how the elements of academic preparedness and its factors – course prerequisites, college degree, age, race, gender, course level – beginner, intermediate, or advanced, and STEM or non-STEM influence learner the likelihood of the course completion. Some research suggests, "researchers lack a solid understanding of what learner needs MOOCs are addressing, and how well MOOCs now address (or fail to address) these needs" (Zheng, Rosson, Shih, & Carroll, 2015, p. 1,882). It may be the case that traditional models of measuring course success, such as course completion rates and learner accountability, are not well-aligned to the learning goals of MOOC participants. This quantitative study attempts to evaluate the likelihood of course completion and the factors that may influence these outcomes using secondary data from Duke's MOOC pre- and post-course surveys. This study will use a logistic regression analysis with the dependent value (a learner completes a MOOC) and the independent variables (academic readiness, college prerequisites, college degree, age, race, gender, STEM or non-STEM course) to estimate the likelihood that understanding these variables will encourage learners to complete them.

Central Research Questions

Does academic readiness and its components influence the likelihood of course completion in MOOCs?

Accordingly, the research question in this study will attempt to answer whether learner's academic readiness influences the likelihood of course completion in MOOC. The components of academic readiness consist of the level of experience the learner has with course content; online learning; previous academic education, age, gender, and race of the learner, course rigor, and whether the course is a STEM or non-STEM course. Most four-year institutions have minimum requirements for admissions. This requirement is based on certain prescribed criteria such as courses, grades, rank, and scores (Rigol, 2003). Academic institutions are competitive for students; they want students that are a match for their culture and the institution's academic goals. To ensure students are prepared for college, institutions began creating portfolios in 2015 of ninth graders' academic efforts to develop a body of work that may determine the appropriate colleges for their skills (Jaschik, 2015). Juxtaposed to the traditional education matriculation process, a MOOCs' admission process may include a course survey, a reliable computer and Internet, and an option for a statement of accomplishment (certificate). The dependent variable, a learner who completes a MOOC, remains a small number compared to those who enroll. The independent variable, academic readiness, is subjective and varies among all Massive Open Online Courses regardless of their moniker.

There is no association in MOOC course completions and academic factors.

Traditionally students apply to college and are vetted before admission to an institution. In MOOCs, only enrolling occurs. There is no application process. The only requirement for registration is an email address and possibly a course survey. At a bare minimum to be academically ready, a student needs, at least, some knowledge of the MOOC course (McAuley, Stewart, Siemens, & Comer, 2010). However, the independent variable, academic readiness, is not a required prerequisite for MOOCs. MOOC courses may provide the learner with some overview of the course complexity via the syllabus or the course preview. However, it is incumbent upon the learner to prevail in the course regardless of the rigor. Therefore, this single research question for this study will seek to determine whether any of the following factors of academic readiness influence the likelihood of course completion in MOOCs:

- College degree. Studies have shown learners with previous college education primarily in the MOOC subject matter or in some cases any college degree may prove valuable since this may demonstrate the discipline needed for course completion.
- Age. The age of learner may prove to be a crucial factor. Youthful and older learners may struggle with rigorous content.
- Race. Underrepresented groups may not perform well in fully online courses and those with limited faculty support.
- Gender. In some MOOC courses, gender has been a factor.
- Course rigor. Course descriptors such as beginner, intermediate, or advanced may serve as important labels for segmenting MOOC learner types.

- Previous course experience. Prior knowledge of the course subject and experience with online courses may be linked to course completion.
- STEM vs. non-STEM courses. MOOC courses in Science, Technology, Engineering, and Math (STEM) versus non-STEM courses may have higher completion rates among some groups.

These factors are discernable in the Duke's pre and post course surveys, and they exist in some of the scholarly literature as possible determinants of course completion in MOOCs.

Overview of the Methodology

The research data used in this study is secondary data collected from pre- and post-course surveys collected from learners enrolling in Duke's MOOCs. Duke's Center for Instructional Technology (CIT) assists Duke's faculty in creating MOOCs and provides technical assistance for the MOOCs while they are active. CIT also created pre and post course surveys and attached them to each MOOC course offered. These Qualtrics surveys were created to learn how learners valued the MOOCs and for future improvements. Qualtrics (2015) is a web-based tool used mostly for online surveys and used in higher education for the purpose of capturing insights to academic questions through the use of surveys. The surveys are completely voluntary. Upon enrollment, the learner is presented with the pre-course survey. Each question of both surveys can be opted out.

The author applied for, and received permission from Duke's Institutional Review Board (IRB) to use this data in this study. Learner's personal information was removed from the data shared with the author, and the dataset contained binary data

such as the question field and the value for the question. The dataset used in this study did not meet the human subjects' research requirements of Duke's IRB process. Duke's MOOC data is confidential to Duke and is only shared with the author by permission from the MOOC instructors and CIT.

The raw data from these surveys was converted to categorical variables to differentiate between a learner who completes a MOOC (the dependent variable) and academic readiness and seven related factors (the independent variables). The analysis used the coded variables from the dataset to identify factors such as college degree, previous knowledge of course subject, age, race, gender, course level – beginner, intermediate, or advanced, and STEM and non-STEM.

Duke enrolled 863,801 learners across 30 MOOCs from fall of 2014 through spring of 2015. From the number of learners enrolled, 65,427 completed pre-course surveys and 9,181 completed post-course surveys; 2,800 people completed both a pre- and post-course survey, and 64% of the learners who did the post-course survey finished the course. Once the data was coded, logistic regression analysis was utilized to determine whether academic readiness factors affect the likelihood of course completion.

Limitations and Assumptions of the Study

This study has several limitations. First, the data for this study is from one institution, Duke University. Duke's MOOCs behavior may not be representative of MOOC behaviors from other institutions with the same MOOC provider, a different MOOC provider, or Duke learners. Duke's MOOC provider is Coursera, and while Coursera formats for MOOCs are universal, the course behavior is institution and

instructor-specific. Learners who take Duke's MOOCs indicate the base demographics (white, male, between 18 and 34 years old) are similar to those offered through other institutions though they may not have the same education levels, familiarity with online courses, or academic goals. According to U.S. News ranking, Duke ranks eighth on its list of National University Ranking and is the only institution not in the northern or western portion of the United States (U.S. News & World Report, 2016). Because of its regional location, Duke may receive more learners from its geographical area and less from other regions of the country. Without knowing other institutions' location demographics, this survey may not be a true presentation of learner intentions or academic readiness across all of Coursera MOOCs or other MOOC providers' learners.

Second, the variables from this survey are voluntary and may contain errors. Some of the variables from the surveys have a significant number of blank responses or nonresponses. It is possible the variance between pre-course completers and post-course completers may not provide enough data to reflect accurately what impacts the likelihood of course completion.

Third, the data used in the study is secondary data, and that data has been used in research by Duke and others to determine methods to improve their courses, to understand who takes their courses, and other such research. The data collected may not meet all of the needs of this study since the questions for the voluntary surveys were created with a Duke objective in mind.

Theoretical Framework

Traditional MOOCs mirror traditional education in their course behavior. Many of the learning theories that apply to higher education and adult education learning

apply to MOOCs. Behavioral, cognitive, social learning and self-determination theory have been applied to the traditional learning model. However, constructivist theory expands upon these social theories as students learn from observed or modeled behavior; they begin to build on that knowledge.

Constructivism has three categories of learning – cognitive, social, and critical constructivism. Of these three categories, social constructivism correlates similarly to MOOCs. Social constructivism occurs when people in groups learn from each other. Cognitive constructivism applies Jean Piaget's theory of learners constructing knowledge with experience. Critical constructivism comprises the societal structures that influence learning. Both cognitive and critical constructivism are components of MOOCs; social constructivism may play a significant role due to the social nature of the learning model. "Social constructivism draws on the social psychology such as the "socially situated cognition" which recognizes that people co-construct meaningful knowledge in communities of practice, and the "social activity theory" which identifies the essential co-development of language and thought" (Taylor, 2014, p. 4).

Constructivist theory suggests that students use prior learning to make sense of present opportunities to learn. As such, students who do not have prerequisite content or technological knowledge may not be able to benefit from MOOC courses. They drop out because the course is over their head. This study considers constructivist theory in the context of learner academic readiness to understand how this theory may contribute to the likelihood of course completion in MOOCs.

Constructivism and learner readiness can be seen as tools for success in MOOCs. The learner must bring some knowledge to the MOOC. There must be some

knowledge of online technology. There must be some knowledge of the course if nothing more than an interest that has the learner enroll. From this level of knowledge, the learner must construct or add new knowledge. The level of readiness may determine how successful the learner is in this construction. Cognitive constructivism determines how the learner comprehends and processes knowledge (Atherton, 2013). MOOC courses require the learner to be self-motivated and active in his or her learning. The course activities are not regulated as on-campus courses. Although the course may have a begin and end date, it is up to the learner to fulfill the course activities. If the learner does not have sufficient readiness, success in MOOCs may be an elusive goal. Further research is needed in the domain of cognitive constructivism theory and its application to readiness in MOOCs.

Importance of the Study

MOOCs arrived in higher education with several premises. The first, and still relevant, was to democratize education. MOOCs are available to anyone with a computer and Internet access anywhere in the world for no cost (Dillahunt, Wang, & Teasley, 2014). The second was to reshape higher education.

> MOOCs are an innovation of previous courses offered online. These courses have been successful regarding the relatively high numbers of learner enrollment. However, there has been a criticism of the effectiveness and low rate of learners finishing and passing the courses. An argument against the effectiveness of MOOCs is that it targets learners at the bottom of the economic tier who require the most one-on-one interaction with professors. That kind of

> personal assistance is hard to obtain through online courses (Finkle & Masters, 2014, p. 4).

Popular and scholarly literature have focused on the negatives of MOOCs. Completion rates, validating course participants, and whether the courses can be offered for academic credit are ongoing concerns (Jobe, 2014). Some question whether MOOCs can be offered for credit if peer grading or peer assessments are the tools used to assess what the learners are taught (Masterson, 2013). Concerns about who takes MOOCs have led some to question whether MOOCs actually serve those in most need of an education.

> Giving people in remote locations or the poor the ability to get a high-quality education and eliminating the need for college loans has culminated in only about 3 percent of attendees from underserved areas and that more than 65 percent of all registrants already held a bachelor's degree or higher (Pretz, 2014).

The disruption many predicted MOOCs to have on higher education has been met with predictions of their failure. "From the perspective of early 2015, this stage of MOOC intoxication now embarrasses. The promised transformation of higher education failed to arrive. MOOCs ended up raising as many questions as they provided answers" (Siemens, 2015, p. xiv.a). Some indicate the massive size of MOOCs impacts their pedagogical value. "A recent revolution (MOOCs), largely video-based, has focused on making low-cost equivalents of hoarding classes, have translated the pedagogical problems with hoarding into an even less personal forum online, and on being massive, when they should strive to feel individual" (Compeau & Pevzner, 2015, para. 6). "That

obvious calculation is not a reduction to the absurd: it is the source of the absurd MOOC strategies to reduce their disruptive tsunami of learners seeking an actual education" (Rollins, 2014, para. 18). Even those who support MOOCS are changing their minds about this online model. In a recent Fast Company Magazine profile of Sebastian Thrun of Udacity, one of the biggest original proponents of MOOCs, called the courses "a lousy product" and indicated online education is not a great option for everyone except the highly motivated (Westervelt, 2013).

A few have begun to rethink the MOOC product. Some believe MOOC courses can serve as remedial tools, others see MOOCs as possible textbooks, and still others see them as tools for professional development (Krause, 2014). Where and how MOOCs will serve higher education requires additional research, processes and standards, and policies for their learners. This study is intended to contribute to the scholarly literature about MOOCs and the factors that may explain the likelihood of course completion in the light of academic readiness. The secondary data used from Duke's MOOCs may provide some clarity regarding learner academic abilities and related factors. The data may also provide resources to retain learners through course completions.

The ongoing issues in higher education that MOOCs, or some version of this learning model, may require additional research and consideration of all of the factors specifically, the learner. Given the impact of MOOCs (i.e., the number of individuals served, the amount of attention garnered, and their potential to add to the educational space), an academic lens on their place in the academy and the factors in MOOCs that

may affect learners' ability to persist, specifically, and enhance higher education in general, is warranted.

Definition of Terms

50 Percent Rule - The Higher Education Reconciliation Act of 2005 (HERA) (Pub. L No. 109-171) modified the 50 Percent Rule. 20 U.S.C. §§ 1002(a)(3), 1091(1) (2006). Students enrolled in a course of instruction that was offered through telecommunications and that led to a recognized certificate, associate, bachelor's, or graduate degree were no longer considered to be enrolled in correspondence courses. Id. § 1091(1) (2006). Thus, otherwise, eligible institutions that offered over 50% of their courses by telecommunications, or had 50% or more of their regular students enrolled in telecommunications courses, became eligible to participate in the Title IV programs. HERA also allowed students enrolled in certificate and degree programs offered wholly or in part by telecommunications to be eligible to receive Title IV funds. However, the 50 Percent Rule continued to apply to correspondence courses and students (Hamel, 2011, p. 5).

Academic readiness - the level of preparation a student needs to enroll and succeed—without remediation—in a credit-bearing general education course at a postsecondary institution that offers a baccalaureate degree or transfer to a baccalaureate program (Porter & Polikoff, 2011, p. 4)

Active learning - a process whereby students engage in activities, such as reading, writing, discussion, or problem-solving that promote analysis, synthesis, and evaluation of class content. Cooperative learning, problem-based learning, and the use

of case methods and simulations are some approaches that promote active learning (Center for Research on Learning and Teaching, 2015, para. 1).

Andragogy - a term coined to refer to the art/science of teaching adults (New Jersey Institute of Technology [NJIT], n.d.).

Asynchronous learning - a general term used to describe forms of education, instruction, and learning that do not occur in the same place or at the same time. The term is most commonly applied to various forms of digital and online learning in which students learn from instruction—such as prerecorded video lessons or game-based learning tasks that students complete on their own—that is not being delivered in person or in real time. Asynchronous learning may also encompass a wide variety of instructional interactions, including email exchanges between teachers, online discussion boards, and course-management systems that organize instructional materials and correspondence, among many other possible variations (Edglossary, 2013a, para, 1).

cMOOCs (connectivist massive open online courses) - Stephen Downes, co-founder of one of the first MOOCs, coined this term in 2012 to create a distinction in MOOCs in this category from what he termed ‘xMOOCs’. Connectivism and Connective Knowledge was about — and based on — the learning theory of connectivism, developed by one of the instructors, George Siemens. His theory is based on the idea that learning happens within a network, where learners use digital platforms such as blogs, wikis, social media platforms to make connections with content, learning communities and other learners to create and construct knowledge. cMOOCs are organized by individuals with a passion for a specific content area. Organizers commit

their time to create a framework for learning where participants from all over the world can connect share, contribute, collaborate to learn, and expand their networks professionally and personally. cMOOCs are also open and flexible, responsive to needs of their participants which can provide a tailored learning experience. Within a cMOOC, learners are encouraged (though not required) to contribute actively, using these digital platforms. “Participants’ contributions in the form of blog posts, tweets, etc. are aggregated by course organizers and shared with all participants via daily email or newsletter” (Morrison, 2013, para. 6).

Collaborative learning - an instruction method in which learners at various performance levels work together in small groups toward a common goal. The learners are responsible for one another's learning as well as their own. Thus, the success of one learner helps other students to be successful (Srinivas, n.d.).

Completers - a student who receives a degree, diploma, certificate, or other formal award. To be considered a completer, the degree/award must be conferred (Tompkins Cortland Community College, n.d, para. 5).

Constructivist theory - this theory holds that learners construct knowledge by understanding new information building on their current understanding and expertise. Constructivism contradicts the idea that learning is the transmission of content to a passive receiver. Instead, it views learning as an active process, always based on the learner's current understanding or intellectual paradigm. Knowledge is constructed by assimilating new information into the learner's knowledge paradigm. A learner does not come to a classroom or a course Web site with a mind that is a tabula rasa, a blank

slate. Each learner arrives at a learning "site" with some preexisting level of understanding (Brown, 2016, para. 17).

Costs - what institutions must pay to educate students. In other words, all institutional inputs—such as faculty and administrative salaries, benefits, building maintenance, and student services (National Centers for State Legislatures, 2016a, para. 4).

Cost to Attend (COA) - the price students pay for room and board, textbooks, school supplies, and transportation specifically related to their education (College Data, 2015, para. 2).

Disruptive innovation - a term of art coined by Clayton Christensen describes a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors (Christensen, 2016, para. 1).

Distance education - a formal education process in which the student and instructor are not in the same place. Thus, instruction may be synchronous or asynchronous, and it may involve communication through the use of video, audio, or computer technologies, or by correspondence (which may include both written correspondence and the use of technology such as CD-ROM) (Tice, 2007, p. 1).

Endowments - money or other financial assets that are donated to universities or colleges (Phung, 2016, para. 1).

Graduation rates - data are collected on the number of students entering the institution as full-time, first-time, degree/certificate-seeking undergraduate students in a particular year (cohort), by race/ethnicity and gender; the number completing their

program within 150% of normal time to completion; the number that transfer to other institutions if transfer is part of the institution's mission (National Center for Education Statistics, n.d.a).

Hybrid (Blended) learning - courses where students learn partly in a face-to-face setting and partly through online forums and coursework (National Conference of State Legislatures, 2016b, para. 2).

Learning - learning is a relatively permanent change in behavior brought about by practice or experience. Improved definition: Learning is the process by which a relatively stable modification in stimulus-response relations is developed as a consequence of functional environmental interaction via the senses (Lachman, 1997, p. 477).

Massive open online courses - MOOCs are massive (very large enrollment), open (no admissions standards, no prerequisites), online courses. Enrollments that exceed 20,000, 50,000 or even 100,000 learners for a single course are not unusual. MOOCs are also, at the moment, typically free: Learners pay no fees to register for or participate in the course. Also, MOOCs currently do not offer official college credit; just because you have completed a MOOC does not mean you can take your certificate of completion, if available, to those institutions (or others) to receive course credit. Also, MOOCs are offered and managed by third-party organizations such as Coursera, edX, and Udacity, which may or may not have formal institutional relationships with specific postsecondary institutions. For example, the University of Virginia has a formal institutional relationship with Coursera, but an individual UVA professor also leads a MOOC at Udacity. Finally, course completion rates for MOOCs are, to date, extremely

low. Frequently, less than 5% to 10% of the learners who register, go on to finish the course (Green, 2013, para. 10).

MOOC completion rates - the number of certificate earners (those who successfully met the completion criteria of a course) divided by the total number of people who registered for a course (HarvardX, 2014b, para. 4).

Online education - credit-granting courses or education training delivered primarily via the Internet to students at remote locations, including their homes. Online courses may be delivered synchronously or asynchronously. An online course may include a requirement that students and teachers meet once or periodically in a physical setting for lectures, labs, or exams, so long as the time spent in the physical setting does not exceed 25% of the total course time (U.S. News & World Report, 2010, para. 5).

Online learning - courses where at least 80 percent of the content is delivered through online technology. These courses usually have no face-to-face interaction between students and the professor (National Conference of State Legislatures [NCSL], 2016c, para. 2).

Price - simply represents tuition—the amount institutions charge students for educational opportunities (NCSL, 2016d, para. 4).

Open access - the free, immediate, online availability of research articles coupled with the rights to use these articles fully in the digital environment (SPARC, 2016).

Open access institutions - open-access, nearly open-access, and nonselective institutions are defined as colleges and universities that admit at least 80% of applicants (Doyle, 2010).

Residential or traditional education - the typical label for face-to-face courses that take place in a traditional classroom where no online technology is used (National Conference of State Legislatures [NCSL], 2016e, para. 2).

Retention rate - a measure of the rate at which students persist in their educational program at an institution expressed as a percentage. For four-year institutions, this is the percentage of first-time bachelor's (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions, this is the percentage of first-time degree/certificate-seeking students from the previous fall who either re-enrolled or completed their program by the current fall (National Center for Education Statistics, n.d.c).

State education appropriations - that part of the state and local support available for public higher education operating expenses, defined to exclude spending for research, agricultural, and medical education, as well as support for independent institutions or students attending them. Since funding for medical education and other major non-instructional purposes varies substantially across states, excluding these funding components helps to improve the comparability of state-level data on per-student funding (State Higher Education Executive Officers [SHEEO], 2011, p. 13).

Student behavior - motivation – includes personal characteristics that help students succeed academically by focusing and maintaining energies on goal-directed activities. Social engagement– includes interpersonal factors that influence students'

successful integration into the environment. Self-regulation includes the thinking processes and emotional responses of students that govern how well they monitor, regulate, and control their behavior related to school and learning (ACT, n.d, p. 1).

Student debt - money owed on a loan taken out to pay for educational expenses. Rapidly rising college tuition costs have made student debt the only option to pay for college for many students. In the United States, most federal student debt is serviced by Sallie Mae, a publicly traded company (Investopedia, 2015, para. 1).

Student intention - on the surface, a student intention's may be to obtain a college degree but the more intrinsic goals are to "get a better job and to make more money" (Wyer, 2012, para. 4).

Synchronous learning – a general term used to describe forms of education, instruction, and learning that occur at the same time, but not in the same place. The term is most commonly applied to various forms of televisual, digital, and online learning in which students learn from instructors, colleagues, or peers in real time, but not in person. For example, educational video conferences, interactive webinars, chat-based online discussions, and lectures that are broadcast at the same time they are delivered would all be considered forms of synchronous learning (Edglossary, 2013b).

Tuition - tuition is the sticker or published price—this is the sticker published on institutional websites before any financial aid is applied. If a student were to receive no financial aid, sticker price tuition is the amount he or she would pay for courses each year. However, most students receive some type of financial aid—grants, scholarships, tax credits, or tuition waivers—and do not pay the published price (NCSL, 2016e, para. 2).

Tuition discounting - the process by which the institution offsets its published tuition price (sticker price) with institutional grant aid for enrolling students. The result is the discount rate, the ratio of total institutional grant aid relative to gross tuition revenues at an institution (Association of Governing Boards of Colleges and Universities, n.d., para. 3).

xMOOCs - is a massive online course with a strongly predetermined learning path, communication tools, and assignments. The prefix "x finds its origin afford by the famous universities such as Harvard and Stanford and serves as the abbreviation: “extended.” Online platforms providers started to distribute additional information, learning resources and activities to lectures, which made these courses open and easily accessible by general users. Unlike cMOOCs, which focus on distributing information on networks, xMOOCs are based on the traditional instruction-driven principle. Information is made available via an online learning platform for a large group of learners (Khalil, Brunner, & Ebner, 2015, p. 40).

Organization of the Study

Chapter 1 is an overview of the issues in higher education and the influx of MOOCs. The chapter contains background information on MOOCs. Because MOOCs were thought to become a disruptive innovation initially in higher education, much hope was held out for what they could mean for democratizing education. In the initial offering of MOOCs, concerns were raised about completion rates, course credit, and validity. The brunt of the criticism about MOOCs was levied on completion rates. The problem statement asserts that learner academic readiness may influence the likelihood of course completion. An overview of the methodology used to assess these factors is also

described in this chapter. The limitations and assumptions found during the research process for this study are detailed.

Chapter 2 describes the search of the literature. The section outlines the paths higher education has taken to MOOCs and the events that have occurred since their arrival. Theoretical frameworks are also discussed. The theory of constructivism is applied to xMOOCs and MOOC learner academic readiness.

Chapter 3 provides the details of the methodology and the logic for pursuing the statistical analysis for the study and restates the research question. A brief overview of the results of the study is described.

Chapter 4 fully explains the results of the study. The secondary data is described in detail and how they were used in the analysis.

Chapter 5 provides the final overview of the study, a summary of the results of the study, and conclusions as a result of the study. A brief discussion of how the findings may be used to predict better outcomes for MOOCs.

CHAPTER 2: REVIEW OF LITERATURE

Background

This study considers academic readiness and other variables as factors that may influence the likelihood of course completion in MOOCs. The introduction of this chapter provides a review of the factors that gave rise to MOOCs and online education as a learning model. Higher education policies and practices have cited student debt, reduced state budgets, and increased the time to graduation as reasons why MOOCs have expanded throughout the academic space. As online education models such as MOOCs move through higher education, how well this learning model serves those who need an alternative to the high-cost traditional model requires further research. The data about who completes and takes a MOOC is limited. Most data indicate white men with some college education are the majority. Data regarding underserved populations, women, and those who are academically unprepared for courses with limited descriptors is limited because of the proprietary nature of the model. Providers and institutions present very little information about those who enroll and complete based on race, age, gender, and Science, Technology, Engineering, and Math (STEM) courses. These factors are considered to better understand the influence of student academic readiness on MOOC course completions.

Online Education: An Overview

Online education has deep roots in educating society. In 1840, Isaac Pitman, the founder of distance education, taught the first distance education course, a correspondence course offered in shorthand (Kentnor, 2015). Distance education continued as correspondence courses with more institutions offering courses. Whereas

these forms of distance education continued to grow, it was not until the 1920s, when technology started to come of age and distance education moved from correspondence courses to radio and television (Kentnor, 2015). As time progressed and innovations in technology advanced, other mediums were used to advance distance education. By the 1980s, distance education was no longer a simple correspondence course available through print, radio, or television – and available only to a few. The promise of distance education included cheaper courses than on-campus courses and its reach to students unable to attend classes in person (Kentnor, 2015). Fiber technology provided two-way communications (synchronous) and the spawning of the Internet. “Over the last 150 years, and through a variety of technological advances, distance education has continued to transform higher education” (Bower & Hardy, 2004, p. 11).

There are two modes of online learning, asynchronous and synchronous. As a matter of course design, an instructor can choose to blend the two. Asynchronous learning can occur at anytime from anywhere. The learner can participate in the course when it is most convenient (Hrastinski, 2008). Synchronous learning occurs when the entire class is convened, including the instructor, in one place (Hrastinski, 2008). Most online courses are facilitated by learning management systems (LMS) such as Blackboard, WebCT or Sakai. LMS provide an interface for instructors to manage course activities (Shawar, 2009). The benefits of asynchronous learning are: “The playing field is leveled for all learners by allowing for extended time to reflect and decreased pressure to perform on the spot. Also, “some people communicate better in writing” (Johns Hopkins, 2010, p. 1). Synchronous learning benefits are: “Participants

can receive instant feedback or answers/acknowledgment to any questions without delay" (Johns Hopkins, 2010b, p. 2).

The growth in traditional online education has caught up, and possibly, has equaled in size to traditional brick and mortar courses (Allen & Seaman, 2015). Hollands and Tirthali (2014a, p. 1) report "online education at the college level has been expanding rapidly over the last decade with students participating in single courses or even earning entire degrees without setting foot in a brick-and-mortar institution." The expansion of online learning includes taking a course through completing a degree completely online. More than seven million took an online course, 66% of academic leaders are considering an online option in their academic strategy and of those leaders, 77% do not distinguish online and on-campus education and considering an online option as a part of their academic strategy (Allen & Seaman, 2014).

The increase in online enrollments is seen across all institution types, but among students at Historically Black Colleges and Universities (HBCUs), online education is preferred compared to their counterparts (Straumsheim, 2014a). It is not clear whether the demand for online education is directly related to the advancements in technology, a new kind of learner, or the convenience of online offerings. Data on student preferences for on campus versus online classes indicate student prefer on-campus courses. "Flexibility and convenience were key reasons to take courses online; moreover, a handful of students preferred the learning environment of online learning. Despite these advantages, however, very few respondents wished to take all their courses online" (Jaggers, 2014a, p. 5).

The benefits of learning online include an alternative to on-campus education and flexibility participation (NCSL, 2015f). It can be a highly effective alternative to face-to-face classes for well-prepared, self-motivated, and disciplined students, but online education may be inappropriate for learners with poor organizational and time management skills (Kumar, 2010). This latter consideration is of concern when contemplating MOOC course completions.

Massive Open Online Courses (MOOCs)

In 1992, the 50 Percent Rule allowed institutions to (1) "offer more than half their courses via distance education or (2) enroll more than half of their students in online programs" (Lederman, 2005, para. 5). As technology advanced and online education grew, the 50 Percent Rule was modified to remove restrictions. The modification to this rule is represented by the number of institutions offering online education since the change. "The 2006 removal of a law known as the 50 Percent Rule opened the floodgates to online enrollment while enabling for-profit colleges to tap more aggressively Wall Street for the capital they have used to expand" (Kirkham, 2011, para. 4). The concomitant increase in online enrollments may have given way to Massive Open Online Courses or MOOCs.

MOOCs were first introduced in 2008 when David Cormier defined the term massive open online courses to describe a course less than 30 students paid for the course and 2,300 learners enrolled without paying (Mehlenbacher, 2012). In 2011, Sebastian Thrun and Peter Norvig offered an artificial intelligence MOOC course where 160,000 participants from 190 countries enrolled and 20,000 received a statement of accomplishment. Early June 2012, the University of Virginia released President, Teresa

Sullivan, over her uncertainty to deploy MOOCs (Webley, 2012). She was reinstated shortly thereafter but the action seems to spur other institutions to partner with Coursera and the MOOC rally began (Kolowich, 2012a). The New York Times termed 2012 Year of the MOOC because for-profit providers and named institutions partnered to offer MOOCs and enrolled just under two million students (Pappano, 2012).

MOOCs may be a wave of a new approach to online education or a passing fad. When MOOCs came onto the academy in 2008, they were just another online learning opportunity. The original MOOCs (connectivist MOOCs, or cMOOCs) class enrollments were not massive. cMOOC enrollments were much smaller than their new counterpart, xMOOCs (Hollands & Tirthali, 2014b). cMOOCs are open (free to participants and open courseware) courses where the content can be shared, participants use collaboration and learn from each other (Saadatmand & Kumpulainen, 2014). The first cMOOC, CCK08 – a seminar course about the “c” in MOOCs – connectivism, enrolled just over 2,200 learners and some of those students paid for the course (Bhatia & Trivedi, 2015). cMOOCs did not have the benefit of wide acceptance but produced enough interest for others to further experimentation. In 2011, several professors from Stanford University joined to provide three free courses online, these courses enrolled over 100,000 participants, and as a result, the instructor-led MOOC (xMOOCs) was born (Rodriquez, 2012). MOOCs were moving through the academic space without understanding learner preparedness or intention, and these factors may lie at the root of the course completions and MOOCs impact on its role in higher education. Many prestigious institutions offer MOOCs. To date, the number of organizations and institutions offering MOOCs has grown from just a handful in 2012 to more than 100 serving up several

thousand courses covering every imaginable subject for every imaginable audience for free or much less than traditional on-campus costs (Online Course Report, 2016a).

What is a MOOC?

A MOOC is an online education model. MOOC is an acronym that defines its characteristics.

(M)assive – the average MOOC course size is 25,000 participants. MOOC numbers are now massive, indeed. Shah (2014, para. 2) reported there have been "200+ universities, 1200+ courses, 1300+ instructors, and 10 million participants engaged in MOOCs." In 2014, there were "2,400 MOOCs available from 400 universities" (Shah, 2014, para. 3). Coursera, edX, and Udacity emerged as top MOOC providers. They and others have partnered with many universities and colleges to offer MOOCs.

Large numbers of learners enroll in MOOCs. Institutions and providers collect data about these learners. This data is collected through course surveys. Institutions collect this data to understand the MOOC population and to develop strategies for next steps with MOOCs (Finkel, 2013). The data collected is very different from data shared. What data that is shared from MOOCs is ambiguous data at best and does not provide very much in the way of learner demographics, how these learners perform as groups, and importantly how this data may facilitate MOOCs in their projection to reshape higher education and its concerns (Kolowich, 2012b).

MOOCs are candidates for big data analysis. The data collected exists without clear privacy policies. MOOC data is exempt from the Family Educational Rights and Privacy Act (FERPA) as MOOCs do not receive government funding, and the collected

data may remain proprietary (Neal, 2014). Many believe data analysis in MOOCs may serve to predict learner outcomes. Metadata (data that describes other data) can be used to determine the likelihood of learner success, thus the best learner for the best course. Predictive analytics is the use of data, statistical algorithms, and machine-learning techniques, to identify the likelihood of future outcomes based on historical data (SAS, 2016, para. 1). What does this data mean for MOOCs and higher education? Is higher education moving the learner from learner to product to mine for data (metadata) without any protection of their privacy?

This data mining has the potential to address academic readiness, but it also has the potential to create super learners. Research has noted that 60% of high school students enrolling in college are not prepared for postsecondary education. First-generation, low-income, and minority students are a large portion of those unprepared. MOOCs or fully online courses may not be the answer alone. Many administrators and politicians consider MOOCs a low-cost solution for students disadvantaged by rising tuition costs, however, many of those students are not necessarily ready for the postsecondary curriculum and may find MOOC courses difficult although MOOC providers have said this learning model will expand the institutions' academic reach (Bogost, 2013).

(O)pen – has two meanings. For traditional MOOCs (xMOOCs) this means it is open to anyone who has a computer and Internet access. For connectivist MOOCs (cMOOCs), this means the MOOC content is open to anyone who has a computer and Internet access as well as the contents of the MOOC can be modified by the participants. Open also includes that MOOCs are offered for free (no fees), but without

academic credit (Sandeen, 2013). “MOOCs are free and filled with information on just about anything you want to learn — from project management skills to learning a new language” (Singh, 2013, para. 2). “The new global wave of large virtual courses offered for free has attracted an incredibly diverse population of students” (DeBoer, Stump, Seaton, & Breslow, 2013, p. 1).

What is it meant that MOOCs are free? For many MOOCs, anyone can sign up for the courses and complete them without incurring any personal financial costs. There are some costs for learners depending on their goals (Whitehouse.gov, 2013). Most MOOCs do not offer course credit, but learners can earn certificates of accomplishment or achievement, which may have variable costs. Learners may have the option to complete a signature track if they wish to earn a statement of accomplishment. Duke’s MOOC provider, Coursera, introduced the signature track in 2013 for participants to have an authentic credential of a completed course (Coursera Blog, 2013). Signature track certificates does not provide the same academic value as credentials from an on-campus course (Stanford Online, n.d.).

MOOCs came into higher education in 2012 without a clear plan to create a revenue stream since that time Coursera developed the signature track and specializations as methods for developing revenue for both Coursera and its partnering institutions (Hollands & Tirthali, 2015). Some MOOCs are providers are offering college credit and MOOC degrees with varying prices by course, provider, and institution. The MOOC courses approved for credit through the American Council on Education (ACE) Alternative Credit Process (ACP) Credit Recommendation process for $300 or less per course (edX, n.d.b). Georgia Tech partnership with Udacity and AT&T to offer a Master

of Computer Science for $7,000 to both in and out state students in contrast to its normal rate of $45,000 for the same degree on-campus (Schaffhauser, 2014).

Open access has many different meanings. Emerging technologies and the pervasive distribution of open educational resources (i.e., open content, open course, and open access) challenge formats and approaches in higher education (Saadatmand & Kumpulainen, 2014b). As MOOCs are online, courses are accessed remotely. MOOCs aim in democratizing education is most evident in the open access. MOOC courses are available to anyone with a computer and Internet access (Desarrollo, 2013). Finally, MOOCs do not have deadlines but do have course end dates. What makes open access different in MOOCs is the course content.

Some MOOCs depend on course content that is freely available from any source. This content is known in many areas as open educational resources (OER). Open content can be a component of OER tools and its content made available to anyone for modification (Hewlett Foundation, n.d.). The content used in xMOOCs is proprietary and subject to copyright and intellectual property concerns even as these courses are offered to anyone anywhere. It is unclear where the delineation of ownership of materials lie with OER and MOOCs.

Open access institutions, like, MOOCs are less or non-selective. Their academic standards for admissions is a computer and Internet access. Unlike open access institutions where a high school diploma is required, MOOCs learners enroll based on their interest in the course topic. Course prerequisites are not required but may be suggested. Determining readiness in MOOC may be elusive since it is not clear that the courses make it clear what is needed to succeed, and learners may not bring

the skills to the courses to complete the courses. Open access in MOOCs is a substantial topic with broad implications for higher education (Association to Advance Collegiate Schools of Business [AACSB], n.d.).

(O)nline – MOOC courses are fully online. The course is a web-based course with lectures, quizzes, and other course materials available to the participant through online sources. On-campus and online courses both serve a purpose in educating students. MOOCs may cloud the on-campus education versus remote online education simply by size. Wiley (2014a, para. 6) wrote, “The more I think about it, there seems to be only one practical difference between MOOCs and traditional online courses – the platform they are offered on.” Is pedagogy at a higher level more about the weekly lectures that MOOCs emulate or about placing students in an intellectual environment with face-to-face connections”? (Kastrenakes, 2013, para. 2). In many ways, MOOCs and on campus online courses are quite similar.

Most traditional online courses are fully online; they have online content (some videos, quizzes, and some allow for interactions between the instructor and other students enrolled in the course); and they have a start and stop date. The similarities stop there. For MOOCs, there isn’t a fee for admission; there are limited prerequisites for admission if any; whereas most traditional online courses are offered on an LMS or learning management systems such as Blackboard or Sakai. For profit and not for profit providers offer MOOCs. Some research strongly suggests that online coursework—at least as it is currently and typically implemented—may hinder progression for low-income and underprepared students (Jaggars, 2011).

(C)ourses – traditional MOOC courses are similar to traditional on-campus courses. They are instructor led, include lectures, quizzes, homework, and assessment tools. Traditional MOOCs are offered through partnered academic institutions with for-profit providers. cMOOCs do not have the same issues as traditional MOOCs, such as completion rates, academic readiness, validity, or institutional concerns. “The three challenges to connectivist learning are (1) the need for critical literacies and the power relations on the network; (2) the level of learner autonomy; and (3) the level of presence” (Kop, 2011, p. 24).

Content delivery whether online or on-campus has very few differences except those instances where instructor interaction can assist the learner in grasping the course content (Shi, Du, Jiang, & Saab, 2011). In general, online education has reached parity with traditional education. Allen and Seaman (2013) found online education has outpaced traditional education for several years. Discussions regarding learner success in online learning are debated. Research is contradictory regarding the success of learners’ performance in online environments. Some research indicates learners perform as well in online learning environments as traditional learning environments. Another research argues learners in traditional settings perform better than those in online settings. Allen and Seaman (2013) also noted an increase in the number of academic institutional leaders’ views that online courses were comparable to traditional courses.

Wagner, Garippo, and Lovaas (2011) cited several studies that found either no differences between online and traditional learning methods or one method was superior to the other. An undergraduate study of a management course found students

perform the same in both online and traditional courses. When controlling for academic characteristics, (Daymont & Blau, 2008) found students perform equally to face to face courses but not better, and that women performance equaled their male counterparts. While xMOOCs contain many of the same academic characteristics found in on-campus courses, they lack standards for determining learner readiness for course success. As providers and institutions grapple with completion rates, monetizing MOOCs, and credit for courses, successful outcomes for MOOCs may be a result of assessing learners' abilities before course enrollment.

While it is not stated anywhere, there are several understood standards in higher education as a result of coursework – lectures, exams, and grades. Students are expected to listen to the entire lecture (even if they are using Facebook or Twitter during the lecture); they are expected to pass exams, and they must wait patiently to see how well they did on those exams. In MOOCs, learners may view the content of a lecture and determine it is too long, too hard, or not interesting, and leave the course. They may take one quiz and leave if the grade is not what they expected. Grover, Franz, Schneider, and Pea (2013) suggested a framework that incorporates four elements of MOOC course design aimed either at increasing course completion and addressing diverse learning styles. Those elements include interactive learning environment (ILE); learner background and intention; technology infrastructure; and evidence-based improvement. This approach to MOOCs considers learning from the medium to the learner. Numerous studies have indicated lectures are not successful even in on-campus courses. First-year lecture classes can average one to several hundred students in large institutions, and the length of these lectures is typically an hour. The

literature on lectures indicates they may not be as effective as other means of teaching since the brain processes information differently for individuals and information retention is limited (Hanford, 2012). Lectures persist in on campus and MOOC courses.

Much of the research varies on outcomes of online learning. The research is contradictory. For example, a study reports one group of students performed poorly across classes and professors regardless of conditions in online learning environments (Hughes, 2015). Other research indicates success for traditional courses based on topic and students. “Students taking traditional, in-class science courses reported higher perceived learning gains than students enrolled in online distance education science courses. Notably, African-American students taking traditional science courses self-reported greater affective and psychomotor learning gains than students taking online science courses” (Clemson University, 2014, para. 1). Research that compares MOOCs to on-campus courses finds insignificant differences in learning in either model.

Looking specifically at a comparison between MOOC and on-campus students, an MIT study of an edX Introductory Physics MOOC found students learned equally to the on-campus students. They found when online courses are compared to face-to-face courses; the face-to-face students struggled, and some dropped the class compared to those enrolled in the same course through a MOOC. The researchers indicated extra time did not provide an advantage for face-to-face students based on several variables. When the variables (amount of education, math and physics knowledge and ability were equal) both cohorts learned about the same (Colvin, Champaign, Liu, Zhou, Fredericks, & Pritchard, 2014a). That study did find those academically prepared performed better than those who were not (Colvin et al., 2014). This research may provide some insight

into academic readiness. Further research is needed to understand exactly what is measured and what counts as success in MOOCs. Despite the controversy, MOOCs continue.

MOOC Types: Connectivist and Extended MOOCs

The two most common types of MOOCs are connectivist MOOCs (cMOOCs – participant driven) and extended MOOCs (xMOOCs – instructor led). Academic readiness cMOOCs does not infer an expectation of completion but rather an expectation of gaining the knowledge presented in a shared environment. xMOOCs, while not specifically stated, have all of the components of traditional education including an expectation that learners will complete whether rightly so or not and have some intrinsic knowledge that will propel them to complete the course. These two MOOC variants infer the learner has a level of self-efficacy necessary to gain the knowledge the course offers. However, not all MOOC courses may not be designed for the diverse learning abilities and styles of their massive learners.

xMOOCs courses borrow much of their structures from on-campus courses. This borrowing includes lectures, quizzes, and assignments. What xMOOCs do not borrow from on-campus courses is the vetting process for admissions or enrollment. This lack of an admission process has led some to believe the lack of an admission process may be related to course completions. Another emphasis has been on the lack of academic credit. The criteria for completion may lie between the MOOC course and learner's abilities.

In cMOOCs, the instructor has the same role as the learner except his or her knowledge of the subject matter. The instructor may operate as the chief knowledge

officer but does not push the instruction flow. In xMOOCs, the instructor controls the entire learning process except forums content which may be added by both learner and instructor. In this process, the instructor is reactionary.

MOOCs began with cMOOCs. cMOOCs are a creation of Dave Cormier (actually created the MOOC name), Stephen Downes, and George Siemens. cMOOCs are a different approach to teaching in education. In cMOOCs, the assumption is the learners has the skills necessary find and apply knowledge in their academic development (Levy & Schrire, 2015). The first production of xMOOCs as we know them today was the *Introduction to Artificial Intelligence* where 160,000 participants enrolled in the course provided in 2011 by two Stanford professors (Lackner & Kopp, 2014, p. 7,141). The cMOOC and the xMOOC divert on several fronts (Smith & Eng, 2013). The cMOOC is a community of learners without a clear leader. cMOOCs are open content and open access. cMOOCs are not massive. There are few if any proprietary issues. The expected outcome is to learn what is needed from the course not necessarily complete. xMOOCs are almost identical to traditional on-campus courses. The xMOOC is instructor-led, and participants do not contribute to learning except through forums, and then the information provided by the participants may or may not be accurate. xMOOCs are open access but not open content. The course content belongs to the instructor, the institution, and/or the MOOC provider. There are many proprietary issues in xMOOCs. The expected outcomes (course completion) in xMOOCs is similar to those of on-campus courses although course completions are very small.

In on-campus education as well as xMOOCs, there is the assumption that the student is an empty vessel ready to be filled with knowledge from the instructor

(Siemens, 2013). The major xMOOCs are offered by both for-profit and not-for-profit providers partnered with universities and colleges. Unlike cMOOCs, where completion rates are not a theme, xMOOCs have struggled with completion rates since their inception. The common thread between cMOOCs and xMOOCs are their size.

Connectivist MOOCs (cMOOCs)

The first MOOCs were cMOOCs, founded in the theoretical connectivist principle that knowledge is distributed across connections (Downes, 2011a). The belief is knowledge is spread through networks of people and their connections to other people. Downes (2011, para. 9) writes, “To learn physics, in other words, you join a community of physicists, practice physics, and thereby become like a physicist.” This MOOC style encourages the social dimension of learning and self-constructed learning. In cMOOCs, unlike xMOOCs, the learning occurs in a community where the group uses digital tools to find and post content and collectively increase their knowledge as a whole (Xu & Yang, 2015).

In cMOOCs, course materials are mostly content known as ‘knowledge commons’ open to anyone and can be shaped by the instructor or the learner. Knowledge Commons are loosely defined as an approach (Commons) to sharing a resource (knowledge) (Dedeurwaerdere, Frischmann, Hess, Lametti, Madison, Schweik, & Strandburg, 2014). It can be inferred that active learning is a component of cMOOCs and experiential learning is a component of xMOOCs. For cMOOCs, the course format is different from that of xMOOCs and on-campus courses. The participants in cMOOCs construct the course content as the course proceeds as a collective group with agreed upon objectives and from this work, many from the course

form long-term relationships that last beyond the course (Crowley, 2013, p. 3). In connectivism (little to no instructor interaction), learners are connected to each other for support and help each other learn through the Internet. In constructionism (minimal instructor interaction), the instructor is a facilitator acting as guide and observer. Instructivism (full instructor interaction) is where the instructor and others direct the learning (Berkeley Graduate Division, 2015).

cMOOCs may have borrowed their networked learning theme from collaborative learning. However, both models create learning spaces where participants learn and encourage each other, in some cases, in ways not found even in traditional classrooms. This network of learners has been called a community of practice. “A communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly” (Wenger & Wenger-Trayner, 2015, p. 1). The learners in the community operate within a domain (could be an interest, project, hobby, or in the case of cMOOCs learning) which they commit to each as they form relationships, and become sources input to the domain. cMOOCs are suited to a sort of online communities of practice since in most MOOCs; the course is online. In “cMOOCs knowledge is driven by participant need, opportunity, and communication, and is a lateral process across the network, rather than a top-down, instructor lead, or artifact based knowledge transfer mechanism” (Brennan, 2013, para. 34). Participants in a cMOOC are engaged with the learning and as such, completion rates have not been researched in these courses.

The early designers of cMOOCs did not emphasize endpoints or completion but rather emphasized whether the learner learned what he or she intended to learn (Clow,

2013). The literature on cMOOCs does not address completion rates but refer rather to the behavior of cMOOCs participants. The dropout rate in xMOOCs is much higher than in cMOOCs (85% vs. approximately 40% respectively) (Rodriquez, 2012). Mak, Williams, and Mackness (2010) researched blogs and forums in Cormier's 'Connectivism and Connective Knowledge (CCK08) cMOOC and found participants matured and developed personal learning networks to advance their learning. Completing the course was not necessarily the goal in this learning model but rather gaining the course knowledge. It could be said that the learners, in cMOOCs have the academic readiness or develop the readiness through the course to learn what they need through the community. In xMOOCs, the behavior of participants varies based on learner motivation, course content, and their abilities. As xMOOCs followed the traditional on-campus course, course completion were expected since these courses were offered to reach a wider audience of students and to extend the academic reach of the institution (Educause Learning Initiative, 2011).

Extended MOOCs (xMOOCs)

Extended MOOCs or xMOOCs are instructor-led MOOCs. These MOOCs use many of formats as on-campus courses. They have a syllabus, lectures, assignments, and quizzes. They divert from on-campus courses with forums. Videos are the primary source of information distribution information in xMOOCs. These often follow the model of traditional lectures. Moreover, xMOOCs offer multiple-choice questions, asynchronous discussion forums and work with essays (Khalil et al., 2015). xMOOCs mirror traditional on-campus courses with instructor-led content and include a syllabus

that describes the course, its activities and objectives, materials, and possible outcomes including a possible statement of achievement (Khalil et al., 2015, p. 41).

MOOCs were imagined to bring education to the masses especially with financial support from the Hewlett and Gates foundations (Rhoads, Camacho, Toven-Lindsey, & Lozano, 2015a). Much of the MOOC proliferation has occurred with little research in their effectiveness in the academic space. In traditional on-campus education, studies have been done and continue to be done to understand learning behaviors of underrepresented groups and unprepared learners, and yet these groups struggle in college (Kinzie, Gonyea, Shoup, & Kuh, 2008). In MOOCs, the formats are designed to teach all without consideration for underrepresented or unprepared learners. Also, to these groups, the Campaign for the Future of Higher Education (CFHE) questioned Coursera whether online education providers are adequately serving learner populations they have claimed to help in the past, such as those in rural communities and underdeveloped countries (Bidwell, 2014a). These questions and the lack of research on these groups may be represented in course completion. MOOCs might be used as a substitute for meaningful brick-and-mortar access for low-income populations while others saw MOOCs as a form of neocolonialism wherein the “courses threaten to exacerbate the worldwide influence of Western academe, bolstering its higher-education hegemony” (Rhoads et al., 2015, p. 399).

Although xMOOCs were a fully online model, their course format is identical to the on-campus course format including a syllabus, lectures, assignments, and assessments (Venkatesh, 2014). These xMOOCs were a deviation from both the traditional distance education and cMOOC models; they quickly became the

predominant option for fully online courses for traditional institutions. The most salient difference in MOOCs is the peer-to-peer connections made during the course. Caulfield (2015) wrote that in cMOOCs, relationships persist after the cMOOC ends, but in xMOOCs, the relationships exist in proprietary systems and the focus of the relationships is the course work and not the interests of the learners. xMOOCs are formal compared to cMOOCs. The syllabi for MOOCs are constructed by the instructors with institutional requirements – course objectives and policies, participation behavior, course requirements, and grading (University of Maryland, n.d.). Other than institutional requirements and MOOC course provider guidelines, there are few guidelines for MOOC courses. MOOC courses can run for any number of weeks, with any number of video lectures assignments, and assessments with only instructor determining format (Straumsheim, 2014b). xMOOCs have similar behaviors as on campus online courses. The significant differences between these two models are the platform. Most traditional on-campus online courses are offered through a learning management system (LMS) like Blackboard or Sakai. xMOOCs are offered through a MOOC provider such as Coursera or edX. Wiley (2014) found the significant difference between MOOCs and LMSs is the ability to audit MOOCs while in progress but that this ability may not produce the results sought in the current iterations of MOOCs.

xMOOCs do not consider the preparedness of their learners in their design. MOOCs, that experience success, are those with shorter video length, course variety, and consideration for the learner (Learning Advisor, 2015). There are many MOOC courses offering the same subject. This variety may serve as explanations to attempt to reach diverse learners. For example, there are 80 MOOC courses on statistics offered

by a variety of institutions and providers. Udacity (2015) offers an Intro to Statistics. This course is for beginners. It is two months long. It has a six-hour per week commitment. It is free. No credit is offered. Saylor (2016) also offers an introduction to statistics. Their web page does not say whether the course is for beginners but does say the course is for college students. The course indicates it will take the average learner 92.5 hours to complete (Saylor, 2016, para. 14). The course does have the option for university credit and can be proctored for $25 (Saylor, 2016, para. 11). MOOC courses can vary from vendor to vendor, institution to institution, and can be as granular as instructor to instructor. Course offerings now expand to include courses aimed at business professionals, not offered through traditional academic channels. MOOC offerings have become so unwieldy that a list of the top 50 most popular MOOCs is indexed on the Online Course Report (2016a) website. MOOC types continue to evolve. The issues raised in MOOCs have led to variant MOOCs (see Table 2).

xMOOCs are time-intensive learning models. Creating a MOOC takes time and resources. The median hours to create a MOOC is 100 (Kolowich, 2013b). Faculty compliance in MOOCs is an important consideration for their success. Faculty engagement in online course development is necessary if universities are to meet market demand. But more importantly, faculty engagement is a requirement for academic quality (Norman, 2015, para. 18). Much has been written about altruistic reasons for MOOCs but it should also be noted MOOCs do offer institutions which offer them a level of visibility not seen through traditional academic marketing. MOOCs can extend the institution’s reach and reputation internationally, particularly among elite research institutions. MOOCs have become a method of enhancing the institutions

Table 2

MOOC Variants

Name	Year Created	Founder
Massive Open Online Courses - MOOCs	2008	Dave Cormier
Connectivists MOOCs - cMOOCs	2012	Stephen Downes
Extended MOOCs - xMOOCs	2012	Stephen Downes
Big Open Online Courses - BOOCs	2013	Google
Small Private Online Courses – SPOCs	2013	edX
Distributed Open Collaborative Courses – DOCC	2013	FemTechNet
Selective Open Online Courses – SOOCs	2013	Jim Shimabukuro
Synchronous Massive Online Courses - SMOCs	2013	University of Texas
Vocational Open Online Courses – VOCC	2013	IFI CharitableTrust

Note. Adapted from Open Source – Virtual College Trademarks the Term VOOC. Retrieved from http://www.open-thoughts.com/2014/04/virtual-college-trademarks-the-term-vooc/.

brand and signaling innovation. Successful professors can gain a global following, building their reputation—as well as the institution's—and creating new opportunities for collaboration (Educause, 2012). Although these courses have enrolled millions and likely have expanded the institutions' brand, course completions remain low.

Harvard began experimenting with other MOOC concepts after a dismal 1% completed their CS50x (computer science course) with 180,000 enrolling (Garlock, 2015). The massive theme in MOOCs may indeed serve as a factor in course completion, and as research continues, solutions to course completions are explored. One result of HarvardX experimentation led to small private online courses or SPOCs for small courses for very specific audiences (Garlock, 2015, para. 5). Google joined the fray when it funded an Indiana University professor with big open online courses (BOOCs). The concept behind BOOCs is interaction using Google's Coursebuilder as they start small and increase numbers they learn how this MOOC type works with learners (Indiana University, 2013). The other MOOC variants have not fully penetrated the MOOC space but may serve as indicator of what is to come in the xMOOCs domain. Since their arrival on campus, MOOCs have been both battered and championed; yet, they are holding steady. Coursera (for-profit MOOC provider), edX (not-for-profit MOOC provider), and Udacity (for-profit MOOC provider) are beginning to evolve in response to these critiques. These three principal MOOC providers have noted that some online courses have evolved to a sort of "MOOC 2.0" to retain learners and that comparing the retention rates of classic-style MOOCs to those of the updated versions is not a fair evaluation (Hyman, 2013). Coursera, which has the largest catalog of courses, has begun changes to the MOOCs it offers. "Tools like forums and peer grading weren't as

effective when everyone completed work at a different pace. And, as it turns out, most of us need at least a little structure to learn effectively" (Coursera Blog, 2015, para. 3). EdX (the partnership between Harvard and MIT), has begun offering credit for MOOCs and charging lower fees than those for on-campus courses. Agarwal (edX's CEO) spoke of an "undercurrent" at edX that the MOOC provider is "truly not fulfilling [its] mission until we can break through to credit" (Straumsheim, 2015, para. 11). Udacity, in response to the concerns raised by MOOCs, refocused their MOOC efforts to skills training. "Udacity aims to change that dynamic by focusing on very small and focused offerings. In its 'nano-degree program', students pay $2,500 to spend six to 12 months learning skills for high-tech careers" (McCormick, 2014, para. 4).

There are many MOOC providers, however, in the academic space, Coursera and edX have partnered with the majority of institutions (Fahs, 2015). MOOCs, unlike traditional online courses, are free, and anyone can enroll without prerequisites except access to the Internet and a reliable computer. The components that attract learners to MOOCs may also serve as a pitfall. Learners who enroll without the necessary knowledge to complete the course, a commitment to complete the course, and for rural areas, reliable technology are some of the determinants of low course completions in MOOCs. Research has linked course completions to motivation and not learner knowledge.

The Business of Higher Education, Retention, and MOOCs

Higher education in many ways operates as a business (Knapp & Siegel, 2009, p. 2). Stoller (2014, para. 3) defined the components of higher education's business:

> Admissions are the sales team. Athletics (major money sports) are a never-ending cash cow, brand vehicle, and alumni-giving machine. Academic advising and residence life are the customer service centers. Academic programs are the product...the most valuable product that schools offer.

Within this metaphor of higher education as a business, student retention is a measure of product quality and as such is a key component in the business of higher education. Low retention is thought to have negative implications for all entities. “The loss of students returning to campus for another year usually results in greater financial loss and a lower graduation rate for the institution, and might also affect the way that stakeholders, legislators, parents, and students view the institution” (Lau, 2003, p. 126). Institutions have seen some increases in recent years among 4-year institutions – where the overall rates for most institutions are 80% and for non-selective institutions, the rate is 60% (National Center for Education Statistics, 2015)

For on-campus education, retention has an impact on budgets. Retention and attrition have a direct correlation to budgets and funds for college campuses (Raisman, 2013). The Federal Government, as well as, academic institutions research methods to improve on campus completion and retention rates. Nonetheless, completion rates are just above 50%. “The government is spending a great deal of money to improve the completion rate of college students. So far, despite vast amounts of money spent, the six-year completion rate is a dismal 54%” (Friedman, Hampton-Sosa, & Friedman, 2014, p. 1).

Retention in online learning environments have much lower rates than those in on-campus courses, but the factors in retention for on-campus courses are similar to

online courses. “Online courses have a 10% to 20% higher failed retention rate than traditional classroom environments. Totally, 40% to 80% online students drop out of online classes” (Bawa, 2016, para. 2). There are institutional variations as well. Course completions for open access or non-selective institutions are smaller than selective institutions (Doyle, 2010; Jenkins & Rodriguez, 2013; National Center for Public Policy and Higher Education, 2010a).

Completion rates in MOOCs have been a consistent concern theme. Though completion rates are not unique to MOOCs, however, with so much attention given to the learning model since they are free and open to all, completion rates have been the focus of both the popular and scholarly literature (Hill, 2013a; Jordan, 2015; Parr, 2013). Completion rates make sense as a metric for assessing conventional college courses. In a conventional course, the goals are generally consistent and well understood: the institution, instructors, and students share a common goal, course completion and, eventually, a credential. It is possible, in MOOCs, this is also the goal. However, they may not be structured for that outcome. Some students who register for MOOCs have no intention of completing, and some instructors do not emphasize completion as a priority (Kolowich, 2014).

Course completers tend to be more interested in the course content, whereas non-completers tend to be more interested in MOOCs as a type of learning experience. In a wider perspective, motivational goals (e.g. relevant to the job, career change, meet new friends), may predict different behavioral patterns for MOOC learners (Barak, Watted, & Haick, 2016). Learner commitment in a MOOC is not the same as the commitment for traditional academic enrollment where a degree is sought. Currently,

almost half of the students who begin college at a two- or four-year brick-and-mortar institutions fail to earn a degree within six years, according to a report by the National Commission on Higher Education Attainment (via the New York Times). In some colleges, the completion rate is close to 15%. MOOC completion rates are similar. However, for MOOCs, course behavior including rigor may affect completion rates in greater numbers than expected and may explain course hoping across institutions (Koller, Ng, Do, & Chen, 2013).

For many students, academic readiness may be a factor in retention. Demetriou and Schmitz-Sciborsk (2012) find that students who are academically prepared are likely to persist. Academic readiness has many components and has unique definitions according to institutions or learning situations. Social and economic obstacles are likely components for some students. Other factors include understanding student success in elementary education. Are students acquiring the knowledge needed to move onto the next level of study? Academic intervention should occur before the student arrives at the postsecondary level. It is likely some elementary education institutions experience financial shortfalls, counselor and teacher shortages, and large class sizes (ACT, n.d.; Demetriou & Schmitz-Sciborski, 2012; Krasnoff, 2014).

As many institutions confront “the how to make college affordable question,” online options in higher education are considered (Jaggars, 2011, p. 1). As proffered by Lips (2010), the digital age advances, it could be said; technology would play a major role in education specifically higher education and the promise of digital education. Buck (2013, para. 14) adds “new online tools can save colleges money and ‘bend the cost

curve' by restructuring the ways in which parts of instruction are provided, particularly quantitative courses that have a fairly common curriculum across institutions."

Online learning has seen exponential growth in the last few years. According to the National Center for Education Statistics (NCES) (2012), online education has continued to expand. From 1962 to 1975, colleges and universities sought to increase enrollments, especially among diverse populations and with the enticement of federal financial aid students came in droves, however, this level of financing was not sustained due to social, economic and political changes beginning in the mid-1970s (Sanchez, 2014). Tuition increased, public investment in higher education decreased, and an increase in student dependency on educational loans resulted in a net shift in the costs of higher education borne by the individual. The net cost of a college education has risen dramatically from 1982. According to the National Center for Education Statistics (2015), the average tuition costs for a four-year degree at a public institution was $6,941.00 in 1982 and in 2013, that same education costs $15,022. In 2008, the National Center for Public Policy and Higher Education gave Fs to 49 states in the area of affordability (Pope, 2008). The intersection of technology and education has disrupted the higher education model.

Offering online options may provide some fiscal relief to some institutions as it addresses the Baumol effect in the higher education sector. The Baumol effect occurs when an industry cannot readily increase productivity (Dai, 2013). Education is an industry where change is slow and methodical. It is a large sector, and higher education is one of the most competitive industries in the United States and has become a complex enterprise with an extraordinarily diverse array of institutions from community

colleges to globally renowned research universities (Leebron, 2014). Sector size can be a limiting factor on the ability to make widespread changes. Also, the majority of institutional budgets are comprised of fixed costs related to personnel and the physical plant. In fact, Dickeson (2008) reports that on average 75% of institutional expenditures are related to personnel. Through online education, expenditures on physical space are reduced, and gains in productivity are made as instructors can reach a larger number of students, and thereby increasing potential revenue through tuition dollars, financial aid, and state allocations based on enrollments. “Traditional online education is encapsulated in the traditional campus and costs are passed onto students as fees. The traditional online degree or courses are recognized similarly as in class courses while fully online courses are questionable” (Gale, 2015, para. 8 & 9). Online education has its costs, however.

There are significant start-up costs, however, and experts warn that colleges should not offer online education solely to make money. Online courses require substantial upfront investments to design and develop the host technology and to train faculty. Even though faculty members need not physically be in a classroom to teach, they still must post lectures, moderate online discussion forums, and provide constant student feedback—all skills that require professional development (National Conference of State Legislatures (NCSL, 2016a, para. 7).

MOOC costs may not incur those required to administer a college campus; there are costs nonetheless. For providing institutions, MOOC costs vary. The Coursera agreement with Kentucky may provide information about agreements with other Coursera institutional partnerships. In Coursera’s first agreement in with the University

of Michigan, under Section 2 – Service/Revenue Models for Online Courses, the contract states:

> Under the Coursera Monetization Model, at no cost to University, University (through its Instructors) may develop, produce and submit Courses to Company, and Company will host and make any such Courses available through the Platform, provided the Courses fully satisfy the Course Criteria. As between Company and University, Company will be responsible for monetizing and otherwise generating revenue from the offering of such Courses through the Platform and collecting such revenue. All such revenue collected by Company will be shared between Company and University as outlined in Section 5.1 (Young, 2012, p. 6).

Since this agreement with the University of Michigan, data as whether this agreement has changed or is the still the agreement with other institutions is unavailable. The Coursera partnership with institutions includes fees for the partnering institutions.

> The University of Kentucky with Coursera charges the university a flat fee of $3,000 for "course development." After that, Coursera would charge a per-student fee that would decrease as more students registered for the course. The first 500 students would cost the university $25 per student; the next 500 would cost $15 per student; the university would pay the company $8 for each student beyond that (Kolowich, 2013c, para. 12)

Hollands and Tirthali (2014a, p. 1) reported, “We find costs ranging from $38,980 to $325,330 per MOOC, and costs per completer of $74-$272, substantially lower than costs per completer of regular online courses, by merit of scalability.” Monetizing

MOOCs has been in the MOOC discussion almost as much as completion rates. “The costs of developing and maintaining MOOCs can be substantial. Most MOOCs are advertised as free to learners, are subsidized heavily by institutions and venture capitalists, and, some analysts assert, lose money” (Baker & Passmore, 2013, p. 2). The retention factor has implications for costs.

The contract Coursera signed with its partners do not return an investment unless a certain criterion is met. Burd, Smith, and Reisman (2014, p. 40) summarized three models:

> Charging for certificates (this money goes to Coursera. If institutions offered credits or an institution based certificate, possibly the institution could charge for this); creating relationships with students and potential employers (this is a service most institutions perform as a part of their career services departments. This would require institutions to rethink or, at least, redevelop this group to expand their services), and charging for supplementary services (for fee courses). For many institutions specifically, elite institutions, fee reduction may not be worth the effort.

edX is the not-for-profit provider founded by Harvard and MIT. “Open edX is the open-source platform that powers edX courses and is freely available. With Open edX, educators and technologists can build learning tools and contribute new features to the platform, creating innovative solutions to benefit learners everywhere” (edX, n.d.c. para. 6). edX platform is an open source platform and is available to anyone to use to create edX courses. edX has two models for income generation. The first is the University Self-Service Model. With this model, edX will charge participating institutions, $50,000 for

the first course and $10,000 for repeating courses. The institutions receive 50% of all monies generated after the threshold is met. The second model is the edX Supported Model. edX serves a support team for institutions. In this role, edX assists in the design of courses for $250,000 and $50,000 every time the course is repeated. The institutions receive 70% of monies generated by the course (Kolowich, 2013c).

On xMOOCs specifically, law professor Laurence Helfer reports that it takes many hours to create a MOOC, and it needs consistent monitoring (L. Helfer, personal communication, July 22, 2015). Translating these costs for the institution is not a simple formula when juxtaposed against the potential exposure. “Costs are ranging from $38,980 to $325,330 per MOOC, and costs per completer of $74 to $272, substantially lower than costs per completer of regular online courses, by merit of scalability” (Hollands & Tirthali, 2014a, para. 1).

Little research is available that explain how MOOC completion and retention rates impact institutional budgets. The total costs of offering high-quality MOOCs and other online courses may not necessarily result in lower costs for higher education. Outstanding courses can cost more than on-campus courses (Campaign for the Future of Higher Education (CFHE), 2013). Thus, while in theory, online education is posited to reduce costs, it is still unclear the extent of savings given the need for start-up investments. Recent research by economists (Deming, Goldin, Katz, & Yuchtman, 2015) using the Integrated Postsecondary Education Data System (IPEDS) found between 2006 and 2013; the median costs for an online degree dropped by 34% and face-to-face courses rose by 9.2%. Thus, online education may help institutions as a

partial solution to education costs, the benefits of online education may be unequally spread through student populations, proving problematic for some.

Outcomes in MOOCs result in some benefits for on-campus courses. Kim (2015, para. 6) reports the innovations in MOOCs “have very little to do with technology or even pedagogy. Rather, they are innovations at the level of institutional, organizational and cultural change.” Some Duke faculty reports improvements in their on-campus courses as a result of errors learners find in the MOOC courses. Other improvements as a result of MOOCs include ‘large-enrollment introductory courses will either get much better - with significantly greater investments - or they will migrate to open online venues” (Kim, 2015, para. 14). Other institutions and organizations are seeking to utilize lessons learned from MOOCs. Data from a Carnegie Mellon University (CMU) study determined students learn by doing. With this information, CMU has emphasized learning. xMOOCs attract a crowd, however, many who enroll do not complete. Some have characterized participants to account for the low completion rates. However, the lack of clear course skills needed may have a greater impact on course completion (Rea, 2014). When considering the business model, a counter-balancing factor to the retention of students in online learning is that of the efficiencies produced by online education.

Learning Theories in MOOCs

To better understand retention rates within MOOCs, it is useful to consider the concept of learning. What is learning? In its most basic abstract, learning could be framed as the acquisition of knowledge. While theorists have defined learning as a result seen as the individual progresses through stages of proficiency in his or her

growth, learning can be summed as simply a change in the individual's understanding regardless of the environment (Hussain, 2012; Kihlstrom, 2015; Leister & Kezar, 2009). Further explanation of learning expands to a definition of learning theory. There are many learning theories, however, combined, a learning theory is a philosophy that describes the processes of constructing and deconstructing knowledge to increase one's knowledge (Panasuk & Lewis, 2012).

Many theories can be applied to MOOCs. In theory, andragogy, behaviorism, cognitivism, connectivism, and constructivism have concepts that are factors in MOOCs. MOOCs both cMOOCs and xMOOCs are complex learning models. MOOCs make fundamental assumptions regarding those who register for their courses. The first assumption is derived from Clow's funnel of participation (aware, interest, participation, and completion). The 'customer/participant' may be aware of the course, register for the course (interest), may view the course contents or participate in a forum, take a quiz or complete an assignment, none of this means, the 'customer/participant' is going to complete the course. The participant is still in the funnel. The outcomes at each of these layers are based on the motivation of the participants. Another assumption in MOOCs includes how participants learn in social environments. MOOC learner motivation is difficult to manage when the number of participants and each participant may have different learning abilities and styles, goals, and other obstacles including personal and technical.

xMOOC are similar to traditional courses; constructivism theory may be best suited to MOOC learners since they must build on prior knowledge to master the course subject and expand upon that knowledge to actually learn the materials. The

connectivist theory may best apply to learners in cMOOCs as they learn within groups of other learners and construct their knowledge through collaboration. Constructivist and connectivist theory learning theories are not particular to MOOCs since these theories have been around for many years. However, they do provide some measure of theoretical insight as to how learners learn in these models and may provide a framework for course completions.

Behaviorism Theory

xMOOCs use the instructor-led model of knowledge transmission and the student as the receiver of the information. This model of teaching at the heart of the behaviorist theory. Assignments and quizzes may require learners to access knowledge, many times; this is simply regurgitation (Askew, n.d.). This situation reduces students to a position in which they merely receive information, preventing their creativity and cognitive development. For xMOOCs, learners obtain information through the course materials with little cognitive efforts other than responding to assignments and quizzes not necessarily deep learning (Kesim & Altinpulluk, 2015). Behaviorist theory occupies a prominent place in education. Though many consider the theory less relevant than others, behaviorist theory invokes reward and punishment concepts (Askew, n.d.; Berger, n.d.; Snowman, McCown, & Biehler, 2009). The behaviorist concepts may have worked as well on education as it did for Pavlov's dogs. Learners are motivated to achieve good grades, curry favor with their professor, go to the best schools, and in some cases obtain the highest degree all in effort to receive the reward, and the punishments can be seen in socio-economic circumstances, however, for MOOCs (they have some of the same reward and punishments concepts), the

reinforcements necessary for the rewards are left to learner and if the learner is not academically prepared, the learner may fail as a result of his or her inabilities if the instructor is not there to apply the reinforcements.

Constructivism Theory

Since the rise of MOOCs, questions of effectiveness of online teaching has been raised for fully online courses and methods to deliver a quality product to diverse learners with the variety of avenues for learning and to ensure learning occurs (Fish & Wickersham, 2009; Linden & Blunt, 2015). The technological foundations of MOOCs may require not only new theories about how students learn but also new thoughts about who students are and what tools they bring to learning.

Research suggests teaching online is different from face to face instruction. When technology is the primary mode of instruction much of the knowledge transfer required in instruction requires a pedagogical shift in the course delivery. Online education, especially MOOCs, creates isolation, silos, and other means of segregation for learners, also, instructor involvement is reduced to responding to learner inquiries and correcting content, and in many instances, learners become self-instructors (O'Neil, 2006). Academic readiness becomes a central concern when the learner does not have the appropriate knowledge to succeed in the learning environment and to achieve their academic goals.

Academic readiness is a progression of learning. How much and how well one learns according to behaviorist theorists depends on factors internal and external and given the right set of possibilities, the playing field is even for the acquisition of knowledge (Graham, 2015; Munoz, 2011). If this is indeed true, readiness should be

even for learners that begin at the same point. Adult learners have adopted a variety of methods of learning by the time the reach adulthood and whether those methods achieve the required knowledge to move onto postsecondary learning depends on the learner's fundamental construction of knowledge along the way (Levy, 2008; NDT, n.d.). If the theory of constructivism is the process of building knowledge upon existing knowledge, it implies the learner must, first, have a foundation of knowledge, second, understand how to expand the foundational knowledge to increase his or her learning, and third, be active in their knowledge acquisition (Hoover, 1996; Weegar & Pacis, 2012).

Readiness in MOOCs is not an easy process to describe. The MOOC course is a video lecture (information provided by an instructor about the course topic); assignments (course materials to read to reinforce the video content); quizzes (assessing what the learner learned); and forums (a resource for learners and instructors to collaborate virtually and share knowledge and resources) (Leiden University, n.d.). These course components assume the learner has grasped the learning in each of these areas. Many courses do not describe the audience but rather the course outcomes. The syllabus as in the on-campus course outlines the course objectives and the course activities. The learner must then act upon these tasks independent of instructor assistance and from prior knowledge or experience to succeed in the course. "Constructivism is practically the opposite of behaviorism. In constructivism, learners are encouraged to learn through active engagement, by associating new information with existing information, to form new knowledge or

understanding of the meaning of concepts" (O'Donnell, Sharp, Lawless, & O'Donnell, 2015, p. 103).

Constructivist Theory and the Community of Inquiry

Constructivist theory may serve as an ideal foundation for xMOOCs as learners are constructing knowledge from the instructor provided materials. Constructivist theory is the active participation of learners in their creating knowledge. "Constructivism is an educational philosophy which holds that learners ultimately construct their knowledge that then resides within them so that each person's knowledge is as unique as they are" (Oregon, n.d., para. 7). Learners learn in xMOOCs through a variety of means, and the forum is one of the tools for social collaboration, self-efficacy, and the instructor or whoever is monitoring the course activity. "The discussion forum provides the opportunity for this type of social learning in MOOCs" (Kizilcec, Piech, & Schneider, 2013, p. 4). The forums serve as a community of learners sharing experiences and knowledge. This community of learners has been defined by some research as the community of inquiry. The Community of Inquiry (CoI) framework is social constructivist in nature and grounded in John Dewey's (1938) notion of practical inquiry. It is a dynamic process model designed to define, describe and measure elements supporting the development of online learning communities. The three principle elements identified by the CoI model are social presence, cognitive presence and teaching presence (Swan & Ice, 2010, p. 1).

Social presence in xMOOCs is through forums. "The three main aspects of social presence, as defined here, are effective communication, open communication and group cohesion" (Garrison, 2007, p. 63). Learners' social presence in MOOCs is

measured through posts to forums. Research has shown active social presence, forums in xMOOCs, result in higher course completions. “Completing learners are likely to have made more forum posts than non-completers, and forum posting has been cited as an effective measure of student engagement (Onah, Sinclair, & Boyett, 2014, p. 1). For xMOOCs forums may not assist in academic readiness. “Most MOOC discussion forums have dozens of indistinguishable threads and offer no way to link between related topics or to other discussions outside the platform. Often, they can’t easily be sorted by topic, keyword, or author” (Hill, 2013b, para. 3). The massive nature of the forums may not be conducive to collaboration through social presence and assisting learners in learning from each other.

The community of inquiry and constructivist theory blend to create a learning framework for xMOOC learners using social collaboration and technology. For learners who engage in the social aspects of online learning, forums, blogs, social media or other avenues, succeeding in these models are highly probable. These actively engaged users posts and collaborate with other learners and increase (construct) their knowledge. Some learners experience feelings of isolation in online learning environments. Some learners may feel more connected in these learning communities than others. Learner demographics can be factors. Research has indicated age, gender, and motivation are factors in connectedness, and this feeling may increase with age (Shea, 2006). Technology may further impact these feelings of isolation.

Shifting technology and a growing interest in learning activity paralleled and intersected with many of the developments in constructivist learning theory. The evolution of Web 2.0 is one example of a shift that created many opportunities for

constructivist learning. Increased accessibility to information and subsequent changes in the use and creation of knowledge have changed the way we communicate and interact. Web 2.0 is the next generation of the World Wide Web (WWW) that enhances collaboration online (Beal, 2016). Google Mail or Gmail and Facebook are examples of Web 2.0. With Web 2.0, the emphasis is on "participating, doing and experiencing rather than knowing what or where", a constructivist approach (Hicks & Graber, 2010, p. 7). The connectivist learning activities are unique to the group and consist of exploring, connecting, creating, and evaluating, and are team led (Anders & Dron, 2011).

MOOCs assume a certain amount of intrinsic motivation on the part of their learners. MOOC activities including assignments such as watching the lectures, participating in forums, completing homework, if required, and taking quizzes are dependent upon the learner to complete at the learners' convenience within the prescribed course length where defined Cognitive constructivism, one of the theories at the heart of developing knowledge, may hold the key to understanding readiness in MOOCs. Cognitive constructivism can be said is the process of assimilating information through the learning experience. The process suggests the learner's acquisition of knowledge is always influx and advancing with each new experience (Doolittle, 1999). How does one measure the success of cognitive knowledge or the ability to construct knowledge from previous learning? Standards for readiness exists and are seen in standardized tests and other such measures but what are the measures for readiness in MOOCs?

Learning in MOOCs

The learner in a MOOC is in some ways is not that much different than the learner in traditional higher education. He or she has come to the learning space with some intention. However, the level of readiness is likely to be different for each learner and without adequate support to assist the learner as is the case in traditional higher education, completing those intentions may come at a price.

> Perhaps the most critical shift in education in the past 20 years has been a move away from a conception of "learner as sponge" toward an image of "learner as an active constructor of meaning." Although Plato and Socrates (not to mention Dewey) reminded us long ago that learners were not empty vessels, blank slates, or passive observers, much of U.S. schooling has been based on this premise (Wilson & Peterson, 2006).

Learning in any environment is a combination of factors. Student motivation is a large consideration in the context academic readiness. "When we discuss student motivation, what we are really talking about is whether or not students have made educational activities a true priority: whether they have chosen to fully invest their time and energy in their college experience" (Crone & MacKay, 2007, para. 4). If the educational entity provides all of the necessary provisions, if the student is not connected to their success, none of these provisions will matter. Students also need to have the academic tools to thrive in the educational setting. "Nearly 60% of first-year college students discover that, despite being fully eligible to attend college, they are not ready for postsecondary studies and must take remedial courses in English or mathematics, which do not earn college credits" (The National Center for Public Policy

and Higher Education, 2010b, para. 1). How students learn is also an important factor. The traditional model of learning is an instructor-led course within a specific period with an intended outcome (Griffiths, Podirsky, Deakins, & Maxwell, 2002). Educational theories are plentiful but how one learns likely depends on the individual and the instruction, and much of the learning is done through one's individual effort and experimentation, not those that occur in a classroom (Wharton, 2008).

If the objective of higher education is the acquisition of knowledge, then higher education has many tools to offer knowledge. The traditional model is not necessarily best or only option. Negrea (2014) reported, "more than eight million people have taken a MOOC." Studies as early as 2000 found learning in online courses were equal or better than on-campus courses. Other studies found online and on-campus results were similar, and other studies found on-campus students performed better than online students. MOOCs make assumptions regarding their learners. Mak (2013) defined ten assumptions with MOOCs. Assumption 6 states, "MOOCs must be based on prescriptive learning outcomes, and prescriptive knowledge and learning methodology. Should Learning Objectives be prescriptive or emergent?" (Mak, 2013, para. 17). Since xMOOCs follow the on-campus model of learning, the learning is prescriptive. "xMOOCs are following such an approach where students are expected to remember, understand and apply what the professor has explained in the video lectures, and to pass the quizzes, assignments, examinations set up for the course" (Mak, 2013, para. 17). cMOOCs have more characteristics of emergent learning properties. "The goal of cMOOCs is to facilitate emergent, self-organized patterns of collaborative learning" (Anders, 2015, p. 41). "In emergent learning, the knowledge is open, created, and

distributed by the learners. In prescriptive learning, the knowledge is largely predetermined for the learners" (Kawka, Larkin, & Danaher, 2011, p. 48). Whether emergent or prescriptive, MOOCs a learning model with many complexities.

The Role of the Instructor

In adult education, the role of the instructor in retention and academic success has been seen as central. The instructor teaches, interacts, and assesses the student through course content and personal interactions. For traditional education, the instructor is, in essence, the leader of events in the classroom. In fully online courses, the role of the instructor is less clear. In some instances, the instructor is a part of the course contributing and responding as others in the course and at other times, the instructor has to re-center the discussion and provide support to the learners (Cuseo, n.d.; O'Neil, 2006). In recent years, the discussion of whether online education is as effective as face-to-face education has been debated in research studies and among administrators and many conclude there isn't a discernible difference (Tagsold, 2013). Nevertheless, the track toward online education continues.

In recent years, as the infusion of online technology advances further into the education space, the role of the instructor has been debated, questioned, and in some cases re-shaped. Rees (2014, para. 8) wrote, "A professor who does not choose and present educational content in his or her courses is no longer a professor in the traditional sense of the word, becoming a glorified teaching assistant instead." The pros and cons of faculty interest in teaching online drew two new acronyms (as if we needed more), MOOSs and MOODs describing those who approve and those do disapprove of MOOCs. MOOS, or Massive Open Online Supporters, and MOOD, or Massive Open

Online Detractors, highlight the fracture between faculty and online instruction (Covitz, 2015). Faculty are opting in or out of online teaching and how they and their students see the faculty roles vary by institutions. As online education has reached its tentacles further into the academy, discussions and policies that define modes of delivery and the role of faculty will continue.

MOOCs and Diversity

MOOCs were conceived as a possible option to democratize education and were thought to be a disruptive force in combating the cost of a college education and using technology (Whitehouse, 2013). Research has found the majority of learners who enroll are white men under the age of 49 with a college credential. “Approximately 80% already had, at least, a bachelor’s degree, nearly 60% were employed full-time, and 60% came from developed countries. MOOCs seemed to be serving the most advantaged; the headlines blared, and most people weren’t even completing them” (Zhenghao et al., 2015, para. 1). “The majority of people taking advantage of these courses are already employed, have post-secondary degrees, and have encountered few barriers related to the affordability of higher education” (Dillahunt et al., 2014). This same demographic completes at a higher percentage than other groups. MOOCs may have goals of education for all; not everyone has the disciplined to complete online courses with little instructor participation. Dillahunt et al. (2014) researched and compared two distinct learner groups based on demographics, learner intentions and behaviors, course behaviors, motivations, and enrollment numbers by those who enrolled for costs versus those who enrolled for other reasons. The group who enrolled for costs represented only 9.8% of those surveyed.

As seen by some, MOOCs may have the potential to revolutionize education. “It will democratize education,” proclaimed former Tufts President Lawrence Bacow, “opening up access” (Simon, 2015, para. 6). Those that see MOOCs as disruptive to higher education see value in MOOCs’ ability to diversify education. While many proclaim MOOCs as the disruptive force in higher education, the Digital Divide still exists for many. The Digital Divide in the ability to access or own a computer and to access the Internet. Many have thought the Divide is no longer an issue since many schools, and public libraries have computers and Internet access. However, schools and libraries have terms of use, and some have time limits of use. Access to technology remains for low-income and rural areas. Higher income households and metropolitan areas are more likely to have a computer and Internet access than those with lower incomes and those living in rural areas (Roberts, n.d.). Access to technology or reliable technology may be one consideration for underserved populations in MOOCs or other distance education options.

In 1970, the United States accounted for 29% of the world’s college students but since that time, the United States has seen its numbers of college student decreased to 12% in 2006 (National Bureau of Economic Research, 2009). In fits and starts, diversity in enrollments have grown and shrunk over time but, for the most part, have remained steady (Chambers, forthcoming). Colleges are likely to notice a significant increase in enrollments of minority groups by 2021. Hussar and Bailey (2013) project a one-fourth increase in Black college enrollments and a little more than one-third increase in Latino college enrollments and less than a five percent increase in Caucasian enrollments.

Contemporarily, the average MOOC-taker is an educated white man with a least a bachelor's degree (Selingo, 2014). MOOCs were thought to create equity in education for those with the least access or opportunity. Very little ethnic demographic data is available regarding MOOC participants. While most surveys collect this data, correlating ethnicity to academic readiness, course completion, or student intention is not readily available.

MOOCs were initially designed to "extend the institutional reach and access to education" (TC Media Center, 2014, para. 3). However, whether MOOCs meet this lofty goal depends on who you ask. There is some data on MOOC demographics, but that data is voluntary and collected with variable results.

> One Coursera MOOC indicated that 36% of participants were U.S. citizens, 65% were white, 89% were male, 94% of the males completed the course, 65% who completed were white, 1% of blacks completed the course, and 27% of the Asians completed the course (Balch, 2013, para. 9).

Schmid, Manturuk, Simpkins, Goldwasser, and Whitfield (2015) of 13 Duke MOOCs of three populations (people under 18, adults over 65, and people who reported that they did not have access to higher education opportunities) found "that across all three groups, the Coursera classes were supplementing or enhancing their education that they were getting from other either K-12 or higher education formal courses." By contrast, Kahlenberg (2014, p. 1), finds "Low-cost, fully online courses tend to produce negative outcomes for students, particularly for those who are underprepared." Many of the students that fall into this category are the very students MOOCs intended to reach. Learner retention in online courses is 20% lower than those in face-to-face courses (Ali

& Leeds, 2010). Persistence in online education for learners include unfamiliarity with technology, poor collaboration or communications skills, and possibly insufficient knowledge of the course; other factors may be a result of individual inadequacy such as cultural, social, or preparedness which may be a key factor for some learners (Herrera, Jones-Davis, Gates, Jaggars, & Suiter, 2014).

The Potential Impact of MOOCs

MOOCs contemporarily impact higher education in many ways, but they have simply raised the importance of technology in academic curriculum delivery through distance education. As reflected by Salisbury (2014), “Higher education is going digital, responding to the architecture of knowledge in a digital age, and MOOCs, while heavily criticized, have proven a much-needed catalyst for the development of progressive programs that respond to the changing world.” Straumsheim (2013, para. 6) adds “MOOCs are part of a larger socioeconomic shift that would diversify the supply chain of higher education, transferring more academic functions to independent services that are offered on a freelancing basis.” MOOCs certainly have captured the attention of higher education media. A recent search of The Chronicle of Higher Education found 616 articles in the last three years. The same search of Inside Higher Ed produced 797 articles. The New York Times proclaimed 2012 the year of the MOOCs because of all of the attention they received (Pappano, 2012).

While many see MOOCs as a disruptive innovation for education, others believe MOOCs are more an innovative bubble than substance. Although they bore many markers of disruption, when defined narrowly, they lacked a business model

innovation that would allow their disruptive value proposition to be sustainable and move up-market over time (Horn, 2014).

It may just be too early to tell what the long-term impact of MOOCs on higher education will be. “MOOCs are not yet evolved enough to provide thorough peer assessment methodology, robust business revenue models, stabilized retention rates, successful pedagogical design, or resolution for cheating and plagiarism” (Bhatia & Trivedi, 2015, p. 73). “It is perplexing that MOOCs have taken hold without much evidence as to whether they are effective in improving participant skills and knowledge, and without a firmer idea of their economic value, resource requirements, and costs” (Hollands & Tirthali, 2014a, para. 8). Even if not a disruptive innovation, MOOCs certainly are a complex perplexity for academic leaders. As framed by Buck (2013, para. 2) “MOOCs, if they haven't yet fully disrupted American higher education, certainly are giving academic leaders pause when it comes to mapping new — and viable — business models or determining the means by which students can earn degrees.”

Since it is still not clear how institutions benefit from MOOCs, the obvious question has to be why institutions offer them. Hollands and Tirthali (2014b, p. 1) found six rationales for institutions offering MOOCs. The rationales were as follows: “extending the academic reach and access; building and maintaining brand; improving economics by reducing costs or increasing revenues; improving educational outcomes; promoting innovation in teaching and learning, and conducting research on teaching and learning.” Specifically, concerning teaching and learning, Negrea (2013, para. 3) reports, “One of the primary benefits of offering MOOCs is the opportunity to analyze large samples of data that can be used to improve teaching methods.” During the Duke

Center for Instructional Technology Conference (2015), Duke professor Dr. Mohamed Noor characterized his experience with MOOCs as beneficial (M. Noor, personal communication, October 13, 2015). He stated that his experience with MOOCs has led to improvements in his on-campus classes. He also noted that his MOOC learners have found errors in course materials, and that has been beneficial to all. Separately, "Coursera's shift to an on-demand format dramatically changed how MOOCs are offered on their platform, including some notable changes in how instructors can engage their learners in the course content" (Johnsen, 2015, para. 1).

Moreover, MOOCs have the potential to add to the budget bottom line of higher education institutions by recruiting and enrolling new learners. MOOCs act as a vehicle where tens or hundreds of thousands of individuals will have an opportunity to see the institutions and its faculty. "Academic units benefited through a mechanism to attract students and future revenue while the university benefited through digital impressions, branding, institutionally leveraged scalable learning environments, streamlined credit evaluation processes and expanded digital education" (Leeds & Cope, 2015). Kennesaw State University (KSU) in Georgia, a fairly new player in the MOOC space, has benefited from offering MOOCs. Though their MOOC completion rates are no better than those for on-campus courses, the KSU results showed that most institutions consider many factors including the transition of a MOOC learner to an on-campus student. For KSU, MOOCs have been worth their investment: they increased KSU's brand and visibility, as well as student access to academic materials, and two students who previously took one of their MOOCs enrolled in traditional programs at KSU (Mathewson, 2015). The modified program at KSU resulted in 100 participants in the

Professional Learning Unit (PLU) course and 14 for their traditional program (Leeds & Cope, 2015). There is little data regarding students who enrolled in MOOCs and then transitioned to on-campus college. The fact that KSU had students who took their MOOCs and then enrolled in their on-campus courses might provide a powerful incentive for academic institutions. Whether other institutions are seeing such results from their MOOCs is unclear. Concerns, such as small completion rates, course validity, college credit for completers, and how to monetize MOOCs still loom for MOOCs and their place in higher education (Emory University, 2013).

Lectures, active, collaborative, and social learning, and other social engagement have been considered in the pedagogy of online learning models such as MOOCs. How do these models impact learning when used in on-campus learning compared to online models? The obvious differences between on-campus course behavior and online course behavior are not assessed in the study. This study cannot address these differences justifiably but in traditional education, the instructor, and students are in the same space at the same time. Many times, when students have questions, the instructor can answer the questions during class time. Instructors have office hours where students can meet with them to discuss their class concerns. In online education (MOOCs), learner support is available through “online forums, email exchanges, phone conversations and Skype” (Page, 2013, para. 8). With traditional online classes, emails and phone calls and maybe Skype are a means to communicate with the instructor and classmates but do not substitute for in-person interactions. Social media has become a part of the communications between students and in some cases the instructor, too (Cheung, Chiu, & Lee, 2011). As education evolves, mechanisms to

enhance or advance student learning are becoming less familiar than what is commonly seen as core to instruction.

The Challenge of Course Completions in MOOCs

This no cost and open digital model enrolled massive numbers of participants, but few course completers. Also, MOOCs do not have prerequisites for course admission. “There are no qualifications or diplomas needed to participate” (OpenUpEd, 2015, p. 2). One study found only four percent who enroll in MOOCs, complete (Marcus, 2014). Duke’s first MOOCs, Bioelectricity registered just under 13,000 but only 350 completed (Rivard, 2013). Completion rates in MOOCs vary from 2% to 10%, based on the number of certificates earned, divided by the number of participants who enrolled in the course (Reich, 2014). Using a different formula, “MOOC retention were estimating a range from 5% to 15%” (Greene, Oswald, & Pomerantz, 2015, para. 2). According to a recent report by the Open University, MOOCs dropout rates are significantly greater and unequal in patterns of participation compared to traditional learning models (Clow, 2013). These numbers have yet to be fully interpreted for the MOOC learning model apropos to learner intentions. It may be that course completions in “MOOCs should be considered in the context of the learner intent, especially given the varied backgrounds and motivations of learners who choose to enroll” (Koller et al., 2013, para. 1). Low course completions, when contrasted with massive enrollments, may have produced some visceral reactions.

Course completion is not a simple matter to determine in any education platform. “Only one in five of the students who enroll in two-year institutions graduate within three years. And even at four-year colleges, only two in five complete their

degrees within six years" (Lewin, 2009, para. 2). Research data offers a myriad of reasons why students leave college, but there isn't a one-size-fits-all for course completion. Because there isn't a lack of reasons for why students leave college or MOOCs, MOOC designers, institutions, and providers will need to consider the learner and his or her learning goals in discernably different measures than it does on-campus students.

Low course completion rates as a variable are not unique to MOOCs. Completion rates for many of the same populations struggling in MOOCs are also low in on-campus education. Engle and Tinto (2008, p. 2) wrote, "After six years, only 11% of low-income, first-generation students had earned bachelor's degrees compared to 55% of their more advantaged peers." "Barely more than one-half of all four-year college students in the United States earn their bachelor's degree within six years from their initial institution" (Tinto, 2012, para. 4). National Center for Education Statistics [NCES] (n.d.b) reports that 59% of on-campus students attend a four-year complete college.

College retention studies have found that 36% of college students complete their degree in four years, and the majority take six years (Bidwell, 2014b). Even with longer completion times, students are leaving college before completion. "The 56% college completion rates of students enrolled in a bachelor's degree cannot be attributed to a single factor; rather, several factors, including personal responsibility, the cost of college, employment, and academic rigor, which may be the most important factor" (Weissmann, 2012, para. 2, 4, & 5). Dropout rates in MOOCs are attributed to some of these same factors (Yang, Sinha, Adamson, & Rose, 2013).

The Chronicle of Higher Education and the Bill and Melinda Gates Foundation (2013) produced a microsite that provided a look at college completion rates throughout higher education. The results reveal an interesting look at America's higher education. Of the top 20 schools graduating students in the 90 or better percentile in six years, only two are not private four-year schools. Their numbers are in the high 80 percentiles for graduation in four years. No college has a 100% completion rate. The average cost of attendance at these colleges is $263,860.65. Of these top 20, two were two-year for-profit colleges, and one was a four-year public college. It came in last among the top 20. At the end of this report, explanations were given about the data, what is omitted, and why.

There have been more than 100 scholarly articles and an equal number in popular media have written about completion rates in MOOCs. The majority of this work comes from institutions reporting on their individual MOOC experiences or the providers explaining the intricacies of MOOCs. The majority of these articles focus on completion rates while other speak to the disrupting potential of the new learning model. For example, a University of Pennsylvania study of 16 Coursera MOOCs revealed six percent of learners completed the course and only half who registered actually watched a course lecture (Biemiller, 2013). Some of the reasons for the low completion rates are well discussed such as time, language barriers for non-English speakers, or an assumption of knowledge about the course topic by the participant (Xu & Yang, 2015).

Completion rates in MOOCs are defined as "The number of certificate earners (those who successfully met the completion criteria of a course) divided by the total number of people who registered for a course (HarvardX, 2014b, para. 4). This

definition along with learner intentions may not necessarily construct a clear view of completion rates. Harvard researchers analyzed 17 HarvardX and MITX MOOC courses and found a broad range of learner intentions including “learners in the courses who engaged with every single piece of the courseware, learners who only read text or viewed videos, learners who only took assessments or completed problem sets, and learners representing nearly every possible combination of these behaviors” (Rutter, 2014, para. 7). HarvardX suggests completion rates for MOOCs should be considered based on those intending to complete. “Those reporting MOOC completion rates should factor in the percentage of learners who intended to complete a course and actually went on to do so” (HarvardX, 2014a, para. 11). These findings may represent a need for future clarity and distinction for what is a student and what is a learner. The disparity between student and learner may be as simple as the discipline, abilities, and efforts to achieve the learning goals (Heick, 2013).

Further comparisons of students and learners may include more inherent motivations.

> In relationship with educators - students are employees and learners are citizens; in the relationships with other students- students are competitors and learners are collaborators; students are motivated by obligation and learners are motivated by responsibility; students are compensated through grades, additional education, and career where learners are compensated through accomplishment; and students are assessed by measurements of what has been learned and learners are assessed by measuring what the learner can do with what has been learned (Warlick, 2010, para. 5).

Differences between student and learner may also depend on who is asked. R. Barr, a Duke faculty member, said “the distinction is simple - a student is taught, and a learner seeks” (personal communication, September 9, 2015). These subtleties may contain some link to MOOC completion rates. It may be clear why both students and learner attend college or take a MOOC but what happens once they are enrolled may differ based on many factors from academic readiness, costs, self-efficacy, or some other factor. MOOCs are as diverse as their participants. MOOC courses are offered by many institutions of higher education on both open and proprietary models.

If on-campus courses completion rates were calculated in the same manner as MOOC completion rates, we would have to divide the number of people who pass an on-campus course not by the number enrolled in the course at the add/drop deadline, but by the number of people who ever applied to enter the institution. A better approach might be to calculate MOOC completion rates as a percentage of learners who enrolled in a course with the intention to complete the course and then earn a certificate or a degree.

Concerns regarding the calculation of completion rates and contextuality of course completion aside, the completion rates argument is a significant one used opposing MOOCs as a disruptive quantity (Alcorn, Christensen, & Kapur, 2015). Learners who complete MOOCs tend to have significant experience as independent learners, have experience with MOOCs or online courses and have completed a higher level of academic study (Uden, Liberona, & Welzer, 2015). Even among those who are well prepared, MOOC course completions are still low. “MOOCs are a valuable resource for those who can access them, but the majority of MOOC learners have been

well educated, employed, from developed countries, and male" (Greene, Oswald, & Pomerantz, 2015, para 2).

These achieving learners persist in the course and perform many of the course activities. "Given that the typical Coursera course has roughly 8 to 9 hours of lecture video per month, the hourly lecture retention rates in the high-retention group translates to real-world monthly lecture retention rates of around 40% to 50%" (Chen, Do, & Koller, 2013, para. 17). Some consider these retention rates as a success in MOOCs.

In short, the course completions in MOOCs are complex, just as learner retention in higher education more broadly. To better understand MOOC course completions, they should be contemplated against learner preparedness and intention to get a sense of the learner factors in course completions.

Zheng et al. (2015, p. 1,891) defines learner intention among MOOC learners as falling in one of four categories:

1. Increasing their academic knowledge in their current place in time – complementing their current skills or knowledge;
2. Adding to their academic knowledge for a future objective – using the course to improve employability;
3. Determining what a MOOC is and whether learners learn or take anything from the course (friends, knowledge, or new methods of learning); and,
4. Connecting with like-minded people (the Facebook effect).

Studies have considered what factors in MOOCs have an impact on course completions. Significant considerations for MOOC learner intentions include the lack of costs to join and penalties for quitting; anyone can take a MOOC (any age, any skill,

and from anywhere), and a MOOC can be taken with any intention (browsing, completing, or partially completing the course). These considerations along with limited pre- and post-survey options do not provide very much motivation for completion.

Koller et al. (2013) explained learner intent by contrasting it with traditional education. “The vast majority of students who enroll in traditional university classes enter with the explicit intent of earning a credential. Coursera defines their MOOCs learners as passive and active participants, or community contributors” Koller et al. (2013, para. 5). In a study, edX defined its learners by participation “58% reported that they intended to earn a certificate, 25% that they intended to audit, 14% that they were unsure of their intentions, and 3% that they intended to browse” (HarvardX, 2014a, para. 7). Udacity no longer considers itself a MOOC provider. Since its inception, they have rethought its MOOCs product and is now offering online nano-degrees. MOOCs haven’t disrupted college and lured the masses and since right now, learners can't come away with a degree from Stanford or Harvard they can use in the job market -or- learners can't graduate with Ivy League credentials they can use. “Udacity’s nano-degree program might cost a thousand bucks and take a few months to complete” (Maney, 2014, para. 6).

The question of who is taking a MOOC has been answered, but the question of why needs further exploration. Learner behaviors in MOOCs have resulted in classifications of MOOC participants. In the popular media reporting on MOOCs, there is a taxonomy of types of populations who take MOOCs. For example, Hill (2013a) described MOOC learner behaviors in five categories: no-shows: those who register but nothing else; observers: they perform limited course activity; drop-ins: they act on select

course materials; passive participants: these learners may complete the course but do not collaborate with other learners, and active participants: are fully involved and are likely to complete the course.

MOOCs can play an important role in creating skills for job (re)training. Data from the University of Pennsylvania indicates more than half who take MOOCs are already employed, while others take MOOCs to increase knowledge for a college degree or add to knowledge for employment (Radford, Robles, Cataylo, Horn, Thornton, & Whitfield, 2014).

The Radford et al. (2014) study used a web survey along with a small qualitative survey of potential employers to understand MOOCs familiarity and their potential in hiring decision making. Their overall findings indicate MOOCs have potential with employers. Some employers recognize MOOC credentials in their hiring decisions and view MOOCs as a tool for professional development (Radford et al., 2014). Other studies have found that some people who take MOOCs take them because they are free, convenient, social, and provide the ability to learn from the best institutions. A United Kingdom study research study found 67% took a MOOC because it was free, 36% because they could fit around the student's life, 54.4% in order to improve their resumes, 55.8% for the social component of MOOCs, and 48.1% because a world-class university was offering it (White, Davis, Dickens, Leon, & Sanchez-Vera, 2014).

The most common comments are those similar to what Konnikova (2014, para. 7) reports, "The problem with MOOCs are - they're massive (tens or hundreds of thousands of students) and open, it can be easy to get lost in them. Often, the students receive no personal acknowledgment or contact to hold them to account." Therefore,

even students having intentions to complete can simply get lost. Successful students tend to be academically prepared experienced learners.

Academic Readiness

In higher education generally, there is no a uniform definition of academic readiness. Every year in the United States, nearly 60% of first-year college students discover that, despite being fully eligible to attend college, they are not ready for postsecondary studies. Despite substantial increases over the past several decades in the number of courses required to graduate from a U.S. high school, many of today's graduates are still underprepared for college-level coursework. An estimated 28% of students who entered college in 2000 required remediation in reading, writing, or mathematics, with the highest need for remediation in mathematics (Long, Latarola, & Conger, 2009).

> Low rates of college completion are a major problem in the United States. Less than 60% of students at four-year colleges graduate within six years, and at some colleges, the graduation rate is less than 10%. Additionally, many students enter higher education ill-prepared to comprehend college-level course material. Some estimates suggest that only one-third of high school graduates finish ready for college work (Bettinger, Boatman, & Long, 2013, para. 1).

Even those students who have done everything they were told to do to prepare for college find, often after they arrive that their new institution has deemed them unprepared. Their high school diploma, college-preparatory curriculum, and high school exit examination scores did not ensure college readiness (National Center for Public

Policy and Higher Education, 2010b). Standardized tests, long considered the measurements of readiness, do not always predict specific skills for specific courses and course behavior. These tests have been used to predict learning outcomes, these; tests measure the students' ability to regurgitate what they have learned to date not how well prepared they are not for post-secondary learning and what is readiness varies by state and institution (National Center for Public Policy and Higher Education, 2010a). Although many students may have completed their high school coursework needed for the next level of education, what readiness is may be different from institution to institution and from high school to high school.

Many institutions have begun to consider MOOCs as remediation or as precursors to college. Broward College offers a MOOC primer course in college-level reading, writing, and mathematics (Broward College, 2015). The research concludes that academically underprepared students do not perform well in fully online courses. "Online learning is a promising means to increase access and improve student progression through college, the Department of Education report does not provide evidence that fully online college courses produce superior learning outcomes, particularly among low-income and academically underprepared students" (Jaggars & Bailey, 2010, para. 3). In this vein, MOOCs as remedial education may, in the long run, increase diversity in higher education.

Readiness is defined as the skills the learner needs to transition to higher levels or education or employment (Parrish & Johnson, 2010). "College readiness is influenced by both cognitive and academically based factors, such as study skills, time management, high school grades and non-cognitive factors such as motivation"

(Giacomo, Linn, Monthey, Pack, & Wyatt, 2013, p. 3). In other words, academic readiness is the level of preparation a student needs to enroll and succeed—without remediation—in a credit-bearing general education course at a postsecondary institution that offers a baccalaureate degree or transfer to a baccalaureate program. Success is defined as completing entry-level courses with a level of understanding and proficiency that makes it possible for the student to be eligible to take the next course in the sequence or the next level course in the subject area (Conley, 2007). In this vein, readiness and success are correlated to completion.

Determinations of readiness may reside in the early knowledge acquisition of the learner. Some have suggested this starts in childhood. Dewey's early theory of readiness revealed that the learner needed to be ready to learn.

> Dewey argued strenuously that in practice, the curriculum is often either inaccessible to the child because its abstract, logical nature is too removed from the child's immediate experience, or if attempts are made to make it accessible, the subject often becomes "denatured"—robbed of its explanatory principles and reduced from a coherent, logical system to a series of isolated facts that must be committed to memory. Neither technique serves in rendering the world more comprehensible to children, nor does it allow them to benefit from the cumulative theoretical knowledge of our forebears in the intentional construction and revision of their own naive theories (Watson, 1998).

For online learning, academic readiness takes on an entirely different meaning. Research has shown that those who perform well in MOOCs are those who are college-educated, knowledgeable about the subject matter, and have prior online experience.

The hype may have been to educate the masses. However, the reality is MOOCs educate the young, the rich, and the educated. “The researchers sent the survey to students who had registered for a MOOC and viewed, at least, one video lecture. More than 80% of the respondents had a two- or four-year degree, and 44% had some graduate education” (Kolowich, 2013d, para. 3). Those who succeed in this learning model have already succeeded in an academic environment, have a commitment to the learning model, and can work with others inside and outside of the course. Success in MOOCs for learners is likely tied to prior academic success, self-motivation, and a willingness to work with others to achieve their academic goals or simply, learners most prepared (Konnikova, 2014). Much of the research data indicates learners who perform best in MOOCs are those who self-motivated and independent. “Most MOOCs are designed in a way that skews toward autodidacts and more advanced learners” (Mazoue, 2013, para. 8). Learners who are academically ready at the college level are diminishing and those who are not are requiring longer degree completion times.

> Only 28% of college instructors believe that public high schools adequately prepare students for the challenges of college. Similarly, other researchers argued that high school often does not adequately prepare students with the skills required for college-level courses, which are generally faster paced and require students to engage in higher-level tasks (College Board, 2013, p. 2).

For MOOCs, the pace and rigor of the course are instructor dependent. “The quality of instruction could vary, and the instructional strategy includes blended components with live face2face interactions depending on the scale and composition of the MOOC” (Bagley & Weisenford, 2015, p. 146). How course pace and rigor effect completion is

not well researched but one study found a link between completion rates and course difficulty. “A dropout diagnosis survey administered in a recent Stanford MOOC revealed that 71% of dropouts reported course difficulty or procrastination as the main reason for dropout” (Halawa, 2014, para. 5).

Most of the data for Coursera MOOCs is fragmented. For example, Duke’s first MOOC, Bioelectricity, registered just under 13,000 learners. Of those who registered, 313 completed from 37 different countries and already had, at least, a bachelor’s degree or higher (Catropa, 2013). A University of Pennsylvania research study received 34,779 completed responses to learners who participated in their Coursera MOOC and found the most of their learners had a degree beyond high school. 83.0% of the respondents had a 2 or 4-year degree, 79.4% of respondents had a bachelor’s degree or higher, and 44.2% had a greater level of education (Christensen, Steinmetz, Alcorn, Bennett, Woods, & Emanuel, 2013).

However, many learners who enroll in MOOCs may not have experiences to prepare them for coursework in MOOCs, in short, they are not ready. “Distance learning is most effective for students who are highly independent and self-motivated learners and who require little or no face-to-face interaction with their professor and peers to understand and appreciate course material” (University of North Florida, 2015, para. 3). In massive course settings, the need for these non-cognitive factors seems even more pressing.

Constructivist theory suggests that students use prior learning to make sense of present opportunities to learn. As such, students who do not have prerequisite content or technological knowledge may not be able to benefit from MOOC courses. They drop

out because the course is over their head. This study considers constructivist theory in the context of learner academic readiness to understand how this theory may contribute to the likelihood of course completion in MOOCs.

Online academic readiness introduces another layer of complexity to the readiness discussion. Some institutions offer an online assessment for learners before their enrolling in an online course. These assessments are used to gauge the user's knowledge of online behaviors and technology. Many of these tools define the users who should consider the assessment (Hanley, 2013). At a technical level, online learning readiness has been defined as the learner's ability to conduct his or her affairs in a manner that allows for the appropriate amount time to perform the course activities and autonomous learning (Lau, 2008).

Understanding learner readiness in MOOCs can assume two schools of thought. The first, learner may have thought they were ready because they enrolled in the course and may be motivated to learn what the course offered. The second thought is the learners' beliefs regarding his or her readiness is enough for the course. Both of these thoughts may be met with reality when the learner is unprepared for the course rigor or the time commitment of the course. As phrased by St. Clair, Winer, Finkelstein, Fuentes-Steeves, and Wald (2015), "Motivation to learn arises when the learner sees that learning could be useful, and each individual needs to have reached their own point of readiness for effective learning to occur" (p. 70).

Both perspectives overlook the fact that students self-select to enroll into MOOCs without further filters. Even in other open enrollment contexts, like community colleges, placement exams help administrators select courses based on students'

cognitive abilities. This lack of specific measurement of readiness in the MOOC may suggest that determining learner success in MOOCs is more challenging than want of motivation. If MOOC courses do not screen learners for academic readiness for the specific course matter and learners come to the courses without the prerequisite readiness, success may be a fleeting option. To parody the film *Field of Dreams* (Frankish & Robinson, 1989), if you build it, they will come, but they will not be able to complete.

Learner Age and Experience

Early educators found distinct differences between teaching children and teaching adults. These distinctions led to studies on adult learners and the coining of the term andragogy (O'Neil, 2006). Malcolm Knowles defined andragogy as a method of learning for adults. Knowles defined four assumptions for adult learners: they are self-directed; they learn from experience, they learn when they assume new roles, and they want to solve problems and apply the knowledge they have learned (New Jersey Institute of Technology, n.d.). Knowles' theory implies learners are self-motivated and interested in advancing their knowledge, but it does not consider the course, its complexity, and the role of the instructor.

Adult learning theory has reconstructed higher education and online learning practices. These models of learning require its learners to have both prerequisite knowledge and self-motivation for success. For both elementary and postsecondary education, the learner population is becoming distinct and diverse. Higher education has two distinct populations: traditional students (under the age of 25) and non-traditional students (those over 25). Teaching these two distinct populations engages

the theory of andragogy, however, as with most things, there are other factors such as preparedness, socioeconomic environment, and learner motivation that may not conform aptly with this theory. With the distinction between education populations, understanding these differences in MOOCs could mean the difference between a completion and leaving the course (Barnard-Brak, Lan, & Paton, 2010; Bellum, 2013; Bessette, 2012). Learning is a process that evolves from instructor led to collaborative learning where learners and instructors merge into a cohesive team that creates capable learners and that, heutagogy, “looks to the future in which knowing how to learn will be a fundamental skill given the pace of innovation and the changing structure of communities and workplaces” (Hase & Kenyon, 2001, para. 7).

xMOOCs are similar the traditional behaviorist model of education. They are instructor led, and the information is transmitted from the instructor to the learner. Bates (2012) reports that xMOOCs are so similar to the tradition modes to teaching (right and wrong answers) that may they be best suited for specific learners.

Learning theories are not necessarily an ideal fit for MOOCs due to the diversity and massive nature of courses, theories apply as xMOOCs course behaviors are similar to those in their academic institutions. Although xMOOCs are streamlined to the traditional educational model, they diverge at the interaction between the learner and the instructor. This factor may be a distinct issue for the xMOOC model as the cMOOCs are fully participant based and do not rely on the instructor-led model. Age of the learner in some studies has been shown to affect course completions in online courses. “Like other groups, older students were less likely to complete online courses than they were on-ground courses though their grades were slightly higher” (Lederman, 2013, para. 8).

The overall average age for MOOC completers is 39 (Dillahunt, Wang, & Teasley, 2014). The average age for Coursera MOOC learners is 37 (Palin, 2014). edX courses indicate younger learners. The age of learners may be an important variable for course completions as older learners may have the busyness of life while younger learners may have limited knowledge of the course content.

Course Factors

Many repudiate xMOOCs due their similarities to on-campus courses. However, MOOCs differ from on-campus courses by size. The largest lecture class (Psychology 101) was taught at Cornell University by James Maas and held 1,600 students (Arenson, 2000). Jordan (2014) reports the average MOOC size is 25,000 learners. In 2014, several researchers at the University of Pennsylvania (an early Coursera partner) studied MOOCs' advancement through higher education focusing on the factors that determine learner behaviors in MOOCs. Specifically, two research questions were posed. (1) "Do MOOC users progress through a course sequentially in the order identified by the course instructor, or do users determine their approach to accessing content?" (2) "What are the milestones that predict course completion?" (Perna, Ruby, Boruch, Wang, Scull, Ahmad, & Evans, 2014, p. 423). The study describes the research methods, data, and the findings. The findings are similar to most MOOC research; course completions are significantly low and learners who intend to persist, persist. Their study introduces two terms not commonly found in MOOC research to define behavior (sequential and user driven). These terms may hold the key to outcomes. If learners only need some portion of the course or are lurking, maybe the term user-

driven is applicable. Whereas if the learner has come to the course for a certificate or a job enhancement, maybe sequential is best suited to describe that learner.

Most xMOOCs including those offered at Duke do not inform the learner of the skills needed to perform well in the course. The course provides an overview of the course and what the learner should learn. The length of the course and the amount of the time required for the course is noted. Some courses also note whether English subtitles are available. Other courses may indicate if there are course prerequisites. If a learner were to take Duke's Bioelectricity MOOC, he or she would see that the course is seven weeks long, does not recommend any prerequisites (is described as an intermediate course) and is described as a course for an advanced undergraduate learner or a graduate student. The course does not have a required text but does suggest one. It has two quizzes each of the seven weeks and then a final quiz. Each session has a ten-minute video. Duke's 2013 data report on course completion for this course reports higher than normal completion rates but typical demographics. Over 12,000 learners enrolled representing more than 100 countries; one-third of enrolled learners held less than a four-year degree, one-third held a bachelor's or equivalent, and one-third held an advanced degree; 25% completed the course (Belanger & Thornton, 2013). The results of this MOOC may not be typical; however, it does shed some light on MOOC completion rates. The majority of people who took the course did so because they were interested in the topic. The majority that did not complete were those who either did not understand the time commitment of the course or the course content.

The massive size of MOOCs may not necessarily scale to meet the needs of the number of users. Massive numbers of posts may leave some learners searching for answers for hours. Instructor and learner interaction is another massive undertaking. Many instructors have assistants or other technical staff answering learner questions but by size alone, this process can overwhelm both the staff and the learner. Duke addresses these issues by creating resources for faculty who teach MOOCs (Anderson, 2013).

Gender and Race

xMOOCs demographics specifics are not always captured across courses. When this data is collected, it is collected through surveys or assessments. Those who typically complete these surveys are those who complete the courses many times. The number of survey completers is not as massive as the numbers of those who enroll. One such Coursera MOOC survey revealed, 'The MOOC had an overall enrollment of about 48,000 students at the time of completion. The pre-course survey received 2,792 responses; among which 38% of the participants were female, and 62% of the participants were male (Wang & Baker, 2015). Other data regarding fully online courses indicate women are the larger population.

> Interestingly, the demographic profile of online students enrolled in a fully online undergraduate or graduate degree, certificate, or licensure program reveals that the "typical" online student is a "Caucasian female about 33 years of age who [is] not the first in their family to attend college and who typically [has] a total family income of about $66,500 (Herrera, Jones-Davis, Gates, Jaggars, & Suiter, 2014, para. 2).

Research has shown female learners perform better in online learning (Schwartz, n.d.). Completion data seems to conflict with these findings. A Georgia Tech MOOC with an enrollment of more than 25,000 and less than 1,200 completing demographics produced 89% men and 65% of those were white (Balch, 2013).

MOOCs were thought to bring equity to education by offering low or no-cost courses to a wider audience. Data to date has shown the majority of those who enroll and complete MOOCs do not need an economic advantage in education. However, Black, Latino, and poor households are finding MOOCs a challenge. The digital divide exists for some while others find online courses less attractive than traditional courses (Jaggars, 2015).

Science, Technology, Engineering, and Math (STEM)

Science, Technology, Engineering, and Math (STEM) fields are on track to employ a greater margin of individuals than any other fields significantly, and these fields tend to pay more (Langdon, McKittrick, Beede, Khan, & Doms, 2011). However, the future does not look bright for STEM fields especially for women and minorities. Women and people of color are not well represented across any of the disciplines of STEM. This lack of representation is throughout STEM. In education, women receive some STEM degrees but still lag behind men. Women of color are farther behind than their counterparts.

> While women receive over half of bachelor's degrees awarded in the biological sciences, they receive far fewer in the computer sciences (18.2%), engineering (19.2%), physics (19.1%), and mathematics and statistics (43.1%). 11.2% of bachelor's degrees in science and engineering, 8.2% of master's degrees in

> science and engineering, and 4.1% of doctorate degrees in science and engineering were awarded to minority women. Minority women comprise fewer than 1 in 10 employed scientists and engineers (National Girls Collaborative Project, 2016, para. 5).

Research on attrition in STEM fields indicates the choice of institution may be a factor. Undergraduate degree seekers at four-year public and less selective institutions leave the field at higher rates than those at private or highly selective institutions (Chen & Soldner, 2013).

For employment in these fields, the numbers do not offer much hope for optimism for people of color. “African Americans, Hispanics, American Indians and Alaska Natives, accounted for 10% of the country’s workers in science and engineering in 2010 – up slightly from 7% in 1993, which was 26%” (Neuhauser, 2014, para. 2).

> The percentages of engineering and computing workers under 25 have decreased by 25% and 15%, respectively. The decline has been especially stark among certain minority groups. While the percentage of females and Native Americans who say they’re interested in STEM fields is now slightly higher than it was in 2000, the percentage of African-American and Latino students, who say the same is down dramatically (Bidwell, 2015, para. 4 & 6).

If women and underserved populations can persist in STEM fields, opportunities for advancement and equitable pay may also serve as factors in attrition (AAUW, 2013).

As higher education grapples with costs and other issues association with student enrollment including STEM persistence for women and underserved populations, MOOCs came into focus as an option to address STEM concerns. The

literature indicates those who enroll and complete are male and educated (Koller, 2016). Of the 27 Coursera MOOCs Duke offered between fall of 2014 and spring of 2015, 21 were STEM MOOCs and 51,949 participants enrolled. Of those that answered the pre-survey question of gender, 26,341 were male, and 4,235 or 16% received a statement of accomplishment. The completion rates for college STEM fields indicate White and Asian complete with five years at a higher rate (42%) than underserved populations (22.1%) for Latinos, and (18.4%) for Black students (Epstein, 2010).

Readiness and Science, Technology, Engineering, and Math (STEM)

Every sector of STEM is expanding, and this expansion requires individuals with experience and education in these fields. However, these fields have fewer women and minorities than other fields and the numbers seem to prove this: women represent 26% of STEM workers, African Americans account for 6%, and Hispanics for 7% (Center for Online Education, 2016; Langdon et al., 2011). For State of North Carolina, ninth graders are required successfully to complete four (4) courses of math and three (3) courses of science to graduate from high school (North Carolina Public Schools, n.d.). However, it seems minorities may be ill-equipped in these fields as early as high school and for women, high school may not hamper their entrance in STEM fields, their gender may and this lack of preparedness has many factors including the education process: (1) Inexperienced teachers; Discouraging these groups from participating in STEM fields; or a lack of academic support in these classes) and social and societal issues affecting this population; (2) Academic readiness (leaving the course due to lack of subject knowledge); low-income or poverty; and institution selection) (ACT, 2016;

Arizona State University Center for Gender Equity in Science and Technology, 2015; Center for Online Education, 2016; New York Times, 2013).

> In 2012, 23% of science classes at schools with the highest concentrations of students eligible for free/reduced-price lunch (i.e., 75%–100% of students) were taught by novice teachers, compared with 10% of science classes at schools with the lowest concentrations of free/reduced-price lunch-eligible students (i.e., 0% –25% of students)" (Arizona State University Center for Gender Equity in Science and Technology, 2015).

Coursera course catalog offers 1,323 courses and of those courses 956 are STEM courses (Coursera, 2016a). STEM Courses are courses likely to draw a larger audience as the rewards in STEM fields tend to be higher. Research chart incomes and career growth in STEM fields to increase while non-STEM to see fewer income increases (Science Pioneers, n.d.). Academic readiness may be a critical factor to success in STEM fields, and readiness can be associated with several components of society. Those who persist in STEM fields have higher GPAs; are White; have incomes above $50K; parents with a college degree; and prior experience with STEM-related courses (Eagan, Hurtado, Figueroa, & Hughes, n.d.).

Chapter 2 Summary

Massive Open Online Courses (MOOCs) are still here although many predicted their doom due to the low completion rates. If one were to review the early days of education, evidence would reveal completion rates were not the objective but rather obtaining the amount of education needed for survival (many only completed the 8th grade) and then education became a means to improve society. Online education has

evolved to include MOOCs and its variants. The traditional model of online education includes the instructor as the proverbial knowledge bearer (serving the knowledge in portions digestible based on interactive feedback) and students as knowledge consumers (learning the knowledge with support from the instructor and the institution); a learning management system; and technology. For MOOCs, the proverbial instructor provides the knowledge through video lectures and other course materials (very little instructor interaction or understanding how the student is learning the materials) and the student then is responsible for consuming the knowledge (constructing the necessary knowledge to learn the course materials through building on prior knowledge and community feedback).

Higher education defines its mission as teaching, service, and research. In addition to these lofty goals, higher education has evolved into a business. As costs rise to educate, higher education, like any wise business looks for ways to curb costs. MOOCs seemed like a reasonable option to offset tuition costs).

Each day, the number and type of MOOCs offered are increasing; however, despite their numbers, MOOCs remain an unproven academic, financial model. A key consideration is that of completion rates. MOOCs do not consider learner academic preparedness for enrollment; however, according to constructivist theory, a learner needs prior knowledge, content or technical, that can be accessed during the MOOC course. Academic readiness is a broad topic and like higher education, there is not a one size fits all definition. Social and economic factors may play a role in readiness. Learner motivation may also be a factor. For STEM courses, readiness introduces complexities beyond the normal. STEM learning requires learners to persist through

challenges that are not just academic. Some women and underserved populations are discouraged from these fields or face obstacles that increase attrition. And the majority of MOOC completers are white men with college degrees. Towards this end, the present study seeks to discover whether there is an association between academic readiness and MOOC completion and if so, whether completion is mediated by age and technology experience, race, gender, and/ or STEM content of the course.

CHAPTER 3: METHODOLOGY

Overview of the Research Methods

This chapter describes the research approach for this study. MOOCs came to prominence in higher education in 2012 and much has been written about this learning model in the popular literature, but there is a limited amount of scholarly research available on MOOCs specifically at the intersection of academic readiness and course completions.

Several studies have considered completion rates in MOOCs. Many of these studies have recommended thinking of completion rates in MOOCs differently than completion rates for on-campus courses. Few, if any of these studies has considered how learner intention and preparedness intersect with several factors of academics including previous college education, age, race, gender, the course level, and Science, Technology, Engineering and Math (STEM) versus non-STEM course and the effect of these factors on course completions.

Site Selection

Duke University selected for this study is located in Durham, North Carolina and is a private research university. Duke University was created in 1924 by James Buchanan Duke as a memorial to his father, Washington Duke. Duke has 14,950 students and has ten schools (Duke Quick Facts, n.d.). Duke was selected as the site for this study for its early adoption of the Coursera platform and its aggressive pursuit of expanding its academic reach to a broader audience.

Coursera was founded in 2011. In April of 2012, Princeton, the University of Michigan, Stanford, and the University of Pennsylvania became partner universities.

Duke joined Coursera in July of 2012 (Ferreri, 2012, para. 2). Duke offered its first MOOC – Bioelectricity- on September of 2012. The nine-week course taught by Dr. Roger Barr registered more than 12,000 learners from more than 100 countries, and 313 earned a certificate of completion (Barr, 2015).

Anyone who registers for a Duke survey is presented with a pre-course survey (see Appendix A). Those that complete the course are asked to a complete post-course survey (see Appendix B). These surveys are intended to understand learner experiences with new pedagogical methods. Each survey is intended to learn facts from learners about their intentions, skills, and the course performance. MOOCs are massive in enrollments. Duke's entire on-campus student body is just under 15,000. One MOOC can register similar numbers. Duke's Center for Instructional Technology (CIT) and the Vice Provost Office manages the data collected from these surveys. These two groups make determinations and recommendations regarding the number of MOOCs to offer, recommend course design modifications to faculty, and advise Duke on the viability of the MOOC platform.

The Duke data indicates its MOOCs populations come from more than 100 countries; ages of the learners vary from 14 to 93; the majority of the learners are white men and hold at least a college degree; and as of 2014, more than 69,500 Statements of Accomplishment had been issued. In 2012, Duke offered four MOOCs. These four MOOCs registered more than 350,000 participants. In 2013, Duke offered 13 MOOCs and registered a little less than 580,000 participants. In 2014, 30 MOOCs were offered during the fall and spring semesters and well over a million participants registered. The course "Think Again: How to Reason and Argue" had the largest registrations. Data

from Duke's MOOCs provide a diverse sample of participants and courses. Duke is one of 130 Coursera partners. However, Duke and the other partner institutions' contracts are similar in language, and all use the same Coursera platform for course delivery.

Duke's Coursera Data

This study employs secondary quantitative data analytic techniques. Secondary data is data collected and sometimes manipulated by another researcher or institution (O'Reilly & Kiyimba, 2015). The secondary data used in this study is a result of pre- and post-course surveys from Duke University's Coursera MOOCs. Each time a Duke MOOC is offered, learners are asked to complete voluntarily a pre-course survey. Once the learner exits the course, they are asked to complete a post-course survey. The pre-course survey provides demographic data including educational background and learner intention.

The post-course survey collects the learner's assessment of the course. 896,801 people enrolled in Duke's fall 2014 and spring 2015 MOOCs. Of those who enrolled in Duke's Coursera MOOCs, the data available to this author included 65,427 who completed a pre-course survey, and 4,290 completed a post-course survey. These differences between survey completers introduces selection bias that may skew the outcome of this research. The ability to self-select likely biases both the sample of pre-course enrollees and the sample of 4,290 completers since these do not represent the intent of the entire 863,801 learners who enrolled.

The course surveys are the same as those offered by other Coursera institutions. The exceptions to the surveys include course-specific characteristics such as course name, course instructor, and course behavior unique to the institution. Duke collected

this data as a part of their online initiative. Their initiative had three goals – promote teaching and learning experimentation, and drive innovation; support strategic goals of global outreach and knowledge in service to society; and, to enhance Duke's reputation (K. Whitfield, personal communication, April 23, 2015). The survey data collection from Duke's MOOCs is used to justify the expense of MOOCs and demonstrate their effectiveness in accomplishing these goals. The data included 69 courses (several repeated each semester). The data collected for the study were from courses beginning in the fall of 2014 and ending in the spring of 2015. This data was requested from Duke through Duke's Vice Provost's Office and the Center for Instructional Technology. This study is an effort to answer the following research question:

Research Question: Does academic readiness and its factors influence the likelihood of course completion in MOOCs?

H_0: There is no association in MOOC between the likelihood of course completion and academic readiness and its factors.

H_a: There is an association in MOOC between the likelihood of course completion and academic readiness and its factors.

Responses

Data was not available for learners who left the course without completely exiting the course. More learners completed a pre-course survey than a post-course survey. Each survey asked a series of questions about the learner, the course, and reasons for selecting the course. The data (pre- and post-course survey results) provided to the author contained a significant number of missing responses. Data was missing for each question in each survey, with an overall missing response rate of 49%.

Some pre-survey questions received more than 56,000 responses. While the largest number of responses for the post-course survey was a little over 9,000. Some survey questions may have missing data as a result of the question or the participant. The pool of responses from the pre-course survey questions are greater than the pool of responses from the post-course survey questions. For the pre-course survey, 84% of participants out a possible population of 65,427 responded to each of the survey questions. For the post-course survey, 14% of participants out of a possible population of 65,427 responded to each of the survey questions. Some pre-course survey questions had a significant number of responses. For example: for the pre-survey course question, “What is your gender?” 84% of the total population (65,427) responded. For the pre-course survey question, “What year were you born?” 82% of the total population responded. The dataset indicated that 9,181 completers responded to the survey question, “Did you earn a statement of accomplishment?” This number may be the entire population of post-course survey population of 65,427 who registered for the course. The ost-course survey question, “Did you earn a statement of accomplishment?” had the largest number of responses in the post-course survey questions. Because of the large number of missing responses, data imputation was imprudent.

The surveys were completely voluntary. Some of the questions are ‘force response’. For Qualtrics’ surveys, force responses require the participant to answer this question before moving on to the next question. Duke’s Coursera surveys for the fall of 2014 and spring 2015 included force responses. In the pre-course survey, “What is the email address associated with your Coursera student account?” was the only forced

response. In the post-course survey, “What is the email address associated with your Coursera student account?” and “Did you earn a statement of accomplishment?” were the only two force responses. The remainder of the questions in both the pre and post course surveys were request response. Request response reminds participants that they did not answer the question but does not require that they answer this question. Shoemaker, Eichholz, and Skewes (2000) state ‘don’t know’ and invalid or lack of responses to questions are examples of item non-response. In the pre-course survey, question 20 – “In what year were you born?”, seven respondents answered “in 1900”, and two answered “in 2014”. The participants (n=7) who responded born in 1900 would be 114 years old, and the participants (n=2) who responded born in 2014 would be two years old when Duke’s fall 2014 Coursera courses began. There is little likelihood that participants (114 or 2) years old would take an online course. Meade and Craig (2011) classify response such as a two-year-old taking a MOOC as careless responses. They define a careless response as “respondents that do not accurately represent their true levels of the constructs being measured” (Meade & Craig, 2011, p. 1). The research indicates there are many reasons for this type of participant behavior. Shoemaker et al. (2000) discusses two types of responses and possibly why these responses occur: don’t know responses are likely linked to cognitive processes while invalid, or lack of responses are linked to personal or sensitive inquiries. Response burden has also been linked to survey behavior. “Response burden is often defined as the effort required by the patient to answer a questionnaire. A factor that has been proposed to affect the response burden is questionnaire length, and this burden is manifested in” (Rolstad, Adler, & Ryden, 2011, p. 1). The pre-course survey has 592 items for the participant to

answer to complete this survey. The post-course survey has 178 items for the participant to answer to complete this survey. The number of questions and question type (personal or cognitive) may have contributed to the missing data in the dataset.

Categories for missing data has been researched and quantified. In 1996, Brick and Kalton identified four categories of missing data. The first, total or unit non-response (lack of responses from any of the participants in the survey); second, noncoverage (all of the survey questions are not offered to all participants); third, item nonresponse (lack of response to a specific variable); and fourth partial nonresponse (a large number of item nonresponse (e.g. some questions are answered, but others are not). Although all of those who enrolled and completed the course were eligible to answer all of the questions, many did not answer the questions. The missing data, the voluntary component of the surveys, and item non-responses resulted in mixed variables sizes across the sample. All ten variables were included in the analysis although each variable had missing values.

Variables

The survey questions were designed to elicit the learners' intentions, concerns about course design, and a few question about academic readiness. For academic readiness, these questions focused on the academic levels of the learners. The research goal of this study, like many other studies, has been to learn from the surveys what happens in a MOOC that causes a learner to complete or leave the course. The independent variables in this study include academic readiness and its factors – highest level of school completed, age, gender, race, race-Latino, previous experience with course subject, current student status, past online course type (STEM or non-STEM),

course descriptors (introductory, intermediate, and advanced), and STEM versus non-STEM. Most of the questions were multiple-choice questions. However, a few questions required participants to enter data such as age, while others provided the option of "Other" in the multiple-choice list.. This data was recoded to facilitate analysis.

Dependent Variable

The dependent variable is whether learners complete a MOOC. Duke's data on MOOC completion rates are 4% for the total enrolled; 7% of those who login; 28% of those who attempt an assessment, and 38% of those who have grades greater than zero (K. Manturuk, personal communications, November 18, 2015). Academic readiness and the sub-variables associated with readiness may factor in the likelihood of course completions in MOOCs. MOOC completion rates vary by course and (Jordan, 2015) states the average MOOC course completion rate is 15%. Completion rates in higher education are defined as the number of students who graduate with a four-year degree within six years (Doyle, 2010). Completion rates in MOOCs are defined as the number who earn a certificate divided by the number of participants who registered for the course (Harvardx, 2014b). MOOC completion rates vary course. (Dependent variable – Academic Readiness – Post Survey Question 3: Did you earn a statement of accomplishment in this class?)

Independent Variables

Academic readiness factors are defined in this study from these nine variables in the course surveys: College degree, academic or learner preparedness in higher education has been defined as having content knowledge and skills in reading and math and additionally non-cognitive skills (motivation and self-efficacy), and environmental

factors (money and external support) upon completion of high school. Collection procedure: Academic readiness data and its factors were collected from both the pre- and post-course survey questions as well as Duke Coursera's courses.

Independent variable #1 describes previous education experience – Academic Readiness – Pre-course question 24: What is the highest level of school you have completed or the highest degree you have received? Most of the learners who complete MOOCs have at least a college degree and some have further education. Many have taken an online course or have some online experience. Independent variable #2 describes the current student status – Academic Readiness - Pre-course question 25: Are you currently enrolled as a student in an educational program? Most of the learners who complete MOOCs are not currently enrolled as a student. Independent variable #3 describes the learner's previous experience with the course subject – Academic Readiness - Pre-course question 4: What best describes your previous experience in this course's subject area? Most learners who complete MOOCs have some previous course experience. Independent variable #4 asks the learner about his or her race - race – Academic Readiness - pre-course question 23: What is your race? Reported data on race is limited. Some statistics report significant numbers of underrepresented groups enroll in MOOCs. However, this same data indicates these students do not perform well in these courses. Independent variable #5 asks the race question for Spanish, Hispanic, or Latino learners – Academic Readiness - pre-course question 22: Are you of Spanish, Hispanic or Latino origin or descent? This question includes all races not described in the broader race question. Independent variable #6 describes the gender of the learners - gender – Academic Readiness - pre-course

question 17: What is your gender? Research data indicates the majority of the learners who enroll and complete MOOCs are male. For Coursera MOOCs, men are 64% of the registrants. Independent variable #7 asks the age of the learner - Pre-Survey Question 20: In what year were you born? The median age for MOOCs is 26. Coursera data indicates 54% of learners are between 20-29 years of age. Independent variable #8 asks the learner to describe past online experience - Pre-Survey Question 11 and Post-Survey Question 44: Please tell us about your past experience with online courses. Learners that are successful with online courses have good time management skills, use the tools in the online course to connect with other learners and instructors. Independent variable #9 describes the course type and rigor. There were only two types of courses: STEM or non-STEM. The majority of Coursera courses are STEM courses. Course type and rigor were not in the pre-course and post-course survey data provided to this author. A variable entitled Course is in the data. Duke's Center for Instructional Technology (CIT) provided a course book that corresponded to each of the binary values for course. The dataset provided to the author listed a course number. These course numbers were described in a separate document. Once the course numbers were connected to the actual course name, each course website and course syllabus was visited to determine their course type: STEM or non-STEM and course rigor: introductory, intermediate, or advanced level of knowledge suggested to succeed in the course. Many STEM participants persist and may complete these courses at a higher rate than non-STEM courses. Schumacher (2014) states that STEM courses are in demand, they are easier to grade, and both Coursera and edX founders come from science backgrounds. The courses available for this study were:

1. Copyright for Educators - Non-STEM
2. Introduction to Chemistry: Reactions - STEM
3. How to Reason and Argue - STEM
4. Bioelectricity - STEM
5. Visual Perception and the Brain - STEM
6. English Composition - Non-STEM
7. Human Physiology - STEM
8. Data Analysis - STEM
9. Sports and Society - Non-STEM
10. Introduction to Chemistry: Structures - STEM
11. Teaching Statistics: Part 1 - STEM
12. Advertising and Society - Non-STEM
13. Responding to 9/11 - Non-STEM
14. The Brain and Space - STEM
15. Astronomy - STEM
16. Visual Perception and the Brain - STEM
17. The Brain and Space - STEM
18. Medical Neuroscience - STEM
19. Image and Video Processing - STEM
20. Genetics and Evolution - STEM
21. Introduction to Chemistry: Reactions - STEM
22. Tropical Parasitology - STEM
23. Data Analysis - STEM

24. Foundational Neuroscience - STEM
25. The Brain and Space - STEM
26. English Composition - Non-STEM

If the course description indicated no prior experience was needed, this course was coded as introductory. If the course required some prerequisite was needed, this course was coded as intermediate. If the course required previous college experience or other experience, this course was coded as advanced. The majority of the courses offered during the fall of 2014 and the spring of 2015 were STEM courses and were intermediate or advance. All non-STEM courses were introductory.

Data Analysis and Method

The raw survey data consisted of a total of 65,427 respondents with 130 data variables from the survey. Of these respondents, only 6,282 subjects fully answered the eleven variables of interest (i.e., one dependent variable and ten independent variables). Age was calculated by subtracting year born (Pre-course question 20) from the year 2015 (the last year of survey data provided to the author). Based on previous literature, age groups were defined as the following: less than 30 years old, 31-40, and 41-80 analyzed as categorical variables (Guo & Reinecke, 2014; Kizilcec et al., 2013). The highest level of education variable (Pre-course survey question 24) was re-categorized into three groups, less than a college degree which included “no schooling completed”, “some primary or elementary school”, “some high school but no degree”, “high school diploma or equivalent”, “some college but no degree”, “associates degree – technical”, and “associates degree – academic”; bachelor’s degree; and professional education which included “masters”, “professional”, and “doctorate” degrees. Course

type and rigor were assigned to each course code. Any responses with a value of “I don’t know” or blanks were regarded as missing.

Data from the raw surveys were re-coded in Excel. The output from Excel was then copied into SPSS. A single research question was attempted for this study. Does academic readiness influence whether learners complete MOOCs? Frequencies were calculated for each category of the ten variables. Chi-squared tests were used to evaluate significance between completions and the independent variables.

A logistic regression analysis was used to determine the effects of academic readiness on course completions adjusted for all other factors. For MOOCs, these values of success or failure extrapolate to completion or non-completion. In the model, the log-odds of completing the course is a linear function of the nine independent variables. Estimates of the coefficients for each covariate are determined from maximizing the likelihood probability of the model. The resulting coefficient estimates from the model are exponentiated to determine odds ratio (OR), the odds of each factor’s category divided by the odds of the factor’s reference group given the other covariates in the model. An “OR equal to one” suggests no difference between groups. An “OR greater than one” is a positive association, in which the given factor’s category has an (OR-1)% increase in odds of completing the course compared to the reference group while all other covariates in the model are the same between the two groups. On the other hand, an OR less than one is a negative association, in which there is a (1-OR) % decrease in odds of course completion. The 95% confidence interval (CI) is the expected range of the OR.

Limitations of the Study

The goal of this study is to add to the scholarly discussion regarding MOOCs and the factors that impact course completion. Collecting data from the MOOC platform presents challenges for researchers outside of those responsible for developing MOOCs. The data is proprietary. Each institution collects MOOC participant data through surveys or other measures; that data then becomes a part of the contractual agreement with Coursera, the institution, and the instructor who created the MOOC. In the case with this author, in addition to institutional permissions, instructor permissions were also needed. These layers of permissions may dilute the data. As the data either belongs to the institution and/or the provider (Coursera for Duke) much of the data needed to analyze learners are outside of the scope of some researchers. Some MOOC data is available through sites like Class Central and MOOC List, but they are limited since they do not have independent collection means. Thus, a complete dataset of participant demographic data MOOCs may be unavailable to some researchers. As a result, what is known about MOOC participants may be skewed. A complete picture of the MOOCs and their learners may be unavailable given proprietary entanglements. A broad overview of some demographic information is available such as enrollments by gender, age, education, and the course. For example, determining the number of 20-29-year-old women who enrolled or completed in a STEM course is not available.

The following limitations are identified in this study: (1) The data collected in the surveys are Duke and Coursera data and are secondary. Permission was granted to the author to use this data by the institution and the instructors. Duke MOOCs are provided by Coursera and as such, they abide the Coursera guidelines for course behavior

(courses must have videos, quizzes, offer statements of accomplishment, etc.), but the actual course structure resides with the instructor and the university. The data used in this study then adheres to Duke academic standards and these standards may vary across Coursera institutions. (2) 863,801 learners enrolled in Duke's 26 MOOCs between the fall of 2014 and the spring of 2015 and 65,427 completed a pre-course survey, and 9,181 completed a post-course survey. The course surveys do not represent the entire population of those who participated in Duke's MOOCs since this is a subset of the entire Duke MOOC population and a smaller subset of those who may have completed Duke's MOOCs during this period. After subsetting the larger dataset to the variables of interest recoding the data for missing, unclear, or unrealistic entries, the sample population analyzed consisted of 6,282. The larger number of pre-course survey completers and small number of post-course survey completers may suggest non-response bias, which occurs when some of the participants fail to respond to survey and since the nature of the subject as learning model is completing voluntary, it is not clear how to correct this bias. The voluntary context of surveys is subjective to impulsive behavior. Testing the hypothesis of whether MOOC academic readiness and its factors determine whether learners complete the course is challenged by the abundance of nonresponses. While the course completions and demographics are similar across Coursera MOOCs and providers, only Duke's MOOCs were used. (3) Another significant limitation is the data used in this study is not representative of all MOOC populations. Research has indicated underrepresented groups are likely to enroll in MOOCs for their convenience, costs, and other factors but these groups have not fared

as well as their counterparts. Data in this study for these groups does not correlate to course completion results.

Chapter 3 Summary

The purpose of the chapter and this research is to describe the data collection process and analytic approach used to interpret the research question. The research question introduces the variable (academic readiness) to studies regarding course completions.

The data collected for this study has several limitations and is unique to a single institution. Coursera (Duke's MOOC provider) provides the course framework for many institutions. However, Duke's academic goals may differ from those institutions. As a result, the data collected may be exclusive to Duke. Missing data were not imputed in the analysis due to the high missing rate for most variables of interest (average missing rate between both the pre and post course surveys is 49%). This study included responses to 130 questions from both the pre and post-course surveys. After the cleaning dataset, 6,282 responses resulted. The ten variables were analyzed using Chi-Square tests to determine the significance between dependent variable and the independent variables. Logistic regression was chosen whereas this statistical method may provide the research to determine the results of academic readiness on learners who completes MOOCs while adjusting for other covariates. The data was cleaned in Excel. The data analysis was performed using SPSS. Logistic regression was chosen for this study because the probability of course completion is likely to be impacted by academic readiness and its factors.

This study will not provide conclusive results regarding course completions and MOOCs. It is intended to add to the course completion literature. Further research will be needed to clarify the preparedness of learners, course descriptors such as course level (beginner, intermediate, advanced), level of education affect success in MOOCs and what success means in a MOOC and what is a success a MOOC?

CHAPTER 4: RESULTS

The purpose of this study is to examine the influence of academic readiness on MOOC completion. The data used in this study is secondary data collected by Duke University to understand learner behavior in MOOCs.

This chapter discusses the pre- and post-course survey responses collected by Duke's Center for Instructional Technology (CIT) from participants who enrolled in MOOCs offered during the fall of 2014 and the spring of 2015.The pre-course survey consists of 592 possible answers to 28 pre-course questions. The post-course survey consists of 178 possible answers to 49 questions. Pre- and post-course surveys are located in Appendix A and B respectively. The only forced response question in both surveys is "*What is the email address associated with your Coursera student account?"*. This information was removed from the data received by this author.

The raw survey data included 65,427 responses. All variables with missing, bad, or decline to state elements were omitted. Due to the number of missing variables, some categories were combined. Age, highest level of school completed, and race were combined into smaller categories within these variables. With the corrections made, the population analyzed in the logistic regression is 6,282.

Central Research Question

Does academic readiness and its components influence the likelihood of course completion in MOOCs?

Global Null Hypothesis - There is no association between MOOC course completions and academic factors.

This research question and hypothesis guide the data analysis below. I begin with descriptive statistical analysis of the dependent variable, then the independent variables. This is followed by the statistical analysis of the dependent and independent variables. Table 3 is a frequency and percent of each variable. The cleaned data yielded a sample size of n=6,282. Table 4 is the Chi-square analysis. This table evaluates the association between the dependent variable (whether learners complete a MOOCs and the independent variables and p-values for each association). Table 5 is the logistic regression. This table indicates the odds ratio of learners completing a MOOC after controlling for all other covariates and the statistical significance of these odds.

Dependent Variable – Whether Learners Complete a MOOC

The dependent variable in this study is MOOC completion. MOOC completion in this study is signified by the attainment of a Statement of Accomplishment. This data is found in Post Survey Question 3. It is a multiple choice question. Participants could choose one of three options. They Earned a Statement of Accomplishment, they Did Not Earn a Statement of Accomplishment, or they could choose they Did Not Know. The 'I do not know" responses may have been a result of follow up questions post questions 4 and 5. Post question 4 asks, Did you sign up for Signature Track, the service where you email Coursera a photo of yourself and they verify your identity? Post question 5 asks, If Did you sign up for Signature Track, the service where you email Coursera a photo of yourself and they verify your identity? No Is Selected Why didn't you sign up for Signature Track? Distinguishing between the Statement of Accomplishment and Signature Track may have confused some participants.

Table 3

Frequency Counts and Percentages of All Variables (n=6,282)

Respondent Characteristics	No.	%
Completion of course		
Yes	3,524	56
No	2,758	44
Highest level of education		
< than college degree	2,282	36
Bachelor's degree	1,820	29
Professional education	2,180	35
Current student status		
Current student	1,889	30
Not a student	4,393	70
Previous course subject experience		
Significant/some	3554	57
Exploring/new	2727	43
Race		
White	4,239	67
Race other	1,104	18
Asian	939	14
Latino ethnicity	1,191	19
Latino		
Non-Latino	5,091	81
Gender		
Women	2,850	45
Men	3,432	55
Age[a] (yr)		
<30	2,521	40
30-40	1,414	23
41-80	2,347	37

Table 3 (continued)

Respondent Characteristics	No.	%
Online Experience		
Much/Some	5,057	80
New	1,225	20
Course type and rigor		
Non-STEM Introductory	324	5
STEM Introductory	1,272	20
STEM Intermediate	1,395	23
STEM Advanced	3,291	52

Note. [a] Mean ± SD of age is 35.99 ± 29.28 years.

Table 4

Chi Square Tests: Completion by Other Independent Variables: (row %) n=6,282

		Completed	Did Not Complete
Gender	Male	1959 (57%)	1473 (43%)
	Female	1567 (55%)	1283 (45%)
Previous course experience	Significant/some	1981 (56%)	1573 (44%)
	New/exploring	1612 (59%)	1115 (41%)
Race*	White	2408 (57%)	1831 (43%)
	Race Other	628 (56%)	476 44%)
	Asian	490 (52%)	449 (48%)
Latino	Non-Latino	3777 (74%)	1314 (26%)
	Latino	784 (66%)	407 (34%)
Age course	<30	1436 (57%)	1085 (43%)
	31-40	761 (54%)	653 (46%)
Student status	41-80	1331 (57%)	1016 (43%)
	Student	687 (36%)	1202 (64%)
	Not a student	1683 (38%)	2710 (62%)
Past online	Much/some	4132 (82%)	924 (18%)
	New	706 (58%)	519 (42%)
Education	Less education	1217 (53%)	1065 (47%)
	Bachelors	1009 (55%)	811 (45%)
Course type* & rigor	More education	1240 (57%)	940 (43%)
	Non-STEM	188 (58%)	136 (42%)
	STEM Into	589 (46%)	683 (54%)
	STEM Interm	741 (53%)	654 (47%)
	STEM Adv	2156 (66%)	1135 (34%)

Note. *p<0.05, **p<0.0001.

Table 5

Logistic Regression (N=6,282)

							95% C.I for EXP (B)	
		B	S.E	Wald	DF	Sig	Exp (B)	Lower	Upper
Age (years) [31-40 reference]				4.187	2	.123			
	<30	.132	.069	3.653	1	.071	1.135	.881	1.153
	41-80	.127	.070	3.270	1	.056	1.142	.921	1.199
Gender	Men	-.052	.280	.034	1	.853	.949	.893	1.093
Highest education [Bachelor's degree Reference]				.253	2	.881			
	Less education	-.019	.065	.089	1	.765	.981		
	Professional degree	-0.32	.064	.253	1	.615	.968		
Student Status	Not a student	-.062	.056	1.221	1	.269	.940	.865	1.075
Previous Experience	Some/much	-.038	.052	.540	1	.463	.962	.849	1.042
Race [White reference]				5.623	2	.060			
	Race other*	.003	.069	.002	1	.021	.845	.974	1.570
	Asian	-.169	.073	5.364	1	.964	1.003	.800	1.060
Latino Ethnicity	Latino	.081	.061	1.774	1	.183	1.085	.955	1.212
Online	Some/much	.021	.065	.108	1	.743	1.021	.896	1.153

Table 5 (continued)

							95% C.I for EXP (B)	
		B	S.E	Wald	DF	Sig	Exp (B)	Lower	Upper
Course type & rigor [STEM Introductory reference] **				69.512	3	.000			
	Non-STEM	.175	.126	1.917	1	.166	1.191	.719	.983
	Intermediate	-0.37	.067	.312	1	.577	.963	.841	1.128
	Advanced **	-508	.081	39.614	1	.000	1.662	.706	.903

Note. * 0.01 < p-value ≤0.05: moderately significant evidence of likelihood of completion being associated with given independent variable. ** 0 < p-value ≤0.001: highly significant evidence of likelihood of completion being associated with given independent variable; there is an effect of the variable on likelihood of completion.

Independent Variables

The independent variables used in this analysis are from the pre-course survey are: (1) Highest level of school completed was sectioned into less education – no school completed, some primary or elementary school completed, some high school but no degree, high school degree or equivalent, some college but no degree, technical associates degree, and academic associates degree; Bachelor's degree; and more education – master's, professional, and doctorate degree; (2) Current enrollment as a student in an educational program; (3) Previous experience with course subject area was broken into two groups – significant and some experience and exploring and new to the course; (4) Race/Ethnicity was divided into three sections, race other includes American Indians, Alaska Natives, Blacks, Native Hawiians, and Pacific Islanders; Asians includes East, South, and other Asian groups; and White; (5) Hispanic/Latino ethnicity; (6) Gender; (7) Age was categorized into three categories: less than 30, 31-40, and 41-80 years old because of ease of interpretation and comparison with the literature review which highlighted these age groups; (8) Past experience with online courses; (9) course type and course rigor which were obtained from the descriptor in the raw data called Course. The options for course type and course rigor were STEM or non-STEM and course rigor (i.e., introductory, intermediate, and advanced). The dependent variable, whether learners complete a MOOC, was found in the post-course survey. The variables, previous experience with course subject area; past experience with online courses; gender; race; highest level of school completed; current enrollment as a student in an educational program; and post-course survey question, did you earned a Statement of Achievement, were multiple choice questions. Age was the only user input option for the academic readiness factors used in this study.

Table 3 displays the frequency counts and percentages of each category of the nine variables where the population is (N=6,282). Within the sample analyzed, a higher percentage (56%) have completed the course compared to the completion rate of the data provided to this author (total population of 65,427 and 4,290 indicating the completed the course (7%).

Descriptive statistics for each independent variable is discussed below:

Course Type. There were two course types, non-STEM and STEM and three course rigors (introductory, intermediate, and advanced). The majority (95%) of learners took a STEM course and of those learners most took an advanced (64%) STEM course.

Prior Education and Experience. Most learners indicated they had a BS or professional degree, 29% and 35%, respectively. The majority of the respondents said they were currently not students (56%). Learners with much/some experience (56%) with the course subject compared those exploring/new of experience (44%) in the course subject.

Race/ Ethnicity. Race was combined into three groups. The groups were White; Asians; and race other. Race other includes Black, Native American, Alaska Natives, Pacific Islanders, and Native Hawaiians ethnic groups due the small number of responses in the survey data. Ethnicity data was separately collected: Latino/ Not Latino. After the data was cleaned of missing and inappropriate responses just under 6% underrepresented participants were in this sample. The majority of the learners (67%) were white; 18% were Latino; and 15% were Asian. Men were 56% of participants who took online courses compared to women who enrolled at a rate of 44%.

Age. Age was combined into three groups due the number of completed responses across all variables for each age group. Those less than 30, 31-40 and 41-80. Leaners less than age 12 were omitted and learners older than 80 were omitted due to the number of participants in those age ranges. The age category had many inappropriate responses. Learners less than 30 were the largest number of respondents (40%). Learners 41-80 were the next largest group (37%). Learners 31-40 were 23% of the population. According previous research, this group has been the group most likely to complete. The mean of age was 35.99, and the standard deviation was 29.28. The minimum age was 12 and the maximum age 80. Learners with much/some past online experience (80%) of population while leaners new to online experience were (20%) of the population.

Bivariate Analysis

Table 4 describes the relationship between the dependent variable (whether learners complete a MOOC) and the independent variables of academic readiness (race, Hispanic/Latino ethnicity, gender, education, previous course experience, past online experience, age, student status, and course rigor and type). This relationship was explored using Chi Square analysis. Observing results, the majority of the academic readiness factors – Latino ethnicity (X^2 =1.905, *df* =1, *p*=.168), gender (X^2 =.125, *df* =1, *p*=.939), education (X^2 =.301, *df* =2, *p*=.860), previous course experience (X^2 =3.743, *df* =1, *p*=.064), past online experience (X^2 =.022, *df* =1, *p*=.882), age (X^2 =4.323, *df* =2, *p*=.115), and student status (X^2 =.806, *df* =1, *p*=.369) are not statistically significant in whether learners complete a MOOC course. Race, course type and rigor were significantly associated with MOOC course completions. There was significant

difference in completion rate among the three racial groups (X^2 =7.013, *df* =2, *p*=.030). Race White and Race Other completions rates are higher than Race Asian. By course type, completion rate was found to be significantly different across different levels of course type and rigor (X^2 =74.638, *df* = 3, *p*=000). Students enrolled in Non-STEM and advanced STEM courses are more likely to complete their course than those enrolled in introductory and intermediate STEM courses.

Logistic Regression Analysis

Table 5 represents the results of logistic regression analysis. Binary logistic regression was used as the dependent variable has only two outcomes: completed or did not complete. The independent variables were categorical. The logistic regression analysis indicates that most of the indiependent variables were not signficant predictors for MOOC course completion after controlling for other factors. Overall, age, race, past online experience, previous course subject knowledge, currently a student or not a student, education level, and Hispanic or Latino ethnicities were not found to be statistically significant. The odds of course completion for advanced STEM learners was less than that for learners in introductory STEM courses after controlling for all other covariates (OR=1.662, p=.000). Non-STEM introductory courses were less likely to be completed than introductory STEM courses (OR=1.191, p=.166). The odds of completing MOOC courses for learners with much or some course experience is less than that for learners who are new to the course subject or just exploring the course, although this is not statistically significant (OR=.962, p=.463). Learners with much or some past online experience were more likely to complete the course than learners that were new to online learning, although this is not statistically significant (OR=1.021,

p=.743). The odds of completing a MOOC course for learners of Hispanic or Latino ethnicity is more than those of non-Hispanic or Latino ethnicity though not statistically significant (OR=1.085, p=.183). Race Other (which includes American Indians, Alaska Natives, Blacks, Native Hawaiian or other Pacific Islander) learners were more likely to complete MOOCs than Race White, albeit not statistically significant (OR=.845, p=.021). The odds of completing a MOOC course was higher for learners in age group 41-80 (OR=1.142, p=.056) and in less than 30 age category (OR=1.135, p=.071) than learners age 31-40, although these differences are not statistically significant. Odds of completing MOOC courses for learners with less education (OR=.981, p=.765) and the odds for learners with professional education (OR=.968, p=.615) were less than the odds for leaners with bachelor's degree. The differences were not statistically significant though. The odds of completing a MOOC course is less for learners not enrolled as a student than those enrolled as students, however this was not statistically significant (OR=.940, p=.269). This study's results suggest academic readiness factors are not significant in whether a learner completes a MOOC. However, course rigor and type are factors in course completions.

Chapter 4 Summary

The purpose of the analysis in this study was to determine if a relationship existed between the dependent variable (whether learners complete a MOOC) and the independent variables of academic readiness. As found through the present analysis, when participants do persist through the course to the post-course survey, they are more likely to complete the course. The small sample population used in this study limits fully answering the research question of whether academic readiness factors

influence learner completions in MOOCs. The results of this study showed course type and rigor, specifically non-STEM and advanced STEM courses, are statistically significant to course completions in MOOCs. Findings in previous studies suggest age, race, and education are factors in MOOC completions. Participants in this study, age less than 30 and older, were more likely to complete the course than participants age 31-40, although this category was not statistically significant. In the race category, White, Race Other which included (Blacks, Native American, Alaska Natives, Pacific Islanders, and Native Hawaiians) and all races of Asians completed less than six percentage points apart, Whites and Race Other were more likely to complete than Asians, though race was not significant. Like race, education completion among the categories of education were less than five percentage points. However, those with more education were more likely to complete MOOCs than those with a Bachelor's degree or those with less education and education was not statistically significant. Course type and rigor were statistically significant and participants enrolled in advanced STEM courses were more likely to complete than participants in introductory and intermediate courses. Learners in non-STEM courses were not statistically significant and less likely to complete their courses than learners in STEM courses. The analysis in this study indicate odds of completing MOOCs are higher for older, more educated, enrolled as a student, new to the course, some online experience, Latino ethnicity, Race Other, age 41-80, had less education, and taking an introductory MOOC. These study results indicate academic readiness are not factors in MOOC course completions.

CHAPTER 5: SUMMARY, CONCLUSIONS, and RECOMMENDATIONS

Background

MOOCs are fully online courses. Since their arrival, many of the issues that plagued higher education also plagued MOOCs. Completion and retention, assessment, and learner motivation were just a few of the issues registered with MOOCs. Unlike the high cost of a college education, MOOCs were initially free. A computer and Internet access were the only requirements for enrolling. MOOCs do share with higher education the quandary of learner readiness. It was also posited that the lack of a matriculation/admissions process and learner previous success with online courses or course subject knowledge may be barriers to learner completion. However, according to the results of this study, course rigor and type, not academic readiness factors, influence whether learners complete a MOOC.

The purpose of this study was to evaluate several academic factors and their influence on whether learners complete a MOOC. Those factors were age, education, gender, previous course experience, online experience, Latino ethnicity, student status, race, and course rigor and type. These academic factors were collected from pre- and post-course surveys from Duke's fall 2014 and spring 2015 MOOCs. This study used secondary data collected from Duke University's Center for Instructional Technology. CIT collected the data when learners enrolled or exited one of Duke's fall 2014 or spring 2015 MOOCs. Duke offered 26 MOOCs in the fall of 2014 and spring of 2015. The results of these MOOCs yielded 65,427 responses. Post question 3 asked participants *Did you earn a statement of accomplishment?* Of 65,427 possible responses, 9,181 (14%) participants responded. 4,290 (6.6%) respondents said yes. 3,372 (5%) said no,

and 1,519 (2%) said they did not know. In the regression analysis used in this study, responses such as ‘don’t know’ or decline to state’ were coded as SPSS system missing. The cleaned data yielded 6,282 observations for the dependent variable with 3,524 (56%) participants indicating they completed the course and 2,758 (44%) stating they did not.

When learners enrolled in a MOOC, they were offered a pre-course survey. The surveys were voluntary. Only one question in both surveys required an answer*:* * indicates a Required question: Q2_post * What is the email address associated with your Coursera student account? This allowed for participant responses in the pre-course survey to be mapped to the post-course survey. While overall MOOC completion rate in this study as in the research and popular literature is low (Parr, 2013; Harvard Gazatte, 2015; Online Course Report, 2016), course completion rates among those who completed the survey for this study were markedly higher once the data was cleaned (56%). MOOC course completers and survey completers may differ in objectives and values. Thus, MOOC course completions are likely to differ significantly from survey completions. Concerns regarding selection bias aside, findings seem to suggest that course rigor rather than academic readiness is a driver of completion rates among students motivated enough to complete both surveys. The following is a discussion of the implication of these results. MOOCs were thought to democratize education specifically in higher education. Most MOOCs, then and now, were Science, Technology, Engineering, and Math (STEM) MOOCs offered at elite universities that partnered with MOOC providers. MOOC courses attracted large numbers of

participants, mostly White, college educated men, although the majority of the participants did not complete these courses.

Science, Technology, Engineering, and Math (STEM) and Level of Academic Challenge

The majority of the MOOCs Duke offered during the fall of 2014 and spring of 2015 were STEM courses. Of the 25 courses, 21 were STEM MOOCs. Ten of the twenty-one STEM MOOCs were introductory and enrolled 20,551 (31%) learners. Three of the STEM MOOCs were intermediate and enrolled 5,719 (9%) learners. There were seven advanced STEM MOOCs with 29,412 (45%) enrolled learners. The remaining five courses were non-STEM with 10,379 (15%) participants The cleaned data resulted in 3,291 (52%) advanced STEM courses, 324 (5%) non-STEM courses, 1,272 (20%) introductory STEM courses, and 1,395 (22%) intermediate STEM courses.

It may be the case that course completions, STEM or non-STEM, may be directly related to the learner's motivation or academic goal. Learners in non-STEM MOOCs were less likely to complete than learners enrolled in STEM introductory MOOCs. Students in non-STEM MOOCs may be more likely to engage MOOCs for personal, intrinsic reasons and may, as such, be more likely to peruse the course for personal reasons rather than for work applications. This is purely speculative, but could be explored in future research. As there were no advanced non-STEM MOOCs, the level of academic challenge and non-STEM are factors that cannot be disentangled in

his study. Further research is needed to disentangle the influence of course rigor and the STEM/ non-STEM dichotomy on course completions.

Level of academic challenge seems a factor in course completions among STEM MOOCs. Advanced STEM MOOC learners' odds of completing were less than learners enrolled in introductory STEM MOOCs. Firmin et al. (2014) found online courses require something other than learner factors for successful course outcomes such as instructor interaction, online support, and course structure. This may be especially true of advanced STEM MOOCs. Learners that require academic assistance may find MOOCs challenging and not the right academic tool. The data provided to this author indicated underserved populations (Race Other) participated in advanced STEM MOOCs more than any other course type – 3,242/65,427 (5%) pre data cleaning and 1104/6,282 (18%) post data cleaning. The Data Analysis Course was offered in the fall and the spring. These two courses had the largest number of participants – 18,866 (28%). The cleaned data resulted in 1,734 (28%) participants. Data Analysis Course included the largest participation of underserved populations - 44 (3%). More underserved populations did not complete (28 – 64%) these courses than did complete (15 – 34%). One learner in this population did not know whether they completed the course (1 – 2%). MOOC syllabi may describe the course content as introductory, intermediate, or even advanced, however, the description of college introductory, intermediate, and advanced specifically in the STEM courses are typically developed by college level instructors and their vision of introductory, intermediate, and advanced may be very different from that of a non-college student. Learners with a specific

academic goal may persist without regard to their level of readiness. Further work could explore student support and completions within advanced STEM MOOCs.

Prior Experience in Online Education

In the survey data provided to this author, 2,420 (3.58%) respondents indicated they had taken many online courses; 3,820 (5.66%) had taken some; and 1,494 (2.21%) said this was their first online course. After the data was cleaned of missing or inaccurate responses, the dataset yielded 6,282 responses. 4,838 (77%) of those participants completed the course. 1,444 (23%) did not complete the course. Although, the majority of the participants had some past online experience, the logistic regression analysis in the study indicates past online experience is not a factor in whether learners complete a MOOC course. Thus, as part of the consideration of academic readiness, lack of prior online experience does not seem a barrier to MOOC completion.

MOOCs and Diversity

Diversity in MOOCs varies by course and institution. In this study, women were almost equally represented. In the overall survey, 27,913 (43%) participants responded they were men. 27,823 (43%) indicated they were women. After the data was cleaned, 3,432 (55%) men completed and 2,850 (45%) women completed. The demographic responses in this survey were small from some groups. American Indian or Alaska Native participants were 474 (0.7%) of the response population; Native Hawaiian or other Pacific Islander participants were 144 (0.2%) of the population; and the Black population was 2,624 (4%). These three groups were combined into one group – Race Other. Once the data was cleaned, 628 (56%) completed and 476 (44%) did not.

The survey listed three groups of Asians – East Asian (5,081 – 8%); South Asian (5,550 – 8%), and other Asian (2,749 – 4%). These three groups were combined into one group called Asians. Of the cleaned data, 490 (52%) Asian completed and 449 (48%) did not.

The number of participants who indicated they were of Latino ethnicity in the pre-course survey were (9,546 – 15%). After the data was cleaned, 5,091 (81%) participants indicated they were not Latino and 1,191 (19%) said they were. Of the cleaned Latino participants, 784 (66%) indicated they completed and 407 (34%) did not. Although completion rates were not great for any racial or ethnic group, the completion rates for Race Other, and Hispanic/Latinos were small comparatively.

The largest race group in the race category was White. In the survey data, 30,221 (46%) participants indicated they were white. The cleaned SPSS data resulted in 2,408 (57%) White participants indicating they completed and 1,831 (43%) did not. In previous studies, the race group White was most likely to complete MOOCs. In this study's analysis, race including White was not statistically significant. This study's analysis, suggests MOOCs do not offer an advantage or disadvantage to any racial group. A Harvard study found MOOCs are overrepresented by White men from English speaking countries and few studies analyze diverse populations to understand numbers beyond the obvious results (Nesterko, Dotsenko, Hu, Seaton, Reich, Chaung, & Ho, 2013). The majority of the MOOCs Duke offered in the fall and spring were STEM MOOCs. These courses had the largest participation across all races although underserved populations enrollments were small compared to other races. For example, the Introduction to Chemistry course enrolled 1,090 participants - 696 (64%) were

White, 170 (16%) were Asian, and 68 (6%) were Black, American Indian/Alaska Natives, and Native Hawaiian/Pacific Islanders. According to the National Center for Education Statistics (n.d.d) higher education enrollments for underserved populations in 2013 was16%. Compared to traditional education, based on the analysis and data in this study, MOOCs are not democratizing education. Rosenberg (2015) stated,

> For those who hope that MOOCs will spread higher education to underserved populations in the United States or around the world, it is thus fair to say, the promise is so far not being definitively met by the high-level HarvardX and MITx offerings—some of which deliberately aim for graduate-level students. Basic-skills and required entry-level courses still hold huge potential, but, not surprisingly, are not the focus of the Harvard and MIT professors deploying courses on the edX platform.

Underserved populations in this study were categorized as Race Other. In the data provided to this author, 474 participants indicated they were American Indian or Alaska native; 2,624 said they were Black, and 144 reported they were Native Hawiian or other Pacific Islander. After the data was cleaned, the total population of these groups was 1,104 with 628 completing the course. The dependent variable, whether learners complete a MOOC, was answered for each course, however, some completion responses did not include race. For example, the data analysis indicated 1,332 participants completed the course, but 286 of those completion responses did not indicate race. The converse of the data indicated race but not whether the course was completed. This behavior is throughout the data. The data provided to this author is replete with non-responses, inaccurate or incomplete responses. The inconsistency in

the data suggest further research is needed with complete demographic data (not only age and gender). Since 2005, the Babson Group has reported on online education. Their studies are thorough and include a breakdown of online participation including racial demographics of the students they describe in the study. This lack of demographic data does not paint a clear picture of who MOOCs are serving.

According to a Duke study, MOOCs are reaching underserved populations. “Contrary to claims that MOOCs are not fulfilling the promise of democratization of education, learners have benefited by gaining access to content and learning experiences they otherwise would not have had” (SSRI, 2015). Clearly, there are opponents and proponents on either side of this equation. It is clear, MOOC providers are not developing MOOC courses intentionally for underserved populations. However, this study’s analysis suggests half of all races who completed a post-course survey completed the course. The small population in this study may not reflect completion rates universally for all MOOC participants.

This study does add to the MOOC discussion by highlighting the proprietary nature of the data collected regarding learners enroll in MOOCs, and the lack of specificity between race and MOOC course completions that seem relevant for presenting a clear picture of who MOOCs serve and the outcomes of all who enroll. The scholarly and popular literature articulate one specific finding when discussing MOOC results - White men with a college degree complete. The literature on other ethnicities’ behavior is infrequent or non-existent. This study suggests all ethnicities enroll in MOOCs – 30,221 Whites; 13,380 Asians, 2624 Blacks, 474 American Indians/Alaska Natives, and 144 Native Hawiian/Pacific Islanders. However, White participation is at

least 2:1 to Asians; 11:1 to Blacks; 63:1 to American Indians/Alaska Natives; and more than 200:1 compared to Native Hawiians/Pacific Islanders. This study also illustrates that MOOCs' success is course specific. This finding may suggest learner characteristics described in previous research on MOOC completion.

The Potential Impact of MOOCs

The rising costs of a college education have pushed education out of reach for many. Adding to the costs are the subjective nature of the admission process that may leave some learners outside of the college doors. Enter MOOCs. MOOCs were thought to be a low-cost equitable model for all. Learners only needed a computer and Internet access. MOOCs do not require learners to provide information about their previous academic background. MOOCs do not require learners to answer any questions about themselves and how prepared they are to take the course. The MOOC data used in this study was collected through pre- and post-course surveys that learners answered voluntarily. Many of the questions in the surveys ask questions about the learner's readiness. One of those questions is the highest level of education. The question includes several levels of education: No education at all (60 – 0.09%); some primary or elementary school (240 - 4%); some high school but did not complete high school (1,356 – 2%); high school diploma or the equivalent (3,388 – 5%); some college but did not complete college (5,011 – 8%); a technical associate degree (1,054 – 2%) or an academic associates degree (1,505 – 2%); a bachelor's degree (18,835 – 29%); a master's degree (17,147 – 26%); a professional degree (2,795 – 4%), or a doctorate degree (4,003 – 6%). No education at all; some primary or elementary school; some high school but did not complete high school; high school diploma or the equivalent;

some college but did not complete college; a technical associate degree or an academic associates degree were combined to one variable called less education. Bachelor's degree is the reference group. Masters, professional, and doctorate were combined into one variable called more education. Once the data was cleaned, the majority of participants had less education 2,282 (36%) and 1217 or (53%) of that group completed. The number of participants with a bachelor's degree were 1,820 (29%) and 1009 or (55%) of those learners completed. There were 2,180 (35%) participants in the more education category and 1240 (57%) of those participants completed.

If MOOC learners with less education are performing as well as those with a college degree, MOOCs have the potential to educate a wide swath of society. However, to educate a broader band of society, MOOCs must adress course completions and course participants. Jordan (2015) reports MOOCs' median completion rates are 12.6%. This is an increase from the dismal 4% of 2012 and 2013 (Penn State, 2013). Underserved MOOC demographics are proprietary. How many underserved learners participate in and complete MOOCs is limited to the institution and the provider. This lack of demographic data narrows what is publically known about these populations. Means, Toyama, Murphy, Bakia, & Jones'Department of Education study (2010) found that online learners perform better than on-campus learners, blended learning has advantages, and size matters (smaller classes). The Means' et al. study data includes K-12, undergraduate, graduate, and other groups but it does not further segregate these populations by race, age, or gender. The lack of specific demographic analysis creates a vacuum or an incomplete picture of the total educable population and whether MOOCs are a viable option for democratizing education. Jaggars & Bailey

(2010) analysis of the Means' et al. study raised several concerns but none more proportionate than the consequences of fully online courses for underserved populations.

> The Department of Education report does not present evidence that fully online delivery produces superior learning outcomes for typical college courses, particularly among low-income and academically underprepared students. Indeed some evidence beyond the meta-analysis suggests that, without additional supports, online learning may even undercut progression among low-income and academically underprepared students (Jaggars & Bailey, 2010).

MOOC course participants are male, educated, and rich. "MOOCs are reaching educated and employed men and the wealthy and educated are the first to enroll" (Christensen & Alcorn, 2014). Glass, Baklan, & Saltarelli (2016) report the median age of MOOCs participants is less than 30, have more male participants (male to female ratios are 2:1), half of the participants are employed (17% are students), most come from affluent backgrounds, four our five have at least a college degree, the majority of participants live in the United States and Europe, participants are self-motivated; speak English; and have some familiarity with technology. These findings are similar to those found by this author. The cleaned results used in the analysis for this study found learners were men (55%), not a student (70%), educated (combined bachelor's and professional education (64%), majority were less than 30 years old (40%), and had some prior online experience (80%). Although these demographics were not statistically siginificant, they are important indicators of who takes a MOOC. Jaggars' (2014) community college study indicated most learners are older, employed, not underserved,

not low income; and are not academically unprepared for college. The result of the Jaggars' study highlights the complexity of who enrolls and who completes MOOCs.

Education's participation is changing. The National Association for College Admission Counseling (2016) projects in 2023 underserved populations will exceed the majority race for the first time in the history of education. Participation in online education is also changing. Straumsheim (2014c) found most students at underrepresented institutions completed some of their education online. Several studies describe an increased preference for online education especially among women and younger students. Studies report 75% of online learners turn to online education to expand their future; learners select the least expensive institution that is geographically close andonline versus on-campus; learners are more female than male; undergraduate age was 32 and graduate age was 35 with younger students online enrollment growing and the majority of the learners were of White and Black ethnicity (Clinefelter & Aslanian, 2015; National Center for Education Statistics, 2012). Several studies suggest diverse participation in MOOCs. However, there is limited information describing the full impact of this learning model on diverse populations. The inconsistency in the data provided to this author, suggests further research is needed to fully understand the populations who enroll in MOOCs and whether this model serves those populations.

MOOCs have raised other concerns such as development costs; faculty concerns, and, course design. The costs to develop a MOOC varies across providers, institutions, and course.

Udacity budgets $200,000 for each course it makes. EdX gives its partners the option of producing a MOOC on their own and then submitting the finished

> product to EdX, or else paying for EdX's design and consulting services at a rate of $250,000 per course plus another $50,000 each time the course is re-run. Coursera's costs are less public, though its partner schools have spent tens of thousands of dollars on their own course development. The University of Pennsylvania spent about $50,000 per course, while the University of Edinburgh dropped approximately $45,000 on each of its six courses (Peterson, 2013).

Some institutions have used MOOCs to increase their academic reach, promote their academic mission, and to subsidize budget shortfalls. As institutions consider these methods, the quandary of on-campus versus online has to be considered. If online education is as good as traditional education, what does this duality on education mean? If the costs for online education is less than on-campus, why would a learner choose on-campus? The answer for some institutions has been to promoted online education for some and on-campus for others. "These institutions are concerned that they will devalue their traditional, residential education if they move to instruction online" (Bacow, Bowen, Gutherie, Lack, & Long, 2012). As the delicate balance of on-campus and online education evolves, "few institutions are using either the savings from online education or the net incremental revenue to reduce the price of education to students" (Bacow, Bowen, Gutherie, Lack, & Long, 2012). The juxtaposition of online education to on-campus education has increased the complexity of the academic equation and have some pondering the costs and justifications for MOOCs if these courses are not reducing costs and reaching certain populations (Online Learning Insights, 2014; Hollands & Tirthali, 2014b; Jackson, 2013).

Since the arrival of MOOCs, some faculty have expressed concern and been reluctant to embrace this model of learning. Many have wondered out loud whether the model serves learners most in need (Straumsheim, 2014c; Weingarten, 2014). It is unclear if fully online education is a disrupting force in higher education, however, faculty may have a different view. The majority of faculty members also strongly disagree or disagree that online courses can achieve the same outcomes as in-person courses in their department or discipline and in the courses they teach (Jaschik & Lederman, 2016). Faculty have asserted several issues with online education. Online education reduces faculty/student interaction, this reduction may result in a diminshed need for faculty, and the instructor time requirement to create a MOOC is significant (Bacow, et al., 2012; Weingarten, 2014; Glass, 2014). Others believe MOOCs are used to save money and shift staff. “Those cost savings would presumably come by replacing well-paid tenured or tenure-track sociologists, with lesser-paid adjuncts. Breaking a course down so that it can be delivered more efficiently, existing professors could easily become glorified TAs, teaching other people’s content” (Rees, para. 6, 2016). Faculty concerns may illuminate the cost versus benefit discussions around MOOCs. Are they worth the academic costs and efforts if only a select few benefit? How is this mode of learning different than highly selective processes of elite institutions? What does re-creating on-campus education in an online format mean for on-campus education? Faculty apprehensions regarding online education amplify these concerns, questioning the quality of online education and student engagement. Fully online education may serve some populations such as those who need less faculty and institutional support

but for those who need academic support, this model of learning may remain an option for a very select group of learners (Jaschik & Lederman, 2016).

In an effort to address some of the issues MOOCs have raised, MOOCs providers have begun to re-tool or reformat MOOCs. Flipped classroom, on-demand courses, and smaller courses have come of age. Some instructors flip their on-campus classroom (students watch the recorded lecture prior to class, may take the quiz online, participate in online discussions) and then classroom time is dedicated to interactive learning forms (Cobb & Steele, 2014). In 2015, Udacity and Coursera offered to its partners on-demand courses. On-demand addresses two issues raised with MOOCs. On-demand increases accessibility. A learner can now take a MOOC course when convenient fversus waiting for the course to become available. On-demand also reduces the completion rate dilemma. The on-demand format may mitigate MOOC course completion concerns now that learners who are interested in only some portion of the course can participate with the course according to their goals and pace (Zhao, 2015). Other MOOC experimentations include smaller and participant specific MOOCs, sometimes called microlearning. Small private online courses (SPOCs) have limited participation numbers and are selective. Participatory open online courses (POOCs) are similar to SPOCs except participation is required, and Little Open Online Courses (LOOCs) are very small and can provide credit (Pilli & Admiraal, 2016). In addition to modifying MOOCs formats, providers and institutions are moving to further monetize the learning model. The three dominant MOOC players now have developed types of learning (Coursera - specializations. Udacity - Nanodegrees, and EdX - xSeries to support the move to monetize courses (Shah, 2016). These changes to the MOOC

model will have some obvious benefits. Learners who pay for MOOCs will have an incentive to complete the course and as paying customers, MOOC learners will likely provide data on course design and for some learners these modifications will enhance their careers (Friedman, 2016). With little demographic data, it is unclear what these changes will mean for underserved populations. The model of paying for online education exists in for-profit institutions and to date, the outcome has been questionable. Some of those questions are whether learners complete their academic goals; are able to use that education in their career, and can afford to to repay their student loans. In the Senate Committee on Health, Education, Labor, and Pensions 2012 report on for-profit institutions, it was reported, “First of all, we all need to understand there’s a radical difference in educating and graduating a low-income first-generation student than there is a middle-income student” (Harkin, 2012). The educational needs of underserved populations may not be met by the reformatting of MOOCs but rather by understanding the needs of those who enroll regardless of race or gender. The MOOC providers goals are different from those of the institution. The divergent missions may leave some learners without an academic solution. The results of this study indicate, underserved populations may participate in MOOCs but their outcomes are different than other races.

Clayton Christensen dsecribed disruptive innovation as anything that reshapes an industry. Many thought MOOCs were such a disruptive innovation. Whereas MOOCs have shifted the digital conversation in the academy, they have not fully reshaped postsecondary education. The improvements MOOC have contributed to higher education are seen in the lessons learned from MOOC instructors and institutions.

Instructors are dividing their in-class lectures into short segments, giving frequent assessments, and providing more opportunities for problem-solving activities that have proven effective in improving student performance (Haynie, 2014b). Other on-campus improvements include blended learning models, increased innovation, and opportunities to meet learners where they are (Manturuk & Ruiz-Esparza, 2015). Although improvements are seen as a result of MOOCs on-campus and online, MOOCs have duplicated some of issues that have plagued higher education. To date MOOCs are most successful for those who need the fully online model the least. Historically Black Colleges and Universities (HBCUs) have not adopted MOOCs at the same pace as traditional institutions. There may many reasons why HBCUs have not embraced MOOCs including faculty demand, MOOC course development costs, technology competency, and student outcomes in fully online learning (Jackson, 2012; Schexnider, 2013). Stitch & Reeves' study (2015) found underrepresented groups are underrepresented in MOOCs, as most learners are educated, and may have more than a bachelor degree. MOOCs as a free fully online education model seems an ideal solution for those academically disadvantaged or unable to participate in the traditional academic process. The analysis of this study suggest academic factors such as previous online and subject experience, race, and age are not factors for MOOC course completions. However, there are other factors that were not considered in this study as well as the small size of this study that may impact the course outcomes for some learners.

The Challenge of Course Completions

In the raw survey data, 4,290 (47%) participants indicated they received a statement of accomplishment and 3,372 (37%) said they did not. The cleaned data sample yielded 3,524 (56%) completed and 2,758 (44%) did not. Though past online experience, race, gender, previous course experience, student status, and age are not statistically significant to course completions, the odds of completing MOOCs are higher for these variables. Studies have found course completions by race and gender are higher for White men. In the analysis for this study of the 4,239 (67%) White participants, 2,408 (57% - 2408/4239)) of that population completed. For Race Other which includes Blacks, Alaska Natives/Native Americans, 1,104 (18%) participated and 628 (57%) completed. The Asian population for this study resulted in 939 (14%) participants and 490 (52%) completed. While the completion numbers for all races were above 50%, the overall participation was modest. When analyzing the raw numbers, the completion rates stand out for race. Across all course types (STEM and non-STEM), Race Asian and Race Other participants combined were one fourth of the completion rates of White participants. This finding is in keeping with other research.

Academic Readiness

Academic readiness variables were defined in this study from questions from the pre- and post course surveys. The post-course survey consisted of 49 questions. The pre-course survey consisted of 28 questions. Most of the questions in both surveys could have been considered academic readiness variables. However, some questions were redundant, and others were assessing the course design by readiness. Academic readiness has been defined as learners who enter college without the need for remedial

education (National Center for Public Policy and Higher Education, 2010; Rice, 2015). In the present study, 36% of learners had less education, meaning their level of education was less than a baccalaureate degree. And yet, among this group of learners, completion rates were 53%, not substantially different from learners with baccalaureate degrees (55%) and advanced education/degrees (57%). In addition, regarding previous experience with online education, individuals without prior experience completed at a rate of 59% as compared to those with prior experience who completed at 56%. No statistical significance was found by either of these factors. Some studies suggest learner readiness may not be significant to course outcomes in MOOCs (Hone & Said, 2016; Engle, Mankoff, & Carbrey, 2015). The analysis of this present study seems to support that position.

This study indicates course rigor and type are significant to course completions, specifically for STEM MOOCs. Many MOOCs are STEM MOOCs and of those MOOCs, technology courses are the most prevalent (Rosenberg, 2015). Duke's fall 2014 and spring 2015 features more Science than technology MOOCs. However, the two Data Analysis MOOCs enrolled the largest share of participants compared to all other courses offered during this period (18,866 – 29%). Advanced STEM MOOCs combined enrolled 44% (28,778) of all participants. After the data was cleaned 5,958 – 95% were enrolled in a STEM MOOC. Of those participating in a STEM MOOC 3,291 – 55% enrolled in an advanced STEM MOOC and 2,156 – 66% completed the MOOC. Other research indicates STEM MOOCs are completed not based on any academic factors but rather on participant course behaviors. One study found STEM participants who registered early were less likely to complete, participants with a non EDU email address

were less likely to complete, and whether the participant took a pre-course survey (Evans, Baker, & Dee, 2016). Other research suggests completion rates are higher in STEM courses for select populations. “MOOC access and completion were larger for adolescents and young adults, the traditional ages where people find on-ramps into science, technology, engineering, and mathematics (STEM) coursework and careers” (Hansen & Reich, 2015). To better understand MOOCs outcomes for all learners, assessing learner motivation and the relationships among learner motivation, course rigor, and the STEM/ non-STEM dichotomy should be explored in future work.

Learner Age and Experience

Several studies have found those who complete MOOCs are in the age category 31-40 and have a college degree. This study’s results indicate age is not statistically significant in whether a learner completes a MOOC. Participants in the age category 31-40 were less likely to complete a MOOC course than those in the age category 41-80 or less than 30 years old. Although those with an EDU address are more likely to complete, one study found the median age of a MOOC completer does not work, is older than a traditional student, and had less education (Morris, Hotchkiss, & Swinnerton, 2015). Learners not actively engaged in academic course work and not employed are likely to have the time and interest that allow them to persist in MOOC courses specifically if they are comfortable with technology.

In the present study, previous course knowledge, past online experience, and student status were not significant factors in course completion. The odds of learners with past online experience completing were more likely than those without past online experience. For learners with significant or some previous course knowledge, the odds

of completing were less than those exploring or new to the course topic. In this vein, it may be the case that some learners are interested in lifelong learning while others may have an interest in advancing or changing careers and see online education as an option. This proposition could be explored in future studies. Overall, however, the analysis in this study indicates age and experience with the course or online education are not statistically significant in influencing course completion.

Implications of the Study

The analysis in this study produced similar findings to other MOOC research. As the number of MOOCs have increased, the data in one study may suggest MOOCs are meeting the needs of all populations. While another study may find MOOCs serve only a select population. The first implication of this study emphasizes the need for further research. The proprietary nature of MOOCs has resulted in mixed theories and outcomes. The second implication of this study is the complexity of whether on-campus or online education is effective. Numerous studies have contrasted on-campus versus online with mixed results. Another implication is related to completion rates. Completion rates have been the central concern with MOOCs since their arrival on campus. The consistent completion rate findings in MOOCs are that course type matters and possibly advanced courses. As the literature suggests some learners do not intend to complete the course but are window shopping the course. Articulating course prerequisite knowledge, may reduce the window shopping effect.

This study highlights issues for MOOC researchers not associated with MOOC providers or MOOC offering institutions. MOOC data is proprietary. MOOC providers and institutions tightly control the data that is released regarding their MOOCs, including

the behaviors of those in MOOCs and the participants who enroll in these courses. Those internal to the organizations publish articles or grant interviews. However, raw user data at the institution or provider level is locked behind institutional review boards or corporate legal teams with pages of confidentiality agreements that protect and prevent the data from being shared with anyone outside of the institution or corporation. This author was granted access to this data used in this survey through Duke IRB approval and even with that approval, the author did not have access to all of the courses during the fall of 2014 and spring of 2015. These safeguards construct the view of how MOOCs are perceived in the public domain. If MOOCs are going to persist in higher education, further research is needed from those within academia and those outside of academia.

Several research studies have suggested there is very little difference between learning in a classroom and learning online. For many learners this may be valid. However, for some populations online learning may present challenges. While completion rates overall were low, the small completion numbers for minority groups may represent concerns in fully online courses for some populations. However, differences in completion rates by race/ethnicity were not found in this study. This maybe a result of the inaccuracies in the data provided to this author and further biases as a result of removing those inaccuracies. Jaggars (2011) suggests underserved populations perform better in face-to-face courses and that online courses harm instead of help these students. Further research with an emphasis on underserved learner demographics and the effects of learning in fully online courses is needed before suggesting this population is directed to this learning model.

The analysis in this study found non-STEM, introductory, and advanced STEM courses were statistically significant. MOOC course descriptors may serve as a source of the completion rate conundrum. The course syllabus on the course page describes the audience for the course. For example, Duke's MOOC Introduction to Chemistry: Reactions and Ratios web page lists the following: *About this course: This is an introductory course for students with limited background in chemistry; basic concepts involved in chemical reactions, stoichiometry, the periodic table, periodic trends, nomenclature, and chemical problem solving will be emphasized with the goal of preparing students for further study in chemistry as needed for many science, health, and policy professions*. The course does indicate it is an introductory course for those with a science background. The course does not prohibit those without this background from enrolling. In the week one syllabus, the course says: *This course is intended for students with very little background in the subject, but a strong foundation in algebra is needed to solve some of the problems*. If course completions are important to academic institutions and MOOC providers, the course should include granular descriptors and prerequisites at the time of enrollment. As MOOC providers push to enroll learners, there must be a correlative partnership with the learner as well as the academic institution. The provider should include plausible expectations and the learner should be prepared to learn in the course as it is offered. When a learner views the course and it is described as introductory, the instructor, the institution, and the provider should emphasize what introductory means in a fully online course. The learner will know what is expected in order to complete the course. If the prerequisites are defined, then the

characterizations of learners may then be valid because the learner will be aware of the requirements of the course as college courses require.

Recommendations for Higher Education and MOOC Providers

MOOCs should include an admission or registration process for anyone interested in enrolling. Learners who register for an intermediate or advanced course should be routed to a website that tests academic readiness for the selected course. If completions are a goal for MOOCs, then MOOCs should include an assessment tool before enrolling a learner. The assessment tool should determine the learner's goals. When the learner leaves the course, the MOOC provider, and the institution would be notified (this notification would include some detailed tracking information about the user so when the user re-entered the institution or the provider's site, his or her credentials would pick up where he or she left off and ask if the user wishes to complete the MOOC they drop. If they decline, a pop-up would ask occasionally if they want to complete this MOOC). The assessment tool should also inquire about the learner's academic background. The tool should also assess prior online experience. If the learner does not have access to a computer and the Internet at home or has to use a public space to do the course work, this should be noted. If the learner indicates he or she was not going to complete the course, he or she would be directed to a model of the course that can be completed in stages so he or she can return to the course until the learner can complete the course. A cookie could track the learner's activities, how much they paid, and their progress with the institution and the provider. If this model is onerous for the institution and provider, fees could be added for each re-entry. If the learner does not have the appropriate academic skill for the course, he or she would be directed to another MOOC

course that matches his or her skill set. The new course would be considered as a prerequisite for the advanced course. It would remind the learner once they completed the new course to enroll in the original course. If the assumption is all who enroll in MOOCs are academically fit, then completions may be associated with some other factor.

Recommendations for Higher Education

Moreover, most colleges have attendance policies that allow learners to miss classes when life happens. Institutions and instructors may have different rules for the number of missed classes before a penalty is applied however both have penalties if the criteria for the number of missed classes is reached. Unlike elementary education where state and federal laws mandate student attendance policies, post-secondary education attendance policies are not legal policies but rather school policies. The implications of missing college classes are several. The learner could be dropped, failed, or withdrawn from the class or the program. The learner could also lose the financing for their education, but there are no legal ramifications for failure to attend. MOOCs are not designed to allow learners to miss time in the course and re-engage at a later interval. Most academic institutions have services in places that assist learners as they move their academic career. MOOCs do not.

Possibly MOOCs could allow learners to ‘pause’ the course for a period of time for valid excuse. Learners would ask their instructors for permissions to miss time in the MOOC for a legitimate cause. With on-demand (not on a fixed time or schedule) students may have less access to the instructor, so if the instructor agrees to pausing

the course for the student, this may require more self-sufficiency on the part of the learner.

MOOCs were thought to democratize education. This study and others have demonstrated MOOCs are not bringing education to the masses. For learners unprepared for the needed discipline of MOOCs, these courses, though convenient, do not provide learning for all. The segments of the populations where the digital divide creates access barriers, fully online courses introduce additional challenges. These challenges cross borders, cities, states, oceans, and economic populations. Learners in rural areas may find the bandwidth or lack of the Internet an impediment. Other rural learners may face the scarcity of technology. Democratizing education should not be education for those least in need for the sake of profits. Numerous institutions and organizations have already laid stake to the domain.

Recommendations for Future Research

MOOC course instructors and providers should design MOOCs for the population types that may enroll. Many studies have described the types of learners who enroll. These learner types impact completion rates. With several research studies indicating MOOC completion rates are highest for a specific population (White, highly educated, and certain age groups), finding methods to increase completion rates for other groups should be a priority if MOOCs intend to democratizing education or increasing the academic opportunities to those less able to participate in traditional models of education.

As institutions and MOOC providers search for methods to improve issues in this learning model, further research is needed to understand MOOC populations,

learner goals, and MOOCs place in the academic mission. The proprietary nature of MOOCs presents challenges for the larger research community. MOOC demographic data is not readily available to researchers, and thus data regarding some populations and their behavior in MOOCs are not easily assessed.

Data mining is needed to fully understand the characteristics of MOOC participants. The dataset should include demographic data for each participant, participant motivations and goals, as well as information about the courses. For this study, each question in this study had inappropriate and missing data. This data used in this study was secondary. It is unknown to this author how the data may have been changed or what was omitted from the dataset. Given the evolution of MOOCs, the meta-analysis should consider trends in the learning model, learner types, completion rates by race, age, education, gender, and course type and rigor.

The increased interest in distance education in the academy and the larger society has implications for several factors. In this study, some variables were combined due to the small number of complete responses to these variables. The small numbers resulted in combining variables. Age was combined into three variables, less than 30, 30-40, and 41-80. Race Other combined three groups: Native American and Alaska Natives, Blacks, and Native Hawaiians and other Pacific Islanders. And education was combined into three groups, less education, Bachelors, and more education. Future research should analyze these variables individually to reflect the demographic changes in distance education. The analysis should also consider the learner's previous academic experience in the context of fully online courses and the course subject.

Limitations of the Research

This study does add to the MOOC scholarly literature specifically providing some statistical demographic observations. The data the author used in this study is secondary and is from one institution. As a result, it may not represent populations or behaviors in all MOOCs. A Census Bureau Study found voluntary surveys reduce the number of self-response rates significantly and affect the accuracy of the survey. The survey data available in this study would suggest similar findings. Thus, the findings of this study should be used cautiously. Although many variables had large numbers of responses, most had a significant amount of missing or inaccurate data. Thus, the number of observations may be insufficient to answer the research question. The number of responses consistent across all variables was 6,282 or 9.3%. With only 6,282 observations to fit a model, many combinations may not be represented. It was possible to estimate academic readiness for some factors. However, inferences for other factor combinations based on the available data was not feasible.

The primary limitation of this study is the proprietary disposition of MOOC data. The institutions and providers do not make the participant data available to those outside of their organizations. The secondary data used in this study was granted to this author by permission through Duke's Vice Provost Office;, Institutional Review Board, and the Center for Instructional Technology. The data was scrubbed of any personal data before given to this author. Permission was sought from all participating instructors before providing access to this author and some instructors declined to provide this author access to their course characteristics. Therefore, their course was omitted from the study.

The data used in this study was during the window of the fall of 2014 and the spring of 2015. This window produced 65,427 responses from 26 courses. To capture the full picture of completions in the context of learner demographics and behavior, a longitudinal study encompassing multiple course types and rigors may provide detailed answers to the perplexing issue of completions in MOOCs.

Conclusion

One of the initial goals of MOOCs was to democratize education. However, to democratize education, understanding the entire population and their needs would seem an important consideration. MOOCs in their infancy faced low completion rates comparative to the large number who enrolled. Today, MOOC institutions, new providers, and old providers have re-thought the MOOC product and come up with several variants of MOOCs including for-fee courses, on-demand courses, smaller courses, and courses for specific populations. These modifications may save MOOCs. However, these changes may not help MOOCs democratize education but rather further isolate those most in need of a flexible and affordable option to the rising cost of an on-campus degree.

MOOCs are a fully online learning model with many of the same facets as traditional on-campus models with one clear exception. In most on-campus model, learners are required to apply for admittance, and there is some level of assessment. Learners must provide records of their academic career. Most non-selective and selective institutions require a litmus for admission. The admission process provides some level of knowledge of whether the learner is academically ready for coursework. If the learner is not, some intervention is made or the learner may be denied admittance.

MOOCs simply require the learner to have a computer and the Internet. The academic readiness of the learner is not a factor to enrollment. The results of this study suggest academic readiness is not significant to MOOC course completions, however, these results for this study may suggest the learners in this study who completed were motivated to complete. Research suggest 60% of learners entering college are unprepared for post-secondary rigor. If learners are not ready for college, are they MOOC ready? MOOCs are not ancillary to high school courses. They are college-level courses developed and lead by college-level instructors. The content these instructors develop is likely equal to his or her college courses and their academic knowledge. Those who enroll in a MOOC should be aware this as they consider these courses.

In higher education, completion and retention rates are complex principles. Many studies and resources are used to improve completion and retention rates, however, understanding what makes a learner leave a course or school may never be completely understood. MOOCs have little commitment to remain in the course other than the learner's interest or motivation. Several studies have indicated MOOCs are successful for those who are motivated, have a college degree, and are prepared for learning in this model. For learners without the cognitive skills and intrinsic motivation, MOOCs may be a challenge. With the lower costs and increased interest, learners unprepared for this learning model may gravitate to these courses only to find further academic challenges.

The purpose of this study was to determine whether academic readiness factors (independent variables) such as age, college education, course rigor and type, experience with online courses and course subject knowledge, gender, race statistically

impacted whether learners completes a MOOC (dependent variable). The analysis in this study does not confirm what other studies have found. This study analysis indicates course rigor is statistically significant for learners to complete a MOOC. MOOCs have highlighted a need in education for increased opportunities for underserved populations, reducing the cost of an education, and diversifying how students learn. However, MOOC providers and institutions have not addressed these issues as many hoped. As a result of concerns with the fully online model, the focus on completion rates has diminished as these courses have been reframed to new models of MOOCs such as SPOCs, costs for course participation, and on-demand formats. These changes have led to less democratization of education and are duplicating the highly selective academic model leaving the very population MOOCs intended to serve left out of the advantages MOOCs could offer. MOOCs may serve a purpose in higher education, however, that purpose may not be the democratization of education.

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APPENDIX A: PRE-COURSE SURVEY

* **Pre-Course Survey**

Coursera XX.XX Universal Core Pre-Effective Fall 2014

Getting to know you - <Course Name> <Term> Your participation in this survey is voluntary. The information collected will be kept strictly confidential and will not be printed or published in any form that would identify any individual. Your responses will have no bearing on your grade in any Coursera courses you may be enrolled in, present or future. Information from this survey may be connected to other data collected during the course, such as participation data or performance data, to better understand and evaluate Coursera courses offered by Duke faculty. If you have questions about the survey, or about your rights as a participant in this survey, please contact Duke's Center for Instructional Technology at cit@duke.edu

* indicates a required question

Q2_pre * What is the email address associated with your Coursera student account?

Q3_pre Why did you enroll in this course? (Please rate on a scale of very unimportant to very important)

	Very unimportant (1)	Somewhat Unimportant (2)	Neither important nor unimportant (3)	Somewhat Important (4)	Very Important (5)
This subject is relevant to my academic field of study (1)	❍	❍	❍	❍	❍
This class teaches skills that will help my job/career (2)	❍	❍	❍	❍	❍
I want to earn some sort of credential that I can use to enhance my CV / resume (3)	❍	❍	❍	❍	❍
Because this course is offered by a prestigious university (4)	❍	❍	❍	❍	❍
I think taking this course will be fun and enjoyable (5)	❍	❍	❍	❍	❍
I'm curious about what it's like to take an online course (6)	❍	❍	❍	❍	❍
I am taking this course in conjunction with another learning experience (7)	❍	❍	❍	❍	❍
I am taking this class because the content is not available elsewhere (8)	❍	❍	❍	❍	❍

Q4_pre What best describes your previous experience in this course's subject area?
❍ I have a degree in this field or significant work experience (1)
❍ I have completed some coursework or have some work experience in this field (2)
❍ I like to learn about this subject on my own (3)
❍ I am mostly new to the subject (4)

Q5_pre On a scale from 1 to 10, please rate how much you know right now about the topic of this course, where 1 means you don't know anything yet and 10 means you are an expert
_____ Current knowledge of course topic (1)

Q6_pre Which of the following best describes your affiliation to Duke, if any (select all that apply)?
❑ None (1)
❑ Currently enrolled student in regular credit-bearing Duke course(s) (2)
❑ Alumni (3)
❑ Part of Duke community (parent, staff, faculty, librarian, etc.) (4)

Q7_pre Which of the following course activities do you plan to complete/participate in?
❑ Watch videos (1)
❑ Participate in discussion forums (3)
❑ Take the quizzes (5)
❑ Take the tests (6)
❑ Earn a certificate (4)

Q8_pre What is the primary medium you plan to use to access the course/watch the videos
❍ desktop/laptop computer (1)
❍ tablet (e.g., iPad) (2)
❍ small mobile device (e.g., phone, iPod Touch) (3)
❍ Other (4) _____

Q9_pre Where do you most often access the Internet?
❍ At home (1)
❍ At school (2)
❍ At a business (3)
❍ In a public place such as a government building (4)
❍ At work (5)

Q10_pre How reliable is your access to the Internet and a computer or other device for accessing the course?

	Often unreliable (1)	Sometimes unreliable (2)	Occasionally unreliable (3)	Never unreliable (4)
Internet access (1)	❍	❍	❍	❍
Access to a computer or other device (2)	❍	❍	❍	❍

Q11_pre Please tell us about your past experience with online courses.
- ❍ I have taken many online courses before (1)
- ❍ I have taken a few online courses before (2)
- ❍ This is my first online course (3)

Q12_pre In what type of area do you live?
- ❍ A large city (1)
- ❍ A suburban area (2)
- ❍ A small city or town (3)
- ❍ A rural area (4)

Q13_pre How many hours per week will you be spending on this course?
_____ Number of hours (1)

Q14_pre Is English your first language?
- ❍ Yes (1)
- ❍ No (2)

Answer If Is English your first language? No Is Selected
Q15_pre Please indicate your level of proficiency with the English language
- ❍ Fluent (1)
- ❍ Proficient (2)
- ❍ Intermediate (3)
- ❍ Beginner (4)

Q16_pre What language subtitles would you like to see in the course videos?

Q17_pre What is your gender?

- ❍ Male (1)
- ❍ Female (2)
- ❍ Other (3)

Q18_pre In which country were you born?

- ❍ Afghanistan (1)
- ❍ Aland Islands (2)
- ❍ Albania (3)
- ❍ Algeria (4)
- ❍ American Samoa (5)
- ❍ Andorra (6)
- ❍ Angola (7)
- ❍ Anguilla (8)
- ❍ Antarctica (9)
- ❍ Antigua and Barbuda (10)
- ❍ Argentina (11)
- ❍ Armenia (12)
- ❍ Australia (13)
- ❍ Austria (14)
- ❍ Azerbaijan (15)
- ❍ Bahamas, The (16)
- ❍ Bahrain (17)
- ❍ Bangladesh (18)
- ❍ Barbados (19)
- ❍ Belarus (20)
- ❍ Belgium (21)
- ❍ Belize (22)
- ❍ Benin (23)
- ❍ Bermuda (24)
- ❍ Bhutan (25)
- ❍ Bolivia (26)
- ❍ Bonaire, St Eustatius and Saba (27)
- ❍ Bosnia and Herzegovina (28)
- ❍ Botswana (29)
- ❍ Brazil (30)
- ❍ Brunei Darussalam (31)
- ❍ Bulgaria (32)
- ❍ Burkina Faso (33)
- ❍ Burundi (34)
- ❍ Cambodia (35)
- ❍ Cameroon (36)

- Canada (37)
- Cape Verde (38)
- Cayman Islands (39)
- Central African Republic (40)
- Chad (41)
- Chile (42)
- China (43)
- Colombia (44)
- Comoros (45)
- Congo, Dem. Rep. (46)
- Congo, Rep. (47)
- Costa Rica (48)
- Cote d'Ivoire (49)
- Croatia (50)
- Cuba (51)
- Curacao (52)
- Cyprus (53)
- Czech Republic (54)
- Denmark (55)
- Djibouti (218)
- Dominica (56)
- Dominican Republic (57)
- Ecuador (58)
- Egypt, Arab Rep. (59)
- El Salvador (60)
- Eritrea (61)
- Estonia (62)
- Ethiopia (63)
- Faeroe Islands (64)
- Fiji (65)
- Finland (66)
- France (67)
- French Polynesia (68)
- Gabon (69)
- Gambia, The (70)
- Georgia (71)
- Germany (72)
- Ghana (73)
- Gibraltar (74)
- Greece (75)

- Greenland (76)
- Grenada (77)
- Guam (78)
- Guatemala (79)
- Guinea (80)
- Guyana (81)
- Haiti (82)
- Honduras (83)
- Hong Kong SAR, China (84)
- Hungary (85)
- Iceland (86)
- India (87)
- Indonesia (88)
- Iran, Islamic Rep. (89)
- Iraq (90)
- Ireland (91)
- Israel (92)
- Italy (93)
- Jamaica (94)
- Japan (95)
- Jordan (96)
- Kazakhstan (97)
- Kenya (98)
- Kiribati (99)
- Korea, Dem. Rep. (100)
- Korea, Rep. (101)
- Kosovo (102)
- Kuwait (103)
- Kyrgyz Republic (104)
- Lao PDR (105)
- Latvia (106)
- Lebanon (107)
- Lesotho (108)
- Liberia (109)
- Libya (110)
- Liechtenstein (111)
- Lithuania (112)
- Luxembourg (113)
- Macao SAR, China (114)
- Macedonia, FYR (115)

- Madagascar (116)
- Malawi (117)
- Malaysia (118)
- Maldives (119)
- Mali (120)
- Malta (121)
- Martinique (122)
- Mauritania (123)
- Mauritius (124)
- Mayotte (125)
- New Caledonia (126)
- Mexico (127)
- Micronesia, Fed. Sts. (128)
- Moldova (129)
- Monaco (130)
- Mongolia (131)
- Montenegro (132)
- Morocco (133)
- Mozambique (134)
- Myanmar (135)
- Namibia (136)
- Nepal (137)
- Netherlands (138)
- Netherlands Antilles (139)
- New Zealand (140)
- Nicaragua (141)
- Niger (142)
- Nigeria (143)
- Northern Mariana Islands (144)
- Norway (145)
- Not Applicable (146)
- Oman (148)
- Other (149)
- Pakistan (150)
- Palau (151)
- Panama (152)
- Papua New Guinea (153)
- Paraguay (154)
- Peru (155)
- Philippines (156)

- Pitcairn (157)
- Poland (158)
- Portugal (159)
- Puerto Rico (160)
- Qatar (161)
- Romania (162)
- Russian Federation (163)
- Rwanda (164)
- Samoa (165)
- Saudi Arabia (166)
- Senegal (167)
- Serbia (168)
- Seychelles (169)
- Sierra Leone (170)
- Singapore (171)
- Slovak Republic (172)
- Slovenia (173)
- Somalia (174)
- South Africa (175)
- South Sudan (176)
- Spain (177)
- Sri Lanka (178)
- St. Kitts and Nevis (179)
- St. Lucia (180)
- St. Vincent and the Grenadines (181)
- Sudan (182)
- Suriname (183)
- Swaziland (184)
- Sweden (185)
- Switzerland (186)
- Syrian Arab Republic (187)
- Taiwan (188)
- Tajikistan (189)
- Tanzania (190)
- Thailand (191)
- Timor-Leste (192)
- Togo (193)
- Trinidad and Tobago (194)
- Tunisia (195)
- Turkey (196)

- ❍ Turkmenistan (197)
- ❍ Turks and Caicos Islands (198)
- ❍ Uganda (199)
- ❍ Ukraine (200)
- ❍ United Arab Emirates (201)
- ❍ United Kingdom (202)
- ❍ United States (203)
- ❍ Uruguay (204)
- ❍ US Minor Outlying Islands (205)
- ❍ Uzbekistan (206)
- ❍ Vanuatu (207)
- ❍ Venezuela, RB (208)
- ❍ Vietnam (209)
- ❍ Virgin Islands (British) (210)
- ❍ Virgin Islands (U.S.) (211)
- ❍ Wales (212)
- ❍ Yemen, Rep. (213)
- ❍ Zambia (214)
- ❍ Zimbabwe (215)
- ❍ Aruba (216)
- ❍ West Bank and Gaza (217)

Q19_pre In which country do you currently reside?

- ❍ Afghanistan (1)
- ❍ Aland Islands (2)
- ❍ Albania (3)
- ❍ Algeria (4)
- ❍ American Samoa (5)
- ❍ Andorra (6)
- ❍ Angola (7)
- ❍ Anguilla (8)
- ❍ Antarctica (9)
- ❍ Antigua and Barbuda (10)
- ❍ Argentina (11)
- ❍ Armenia (12)
- ❍ Australia (13)
- ❍ Austria (14)
- ❍ Azerbaijan (15)
- ❍ Bahamas, The (16)
- ❍ Bahrain (17)
- ❍ Bangladesh (18)

- Barbados (19)
- Belarus (20)
- Belgium (21)
- Belize (22)
- Benin (23)
- Bermuda (24)
- Bhutan (25)
- Bolivia (26)
- Bonaire, St Eustatius and Saba (27)
- Bosnia and Herzegovina (28)
- Botswana (29)
- Brazil (30)
- Brunei Darussalam (31)
- Bulgaria (32)
- Burkina Faso (33)
- Burundi (34)
- Cambodia (35)
- Cameroon (36)
- Canada (37)
- Cape Verde (38)
- Cayman Islands (39)
- Central African Republic (40)
- Chad (41)
- Chile (42)
- China (43)
- Colombia (44)
- Comoros (45)
- Congo, Dem. Rep. (46)
- Congo, Rep. (47)
- Costa Rica (48)
- Cote d'Ivoire (49)
- Croatia (50)
- Cuba (51)
- Curacao (52)
- Cyprus (53)
- Czech Republic (54)
- Denmark (55)
- Djibouti (218)
- Dominica (56)
- Dominican Republic (57)

- Ecuador (58)
- Egypt, Arab Rep. (59)
- El Salvador (60)
- Eritrea (61)
- Estonia (62)
- Ethiopia (63)
- Faeroe Islands (64)
- Fiji (65)
- Finland (66)
- France (67)
- French Polynesia (68)
- Gabon (69)
- Gambia, The (70)
- Georgia (71)
- Germany (72)
- Ghana (73)
- Gibraltar (74)
- Greece (75)
- Greenland (76)
- Grenada (77)
- Guam (78)
- Guatemala (79)
- Guinea (80)
- Guyana (81)
- Haiti (82)
- Honduras (83)
- Hong Kong SAR, China (84)
- Hungary (85)
- Iceland (86)
- India (87)
- Indonesia (88)
- Iran, Islamic Rep. (89)
- Iraq (90)
- Ireland (91)
- Israel (92)
- Italy (93)
- Jamaica (94)
- Japan (95)
- Jordan (96)
- Kazakhstan (97)

- Kenya (98)
- Kiribati (99)
- Korea, Dem. Rep. (100)
- Korea, Rep. (101)
- Kosovo (102)
- Kuwait (103)
- Kyrgyz Republic (104)
- Lao PDR (105)
- Latvia (106)
- Lebanon (107)
- Lesotho (108)
- Liberia (109)
- Libya (110)
- Liechtenstein (111)
- Lithuania (112)
- Luxembourg (113)
- Macao SAR, China (114)
- Macedonia, FYR (115)
- Madagascar (116)
- Malawi (117)
- Malaysia (118)
- Maldives (119)
- Mali (120)
- Malta (121)
- Martinique (122)
- Mauritania (123)
- Mauritius (124)
- Mayotte (125)
- New Caledonia (126)
- Mexico (127)
- Micronesia, Fed. Sts. (128)
- Moldova (129)
- Monaco (130)
- Mongolia (131)
- Montenegro (132)
- Morocco (133)
- Mozambique (134)
- Myanmar (135)
- Namibia (136)
- Nepal (137)

- Netherlands (138)
- Netherlands Antilles (139)
- New Zealand (140)
- Nicaragua (141)
- Niger (142)
- Nigeria (143)
- Northern Mariana Islands (144)
- Norway (145)
- Not Applicable (146)
- Oman (148)
- Other (149)
- Pakistan (150)
- Palau (151)
- Panama (152)
- Papua New Guinea (153)
- Paraguay (154)
- Peru (155)
- Philippines (156)
- Pitcairn (157)
- Poland (158)
- Portugal (159)
- Puerto Rico (160)
- Qatar (161)
- Romania (162)
- Russian Federation (163)
- Rwanda (164)
- Samoa (165)
- Saudi Arabia (166)
- Senegal (167)
- Serbia (168)
- Seychelles (169)
- Sierra Leone (170)
- Singapore (171)
- Slovak Republic (172)
- Slovenia (173)
- Somalia (174)
- South Africa (175)
- South Sudan (176)
- Spain (177)
- Sri Lanka (178)

- St. Kitts and Nevis (179)
- St. Lucia (180)
- St. Vincent and the Grenadines (181)
- Sudan (182)
- Suriname (183)
- Swaziland (184)
- Sweden (185)
- Switzerland (186)
- Syrian Arab Republic (187)
- Taiwan (188)
- Tajikistan (189)
- Tanzania (190)
- Thailand (191)
- Timor-Leste (192)
- Togo (193)
- Trinidad and Tobago (194)
- Tunisia (195)
- Turkey (196)
- Turkmenistan (197)
- Turks and Caicos Islands (198)
- Uganda (199)
- Ukraine (200)
- United Arab Emirates (201)
- United Kingdom (202)
- United States (203)
- Uruguay (204)
- US Minor Outlying Islands (205)
- Uzbekistan (206)
- Vanuatu (207)
- Venezuela, RB (208)
- Vietnam (209)
- Virgin Islands (British) (210)
- Virgin Islands (U.S.) (211)
- Wales (212)
- Yemen, Rep. (213)
- Zambia (214)
- Zimbabwe (215)
- Aruba (216)
- West Bank and Gaza (217)

Q20_pre In what year were you born (please enter 4 digits)?
Q21_pre The following two questions ask about race/ethnicity. Although we recognize that both the concept of race and the specific categories indicated below are controversial, potentially offensive, incomplete, or biased toward the United States, the data are being collected in accordance with the standard "Integrated Postsecondary Education Data System" (IPEDS) reporting requirements for U.S. educational institutions (see http://nces.ed.gov/ipeds/news_room/ana_Changes_to_10_25_2007_169.asp).As with all other questions in this survey, answering is entirely optional, and you may explicitly decline to state.

Q22_pre Are you of Spanish, Hispanic or Latino origin or descent?
- ❍ Yes (1)
- ❍ No (2)
- ❍ Decline to state (3)

Q23_pre What is your race? (Select one or more.)
- ❍ American Indian or Alaska Native (4)
- ❍ East Asian (5)
- ❍ South Asian (6)
- ❍ Other Asian (7)
- ❍ Black or African American (8)
- ❍ Native Hawaiian or Other Pacific Islander (9)
- ❍ White or Caucasian (10)
- ❍ Decline to state (11)

Q24_pre What is the highest level of school you have completed or the highest degree you have received?
- ❍ No schooling completed (4)
- ❍ Some primary or elementary school (5)
- ❍ Some high school (but no degree) (6)
- ❍ High school diploma (or equivalent) (7)
- ❍ Some college but no degree (8)
- ❍ Associate degree - occupational/technical/vocational program (9)
- ❍ Associate degree - academic program (10)
- ❍ Bachelor's degree (e.g., BA, AB, BS) (11)
- ❍ Master's degree (e.g., MA, MS, MEng, MEd, MSW, MBA) (12)
- ❍ Professional school degree (e.g., MD, DDS, DVM, LLB, JD) (13)
- ❍ Doctorate degree (e.g., PhD, EdD) (14)

Q25_pre Are you currently enrolled as a student in an educational program?
- ❍ Yes, I am currently a full-time student. (4)
- ❍ Yes, I am currently a part-time student. (5)
- ❍ No, I am not currently a student. (6)

Answer If What is the highest level of school you have completed or the highest degree you have received? No schooling completed Is Not Selected Or What is the highest level of school you have completed or the highest degree you have received? Some primary or elementary school Is Not Selected Or What is the highest level of school you have completed or the highest degree you have received? Some high school (but no degree) Is Not Selected Or What is the highest level of school you have completed or the highest degree you have received? High school diploma (or equivalent) Is Not Selected Or What is the highest level of school you have completed or the highest degree you have received? Associate degree - occupational/technical/vocational program Is Not Selected Or Are you currently enrolled as a student in an educational program? Yes, I am currently a full-time student. Is Selected Or Are you currently enrolled as a student in an educational program? Yes, I am currently a part-time student. Is Selected

Q26_pre What is your educational background or your current field of study?
- ❍ Math (1)
- ❍ Natural sciences (2)
- ❍ Social sciences (3)
- ❍ Health sciences (4)
- ❍ Engineering or computer science (5)
- ❍ Arts and humanities (6)
- ❍ Business or law (8)
- ❍ Undecided or general studies (9)

Q27_pre Which of the following best describes your employment status?
- ❍ Employed full-time (35 or more hours per week) (4)
- ❍ Employed part-time (less than 35 hours per week) (5)
- ❍ Homemaker, taking care of a family member, or on maternity/paternity leave (8)
- ❍ Unemployed and looking for work (9)
- ❍ Unemployed and not looking for work (10)
- ❍ Retired (11)
- ❍ Unable to work (12)

Q28_pre Do you have any additional comments that you would like to share with us?

APPENDIX B: POST-COURSE SURVEY

Coursera XX.XX Universal Core Post-Effective Fall 2014
Q1_post Post-Course Survey for <Course Name> <Term> Your participation in this survey is voluntary. The information collected will be kept strictly confidential and will not be printed or published in any form that would identify any individual. Your responses will have no bearing on your grade in any Coursera courses you may be enrolled in, present or future. Information from this survey may be connected to other data collected during the course, such as participation data or performance data, to better understand and evaluate Coursera courses offered by Duke faculty. If you have questions about the survey, or about your rights as a participant in this survey, please contact Duke's Center for Instructional Technology at cit@duke.edu
* indicates a Required question
Q2_post * What is the email address associated with your Coursera student account?

Q3_post * Did you earn a Statement of Accomplishment in this class?
- ❍ Yes (1)
- ❍ No (2)
- ❍ I don't know (3)

Q4_post Did you sign up for Signature Track, the service where you email Coursera a photo of yourself and they verify your identity?
- ❍ Yes (1)
- ❍ No (2)
- ❍ I don't know (3)

Answer If Did you sign up for Signature Track, the service where you email Coursera a photo of yourself and they verify your identity? No Is Selected
Q5_post Why didn't you sign up for Signature Track?
- ❍ I didn't know about it (1)
- ❍ It was too expensive (2)
- ❍ It would not be valuable to me (3)
- ❍ I did not intend to complete the course (4)
- ❍ It was too complicated (6)
- ❍ Some other reason - tell us why: (5) _____

Q6_post Did you enroll in a previous offering of this course on Coursera?
- ❍ No (1)
- ❍ Yes - and I completed the course (2)
- ❍ Yes - but I did not complete the course (3)

Q7_post To what extent did you participate in the following course activities?

	Not at all (1)	Occasionally (2)	Frequently (3)	Not applicable (4)
Watch lectures/videos (1)	❍	❍	❍	❍
Complete the required readings (2)	❍	❍	❍	❍
Complete the optional readings or movies (3)	❍	❍	❍	❍
Complete the homework (4)	❍	❍	❍	❍
Complete the quizzes (5)	❍	❍	❍	❍
Participate in discussion forums (6)	❍	❍	❍	❍
Join a Google Hangout with other students (7)	❍	❍	❍	❍
Actively participate in a study group (8)	❍	❍	❍	❍
View the course wiki (9)	❍	❍	❍	❍
Contribute to the course wiki (10)	❍	❍	❍	❍

Q3_post Why did you enroll in this course? (Please rate on a scale of very unimportant to very important)

	Very unimportant (1)	Somewhat Unimportant (2)	Neither important nor unimportant (3)	Somewhat Important (4)	Very Important (5)
This subject is relevant to my academic field of study (1)	❍	❍	❍	❍	❍
This class teaches skills that will help my job/career (2)	❍	❍	❍	❍	❍
I wanted to earn some sort of credential that I can use to enhance my CV / resume (3)	❍	❍	❍	❍	❍
Because this course is offered by a prestigious university (4)	❍	❍	❍	❍	❍
I thought taking this course would be fun and enjoyable (5)	❍	❍	❍	❍	❍
I was curious about what it's like to take an online course (6)	❍	❍	❍	❍	❍
I took this course in conjunction with another learning experience (7)	❍	❍	❍	❍	❍

I took this class because the content is not available elsewhere (8)	❍	❍	❍	❍	❍

Q23_post How much do you agree with each of the following statements about your learning in this course?

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
For the amount of time I invested in this course, I'm happy with what I learned (1)	❍	❍	❍	❍	❍
The course materials were presented in an engaging manner (2)	❍	❍	❍	❍	❍
I would like to take a more advanced course in this topic (3)	❍	❍	❍	❍	❍
I found this course personally fulfilling (4)	❍	❍	❍	❍	❍
I learned what I was hoping to learn in this course (5)	❍	❍	❍	❍	❍
I felt I had the background required to do well in this course (6)	❍	❍	❍	❍	❍

Q24_post In what ways have you used the material you learned in this course (check all that apply)?

- ❑ In my career (1)
- ❑ In my hobbies or activities outside of work (2)
- ❑ In my education (3)
- ❑ To prepare for a test or activity in the future (4)
- ❑ In some other way: (5) _____

Q25_post Rate your overall experience with this course

❍ 1 = Poor (1)
❍ 2 (2)
❍ 3 (3)
❍ 4 (4)
❍ 5 (5)
❍ 6 (6)
❍ 7 = Excellent (7)

Q26_post How would you rate the difficulty of this course?
❍ Much too difficult (1)
❍ Slightly too difficult (2)
❍ Just right (3)
❍ Slightly too easy (4)
❍ Much too easy (5)

Q27_post How would you rate the pacing of this course?
❍ Much too slow (1)
❍ Slightly too slow (2)
❍ Just right (3)
❍ Slightly too fast (4)
❍ Much too fast (5)

Q28_post How would you rate the length of this course?
❍ Much too long (1)
❍ Slightly too long (2)
❍ Just right (3)
❍ Slightly too short (4)
❍ Much too short (5)

Q29_post How would you rate the depth of content of this course?
❍ Much too broad (1)
❍ Slightly too broad (2)
❍ Just right (3)
❍ Slightly too narrow (4)
❍ Much too narrow (5)

Q30_post On a scale from 1 to 10, please rate how much you knew before you took this class about the topic of this course, where 1 means you didn't know anything then and 10 means you were an expert
_____ Current knowledge of course topic (1)

Q31_post On a scale from 1 to 10, please rate how much you know now about the topic of this course, where 1 means you don't know anything yet and 10 means you are an expert

_____ Current knowledge of course topic (1)

Q32_post When you were taking this course, where did you most often access the internet?

- ❍ At home (1)
- ❍ At school (2)
- ❍ At a business (3)
- ❍ In a public place such as a government building (4)
- ❍ At work (5)

Q33_post In what type of area do you live?

- ❍ A large city (1)
- ❍ A suburban area (2)
- ❍ A small city or town (3)
- ❍ A rural area (4)

Q34_post On a scale from 1 to 5, please indicate how much each course activity contributed to your learning in this course

_____ Discussion forum (1)
_____ Videos (2)
_____ Readings (3)
_____ Tests (4)
_____ Quizzes (5)
_____ Extra materials and optional resources (6)
_____ Labs (7)
_____ Peer assessment activity (8)

Q35_post While this course was running, how reliable was your access to the Internet and a computer or other device for accessing the course?

	Often unreliable (1)	Sometimes unreliable (2)	Occasionally unreliable (3)	Never unreliable (4)
Internet access (1)	❍	❍	❍	❍
Computer or other device for accessing the course (2)	❍	❍	❍	❍

Q36_post How would you rate the quality of the videos in this course?

- ❍ Very high-quality videos (1)
- ❍ Somewhat high-quality videos (2)
- ❍ Average looking videos (3)
- ❍ Somewhat low-quality videos (4)
- ❍ Very low-quality videos (5)

Q37_post How much do you agree with each of the statements about <Faculty Name>?

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
Explains things in very orderly ways (1)	❍	❍	❍	❍	❍
I would take another course from (2)	❍	❍	❍	❍	❍
Explains difficult things clearly (3)	❍	❍	❍	❍	❍
Communicates enthusiasm for the subject (4)	❍	❍	❍	❍	❍

Q38_post How much do you agree with each of the statements about <2nd Faculty Name>?

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
Explains things in very orderly ways (1)	❍	❍	❍	❍	❍
I would take another course from (2)	❍	❍	❍	❍	❍
Explains difficult things clearly (3)	❍	❍	❍	❍	❍
Communicates enthusiasm for the subject (4)	❍	❍	❍	❍	❍

Q39_post How much do you agree or disagree with the following statements:

	Strongly agree (1)	Agree (2)	Neither Agree nor Disagree (3)	Disagree (4)	Strongly Disagree (5)
My family supported my taking this course (1)	❍	❍	❍	❍	❍
I did not have enough time to take this course (2)	❍	❍	❍	❍	❍
My employer did not support my taking this course (3)	❍	❍	❍	❍	❍
This course was relevant to my job (4)	❍	❍	❍	❍	❍
This course met my expectations (5)	❍	❍	❍	❍	❍
I found the course difficult to navigate (6)	❍	❍	❍	❍	❍
I did not learn well online (7)	❍	❍	❍	❍	❍
I received adequate technical support (8)	❍	❍	❍	❍	❍

Q40_post How much did this course contribute to your progress on the following learning objectives?

	Not at All (1)	A little (2)	Moderately (3)	Highly (4)	Very Highly (5)	Not Applicable (6)
Gaining factual knowledge (1)	❍	❍	❍	❍	❍	❍
Understanding fundamental concepts and principles (2)	❍	❍	❍	❍	❍	❍
Learning to apply knowledge, concepts, principles, or theories to a specific situation or problem (3)	❍	❍	❍	❍	❍	❍
Learning to synthesize and integrate knowledge (4)	❍	❍	❍	❍	❍	❍
Learning to conduct inquiry through the methods of the field (5)	❍	❍	❍	❍	❍	❍

Q41_post Do you plan to take this course again?

❍ Yes (1)
❍ Maybe (2)
❍ No (3)

Answer If Do you plan to take this course again? Yes Is Selected
Q42_post Why do you plan to take this course again?

❍ To reinforce what I learned the 1st time (1)
❍ To fully complete the course (2)
❍ To complete more of the course than I did this time (4)
❍ Other (3) _____

Q43_post On average, how many hours per week did you invest in this course?
_____ Average Hours Per Week (1)

Q44_post Please tell us about your past experience with online courses.
- ❍ I have taken many online courses before (1)
- ❍ I have taken a few online courses before (2)
- ❍ This was my first online course (3)

Answer If Please tell us about your past experience with online courses. This was my first online course Is Not Selected

Q45_post How did this course compare to other online courses you have taken?
- ❍ Much Better (6)
- ❍ Better (7)
- ❍ About the Same (8)
- ❍ Worse (9)
- ❍ Much Worse (10)

Q46_post What best describes your previous experience in this course's subject area?
- ❍ I have a degree in this field or significant work experience (1)
- ❍ I have completed some coursework or have some work experience in this field (2)
- ❍ I like to learn about this subject on my own (3)
- ❍ I am mostly new to the subject (4)

Q47_post Which of the following best describes your affiliation to Duke, if any?
- ❍ None (1)
- ❍ Currently enrolled student in credit-bearing Duke campus courses (2)
- ❍ Alumni (3)
- ❍ Part of Duke community (parent, staff, faculty, librarian, etc.) (4)

Q48_post Please use the space below to provide any additional comments that you would like to share with the instructor, with Duke University or with Coursera.

Q49_post Would you be willing to be contacted for follow-up research about your experience in this course?
- ❍ Yes (1)
- ❍ No (2)

APPENDIX C: DUKE IRB APPROVAL

Duke | RESEARCH WITH HUMAN SUBJECTS

Request for Protocol Approval for Secondary Analysis of Existing Data

Existing Data are in existence at the time the research is proposed. The data may be in the form of data sets, but may also be in the form of interview notes or audio- or video-recordings.

This form is to be used when **identifiable** data about human subjects will be obtained by an investigator for secondary analysis. Data are identifiable if they include direct or indirect identifiers.

This form is to be used for all types of review. After reading the guidelines for submitting a protocol for secondary analysis of existing data (http://www.ors.duke.edu/researchers/requests-analysis-existing-data), and consulting with the IRB staff if necessary, please check the type of review you are requesting.

Screening for Exemption: _X__ Expedited Review: ___ Full Review: ___

- Submit this form and any attachments as a *single* Word file to **ors-info@duke.edu** for pre-review by the IRB staff.
- Send the signed form to the Office of Research Support, Suite 710, Erwin Square, 2200 West Main Street, Durham, NC 27705.

There are three parts to this request:

A. Investigator and Project Information
B. Investigator and Advisor Assurances
C. Instructions for Preparing the Research Description

A. Investigator and Project Information

Project Title: Determining What Student Level Factors Influence Completion Rates in Coursera Courses

Investigator(s): Rochelle Newton

Status: [ ] Faculty [ ] Graduate Student [ ] Undergraduate [X] Other: Staff

Department/School: Vice Provost Office

E-mail:newton@law.duke.edu Phone: 919.613.7245

Faculty Advisor for Graduate and Undergraduate Students:
Keith Whitfield, Ph.D._____

E-mail:_Kwhit1@duke.edu _____ Phone: 919-660-0330_____

Source of Funding: _N/A_____
(If externally funded, submit a copy of the application or the award.)

APPENDIX D: ECU IRB APPROVAL

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** · www.ecu.edu/irb

Notification of Exempt Certification

From: Social/Behavioral IRB
To: Rochelle Newton
CC: Crystal Chambers
Date: 6/8/2016
Re: UMCIRB 16-000611
MOOCs - Academic Readiness and Completion Rates

I am pleased to inform you that your research submission has been certified as exempt on 6/8/2016. This study is eligible for Exempt Certification under category #4.

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

The UMCIRB office will hold your exemption application for a period of five years from the date of this letter. If you wish to continue this protocol beyond this period, you will need to submit an Exemption Certification request at least 30 days before the end of the five year period.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.
