GRIT AND MINDSET AS PREDICTORS OF STUDENT SUCCESS IN A FIRST-TIME ONLINE HIGH SCHOOL COURSE

A Dissertation

Presented in Partial Fulfillment of the Requirements for the

Degree of Doctor of Education

With a

Major in Educational Leadership in the

Department of Graduate Education

Northwest Nazarene University

by

Brooke Phillips-Martinez

MAY 2017

Major Professor: Eric Werth, Ph.D.

AUTHORIZATION TO SUBMIT

DISSERTATION

This dissertation of Brooke Martinez, submitted for the degree of Doctor of Philosophy in Education with a major in Educational Leadership and titled GRIT AND MINDSET AS PREDICTORS OF STUDENT SUCCESS IN A FIRST-TIME ONLINE HIGH SCHOOL COURSE has been reviewed in final form. Permission, as indicated by the signatures and dates given below, is now granted to submit final copies.

Major Professor _____ Date 4-17-17
Dr. Eric Werth

Committee Members _____ Date 4-11-17
Dr. Pat Kissell

_____ Date 4-20-17
Dr. Greg Richens

Program Administrator Heidi Curtis Date 4-11-17
Dr. Heidi Curtis

Discipline's College Dean Paula D Kellerer Date 4-25-17
Dr. Paula Kellerer

ACKNOWLEDGEMENT

I would like to thank my chair Dr. Eric Werth and my committee members Dr. Greg Richens and Dr. Pat Kissell for pushing me along and assisting me in achieving my goal. I would like to thank my Uncle Reid, sister Cree, and colleagues Dave and Allison for helping me with my edits. I would like to thank Dr. Michael Poe for encouraging me to sign up for this program and having faith that I would succeed. I would like to thank all of my teachers who have helped me learn that I can be better than I ever imagined. I would like to thank the students within my cohort for being so encouraging, helping me keep my balance, and laugh along the journey, especially Jessi, Dan, and Lori. I would like to thank my husband for being my sounding board, confidant, person to cry to, person to share my joys with, and person to push me when I couldn't push myself. I would like to thank my parents for raising me to be excited about learning and pushing myself. I would like to thank my siblings for encouraging me to always do my best. I would like to thank my Aunt Barbara for being the first person I knew personally to strive to get her doctorate, which helped me to know it was possible. I would like to thank my students for being my inspiration for this study. I would also like to acknowledge my dog Perci for going through this eight-year journey with me and my puppy Bella for being right next to me every day for the final nine months of writing my dissertation. Thank you to everyone who has ever had a part in shaping and molding me into the person I have become and will continue to become.

DEDICATION

I would like to dedicate this dissertation to my students past, present, and future and to anyone who needs encouragement to become successful in his or her own life. “Success occurs when opportunity meets preparation.”

— Zig Ziglar

ABSTRACT

As online education becomes more available for high school students, the enrollment continues to grow. Unfortunately, the attrition rate is also increasing and educators are challenged to find a better vetting process to determine if students will be successful in his or her first online high school course. Growth mindset and grit have been predictors of success in high attrition situations and in some cases demographics such as age and gender have also been predictors of success. The purpose of this study was to examine the relationships among grit, mindset, age, and gender to determine if these variables were indicators of success in a student's first online high school course. A survey was distributed to high school students taking their first online course. Demographic questions were asked, followed by the short version of the grit scale (Grit-S) and a mindset assessment. These items were used to measure the relationships of age, gender, grit, and mindset when compared to the student's end of course grade. This study was a quantitative approach to gather data and add to the literature for online education. The results of this study did not find a significant difference in student grade when organized by grit, mindset, or gender categories. However, a significant relationship between age and course grade was found to be significant at the $p < .05$ level. Supplemental analysis showed a significantly larger drop rate in an asynchronous model than a synchronous model. The results of this study will potentially impact one school in changing their course design from asynchronous to synchronous.

TABLE OF CONTENTS

List of Tables

List of Figures

Chapter I

Introduction

"Online learning is not the next big thing; it is the now big thing."

—Donna J. Abernathy

Online educators are witnessing an increase in enrollment but a decrease in course completion rate. It is challenging to keep students in online courses at attrition rates from 20-80% higher than traditional face-to-face courses (Allen & Seaman, 2007; Clay, Rowland, & Packard, 2009; Diaz, 2002; Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, & Marczynski. 2011; Finkel, 2015; Flood, 2002; Frankola, 2001; Nora & Snyder, 2009; Patterson & McFadden, 2009; Lykourentzou, Giannoukos, Nikolopoulos, Mpardis, & Loumos, 2009; Picciano & Seaman, 2007).

Because of the increase in enrollment and high attrition rates, student readiness should be analyzed before the student enrolls in an online course. Several educational institutions have used student readiness surveys to predict success in an online course (Bernard, Brawer, Abrami, & Surkes, 2004; Kerr, Rynearson, & Kerr, 2006; McVay, 2011; Parnell & Carraher, 2003; Mattice & Dixon, 1999; Picciano & Seaman, 2007; Pillary, Irving, & McCrindle, 2006; Smith, 2005; Smith, Murphy, & Mahoney, 2003; Watkins, Leigh, & Triner, 2004; Wladis & Samuels, 2016). However, there have not been studies that confirm whether the surveys predict online success in a student's first online high school course.

Wladis and Samuels (2016) analyzed the reliability and validity of online readiness surveys and were unable to find significant predictors of success. As a result of this research, it is clear that a more effective online readiness assessment is needed.

"Some people want it to happen, some wish it would happen, others make it happen."

—Michael Jordan

Perseverance. Hardiness. Resilience. Ambition. Grit. These words describe the people who do not just create hopes, dreams, and wishes, but they make their goals a reality. They make it happen. These people have grit and a growth mindset.

Grit is "the passion and perseverance for long-term goals" (Duckworth, 2007 p. 1087). A growth mindset is believing that the brain can develop skills such as grit (Dweck, 2008). Growth mindset and grit have been shown to be linked with success in several areas where failure was more common than success (Duckworth, 2007; Dweck, 2008). Angela Duckworth, a psychologist at Stanford University, researched several challenging areas with significant failure rates including: West Point Military Academy, the National Spelling Bee, and people involved in corporate sales (Duckworth, 2016). Duckworth (2007) gave each participant in her studies a grit survey, which monitored perseverance and passion. The participants may have had an equal IQ level, GPA, age, and gender, but few succeeded and several failed. What did the successful participants have that the others did not? Why are some people able to succeed in challenging areas when their counterparts cannot? Duckworth (2007) found that in every challenging area studied, the people who succeeded had grit. Is grit something with which people are born? How did these people get grit? Is grit increased by a person's environment? Can grit be developed within people? Duckworth (2007) hypothesized that as growth mindset increased so would grit.

Growth mindset and fixed mindset were described by Carol Dweck (2008), another psychologist at Stanford University. It is the idea that people either have a fixed mindset or a growth mindset. If someone has a fixed mindset, he or she believes intelligence and talent are fixed traits (Dweck, 2008). Someone with a growth mindset believes abilities can be developed

through perseverance and hard work, and that intelligence and talent can be increased (Dweck, 2008). For example, when observing two students' academic self-efficacy, one student might be confident in his or her abilities to master Geometry, while another student might lack the confidence and believes that he or she will never be able to master the same subject. Dweck (2008) developed a mindset survey that determines if an individual has a fixed or growth mindset. Individuals can change their mindset through practice.

One challenging area with a high attrition rate that has not been studied in the context of grit or a growth mindset is online high school courses. It is estimated that 40% - to 90% of students do not complete their first online high school course (Hendricsen, 2014). If people were just born with or without grit, then students could conclude that they were either able to do online-course work, or they just didn't have the talent to do so. However, because Duckworth (2016) found that grit can be increased through the growth mindset and that a fixed mindset can turn into a growth mindset, these variables should be studied in the context of a student's first online high school course.

Purpose of Study

The purpose of this study was to determine if grit, mindset, age, and gender are indicators of success in a student's first online high school course. Participants in this study completed a survey including demographic, grit, and mindset questions. The demographic questions included age, gender, and the course topic they are taking. Duckworth and Quinn (2009) showed that grit can also develop with age and that it does not vary across gender. Age is significant because online course rates are growing rapidly and students who are taking online courses are getting younger and younger (Drysdale, 2013).

The Grit-S and the mindset survey scores were evaluated in relation to a student's first online high school course grade. The value of this research is that, if grit and mindset can be linked with the success of an online student, schools can incorporate training for growth mindset in their curricula, which can develop into grit, and theoretically increase the success rate in online courses.

Statement of the Research Problem

"Failure is not the opposite of success; it's part of success."

—Arianna Huffington

Online learning is increasing significantly in high schools. However, even though taking an online class is trending upward, the completion rates are not increasing as quickly as the enrollment rates. It is crucial for research to determine how to increase the success of this new delivery method among high school students (DiRienzo, 2014; Haynie, 2015). Completion rates in studies range from 10% to-62% depending on the course (Cash, Jones, & Richardson, 2014; Hawkins, Graham, Sudweeks, & Barbour, 2013; Hendricsen, 2014; Jordan, 2014). Therefore, it is important for schools to identify the significant predictors of academic success in an online class so they can determine which students will succeed and which students need an intervention so they will be successful once they take an online class.

Although online classes have been growing in popularity in high schools, gaps exist in the literature regarding predictors of academic success in a student's first online high school course (Allen & Seaman, 2007; Clay, Rowland, & Packard, 2009; Diaz, 2002; Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, & Marczynski. 2011; Finkel, 2015; Flood, 2002; Frankola, 2001; Lykourentzou, Giannoukos, Nikolopoulos, Mpardis, & Loumos, 2009; Nora & Snyder, 2009; Patterson & McFadden, 2009; Picciano & Seaman, 2007;).

Background

The first virtual school, Laurel Springs School (private), was introduced in 1991 and based out of California (Tonks, 2013). Utah Electronic High School, located in Salt Lake City, Utah, was the first public online high school in the United States in 1994 (Tonks, 2013). In the early 2000s, several high schools started offering their core classes online. Students could often choose which modality they wanted for their education, whether that be a public, private, or charter school; traditional, blended, or online (Pape, 2016; Smith, 2015).

Around 2001, there were approximately 40,000 to 50,000 high school students enrolled in an online course. This number increased to 1.5 million students by 2010 (Barbour, 2012). It is estimated that 5.8 million students were enrolled in at least one online course in 2014 (Friedman, 2016). Due to the popularity and increasing need for online-course skills, Michigan was the first state to require an online course as a high school graduation requirement in 2006; since then, several other states have followed that requirement (Tonks, 2013). The states that require an online course for high school graduation are Michigan, Virginia, Florida, Alabama, and Arkansas; Georgia, New Mexico, and West Virginia recommend it but do not require it (Leventoff, 2015).

From 2009 to 2014, there was a 50% increase of online or blended course offerings and a 58% increase in full-time online public schools (Connections Academy, 2015; Speak Up, 2015). The Speak Up (2015) 2014–2015 survey, covering a sample of high school students nationwide, showed that 24% of high school students wanted to take all their classes online, which was an 8% increase from 2013–2014. Smith (2015) showed that 316,320 students attended fully online schools in 2013–2014. From 2009 to 2014, Connections Academy (2015) showed an increase from 1.5 million to 2.7 million students taking an online or blended class. Thirty states and

Washington, D.C., have fully online schools open to high school students statewide (Smith, 2015). According to Connections Academy (2015), about one in four high school students across the United States is taking online courses.

There are several advantages of online courses which attribute to the increase in online education. Mbuva (2014) found the advantages of online learning to be convenience, time efficiency, accessibility, dynamic interactions, and creativity. Other advantages include cost-effectiveness, flexibility, and quality learning (Nelson, 2008).

If these courses are so attractive, why are some students succeeding in their online courses and some are not? Traditionally, cognitive ability, grade-point average (GPA), and scores on standardized tests including both national and state tests have measured student success. Examples include The American College Test (ACT), and/or Scholastic Aptitude Test (SAT), which are national tests, and Student Assessment of Growth and Excellence (SAGE), which is a Utah state assessment (Cognitive, 2013). Several studies have been completed about the role of intelligence in school success. There is limited research on why people with the same level of intelligence succeed and fail. More recently, personality factors have been researched as factors that influence online-student success (Meredith, 2011). Some predictors of success have previously been identified, such as relationships with others, resilience, adaptability, high emotional intelligence, and motivation level (Mbuva, 2014; Nelson, 2008). Depending on the situation, some traits are more important than others (Mbuva, 2014).

Duckworth (2007) indicates that grit is the personality trait that is shared throughout all circumstances. Across six studies, grit was a more significant predictor of success than IQ, however; it has not been thoroughly researched with high school students, specifically students taking an online course (Duckworth, 2007). This study adds to the literature in this area and

provides information for researchers who are interested in learning more about online-course success for high school students.

Understanding the role of grit in the success of students taking their first online class will help high school administrators guide the appropriate students into online courses. It can also play a role in the early identification of students who may struggle online so they can be provided support. It may suggest schools could assist students by offering education designed to increase grit through building a growth mindset. Duckworth (2016) said the way to develop grit is by practicing and viewing failed attempts as practice and knowing that it is alright to fail as long as you do not give up. Specifically, this study examined whether grit and mindset predict academic performance in a student's first online high school course. The objective of this quantitative study was to examine the relationships among grit, mindset, age, and gender during a student's first online high school course to determine if these variables affect the students' academic success.

Research Questions

"If I had an hour to solve a problem and my life depended on it, I would use the first 55 minutes determining the proper questions to ask."

—Albert Einstein

The following research questions sought to be answered through this dissertation:

1. What are the relationships among grit, mindset, age, gender, and a student's first online high school course grade measured by percentage?

   The sub-questions included:

   a. Does course grade vary by grit category, mindset category, or gender?

   b. Is there a correlation between grit, mindset, or age and course grade?

2. What combination of factors (grit, mindset, age, gender) best predict success in a student's first online high school course?

The following data-collection instruments were utilized: the 8-item Grit Scale (Grit-S) developed by Angela Duckworth and the 8-item mindset survey created by Carol Dweck. The background demographics of age and gender were also gathered from the students directly through an online survey. Student grades were collected from the administrator or teacher at the students' school. A one-way ANOVA was used to analyze the course grade to identify if it varied by grit category or mindset category. An independent t-test analyzed the course grade to find if it varied by gender. Pearson correlation was used to measure the linear correlation between grit, mindset, age, and course grade. Lastly, a multiple regression analysis was used to determine the combination of factors (grit, mindset, age, gender) that best predict success in a student's first online high school course.

Theoretical Framework

"High achievement always takes place in the framework of high expectation."

—Charles Kettering

The theoretical framework for this study is the concepts of grit and mindset. Grit was chosen as a part of this study's theoretical framework as it has been shown to be predictive of an individual's success, which is the central focus of this study in relation to a student's performance in his or her first online high school course.

Grit is explained as the persistence and desire to reach goals (Duckworth et. - al., 2007). Completing an online high school course for a student requires perseverance and passion. Administrators and faculty believe that to succeed, students need to be more disciplined and have more internal motivation with an online course in comparison to a traditional course (Haynie,

2015). Therefore, it is essential to understand whether or not grit is related to the academic performance of students in online high school courses. Students who persevere during challenges seem to have grit.

Grit and mindset are frequently assessed together and both have been linked to success with studies having shown a very strong statistically significant relationship exists between grit and success (Hogan & Larkin-Wong, 2013). According to Farmer (2014), individuals can increase grit by having a growth mindset meaning that if a student does not have a high grit score, he or she can work to develop this characteristic.

Significance of the Study

"Success is when I add value to myself. Significance is when I add value to others."

—John Maxwell

This study is significant considering the increase in learning modalities available to high school students and the growth in online student enrollment at the high school level. Students often have a choice in whether they want to learn in a traditional way, in a blended environment, or strictly online (Pape, 2016; Smith, 2015). However, just because online is more flexible than the traditional method does not mean all students will be successful with that modality. Studies around the country show different attrition levels in online courses. Spieth (2009) reports that 28% of online students were unsuccessful. Meredith (2011) found that 60% of students who took an online class did not finish.

If grit and mindset are shown to explain student success, administrators potentially could use these measures to determine which students are more likely to succeed and what other students can work on before they take an online course. This effort could increase course-

completion rates. High school enrollment counselors can use the grit and mindset surveys to predict which students are more likely to succeed in an online high school course, consequently identifying students who may not do as well in an online course.

This study helps fill the gap in the relatively limited literature examining the factors that predict success for students in their first online high school course. This study will seek to determine if there is a correlation between grit, mindset, and student achievement which may encourage school administrators to revisit their online program policies and practices.

Description of Terms

The terms used in this study are important concepts in understanding the purpose and findings of the study; the terms provided show clarification to those not familiar with the environments.

Blended Learning. Blended or hybrid learning is a mixture of traditional face-to-face learning and online learning (Perry & Pilati, 2011).

Fixed Mindset. Where a person believes intelligence is unchangeable and his or her intellect is a natural characteristic (Hochanadel & Finamore, 2015).

Grit. Grit is a "trait-level perseverance and passion for long-term goals" (Duckworth et. al, 2007, p. 1087).

Growth Mindset. Individuals with a growth mindset value effort and know that their ability and intelligence can be developed, formed, and enlarged over time (Hochanadel & Finamore, 2015).

Learning Management System (LMS). The platform used for an online course that shows students the course syllabus, assignments, projects, and assessments (Mbuva, 2014).

Online Learning. Gaining knowledge through learning applications, which are communicated and managed through technology on the Internet (Morrison, 2003). Online learning can exist in many forms (Perry & Pilati, 2011).

Overview of Research Methods

"If we knew what we were doing it would not be called research, would it?"

—Albert Einstein

The target population for this study were students taking an online high school course for the first time. The sample for this study was drawn from two high schools in Utah that offer online courses. To be included in the study, students must have been taking an online course for the first time, complete a grit survey, and complete a mindset survey. Students taking an online high school course for the first time were selected for this study because the aim was to determine if grit, mindset, age, and gender contributed to a student's success the first time he or she took an online course.

This study utilized a quantitative analysis of primary data attained from the students. The independent variables include grit, mindset, age, and gender. Student grades were obtained from the online high school teachers or administrators where the students were enrolled. Responses to the grit and mindset surveys and student age and gender were self-reported and collected through a web-based survey program, Qualtrics.

The grit survey questions and directions were used from the grit survey by Duckworth (2016). The grit survey, shown in Appendix D consists of eight items that are measured on a five-point Likert scale from 1 (Not at all like me) to 5 (Very much like me) (Duckworth & Quinn, 2009). This survey is available at no cost through the Duckworth Lab for research purposes.

The mindset-survey questions and directions were created by Carol Dweck (2006). The mindset survey as shown in Appendix E consists of eight items that are measured on a six-point Likert scale from 1 (Disagree a lot) to 6 (Agree a lot) (Dweck, 2006). This survey is also available at no cost through the Project for Education Research (PERTS). Once the survey results were collected through Qualtrics, a spreadsheet was made and sent to each participating school where the teacher or administrator input each student's end-of-course grade as well as student codes in place of students' names to protect their privacy.

The dependent variable of this study was success shown through academic performance. Academic performance was defined by a student's end-of-course grade ranging from 0% to 100%. Success was measured by a passing grade of 60% or higher. The independent variables analyzed were student age, gender, grit scores measured by the grit survey, and mindset scores measured by the mindset survey.

Limitations

Several limitations to this study should be noted, primarily the use of a relatively limited sample and selection of participants through convenience sampling. The researcher contacted 10 online schools in Utah and three online schools in Idaho; however, convenience sampling was chosen because only two schools agreed to participate in this study. This limited sample size brings into question the ability to generalize findings to other contexts and the power of the statistical tests. Of the two schools that participated one school operates with a synchronous model and had a structured nine-week course period with due dates. The data may be more accurate with a higher number of participants and if the schools examined had a more similar course design.

The second school had an open entry open exit method (asynchronous) that allowed students to work throughout the school year on their course (August-May). This schedule limited the response rate because the students had more time to complete the course after the time limits of this study. The response rate was limited to 55 responses due to incompletion of the survey, duplications, and students who did not meet the participant criteria. The survey is self-reported which is a limitation as respondents can input responses that exaggerate or limit an accurate response. The sample may not be representative of all students in their first high school online course since many students, or their parents, declined to participate. The study only examined courses during one semester.

The survey was self-reported which may lead to response bias. A student may overstate or understate his or her abilities and intellect. The student may control their responses in order to show high grit or growth mindset to receive the score they would like. The participant may think he or she is not a hard worker because he or she does not have a high grade; however, the teacher may observe the student to be a hard worker and the subject may be more difficult. The students were not directed to think about school during the survey; consequently, the response to a statement like "I am a hard worker" could be high or low depending on the participants' mindset in that time frame. The student could respond "Mostly like me" if thinking about work and "Mostly not like me" if thinking about school.

Delimitations

In addition to the limitations, the delimitations of this study include one data collection method, the target population, and the demographics chosen. The researcher chose a smaller target population instead of nationwide due to difficulties in collecting data. The researcher also

limited the demographics studied to age and gender instead of including course type, ethnicity, and socio-economic status because the main focus of this study was on grit and mindset.

Chapter II

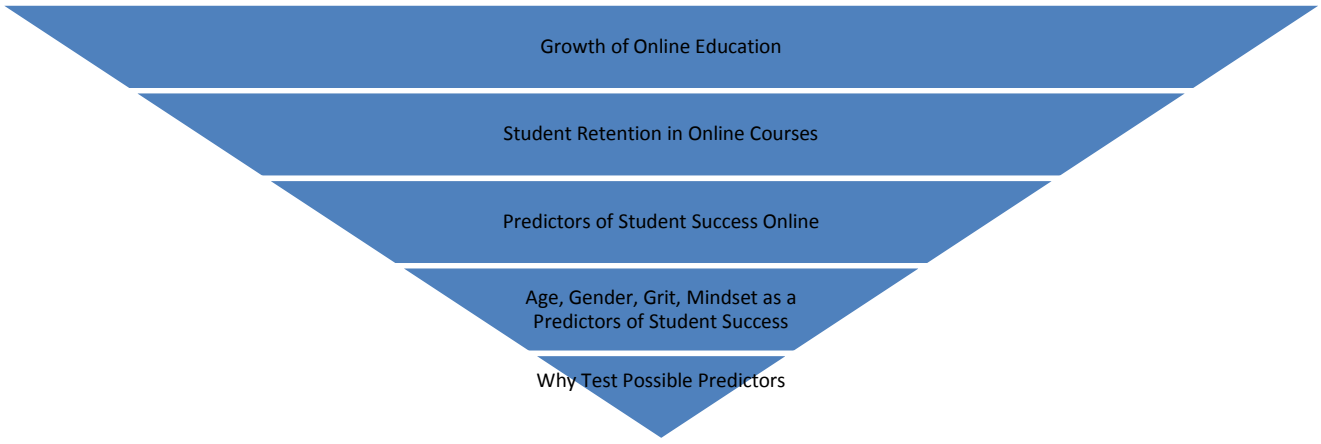
The Literature Review

Overview

With the dramatic increase in online course enrollment, researchers must analyze potential predictors of student success. This literature review provides an overview of the growth of online education and the low retention rate. It also examines the known predictors of student success, discusses some of the potential predictors for student success, and analyzes why these predictors should be tested using the research questions chosen by the researcher.

As Figure 1 indicates, the review of literature is divided into multiple sections. The first section presents the growth of online education. The second section focuses on student retention rate in online courses. The third section concentrates on the predictors of student success in online courses and online-readiness surveys. The fourth section focuses on age and gender as predictors of student success. The fifth section concentrates on the concepts of grit and mindset as possible predictors of student success in online courses. The final section focuses on why age, gender, grit, and mindset should be tested as potential predictors of student success in a student's first online high school course.

Figure 1 Components of the Literature Review



Introduction

Predictors of success in traditional high school classrooms and in college online classrooms have been more heavily studied, and can provide clues to what factors might affect high school online retention rates (Dray, Lowenthan, Miszkiewwicz, Ruiz-Primo, & Marczynski, 2011). Student enrollment in online high school courses has continued to grow recently and is predicted to continue increasing. The retention rate has been low and is encouraged to increase along with enrollment. In order for retention rates to increase, educators must find out what variables can predict student success in a student's first online high school course (Allen & Seaman, 2007; Clay, Rowland, & Packard, 2009; Diaz, 2002; Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, & Marczynski, 2011; Finkel, 2015; Flood, 2002; Frankola, 2001; Lykourentzou, Giannoukos, Nikolopoulos, Mpardis, & Loumos, 2009; Nora & Snyder, 2009; Patterson & McFadden, 2009; Picciano & Seaman, 2007). Online-readiness surveys should be analyzed to see if they truly predict student success. Once educators find the predictors of online success for high school students, they will be able to put in place interventions to address the predictors, with a subsequent increase in the retention rate.

Growth of Online Education

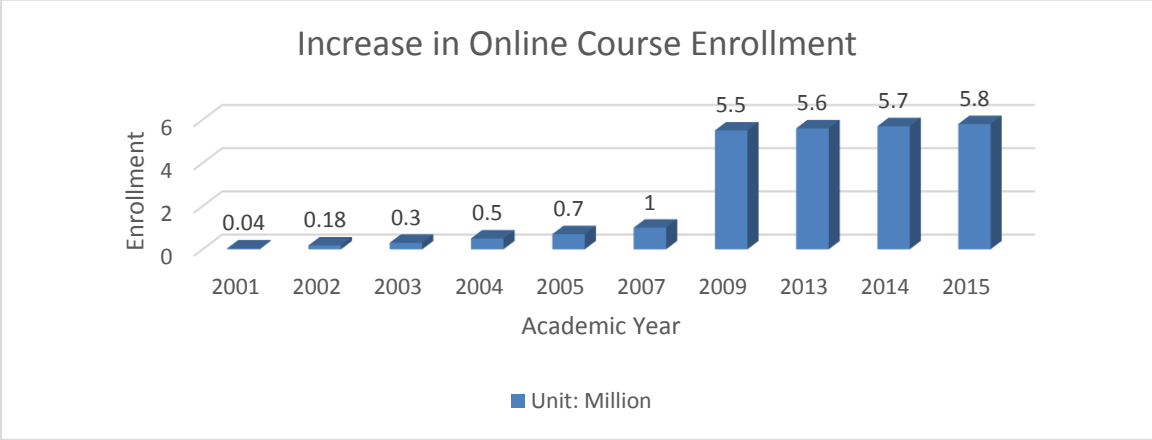
Studies in secondary education have shown that individual students may now choose whether to take their courses traditionally, blended, or in an online format. Online education is not a new learning method, but its popularity has increased over the last decade. The first completely virtual secondary school was Laurel Springs private school, which was introduced in 1991 (Tonks, 2013). Three years later in 1994, the first public online high school in the United States was Utah Electronic High School (Tonks, 2013).

In the early 2000s, several high schools started offering their core classes online. In 2001, there were roughly 40,000 to 50,000 high school students enrolled in an online course and this increased to 1,500,000 students by 2010 (Clark, 2001). The first state to add an online course requirement to student graduation was Michigan in 2006. Since then, several other states have followed that requirement (Tonks, 2013).

Concurrent with the increase in internet usage, education has also increased online (Hussain, 2015). Online education is defined as a class having at least "80% of its content distributed online and involving no face-to-face meetings" (Allen & Seaman, 2008, p. 15). Many students enter college now with experience in online education they received from K–12 (Hussain, 2015).

Online courses are in extreme demand at schools throughout the nation (Capra, 2011; Lloyd, Byrne, & McCoy, 2012). On average, online education is increasing by 30% annually (Sanchez, M., Heredero, C., & Merodio, J., 2014). Online education has especially seen an increase with massive open online courses (MOOCs) (Kelly & Seppala, 2016). Figure 2 depicts the increase in online enrollment from 2001 to 2015.

Figure 2: Online Course Enrollment



(Allen & Seaman, 2007; Clay, Rowland, & Packard, 2009; Diaz, 2002; Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, & Marczynski. 2011; Finkel, 2015; Flood, 2002; Frankola, 2001; Lykourentzou, Giannoukos, Nikolopoulos, Mpardis, & Loumos, 2009; Nora & Snyder, 2009; Patterson & McFadden, 2009; Picciano & Seaman, 2007)

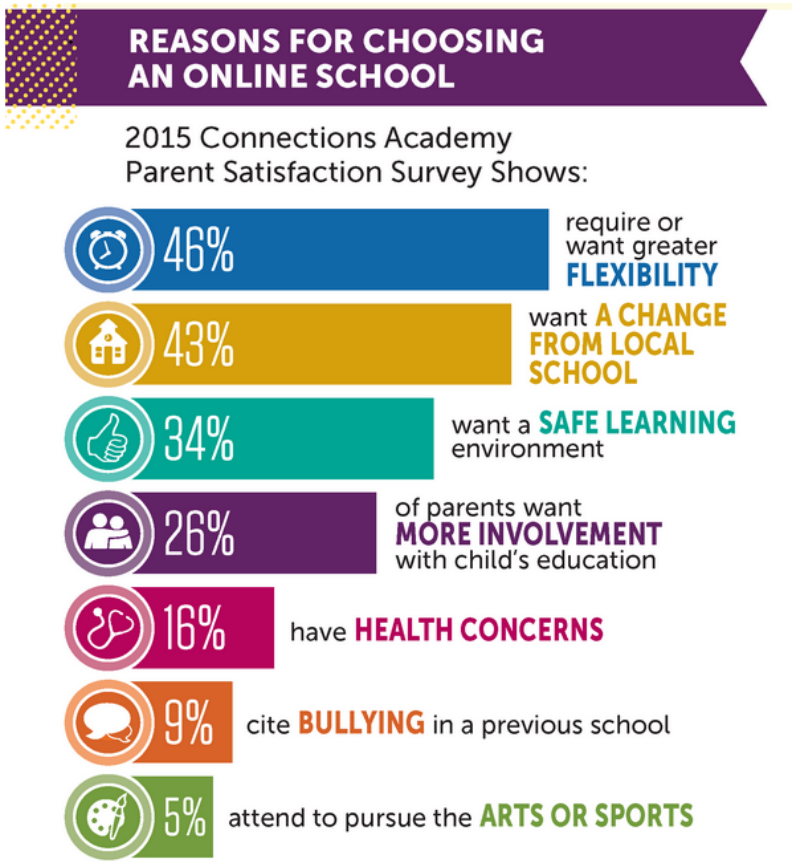
Parsad and Lewis (2008) report that the most common reasons to offer online programs were to grow student enrollment, offer more courses, accommodate student schedules, and offer access to those who could not attend face-to-face courses. Online education has grown substantially over the past 10 years (Studebaker, 2011). Enrollments are still increasing in online programs across the United States (Meisenburg, 2012). There are several reasons to account for this growth, a few being the convenience and flexibility of taking online courses, the ability to take courses that are not offered at the student's home school, and credit recovery (Studebaker, 2011). Online education is now commonplace within American schools (Meisenburg, 2012).

There are several advantages of online courses, which has likely contributed to the increase in online education. One benefit of online learning is that it is easier to customize the learning so that it is more student-centered. Other benefits of online learning include working at one's own pace, receiving customized and individualized instruction, becoming more technologically savvy, offering a variety of courses, providing a more comfortable learning environment, and having scheduling flexibility (OEDb, 2012). Several studies have been

completed on the effectiveness and benefits of online learning. Some research shows that students receive more immediate feedback and consequently, perform better online than in a traditional classroom (Khanlarian & Singh, 2014; Maddix, 2013; Palloff & Pratt, 2007; Perry, 2011).

Additional advantages of online learning include preparing students to be 21st-century learners, offering self-paced instruction at any time, presenting extended educational opportunities, allowing access to advanced courses and courses not offered at a student's home school, and allowing students to work at a slower pace (Jordan, 2012; Savoia, 2015). Figure 3 indicates reasons for choosing an online school from a 2015 Connections Academy survey. In some schools, the dropout rate is lower in online courses than in face-to-face courses, and the option has been beneficial for nontraditional students such as students seeking credit recovery, at-risk students, and homebound students (Savoia, 2015).

Figure 3: Reasons for Choosing an Online School



(Connections Academy, 2015) Reprinted with permission.

Although there are many benefits to online learning, disadvantages have been identified as well. Some of the disadvantages or challenges of online learning include funding, policy changes, retention issues, finding appropriate student-to-teacher ratios, professional development, and students preferring face-to-face discussions versus online discussions (Savoia, 2015; Tiene, 2000). According to Baker and Bathon (2012), research on funding online education is limited and inconsistent. Most of the research on funding is limited to government subsidies (Savoia, 2015). One of the policy changes, highly debated, is how to fund full-time online schools (Huerta, King-Rice, & Rankin-Shafer, 2014). Another policy change is requiring all students to complete at least one online course during their high school experience (Murin, Tenuta, & Keckler, 2012). Some educators question if implementing this policy is realistic and

attainable for all students (Murin et al., 2012). Research needs to be conducted to determine how this delivery method can increase success among high school students (DiRienzo, 2014).

Other disadvantages of online education include student:teacher ratios, teacher professional development, and lack of understanding related to why some students succeed in the modality and others struggle. O'Connor (2012) found that at K12, the nation's largest online education company, teachers had as many as 275 students in one class. Several studies have indicated that teachers often complain that they are not getting the amount of professional development training they need to feel comfortable teaching online and using best practices (Gold, 2001; The Journal, 2004). Not every student is successful in online education and predictors of student success have been researched to try and understand this phenomenon (Grubb, 2011). Wagner and Mejia (2014) found that achievement gaps were larger in online classes than face-to-face classes and that students are more likely to pass a face-to-face class versus an online class regardless of the subject.

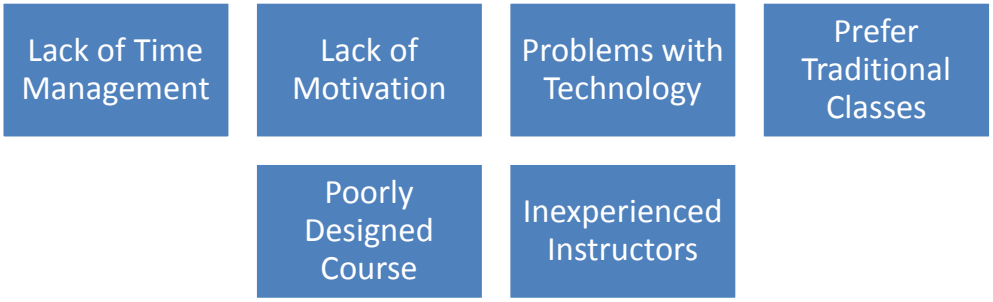
Student Retention

One of the significant concerns in online education is high attrition rates, especially compared to traditional courses (Heyman, 2010). Online courses generally have an attrition rate of 40–80%, which is 10–20% higher than in a traditional classroom (Herbert, 2006; Smith, 2010; Jaggars, 2011; Irvin et al., 2014). Bawa (2016) and other studies examined why online learners did not complete their course, at what point they left in the course, and what could have been done to keep online learners. These studies have shown that there is not a single reason students' dropout of an online course. It could be for personal, a job, or program reasons (Bawa, 2016; Perry, Boman, Care, Edwards, & Park, 2008; Willging & Johnson, 2009).

Online classes that are heavily self-directed can lead to a high attrition rate in at-risk youth and younger students (Bawa, 2016). Students who tend to be more at risk of dropping out generally have a lower level of proficiency at the start of the course, which may make self-paced online education more difficult for them (Levy, 2007). Also, a student is more likely to drop out of an online class if the student is just beginning high school, which signals that age is a factor to retention (Levy, 2007). Students often think online classes involve a lower time commitment, and a smaller workload (Bawa, 2016). These misconceptions can lead to a higher attrition rate because students' expectations of the simplicity of an online class go unrealized (Bawa, 2016). Online classes which are heavily self-directed can also result in a high attrition rate (Bawa, 2016), suggesting that the level of guidance and interaction with the instructor is likely a factor in student success. In addition, if students begin taking an online course as a freshman as opposed to a senior, he or she is more likely to drop out of an online class (Levy, 2007).

Common assumptions and misconceptions of online class can hamper student success. Some of these include the idea that in an online class there is less time commitment, and a lower workload, as well as a greater reliance in student self-direction online (Bawa, 2016). Irvin, Jordan, Hannum, and Farmer (2014) found that high school students were dropping out due to lack of time management, lack of motivation, problems with technology, preferring traditional classes, poorly designed courses, and inexperienced instructors. Figure 4 below outlines reasons found in the literature related to why online high school students drop out.

Figure 4: Why Online High School Students Drop Out



(Bawa, 2016; Irvin, Jordan, Hannum, & Farmer, 2014; Perry, Boman, Care, Edwards, & Park, 2008; Willging & Johnson, 2009)

Oblender (2002) discovered that students who were advanced and did well in traditional courses did not necessarily do well in online courses because they lacked essential skills such as time management and self-discipline. Examples of students' comments from the study of (Irvin et al., 2014, p.330) were

"I would not have been able to juggle the online course, my family, and work all at the same time. I would not have been able to find time to sit down and do the assignments with all my other work from my other classes," (Lack of time management)

"I dropped this class because it was hard and I didn't want to read again until I am in college," (Lack of motivation)

"The website had constant problems; I could not get my assignments because the website would freeze," (Problems with technology)

"It is hard to critique and learn from your work if you have forgotten what the assignment was about by the time that you get the graded paper back," (Poorly designed course/inexperienced instructors)

"I feel more comfortable in a classroom with a teacher giving me directions every day and where I can ask a question and get an immediate response." (Prefer traditional)

Online courses can take greater time management and motivation than a face-to-face course because the student does not have a teacher in his or her room motivating them and keeping them on track. These quotes also indicate that a student may not know what to do if the technology is not working and they value immediate feedback that does not always happen in an online course.

Lack of student preparation for online learning may lead to higher attrition rates compared to traditional face-to-face courses. Just because the current high school generation has grown up with technology, does not mean that they are right for online education. Prensky (2001) describes many students as "digital natives," who are people familiar with popular technology but not necessarily with educational technology. Instructors cannot assume just because a student is young and grew up with technology he or she is familiar with the skills and tools necessary for the work of online learning. A general assumption is if students are tech-savvy, they will be successful in an online course (Prensky, 2001). Grubb (2011) stated that not all students are successful in online courses, and students should be reviewed individually to see what strengths and weaknesses they possess before enrolling them in an online course.

Predictors of Student Success

Student achievement is the number-one focus in American schools (Vollmer, 2010). Duckworth et al. (2007) stated that student achievement may be viewed as student success. Student achievement or success has traditionally been predicted by grade-point average and standardized tests (Grub, 2011). Studies have been conducted to analyze predictors of student success in online courses (Grubb, 2011; Perry, 2011). Student success in this research is considered passing the online course. Age is one predictor that has been shown as an indicator of success in school (Artino, 2008; Bressler, et al., 2010; Grubb, 2011; Hughes et al., 2007; Perry,

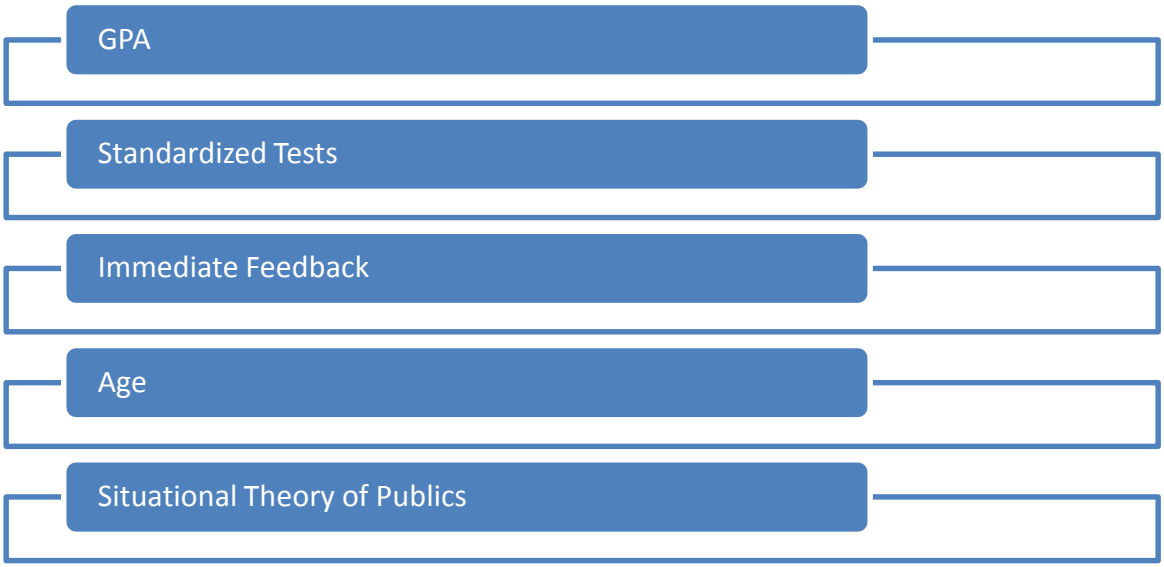
2011). Khanlarian and Singh (2014) showed that online learning success could improve by teachers providing immediate feedback because the sooner the student receives the feedback, the more successful he or she will be in that course.

Kruger-Ross and Waters (2013) studied the situational theory of "publics" and found that this framework can be a predictor of success in an online course. The situational theory of publics states that "there are four types of publics: latent, aware, active, and a nonpublic" (Kruger-Ross & Waters, 2013). A latent public consists of people who fail to notice the problems they encounter, such as a student who does not realize a due date is approaching. An aware public is a person who recognizes when he or she has problems and faces them; for example, a student who understands he or she is busy and knows a deadline is coming up for an examination. An active public consists of people who face, recognize, and attempt to resolve their problems, such as a student who has a full-time job and a family, knows a deadline for a final project is coming up and attempts to schedule his or her time so that he/she can finish the project on time. The last group is a nonpublic, which is someone who does not face their problems. An example would be, a student who thinks an online course would be a challenge so they would not even sign up for an online course (Kruger-Ross, & Waters, 2013). Kruger-Ross and Waters (2013) found that grouping people into active, aware, and latent publics was accurate in predicting test scores and how involved the students were in the course.

Figure 5 shows currently accepted predictors of success in online courses. Recently many researchers have been focusing on non-performance-based predictors of academic performance (Sparkman, Maulding, & Roberts, 2012). Some non-performance-based predictors include grit and mindset. Grit is defined as "trait-level perseverance and passion for long-term goals" (Duckworth et al., 2007, p. 1087). The grit survey is a potential predictor of student success in

online courses. “Growth” and “fixed” mindsets, developed by (Dweck, 2006) categorize people into two groups who believe either that the brain is capable of change or that his or her intelligence is unchangeable.

Figure 5: Predictors of Success in Online Courses



(Artino, 2008; Bressler, et al., 2010; Grubb, 2011; Hughes et al., 2007; Kruger-Ross & Waters, 2013; Perry, 2011; Sparkman, Maulding, & Roberts, 2012)

Research began in 2000 to develop a measuring instrument that could predict if an online learner would be successful (McVay, 2000). An online-readiness survey was created and focused on technology savviness, the perception of the effectiveness of online learning, self-discipline, motivation, and initiative (McVay, 2000). Five characteristics emerged as the necessary traits to be successful in the online-learning environment: independence; technology skills; internal motivation; interest in the topic; and communication skills (Hung, Chou, Chen, & Owen, 2010).

Online Readiness Surveys

Online readiness surveys are utilized in some high schools that offer online courses. The purpose of an online readiness survey is to screen students interested in enrolling in an online class and give feedback on their ability to be successful in an online class. These surveys consist

of a number of intrinsic factors, extrinsic factors, and personality characteristics that are predictors of student success. Online readiness surveys should identify students who will be successful in an online course (Wladis & Samuels, 2016). Included in these surveys are questions based around lifestyle, goals, communication skills, learning styles, computer skills, motivation, reading, writing, learning skills, learning styles, time management self-efficacy, persistence, academic skills, computer literacy, technology usage, among others. (Bartlett & Kotrlik, 1999; Pintrich, Smith, & Garcia 1993; SmarterMeasure, 2017). Readiness surveys preceded online learning and were utilized for students to understand his or her strengths and weaknesses as a learner. These surveys have since evolved into a barometer of student readiness to begin an online course.

Motivated Strategies for Learning Questionnaire (MSLQ)

Pintrich et al. (1993) created a readiness instrument, not specific to online learning but which can be used for online readiness, called the Motivated Strategies for Learning Questionnaire (MSLQ). The MSLQ was "developed to measure types of learning strategies and academic motivation for students" (Pintrich et al., 1993, p. 27). The MSLQ consists of 81 questions and uses a 7-point Likert scale ranging from "not at all true of me" to "very true of me" (Pintrich et al., 1993). The questions regard items such as motivation, study skills, learning skills, time management, reading, and learning styles (Pintrich et al., 1993). This survey uses six motivation scales and nine learning-strategy scales shown in Table 1. The higher the score, the better, except in the scale of text anxiety, in which a higher score represents higher anxiety.

Students who take the MSLQ are given feedback on the following areas: "task value, self-efficacy for learning and performance, test anxiety, rehearsal, elaboration, organization, metacognition, time and study-environment management, effort regulation, individual survey

scores; class scale means; quartile information; descriptions of each scale; and suggestions on how to increase levels of motivation" (Pintrich et al., 1993, p. 27).

Table 1: MSLQ Scales

MSLQ SCALES

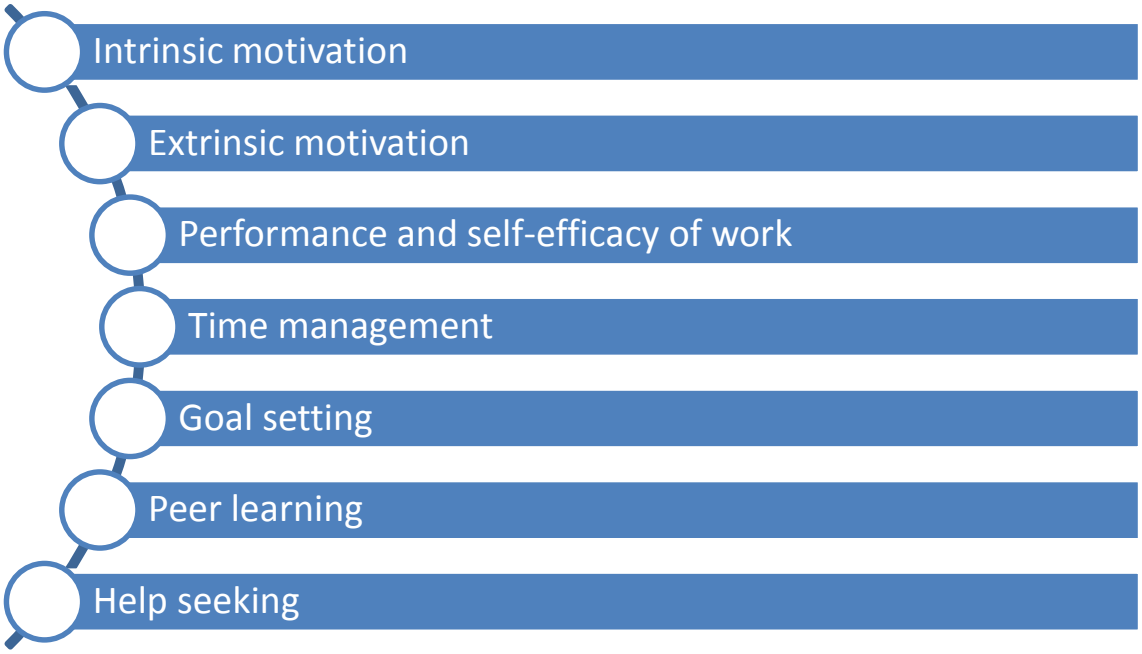
Cognition	Motivation	Behavior	Context
Rehearsal	Intrinsic Goals	Effort Regulation	Time Management
Elaboration	Extrinsic Goals	Help-Seeking	Peer Learning
Organization	Task Value		Study Environment
Critical thinking	Control Beliefs		
Metacognition	Self-Efficacy		
	Test Anxiety		

(Pintrich et al., 1993)

Bartlett-Kotrlik Inventory of Self-Learning (BISL)

The Bartlett-Kotrlik Inventory of Self-Learning (BISL) used several items from the MSLQ and applied them to corporate online training (Bartlett & Kotrlik, 1999). The purpose of the BISL was to assess self-directed learning, which aligns more toward the learning style of online courses. The BISL consists of 49 items and has an internal consistency of .91 (Bartlett & Kotrlik, 1999). The creators do acknowledge that more research needs to be done to establish reliability. Factors used in the BISL are shown in Figure 6.

Figure 6: BISL Factors



(Bartlett & Kotrlik, 1999)

Online Technologies Self-Efficacy Scale (OTSE)

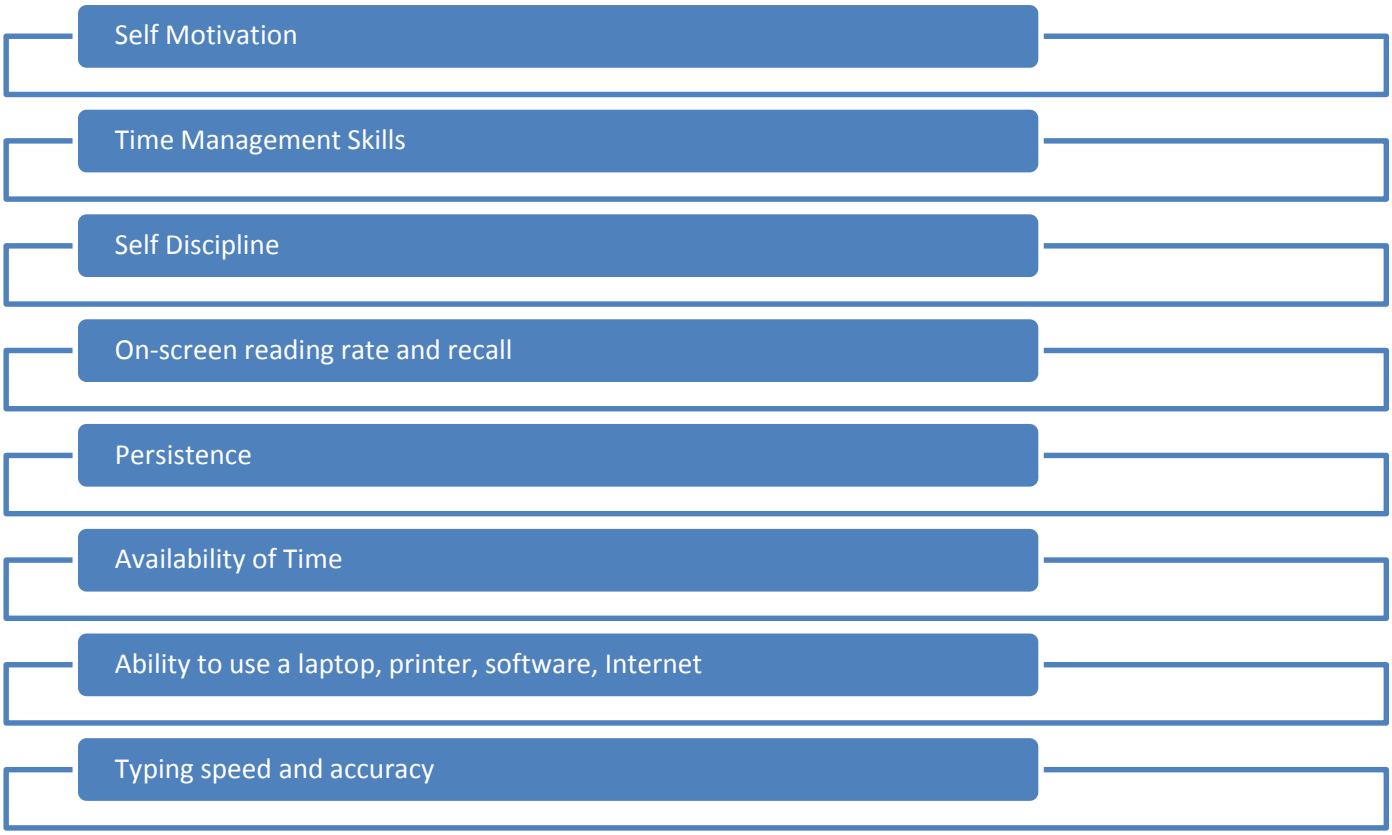
The purpose of the online technologies self-efficacy scale was to "develop and validate a new instrument that would measure students' confidence levels with online technology" (Miltiadou & Yu, 2000). This instrument consists of 30, 4-point Likert-scaled items, from "Very Confident," "Somewhat Confident," "Not Very Confident," to "Not Confident at All." The internal consistency reliability was .95 (Miltiadou & Yu, 2000). The online technologies self-efficacy scale was developed to assist educators in identifying students who are not confident in using online technologies before they enrolled in an online course.

SmarterMeasure

SmarterMeasure, created in 2001, indicates "the degree to which an individual student possesses the attributes, skills, and knowledge that contribute to success" (SmarterMeasure, 2017). There are two versions of the online-readiness indicator: one for high school students and another for college students. Instead of self-assessment questions, it uses a series of activities to

measure students abilities in recommended online skills (SmarterMeasure, 2017). SmarterMeasure skills for success are listed in Figure 7.

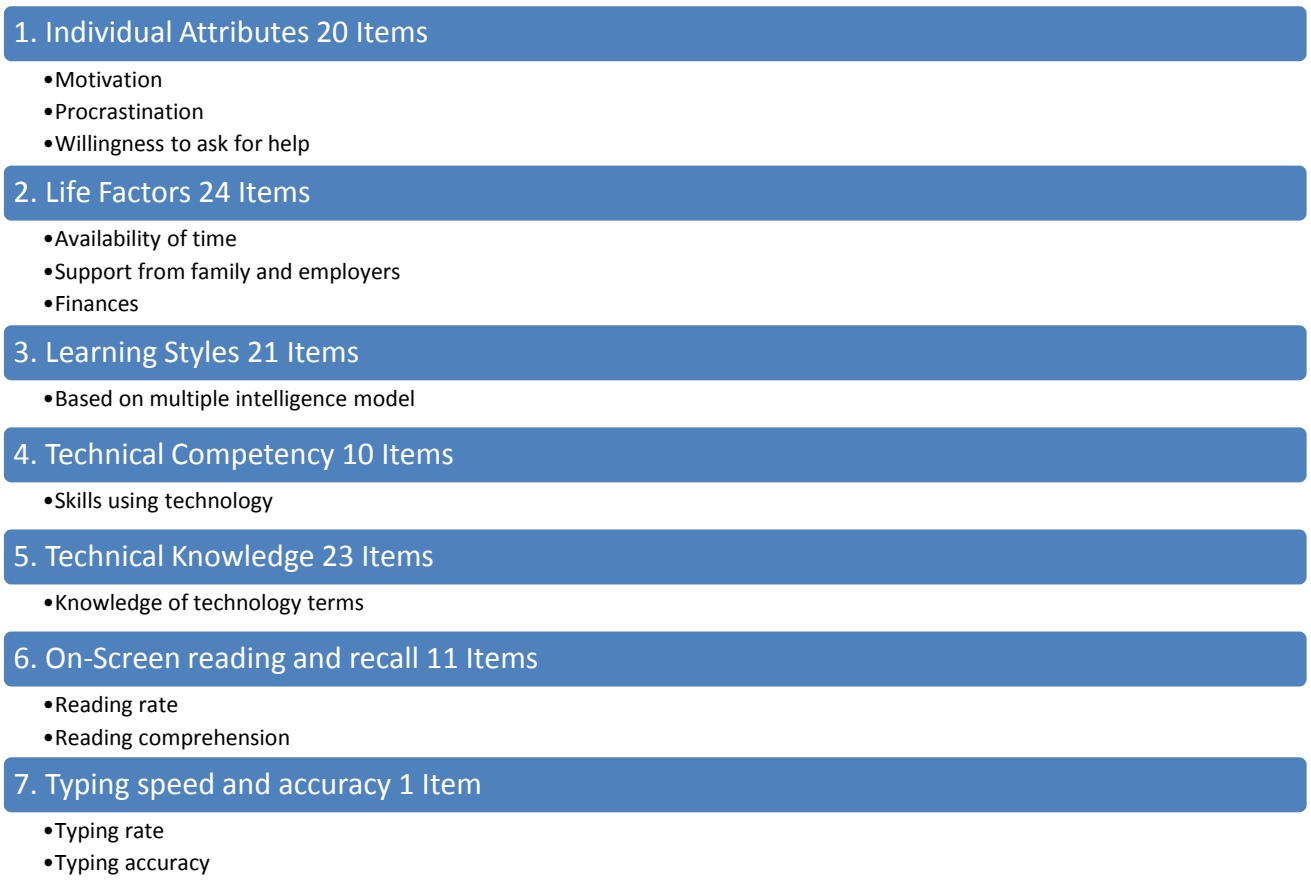
Figure 7: SmarterMeasure Skills for Success



(SmarterMeasure, 2017)

The SmarterMeasure survey notifies students who may be lacking skills necessary for success in an online course (SmarterMeasure, 2017). It also provides remediation for improvement for at-risk students. There are seven major assessment components for the SmarterMeasure learning-readiness indicator, shown in Figure 8. Each section has 1–24 items measured on various Likert scales, and a variety of question types, including reading comprehension, multiple choice, and fill-in-the blank (SmarterMeasure, 2017). Students are given feedback that indicates if they are in a low, medium, or high level of readiness. There are also two optional cognitive sections that measure math and writing readiness with 30 items each.

Figure 8: SmarterMeasure Sections



(SmarterMeasure, 2017)

Wladis and Samuels (2016) studied 12 instruments, including MSLQ, BISL, OTSE, and SmarterMeasure, that are used to test if a student is ready to take an online course. They were unable to find factors that predict how well a student will do in an online course when compared to a traditional course (Wladis & Samuels, 2016). Wladis and Samuels (2016) stated that there have been no well-controlled studies to confirm that online readiness surveys predict online success. Wladis and Samuels (2016) suggest that educators should test online readiness surveys for validity before implementing them.

Gender and Age as Predictors of Success

Many studies exploring academic success have shown that gender and age can be predictors (Alstete, & Beutell, 2004; Kupczynski, 2014; Muse, 2003; Vella, Turesky, & Herbert, 2016). Vella et al. (2016) found that age was positively associated with success for females in online courses, and the difference in performance between men and women diminished among older compared to younger students. Kupczynski (2014) found that older females were more successful in online courses. Bayrak and Gulati (2015) discovered that female students performed better than males in online courses. Alstete and Beutell (2004) examined indicators of academic success, and the results indicated gender and age predict academic success and that older female students earned higher grades in an online course. Muse (2003) found age to be a significant predictor of successful course completion in Web-based courses. Alstete and Beutell (2004) explained that older students tend to get better grades in online courses and suggest that younger students may not be ready for a self-directed online format.

Grit

As mentioned previously, grit has been an area of study related to non-performance factors of student success. Grit is defined as "trait-level perseverance and passion for long-term goals" (Duckworth et al., 2007, p. 1087). Duckworth et al. (2007) suggested that the commonality between people who become successful is grit. Angela Duckworth began her grit research with the United States Military Academy at West Point. West Point begins with over 14,000 applicants each year and only 1,200 are admitted and enrolled (Duckworth, 2016). One-fifth of these students will drop out before graduation (Duckworth, 2016).

Several researchers have studied this high attrition rate with no certainty of why some drop out and others stay (Hyllegard, Deng, & Hunter, 2008; Mgutshini, 2013; Salazar, 2010; Xing, Chen, Stein, & Marcinkowski, 2016). The process of admissions looks at a Whole Candidate Score, which consists of the student's average SAT or ACT examination scores, his or her high school rank, letters of recommendation regarding leadership, and the candidate's physical fitness. This Whole Candidate Score did not reliably predict who would finish, and students with a high score were just as likely to drop out as those with lower scores.

Duckworth (2016) began as a mathematics teacher for seventh graders. She observed that some were more talented than others, yet, some of the students who were more talented were still getting bad grades. Some who initially struggled had good grades. She concluded that aptitude did not guarantee achievement. As she moved on to teaching math for students in high school, she again observed that talent did not equal success. At this point, she decided to transition to the field of psychology to study this concept (Duckworth, 2016).

Duckworth (2016) studied Charles Darwin (1887) and his belief that zeal and hard work are more important than intellectual ability. She also studied William James' (1989) work on how different people pursue goals and the gap between potential and actualization. She observed several studies where most Americans believe effort is more important to success than talent (Duckworth, 2016).

The concept of grit indicates that what is accomplished may depend more on passion and perseverance than on talent. Grit is also malleable. Grit can be grown in people. Duckworth (2016) explained that the qualities associated with grit change over time with practice. People who are interested in something they are passionate about, pursue it, practice it, and have a purpose, will see a growth in grit (Duckworth, 2016).

Duckworth (2016) studied the psychology of success in several fields such as business, art, athletics, journalism, academia, medicine, and law. These successful people all had resilience, commitment, determination, direction, and were hard-working. This combination of passion and perseverance equaled the concept of grit (Duckworth, 2016).

To quantify Duckworth's (2016) research, she developed questions on perseverance and on passion. The resulting tool is called the "grit scale." The grit scale measures the extent to which a person approaches life with grit. In 2004, Duckworth gave 1,218 West Point cadets the grit scale. Grit scores showed no relationship to the Whole Candidate Score, which suggested that talent is not a guarantee of grit. There were 71 drop outs within seven weeks. Grit predicted who would stay and who would go. In 2005, Duckworth again tested the scale. That year there were 62 drop outs, and again grit predicted who would stay and who would drop out.

Duckworth (2016) wanted to evaluate the grit scale in another high-dropout field, so she used the grit scale in a vacation time share company, where there was a very high turnover of employees. At this company, within six months, 55% of the salespeople were no longer employed. Grit again predicted who would be retained and who would not. Grit was more effective in predicting job retention than extroversion, emotional stability, and conscientiousness (Duckworth, 2016).

Chicago Public Schools approached Duckworth and wanted to know which students would earn their high school diploma. Thousands of high school juniors took an abbreviated grit scale and Duckworth waited to see who would graduate. Students who graduated were significantly grittier than the 12% who failed to graduate (Duckworth, 2016). Grit was a better predictor than how much students cared about school, conscientiousness about studies, and how safe they felt at school (Duckworth, 2016).

Duckworth additionally looked at two American samples of adults and education. Grittier adults were more likely to get further in formal schooling. Those with an MBA, PhD, MD, or JD were grittier than those with a four-year degree (Duckworth, 2016). Those with a four-year degree were grittier than those with some college or no degree. Different ages and gender did not vary when compared with the differences in grit score among education level (Duckworth et al., 2007).

Duckworth also analyzed the Army Special Operations Forces (Green Berets) Special Forces Selection Course. This course had a 42% dropout rate and, once again, grit predicted who would stay and who would not go on (Duckworth, 2016). Finally, Duckworth analyzed 273 spellers from the Scripps National Spelling Bee. Two-thirds of the spellers returned their grit-score questionnaire. The spellers ranged in age from 7 to 15. The grittier children went further in the completion. Duckworth also found no relationship between verbal IQ and grit (Duckworth, 2016).

How Grit Impacts Student Success

From Duckworth's research, it appears that in high attrition areas, such as the military, education, and sales positions, the grit score can predict the success of an individual. This led the researcher of this dissertation to believe that a student's grit score may be an effective predictor of success in the relatively high attrition area of online education.

The grit scale provides statements that analyze the participant's passion and perseverance. The participant chooses an option based on a five-point Likert scale for each statement and is assigned a point value. The Likert scale ranges from "not at all like me" to "very much like me." The survey statements include: "New ideas and projects sometimes distract me

from previous ones," "I often set a goal but later choose to pursue a different one," and "I have been obsessed with a certain idea or project for a short time but later lost interest."

To calculate the grit score, all the points were added for the statements checked and divided by 10. The maximum score on this scale is 5, which represents extremely gritty and the lowest possible score is 1, which represents not gritty at all (Duckworth & Quinn, 2009). A participant's score can change because people's sense of their persistence can vary and it can also vary with age (Duckworth & Quinn, 2009).

Grit is composed of passion and perseverance. To calculate the "passion" score, one would add the points for the odd-numbered questions and divides by 5. For "perseverance" score, one combines the points for the even-numbered items and divides by 5. Duckworth (2016) found that passion and perseverance are positively correlated, meaning that high scores on one are often associated with high scores on the other.

Most people studied have a perseverance score slightly above their passion score (Duckworth, 2016). The questions that generate the passion score ask the participant to reflect on how steadily he or she holds to goals over time. The questions that generate the perseverance score reflect on working hard and bouncing back from impediments.

All gritty people Duckworth studied can acknowledge parts of their work they enjoy less than others, but they could see the big picture and endure (Duckworth, 2016). Gritty people also try to do things better daily, and they try to improve weaknesses (Duckworth, 2016). Gritty people have the conviction their work matters, which fuels their passion. People with grit push through hardships even when things are difficult (Duckworth, 2016).

Gritty people get up every time they get knocked down. Even if people do not have interest, practice, purpose, or hope, they can still learn to discover, develop, and deepen interests,

acquire the habit of discipline, cultivate a sense of purpose and meaning, and teach themselves hope. People can develop grit by finding a job that fits their personal interests, because it creates job satisfaction and people perform better at work when they do what interests them (Duckworth, 2016).

People can also develop grit by practice. Spending hours on developing skills and continuously improving will develop grit. Gritty people seek out challenges they cannot yet meet and strive to accomplish those goals. Duckworth (2016) found that grittier people practice more than less gritty people.

Grit scores vary by age. The grittiest adults in Duckworth's sample were in their late 60s or older; the least gritty were in their 20s (Duckworth, 2016). It is possible that adults older than 60 grew up in a culture that valued passion and perseverance more so than the culture for those in their 20s. It is also possible that age trends have nothing to do with the generational change in grit. Duckworth (2016) stated that grit may grow alongside age because of the increase in life experience, maturity, perseverance, and passion.

To find the correlation between age and grit, Duckworth asked people of different ages about their current level of grit. She also looked at several studies based on personality traits which showed that over time, people become more conscientious, confident, caring, and calm (Duckworth, 2016). The reasons life experiences change personality are that we change when we learn something we did not know before. As we age, we experience new situations, and we change when needed. Over time, people learn life lessons and adapt in response to the growing demands of his or her circumstances (Duckworth, 2016).

Duckworth (2016) says grit changes as a function of the cultural era in which we grow up and we get grittier as we grow older. This finding shows grit is not entirely fixed. People with

grit share the following: interest, practice, purpose, and hope. Duckworth et al. (2007) integrated the concept of grit with predicting success in challenging areas of a person's life.

Since Duckworth's original study, others have examined if grit can predict success in other areas, and a positive correlation has been shown (Carrier, 2014; Kearns; 2015; Robinson, 2015; Black, 2014; Chang, 2014; Stewart, 2015).

Development of the Grit-S

Participants in the grit studies mentioned earlier originally took a 12-item grit survey called the Grit-O (Duckworth, 2009). This later has become the Grit-S survey after the researchers excluded four items that were most commonly below the median in predictive value (Duckworth, 2009). Duckworth's 2009 study found that the Grit-S survey is consistent over time (Duckworth, 2009). The Grit-S survey has eight items with questions such as "New ideas and projects sometimes distract me from previous ones," "I am a hard worker." Participants must choose an option based on a 6-point Likert scale ("Very much like me," "Mostly like me," "Somewhat like me," "Not much like me," "Not like me at all"). For each of the questions, certain points are assigned based on the participant's answer. Once the points are added, they are divided by 8. "The maximum score on this scale is 5 (extremely gritty), and the lowest score on this scale is 1 (not at all gritty)" (Duckworth, 2009).

For a "passion" score, one can use the points for the odd-numbered survey questions, and the "perseverance" score can be determined by using the points of the even-numbered survey questions (Duckworth, 2016). Duckworth (2009) has shown a high internal consistency in several areas, shown in Table 2. Cronbach's alpha measures the internal consistency to analyze how closely related a set of data is as a group. "A reliability coefficient of .70 or higher is considered acceptable in most research" (UCLA, 2017).

Table 2: Internal Consistency of Grit-S

	Internal consistency (α)
National spelling bee 2005	.80
West point 2008	.73
West point 2010	.76
Ivy league undergraduates	.83

(Duckworth & Quinn, 2009)

Building Grit

In a recent interview with a business professor, Angela Duckworth was asked how grit can be developed. Duckworth stated that someone must first be interested in the topic, then that person needs to have a period of prolonged skill development and dedicated practice (Editors, 2016). Much feedback is necessary for the process of dedicated practice, which can build grit. Next, the person must identify the purpose of what he or she is doing. Finally, the person must have hope (Duckworth, 2016).

Duckworth also gave credit to Dweck and the concept of a growth mindset. Duckworth stated if one is stuck in a fixed mindset where he/she believes things are not going to change, and this individual continues to look for evidence that nothing will change, then he or she will end up proving themselves right. This is because the individual will be stuck in a fixed mindset instead of having hope and finding evidence that one can change and subsequently making the change (Duckworth, 2013; Editors, 2016).

Criticism of Grit

Grit has been very popular in the education community over the past few years and it has its critics. Hattori (2015) interviewed some of the critics, and one of the arguments presented is

that grit is not the key answer to raising student achievement. Particularly with low-income students, this may be the case because grit ignores conditions in low-income students' homes, neighborhoods, and schools. Grit also assumes school failure is a lack of personal grit instead of the effects of his or her environment.

Another critique is that grit in school can often be associated with obedience and completing work that is not helping the student to learn, which should not be something to praise (Hattori, 2015). Critics say that the research supporting grit is weak, is based on self-report surveys, and only suggests a correlation and proves no causation (Hattori, 2015).

Another critic stated that a big mistake in understanding grit is that an individual has it or does not have it, and if the person does not have it, they need to build it (Hattori, 2015). A student from one of the schools interviewed said, "The drug dealer on my corner has grit. That doesn't mean it's a good thing" (Hattori, 2015).

Crede (2016) stated that he had analyzed grit and found it to be no different from conscientiousness and that the grit questions and conscientiousness questions are almost word-for-word the same. Grit is simply a repackaging of conscientiousness and perseverance is a better predictor of success; researchers of grit should shift to perseverance in future research (Crede, 2016). Grit was critiqued with the inference that the impact of grit is exaggerated and the effect sizes are misleading (Crede, 2016). For example, in the study based on West Point cadets, Duckworth had shown that individuals with grit scores above average were 99 percent more likely to succeed than individuals with an average grit score; however, Crede stated that data was incorrect and his examination showed the increase was closer to 3 percent (Crede, 2016).

Kamenetz (2016) interviewed Duckworth and she did admit that she poorly described the size of her outcomes but her intention was not to mislead. Duckworth did not mention that 95

percent of all cadets make it through basic training, and 98 percent of the grittiest cadets made it through (Kamenetz, 2016). Duckworth failed to clarify that it is the odds of making it through that improved by 99 percent, not that a cadet would be 99 percent more likely to make it through (Kamenetz, 2016). Duckworth continued to state that she agrees with Crede that the relationship between grit and academic success are not as strong as indicated in her 2013 Ted talk (Duckworth, 2013; Kamenetz, 2016). Duckworth's reasoning behind this is that in the Ted talk she stated grit was powerful and unique whereas now she says the independent impact of grit is in a small-to-medium range (Kamenetz, 2016). In reference to Crede's (2016) critique that grit is not unique, Duckworth argues that grit is a skill and conscientiousness is a trait (Kamenetz, 2016).

Grit has not yet been researched with the relationship between online high school course success and the student's grit score. Grit is still linked to success even if the level is argued, and it is still worth researching if it can be a predictor for success for high school students in their first online course.

Mindset

Grit has been linked with the concept of "mindset," which is why these two concepts were studied simultaneously in this dissertation. Mindset has been studied for over 40 years by Carol Dweck and other researchers (Salmon-Nembhard, 2015). Dweck started the research on growth and fixed mindset because she was curious about how people coped with failures (Dweck, 2006). "Growth" mindset is the idea that the brain is capable of change and the response to challenging situations can lead to increase in perseverance (Dweck, 2006). Students who have a growth mindset value effort and know that ability can be formed and enlarged over time (Hochanadel & Finamore, 2015). The opposite of a growth mindset is a "fixed" mindset, where a

person believes his or her intelligence and ability are unchangeable (Hochanadel & Finamore, 2015).

A student's mindset has profound effects on his or her school achievement (Hochanadel & Finamore, 2015). Garofalo (2016) studied the impact of teaching growth mindset on a student's grade and found that teaching growth mindset did show an improvement in course grade and grit. Dweck (2006) believes that mindset versus intelligence determines a student's success. Dweck (2008) also believes that students' mindsets determine not only their achievement, but also their underachievement.

Dweck studied several different ages of students, and students with a fixed mindset generally focused on things that were easy for them while students with a growth mindset sought out more difficult tasks (Dweck, 2006). People's brain waves fluctuate based on their mindset. Students with the fixed mindset have also shown higher levels of depression than those with a growth mindset (Dweck, 2006). A fixed mindset limits achievement while a growth mindset increases achievement. A fixed mindset would think "I can't" while a growth mindset would think "Not yet".

Growth mindset focuses on learning rather than success or failure (Bates, 2016). Students with a fixed mindset believe they need to work at a mistake-free level. Students with fixed mindsets look at mistakes a sign of weakness instead of an opportunity to learn (McCullough, 2015). Often these students have natural talent and when they do not perform well they get down on themselves. Typically, these students have had to work hard to get to their current level. These students always look for ways to get better. Growth and fixed mindset are demonstrated in Figure 9.

Figure 9: Growth Mindset and Fixed Mindset

(Sinibaldi, 2016) Reprinted with permission.

Measuring Mindset

To quantify mindset, Dweck developed a mindset survey comprised of eight questions, where participants choose an answer based on a 6-point Likert scale ("Disagree a lot," "Disagree," "Disagree a little," "Agree a little," "Agree," "Agree a lot") (Dweck, 2008). The questions from the mindset survey discuss how students feel about their intelligence, mistakes they have made, and hard work.

Growth-mindset statements include:

"No matter how much intelligence you have, you can always change it quite a bit."

"You can always substantially change how intelligent you are."

"I like work that I'll learn from, even if I make a lot of mistakes"

Fixed-mindset statements include:

"Your intelligence is something very basic about you that you can't change very much."

"You can learn new things, but you can't really change how intelligent you are."

"To tell the truth, when I work hard, it makes me feel as though I'm not very smart"

Psychometrics of Tools Used to Measure Mindset

When a participant has completed the survey, his or her score is added up. This score becomes the mindset-assessment profile number. The profile number is categorized into a range from 8 to 48 (see Table 3). For example, Profile Numbers 21–24 show that the individual leans toward thinking his or her intelligence cannot change much; whereas Profile Numbers 45–48 show that the participant feels certain that intelligence can be increased by learning, and he or she likes a challenge (Dweck, 2008). Table 4 shows profile numbers, groups, and what each score represents. Silpakit, Silpakit, & Chomchuen (2015) found the mindset assessment scale internal consistency to be .67 and the corrected item total correlation ranged between .13-.49. Hong, Chiu, Dweck, and Sacks (1997) found the scale to have a high internal consistency reliability of .94 and found the test-retest reliability to be high with $r = .80$.

Table 3: Mindset Profile Numbers

PROFILE NUMBER	GROUP	BELIEFS
8-12 13-16	F5 F4	Strongly believe intelligence is fixed. If one cannot perform perfectly he or she would rather not do it. He or she thinks smart people don't have to work hard.
17-20 21-24	F3 F2	One does not really think that his or her intelligence changes much. He or she prefers not to make mistakes and does not like to put in a lot of work. One believes learning should be easy.
25-28 29-32	F1 G1	One is unsure about whether he or she can change his or her intelligence. One cares about how he or she performs and he or she also want to learn but does not want to work too hard for it.
33-36 37-40	G2 G3	One believes that his or her intelligence is something they can increase. One cares about learning and is willing to work hard. One wants to do well but he or she thinks it is more important to learn than to always perform well.
41-44 45-48	G4 G5	One feels very sure that he or she can increase his or her intelligence by learning. He or she likes a challenge. One believes the best way to learn is to work hard. He or she does not mind making mistakes.

(Mindset Works, 2012)

How to Develop Grit in Individuals Through Mindset

People can develop grit if they choose to when faced with something challenging (Hochanadel & Finamore, 2015). Duckworth (2016) and Dweck (2008) researched why some people persevere while others in the same situation give up. Duckworth (2016) studied the concept of grit, while Dweck (2008) studied the concept of "growth" and "fixed" mindsets. Duckworth (2007) determined that grit could be increased by having a growth mindset. Every time Duckworth (2016) measured growth mindset with grit she found that the two concepts had a strong positive correlation. Duckworth (2016) noticed that a fixed mindset led to a pessimistic attitude, which led to giving up on challenges or simply avoiding them. Duckworth (2016) saw that a growth mindset led to perseverance and finding challenges that would make individuals stronger. Dweck (2006) stated that a growth mindset allows people to enjoy what they are doing and continue to enjoy it in the face of difficulties.

Mindset does have some critics. Myers, Wang, Black, Bugescu, and Hoeft (2016) found the grit and growth mindset showed a small correlation ($r = .34$) and the effect was not significant with a p value of .14. Wilson (2016) found no relationship between teaching growth mindset and an increase in student grit scores. More research needs to be done to find if teaching growth mindset does have an effect on a student's grade and grit score.

Conclusion

The popularity of online courses is growing at a significant rate, yet they often have lower success rates. Various scholars have tested methods of predicting success in online courses, with little success. Concepts like grit and mindset may provide a new opportunity for predicting and improving online course success. The literature review presented in Chapter II covered the growth of online education, the low retention rate in online courses compared to

traditional education environments, predictors of success in online classes, various online readiness surveys, age and gender as predictors of student success, and grit and mindset as predictors of success. Current literature on the topic supports the following related to online education: (a) online education in K-12 environments will continue to grow; (b) the retention rate of online courses is not growing with the enrollment of online education; (c) current predictors of success in online courses are GPA, Internet access, reading and comprehension skills, age, course design and additional research needs to be done on non-performance indicators; (d) there are several online-readiness surveys, but none have been found to work for all high school students; (e) age and gender have been found to be predictors of student success with older females tending to succeed more frequently; (f) because grit, mindset, age, and gender have been predictors of success in several high-attrition situations, they are potential variables to predict success in a high school student's first online course (Alstete, & Beutell, 2004; Duckworth, 2016; Dweck 2006; Kupczynski, 2014; Muse, 2003; Vella, Turesky, & Herbert, 2016).

Based upon current research it is evident that there is a gap in the literature pertaining to potential predictors of success in a high school student's online course. This dissertation adds to the current body of literature by focusing on high school students taking their first online course and analyzing grit and mindset as potential predictors of success. This research focuses on high school students, while much of the current literature focuses on college students in online courses (Bond, 2013; Hernandez & Shewchuk, 2008; Mendenhall, 2009; Smith, 2015). With the continuous growth of online education and low retention rate, it is crucial to have a good system that assesses student potential for success. It is important to put in place supports for students who may be at risk for failing to succeed. There are online readiness surveys currently being used; however, their predictive ability has been questioned (Wladis & Samuels, 2016). A number

of studies in other environments have shown that mindset, grit, age, and gender may be more predictive of persistence than academic measures. Although age and gender have been shown to be predictors of student success, this study combines those variables with grit and mindset to find the best predictor of success and what combination of variables can best predict online success. There is a lack of data on how these factors impact the success of students in an online high school environment.

Chapter III

Design and Methodology

Introduction

Chapter II presented a literature review on topics including the growth of online education, student retention in online courses, online-readiness surveys, predictors of student success, grit, and mindset. Gaps in the literature identified include a reliable online-readiness survey for high school students and predictors of success in a high school student's first online course. Chapter III discusses the research design of this study, the high schools and students participating, data collection, analytical methods, and limitations of the study.

The purpose of this dissertation was to analyze several variables that have been predictors of success in areas with high attrition and determine if they translate to the success of a student in his or her first online high school course. In this study, a quantitative design was used to determine if there was a relationship between the variables of grit, mindset, gender, and age, compared to a student's performance in their first online high school course.

According to Szyjka (2012), quantitative methods can be used to acquire broad-based generalizations. The variables analyzed were grit, mindset, age, gender, and online-course grade. Grit was chosen because it has been shown to link success and high attrition areas (Duckworth, 2016). Mindset was included because it is positively correlated with grit and a growth mindset has been shown to increase grit (Dweck, 2006). Age was selected because it has been linked with an increase in grit (Duckworth, 2016), and gender because it has been shown that more females succeed in online classes (Kupczynski, 2014).

Research Questions

This study adds to a gap in literature related to online student success by assessing grit and mindset as possible predictors of success in a student's first online course. Findings could lead to the development of an online-readiness survey for online high school students. For this study, two research questions were designed from gaps identified in the literature.

1. What are the relationships among grit, mindset, age, gender, and a student's first online high school course grade measured by percentage?

   The sub-questions for the first research question included:

   a. Does course grade vary by grit category, mindset category, or gender?

   b. Is there a correlation between grit, mindset, or age and course grade?

2. What combination of factors (grit, mindset, age, gender) best predict success within a student's first online high school course?

The study analyzed 55 students participating in their first online high school course. The data-collection instruments used were an 8-item Grit Scale developed by Angela Duckworth (Duckworth, 2016) and an 8-item mindset survey developed by Carol Dweck (Dweck, 2006). The background demographics of gender and age were also collected. A one-way ANOVA was used to analyze the course grade to identify if it varied by grit category and mindset category. An independent t-test was used to identify if course grade varied by gender. A Pearson correlation coefficient was used to measure the linear correlation between grit, mindset, and course grade. A multiple-regression analysis was used to determine the combination of factors (grit, mindset, age, gender) that best predict success within a student's first online high school course. Table 4 indicates the independent variables (IVs) and dependent variable (DV) used for each research question and the statistical method used to test each variable.

Table 4: Research Questions and Statistical Tests

Research questions	Independent variable(s)	Dependent variable	Statistical Test
1a. Does course grade vary by grit category, mindset category, or gender?	Grit category Mindset category Gender	Course grade	One-way ANOVA Independent t-test
1b. Is there a correlation between grit, mindset, or age and course grade?	Grit Mindset Age	Course grade	Pearson correlation
2. What combination of factors (grit, mindset, age, gender) best predict success within a student's first online high school course?	Grit Mindset Age Gender	Course grade	Multiple regression

Research Design

A survey that included grit and mindset sections as well as demographic questions was administered to participants taking an online course at two high schools in Utah during the first two weeks of their class in the fall semester of 2016. The first portion of the survey related to grit while second part addressed mindset. The students' teachers or administrator sent out the surveys via email. Students enrolled in their first online high school course were eligible to participate in this study. If a student was enrolled in multiple online classes, they were only able to participate in one of his or her classes. Data from the surveys were compared to these students' final course grades, reported by the students' teachers, at the end of the semester.

Instrument

The online survey distributed to students included multiple-choice items on a 5-point Likert scale from very much like me to not like me at all and a 6-point Likert scale from agree a lot to disagree a lot. The survey also included a question on the students' gender and age where they chose from various options. The survey questions received participant feedback on:

1. Grit (8-items)

2. Mindset (8-items)
3. Age
4. Gender

The grit survey determined the level of grit of each student (Duckworth, 2016). The mindset survey determined if the student had a "growth" or "fixed" mindset (Dweck, 2006). The 20-question survey took the participants approximately 20 minutes to complete.

Grit Survey

The original grit survey consisted of 12-items and was called the Grit-O survey (Duckworth & Quinn, 2009). This later became the Grit-S survey after the researchers excluded four items that were most commonly below the median in prediction (Duckworth & Quinn, 2009). The 2009 study found that the Grit-S survey, which was utilized in this study, is consistent over time and does not vary by genders (Duckworth & Quinn, 2009). Duckworth and Quinn also found that the Grit-S survey was a more efficient measure of grit than the previous Grit-O version (Duckworth & Quinn, 2009). Cronbach alpha scores ranged from .73 to .83 for Grit-S displaying acceptable internal consistency (Duckworth & Quinn, 2009).

The Grit-S survey takes approximately eight minutes to complete and asks questions such as "New ideas and projects sometimes distract me from previous ones," and "Setbacks don't discourage me" (Duckworth, 2016) (Appendix B). This survey is free to use for research purposes from the Duckworth Lab.

Once the students completed the survey their scores were calculated as shown in Table 5. The researcher added their points and divided by eight. The maximum score on this scale is 5 (extremely gritty), and the lowest score on this scale is 1 (not at all gritty) (Duckworth & Quinn, 2009).

Table 5: Grit-S scale scoring guide

Question #	Coded	Question #	Reverse-coded
2	5 = Very much like me 4 = Mostly like me	1	1 = Very much like me 2 = Mostly like me
4	3 = Somewhat like me 2 = Not much like me	3	3 = Somewhat like me 4 = Not much like me
7	1 = Not like me at all	5	5 = Not like me at all
8		6	

(Duckworth & Quinn, 2009)

Next, participants were placed into a category based on their grit score listed in Table 6.

Table 6: Grit Categories

Grit score	Grit category
1.0–1.9	Not gritty
2.0–2.9	Fairly gritty
3.0–3.9	Moderately gritty
4.0–5.0	Very gritty

(Duckworth & Quinn, 2009)

Mindset Survey

The mindset survey consists of eight-items and determines if a student is more aligned with a growth or a fixed mindset (Wilkins, 2014). Blackwell (2002) stated the reliability was .78 (Cronbach's alpha) while Wilkins found the Chronbach's alpha to be .76, both on the high end of what is considered acceptable internal consistency reliability (Wilkins, 2014). Silpakit, Silpakit, & Chomchuen (2015) found the mindset assessment scale internal consistency to be .67.

The mindset survey takes approximately eight minutes to complete and asks questions such as "Your intelligence is something about you that you can't change very much," and "To be honest, you can't really change how intelligent you are" (Dweck, 2006) (Appendix C). This

survey is free to use for research purposes from the Project for Education Research (PERTS) website.

Once a student completed the survey, his or her score was calculated as shown in Table 7. The researcher added their points to calculate the participant's mindset score. The maximum score on this scale is 48 (G5: growth mindset), and the lowest score on this scale is 8 (F5: fixed mindset) (Mindset Works, 2012).

Table 7: Mindset scoring guide

QUESTION #	CODED	QUESTION #	REVERSE-CODED
1	6 = Agree a lot 5 = Agree 4 = Agree a little 3 = Disagree a little 2 = Disagree 1 = Disagree a lot	2	1 = Agree a lot 2 = Agree 3 = Agree a little 4 = Disagree a little 5 = Disagree 6 = Disagree a lot
3		4	
5		6	
7		8	

(Mindset Works, 2012)

Once the students completed the survey they were placed into a category based upon their mindset score, shown in Table 8. F1-F5 is considered a "fixed" mindset and G1-G5 is considered a "growth" mindset. G5 is the strongest level of "growth" mindset, and F5 is the strongest level of "fixed" mindset. "Fixed" means the participant believes that his or her intelligence is fixed, while "growth" means that the participant believes that he or she can increase his or her intelligence (Mindset Works, 2012).

Table 8: Mindset Categories

Mindset score	Mindset category	Type of mindset
8-12	F5	**Fixed Mindset**
13-16	F4	
17-20	F3	
21-24	F2	
25-28	F1	
29-32	G1	**Growth Mindset**
33-36	G2	
37-40	G3	
41-44	G4	
45-48	G5	

(Mindset Works, 2012)

Participants

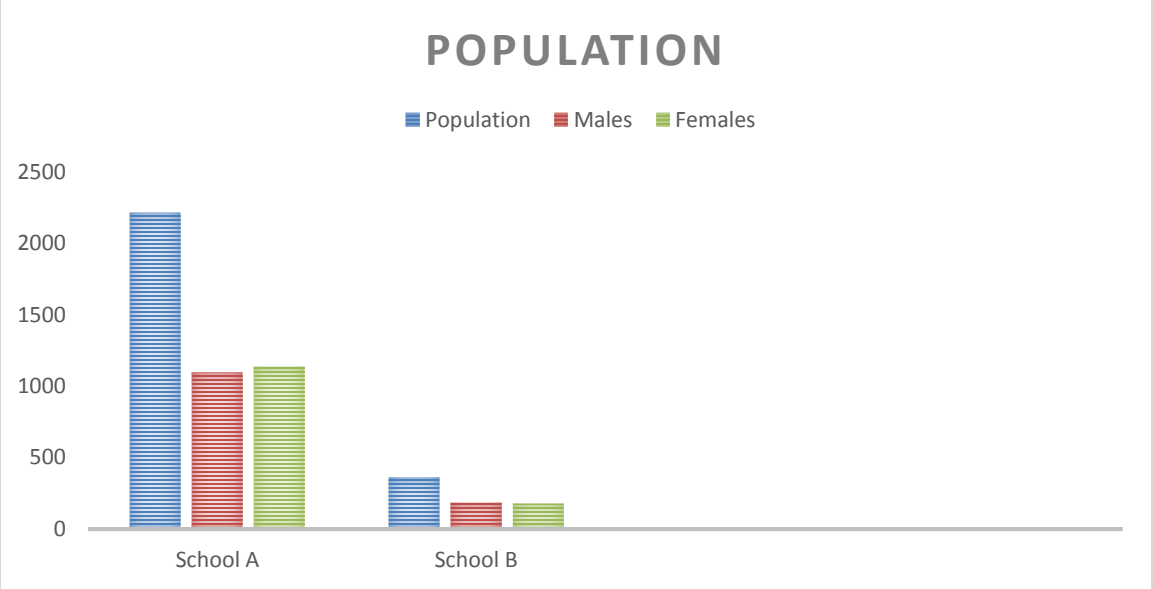
The participants for this study included 55 students from two online high schools in Utah. These high schools were chosen due to the convenience of locations based on their proximity to one another. The researcher applied for and received permission to conduct research for this study (Appendix B). Prior to data collection, all necessary ethical research training was completed (Appendix E).

For this study, the criteria for being a participant in this study were based on the following:

- Student from one of the two high schools selected to participate.
- Student taking his or her first online high school course.

The total population between each of the two schools was 1,795. As evidenced in Figure 10, these schools will be referred to as School A and School B to maintain confidentiality. School A has been offering online classes since 2013. School A is a public institution and provides access to students ages 13–18. The male population is 49.8%, and the female population is 50.2%. School B is a full-time online institution that began in 2009 and is open to students from ages 13-18. The male population is 51%, and the female population is 49%. The gender populations for each school are presented in Figure 10.

Figure 10: School Populations



Data Collection

Table 9 provides a timeline for data collection during this study.

Table 9: Data-Collection Timeline

Survey piloting	Jun–Aug 2016
Survey distributed to each school	Sept 2016
Data collection finished	Jan 2017
Data analysis	Jan–Feb 2017

Approximately 1,795 students received the Grit and Mindset surveys; 35.7% responded to the survey, which included 638 high school students who were enrolled in an online high school course for the first time. After duplicates, incomplete surveys, and outliers were removed, the participant sample was N = 55. Online surveys were distributed to the online teachers from the research to deliver to their students. Teachers also sent a reminder email one week after the initial email. The student demographics of gender and age were collected from the students through the online survey.

Students were minors and needed parental-consent (Appendix A) and student-assent (Appendix A) to participate in the study. After parental consent had been received, the students were able to sign the student-assent form and participate in the study. Students and parents were made aware that the survey was optional and confidential, and they could stop participating at any time. Surveys were administered during the first two weeks of the fall semester of 2016. At the time of data collection, participants were enrolled in a variety of subjects.

Role of the Researcher

The researcher conducting this study has worked in online education for seven years at the collegiate and high school levels. This experience has allowed the researcher to see online education benefit students. Research has shown that online education can be just as effective as traditional education (Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004; U.S. Department of Education, 2009; Zhao, Lei, Yan, Lai, & Tan, 2005). As an online instructor, the researcher has witnessed the growth of online enrollment and the relatively poor retention rate. The researcher's role in this study is that of an observer, seeking information that can help the appropriate students enroll in online courses and increase the online-course success rate.

Analytical Methods

A one-way ANOVA, Pearson correlation, and multiple-regression was conducted using SPSS version 24 to analyze the data generated in this study. The confidence level of 95% was used to determine statistical significance.

Research Question #1: What are the relationships among grit, mindset, and a student's first online high school course grade measured by percentage?

To answer the first research question, the data analyzed was each participant's grit score, mindset score, gender, age, and course grade.

Research Sub-question #1a: Does course grade vary by grit category, mindset category, or gender?

Each participant's grit category, mindset category, and course grade was used for this portion of the research. The grit and mindset surveys total 16 questions and were scored using the scoring guides provided by Dweck and Duckworth (Duckworth, 2016; Mind Works, 2012). First, a one-way ANOVA was conducted with the course-grade (as a percentage) and categories of grit to determine if course grade varied by grit categories (1-5). Next, a one-way ANOVA was conducted with the categories of mindset and course-grade percentage to see if there were differences in the mindset course-grade category (G1-G5; F1-F5). Finally, an independent t-test was used to analyze if course grade varied by gender.

Research sub-question #1b: Is there a correlation between grit, mindset, age, and course grade?

To answer the second sub-question, each participant's grit score, mindset score, age, and course grade (measured by percentage) was examined. A Pearson correlation analysis was conducted with grit and course grade, mindset and course grade, and then age and course grade.

Research Question #2: What combination of factors (grit, mindset, age, gender) best predict success in a student's first online high school course?

To answer the second research question the researcher used each participant's grit score, mindset score, age, gender, and course grade. Multiple regression analysis was used to predict the course grade of a student's first online course based on the grit score, mindset score, student age, and student gender.

Risk Assessment, Informed Consent, Privacy and Confidentiality

The participants of this study were vulnerable because the majority were children under 18. The risk caused by this vulnerability was minimized by the school district agreeing for the study to occur and parents providing written consent for their student to be part of the study before any information was given to the students. The students could opt out at any time. The assent form outlined a student could stop participating at any time without negative impact.

Student-participation risk in participating in this study was minimal, despite their status as minors. Students' grades were involved, which introduced some level of risk; however, to minimize this, a teacher or an administrator from each school was the only person to access grade information tied to student names. Data connecting grades and other study variables was provided to the researcher with student names replaced with coded identification so that actual students' names were not connected to grades. Anyone who assisted in data collection signed a confidentiality agreement (Appendix D). To minimize risks for the vulnerable population, confidentiality was maintained. Permission to conduct research in each school was received from school administrators. Parents signed a consent form and students signed an assent form (Appendix A). Data was secured and stored on a password-protected computer.

When acquiring informed consent and student assent, the researcher notified participants about the purpose of the study, the expected time frame and processes, their right to decline to participate and to remove themselves from the research once contribution had begun, and whom to contact for questions about the research.

A teacher or administrator sent the electronic survey to parents/students. The informed parent-consent/student-assent letter was sent to students via email. Once informed that consent was obtained from the parents, the students were able to agree to the student assent, on the electronic survey.

Participants had the option to stop participation in the study at any time. This right was highlighted in the parent-consent/student-assent form, and the teacher or administrator who offered the study to the students expressed that he or she was making it an optional study available to students who wanted to participate.

To protect the privacy of the students in this study, names were changed into a code by a teacher or an administrator at his or her school. The researcher was not able to distinguish which course grade belonged to a specific student.

Chapter IV

Results

Introduction

Online enrollment in high schools is increasing at a rapid pace. However, the retention rate is not rising and instead is relatively low (Allen & Seaman, 2007; Clay, Rowland, & Packard, 2009; Diaz, 2002; Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, & Marczynski. 2011; Finkel, 2015; Flood, 2002; Frankola, 2001; Lykourentzou, Giannoukos, Nikolopoulos, Mpardis, & Loumos, 2009; Nora & Snyder, 2009; Patterson & McFadden, 2009; Picciano & Seaman, 2007). Research has been conducted regarding predictors of student success in traditional high school courses (Jaschik, 2014; Sekar, 2009) but gaps exist in the literature regarding the predictors of student success in their first online course. This study sought to address this gap by examining grit, mindset, age, and gender as potential predictors of student success within a student's first online high school course. In this chapter, the descriptive statistics and findings based on the collected data are presented. The statistical analyses were completed using SPSS version 24. The reliability of the instruments is discussed, followed by the description of the sample, the data results and analysis, and a summary.

Instrumentation

The survey consisted of two demographic, eight grit, and eight mindset questions. The internal consistency of the items used in the survey for this study had previously been tested by Duckworth (2016) and Dweck (2008). Cronbach's alpha ranged from .73-.83 (grit) and .67-.94 (mindset). In order to address the research questions, the online survey was distributed through Qualtrics to students at two online high schools.

The research questions addressed in this study are:

1. What are the relationships among grit, mindset, age, gender, and a student's first online high school course grade measured by percentage?

    The sub-questions include:

        a. Does course grade vary by grit category, mindset category, or gender?

        b. Is there a correlation between grit, mindset, or age and course grade?

2. What combination of factors (grit, mindset, age, gender) best predict success within a student's first online high school course?

The first question was tested using a one-way ANOVA, Pearson correlation, and an independent t-test. The second question was tested using multiple-regression analysis.

Description of the Sample

The schools that participated in this study will be referred to as School A and School B to maintain confidentiality. Approximately 1,795 students had access to the grit and mindset surveys across the two schools. This study only analyzed students who were in their first online high school class. Surveys were administered online through Qualtrics. Online instructors or administrators were sent an email with the link to the survey which included the parent consent/student assent forms. One week after the initial email a follow up email was sent reminding students of the optional survey. There were 638 respondents, which represents a response rate of 35.7%. The average response rate for email surveys has been reported to be 10-24% (Fluid Surveys, 2014; Fryrear, 2015).

School A has been offering online classes for its school and all other schools within its school district since 2013. School A is a public institution and provides access to students ages 13–18. The male population is 49.8% and the female population is 50.2%. School B is a full-time

online institution that began in 2009 and is open to students ages 13–18. The male population is 51% and the female population is 49%. Data showed that the majority of the surveys that came in were from School A (90%); however, School B had a higher percent of completers (97.3%) versus 8.3% for School A. Part of this may be because School A runs asynchronously and School B runs synchronously. The students from the synchronous courses had a 97.3% pass rate, whereas the students from the asynchronous courses had a pass rate of 8.3% (See Table 10). School A, which is asynchronous, allows students to sign up and take any online course from August until April. The students must complete their coursework and final examination by the middle of May. This dynamic explains why 43% of survey responses in this study are shown as incomplete; because they neither completed nor dropped out prior to data collection (See Table 10). School B which is synchronous runs in nine week sessions and provides due dates throughout the course for students. The pass rate for both schools is based on a traditional grading scale where passing is 60% D-. For purposes of this study, students with grades of 60% or higher were considered successful. Students with grades of 59% or lower or who dropped the course during the study were considered unsuccessful. Of the students who were successful in both schools the average grade percentage was 88.2%. The characteristics of the sample are presented in the descriptive statistics.

Table 10: Completion Rates

Data	**School A**	**School B**
Completed	8.3%	97.3%
Incomplete	43%	0%
Dropped	48.7%	2.7%
Modality	Asynchronous	Synchronous

Descriptive Statistics

Four hundred and fifty-one students who took the survey were in their first online class. Thirty-two surveys were eliminated because they were incomplete and thirty-one surveys were removed because they were duplications. One hundred and seventy-two students who were eligible for the study dropped out of his or her class. These students responded to the survey; however, there was no final course grade. One hundred and fifty-one students who were eligible for the study have not yet completed his or her course (incomplete) because the students in School A had more time to complete the course after the limits of this study. With these exclusions, sixty-five students completed their course and the survey. Ten student surveys were subsequently removed prior to data analysis because the students either marked all 5's or all 1's (3 students) or their scores were outliers being greater than three standard deviations from the mean (7 students) (see Table 11).

Table 11: Sample Descriptive Statistics

1,795 (1755 School A, 40 School B)	Students that had access to the survey
638	Respondents
451	Respondents in his or her first online class
32	Incomplete surveys
31	Duplicate surveys
172	Respondents eligible for study and then dropped out
151	Respondents eligible for study but had not completed the class within the limits of this study
10	Outliers
55 (27 School A, 28 School B)	Participant sample

Of the 27 participants from School A, 25% were male and 75% female. The age range in School A was from 13-18. Three percent were 13 years of age, 22.2% were 14, 14.8% were 15, 29.6% were 16, 25.9% were 17, and 3.7% were 18 (See Table 12). Demographic data showed that the largest age group to complete the survey and the course at School A was age 16 (29.6%). The smallest age group to complete the survey was equal between ages 13 and 18 (3.7%) (See Table 12).

Twenty-eight students from School B were participants and at this study location, 38% were male and 62% female. The age range in School B was from 13-16. Twenty-eight and a half percent were 13, 25% were 14, 35.7% were 15, and 10.7% were 16 (See Table 12). Demographic data showed that the largest age group to complete the survey at School B was age 15 (35.7%). The smallest age group to complete the survey was equal between 17 and 18 because there were no participants in this age range from School B (See Table 12).

Table 12: Survey Response Rates

Demographic Data	**School A**	**School B**
N	27	28
Male	25%	38%
Female	75%	62%
13	3.7%	28.5%
14	22.2%	25%
15	14.8%	35.7%
16	29.6%	10.7%
17	25.9%	0%
18	3.7%	0%

Research has shown the type of course the student is taking has an effect on whether or not he or she will complete it (Carnevale, 2003; Nelson, 2006; Noble, 2004; Paden, 2006; Smith, Heindel, & Torres-Ayala, 2008). See Table 13 for the percentages of course completion, incompletion, and drop rates for each course discipline. The course with the highest completion rate was art (80%) and the course with the lowest completion rate was a driver's education class and science (0%). The course with the highest dropout rate was physical education (51.9%).

Table 13: Course completion rates by course discipline

Course	Completion rate	Incompletion rate	Drop rate
Art	80%	20%	0%
Computer technology	28.8%	27.1%	44.1%
Drivers education	0%	56%	44%
English	12.5%	20%	37.5%
Financial literacy	20.8%	37.7%	41.5%
Math	26%	30%	44%
Physical education	5.2%	42.9%	51.9%
Science	0%	54.5%	45.5%
Social studies	3.5%	51.7%	44.8%

The courses that were completed by the participants in this study are shown in Table 14.

Table 14: Courses completed by participants

Course	Students Completed
Computer technology	28
Financial literacy	11
English	4
Physical education	4
Math	4
Art	3
Social studies	1

Participants showed the highest mean grit score in the incomplete and dropped categories and the lowest mean grit score in the complete category. The max, min, and standard deviation were very similar across categories (see Table 15).

Table 15: Grit Descriptive Statistics

Grit Descriptive Statistics	**Complete**	**Incomplete**	**Dropped**
N	55	151	172
Mean	3.3	3.5	3.5
Max	4.9	4.8	4.9
Min	2.0	2.2	1.5
Std. Deviation	.57	.54	.56

Grit questions can be separated into two categories: passion and perseverance. The overall mean score for passion in this study was 3.3. The overall mean score for perseverance in

this study was 3.6 (See Table 16). Duckworth stated that perseverance scores have been slightly higher than passion scores in her research and that was confirmed in this study (Duckworth, 2016).

Table 16: Passion and Perseverance Means

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Passion	388	3.3	.71	.04
Perseverance	388	3.6	.62	.03

The majority of participants were in the "moderately gritty" category (see Table 17). The group of participants that scored the highest in the "very gritty" category were the students who completed his or her course with a B level grade. The students who scored the highest in the "moderately gritty" category were those who received a C level grade. The students who scored in the "fairly gritty" category were those who received a B level grade (see Table 17). No students were categorized as "not gritty".

Table 17: Grit Categories and course status

Grit Category	**Fairly gritty 2.0-2.9**	**Moderately gritty 3.0-3.9**	**Very gritty 4.0-5.0**
Complete	21.5%	66.1%	10.8%
A	21.6%	70.3%	8.1%
B	22.7%	13.6%	63.6%
C	0%	83.3%	16.7%
D	0%	0%	0%
Incomplete	16.6%	60.3%	23.2%
Dropped	18.7%	59.1%	22.2%

Participants from School A had an overall average mindset score of 30.9 which is in the mindset category G1. Participants from School B had an overall average mindset score of 29.4, which is also in the mindset category G1. This indicates that the average student who took the survey has a growth mindset. Students who completed their first online course from School A, which had a higher dropout rate, show a higher average mindset score than students who have not yet completed and those who have already dropped the course. This suggests the students with a higher level of growth mindset completed the course. The category with the highest mean mindset score was those students who had not yet completed the course (see Table 18).

Table 18: Mindset Descriptive Statistics

Mindset Descriptive Statistics	**Complete**	**Incomplete**	**Dropped**
N	65	151	172
Mean	30.2	31.0	31.0
Max	44.0	41.0	45.0
Min	19.0	17.0	19.0
Std. Deviation	6.0	4.8	4.8

The highest percentage of students who completed the course were in category F1. The highest percentage of students who had not yet completed the course or had dropped the course were in category G1 (see Table 19). The majority of students who had completed the course with an A were either in category F1 or G2. Students who had completed the course with a B or a C were mostly in category F1. No students that completed the course scored within the D or F grade range (see Table 19).

Table 19: Mindset Categories and course status

Mindset Category	F3 17-20	F2 21-24	F1 25-28	G1 29-32	G2 33-36	G3 37-40	G4 41-44	G5 45-48
N	0	8	21	13	13	0	0	0
Complete	0.0%	12.3%	32.3%	20.0%	20.0%	0.0%	0.0%	0.0%
A	0.0%	10.8%	27.0%	13.5%	27.0%	0.0%	0.0%	0.0%
B	0.0%	13.6%	27.3%	22.7%	13.6%	0.0%	0.0%	0.0%
C	0.0%	16.7%	83.3%	0.0%	0.0%	0.0%	0.0%	0.0%
D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
F	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Incomplete	1.1%	10.1%	25.8%	29.2%	25.8%	7.9%	0.0%	0.0%
Dropped	2.3%	7.6%	22.1%	29.1%	26.7%	9.9%	1.7%	0.6%

Research Question 1

Research Question 1 sought to explore the relationships among grit, mindset, age, gender, and a student's first online high school course grade percentage through a one-way ANOVA and Pearson correlation. This research question was answered through an analysis of subquestions (a) and (b).

Research Question 1a

Research Question 1a measured the relationships among grit category, mindset category, gender, and a student's first online high school course grade measured by percentage through a one-way ANOVA and an independent t-test. The overall course grade mean within grit categories was 88.2%. For the "fairly gritty" category the mean was 90.7%, for "moderately gritty" it was 87.8%, and for "very gritty" it was 85.5% (see Table 20). Based on the standard

deviations, participants in the categories of “moderately gritty” and “very gritty” have a larger scoring separation towards an A level grade or dropping out.

Table 20: Grit category means

Descriptive Statistics

Course Grade

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
Fairly gritty	12	90.7	4.9	1.4	87.5	93.8	84.0	94.0
Moderately gritty	37	87.8	8.1	1.3	85.0	90.5	70.0	94.0
Very gritty	6	85.5	7.1	2.9	78.1	92.9	77.0	94.0
Total	55	88.2	7.5	1.0	86.1	90.2	70.0	94.0

The assumption that all grit category variances were equal was tested through Levene’s test of homogeneity of variances. The homogeneity of variances assumption showed a significance value of .192 and since the significance is above the .05 alpha value the conclusion is that the variances of the distributions in the population are equal and not statistically significant (see Table 21).

Table 21: Test of Homogeneity of Variances grit and course grade

Test of Homogeneity of Variances

Course Grade

Levene Statistic	df1	df2	Sig.
1.705	2	52	.192

A one-way ANOVA was utilized to determine if course grade varied by grit category. The F value was 1.109, which indicates that the population variance observed between groups, is 1.109 times greater than the amount of variance within categories. The significance value of the ANOVA was .337 (see Table 22). Thus, there were no statistically significant differences between group means as determined by the one-way ANOVA.

Table 22: ANOVA Grit category and grade

ANOVA

Course Grade

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	123.859	2	61.929	1.109	.337
Within Groups	2902.977	52	55.826		
Total	3026.836	54			

p < .05

Grit and mindset have been linked within recent research (Duckworth, 2016). It has been theorized that grit can be developed through growth mindset. A one-way ANOVA was utilized to determine if course grade varied by mindset category (Growth Mindset: G1, G2; Fixed Mindset: F1, F2). The overall course grade mean within mindset categories was 88.2%. For the "F1" category it was 85.9%, for "F2" it was 87.3%, for "G1" it was 89.5%, and for "G2" it was 91.1% (see Table 23). Students who scored the highest on average on his or her grade was in the G2 category. Students who scored the lowest on average on his or her grade was in the F1 category (See Table 23). Students in the F1 category had the highest standard deviation. Students in the G2 category had the lowest standard deviation (Table 23).

Table 23: Mindset categories descriptive statistics

Descriptive Statistics

Course Grade

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
F1	21	85.9	9.096	1.985	81.72	90.00	70	94
F2	8	87.3	8.548	3.022	80.10	94.40	70	94
G1	13	89.5	5.076	1.408	86.39	92.53	80	94
G2	13	91.1	5.008	1.389	88.05	94.10	80	94
Total	55	88.2	7.487	1.010	86.12	90.17	70	94

The homogeneity of variances assumption showed a significance value of .010 which indicates the variances of the distributions in the population are not equal and show a significant difference (see Table 24).

Table 24: Mindset test of homogeneity of variances

Test of Homogeneity of Variances

Course Grade

Levene Statistic	df1	df2	Sig.
4.218	3	51	.010

As the assumption of homogeneity of variance was violated, a Welch's ANOVA was conducted. Through this test, it was found that a student's grade did not vary significantly by mindset score category. The p-value (.215) from the test was higher than the alpha value of .05 chosen for determination of statistical difference and consequently mindset category and grade are not statistically significant (see Table 25).

Table 25: Welch's ANOVA mindset category and grade

Robust Tests of Equality of Means

Course Grade

	Statistic[a]	df1	df2	Sig.
Welch	1.609	3	22.632	.215

a. Asymptotically F distributed.

An independent t-test on course grade categorized by gender showed a significance level of .088 which is above the .05 alpha level; therefore, course grade is not statistically different when grouped by gender (see Table 26).

Independent Samples Test

Table 26: Independent Samples T test

		Levene's Test for Equality of Variances	t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Course Grade	Equal variances assumed	3.027	.088	-.040	53	.968	-.086	2.118
	Equal variances not assumed			-.037	30.7	.971	-.086	2.307

Research Question 1b

Research question 1b analyzed if there was a correlation between grit, mindset, or age and course grade. A Pearson correlation was used to find correlations between grit, mindset, age, and course grade. Correlation coefficients resulting from this are found in Table 27. There was a

significant correlation at the 0.05 level between age and course grade (-.280). The negative correlation indicated that as age increased, course grade decreased. There was a significant correlation at the .01 level between grit and mindset (.485). However, there was not a significant correlation between grit or mindset and a student's first online high school course grade (see Table 27).

Table 27: Pearson correlations between variables

Correlations

		Age	Grit	Mindset	Course Grade
Age	Pearson Correlation	1	-.027	.119	-.280*
	Sig. (2-tailed)		.844	.388	.038
	N	55	55	55	55
Grit	Pearson Correlation	-.027	1	.485**	-.064
	Sig. (2-tailed)	.844		.000	.642
	N	55	55	55	55
Mindset	Pearson Correlation	.119	.485**	1	.182
	Sig. (2-tailed)	.388	.000		.183
	N	55	55	55	55
Course Grade	Pearson Correlation	-.280*	-.064	.182	1
	Sig. (2-tailed)	.038	.642	.183	
	N	55	55	55	55

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Of the area that resulted in a significant correlation a linear regression was preformed to analyze the variation. The r-squared value of age as a predictor of course grade was .078. This means that 7.8% of course grade variation can be explained by age (see Table 28).

Table 28: Variation of Significant Correlations

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.280[a]	.078	.061	7.255

a. Predictors: (Constant), Age

Research Question 2

The second research question analyzed the combination of factors (grit, mindset, age, and gender) that would best predict success within a student's first online high school course through multiple regression analysis. The multiple regression correlation coefficient was .409 which indicates a weak positive relationship, thus as the independent variables (grit, mindset, age, and gender) increase so does the dependent variable (course grade). The r-squared value was .168 which indicates 16.8% of variability within a student's first online course grade was accounted for by age, gender, grit, and mindset together (see Table 29). The ANOVA showed that the significance value was .053, which is slightly higher than the alpha value and therefore does not show a statistical significant difference but it is marginally significant (See Table 30).

Table 29: Multiple Regression Summary

Multiple Regression Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Age, Gender, Grit, Mindset, Course Grade	.409[a]	.168	.101	7.098
Age, Course Grade	.280[a]	.078	.061	7.255
Gender, Course Grade	.006[a]	.000	-0.19	7.557
Grit, Course Grade	.064[a]	.004	-0.15	7.542
Mindset, Course Grade	.182[a]	.033	.015	7.431

Table 30: Multiple Regression ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	507.539	4	126.885	2.518	.053[b]
	Residual	2519.298	50	50.386		
	Total	3026.836	54			

a. Dependent Variable: Course Grade

b. Predictors: (Constant), Mindset, Age, Gender, Grit

Next, a stepwise multiple regression was used to estimate each potential independent variable to find the best predictors of course grade. Age was the only variable that the stepwise method generated as a predictor of course grade. The r value was .280 and the r-squared value was .078, which indicates that 7.8% of the variance in course grade could be attributed to the variance in age. The ANOVA calculated from the regression showed a significance value of .038, which is less than the selected alpha level of .05 and indicates age and course grade are statistically significant (see Table 31). The beta value was -1.565 which concludes that the lower the student's age the higher his or her first online high school course would be.

Examination of the regression coefficient reveals that grit, mindset, and gender do not have a statistically significant impact on student success.

Table 31: Stepwise multiple regression

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	237.220	1	237.220	4.507	.038[b]
	Residual	2789.616	53	52.634		
	Total	3026.836	54			

a. Dependent Variable: Course Grade

b. Predictors: (Constant), Age

Summary

In summary the results of this study did not find a significant difference in student grade when organized by grit, mindset, or gender categories. However, significant relationships between age and course grade were found to be significant at the $p < .05$ level. This study used quantitative analysis to determine the relationships between grit, mindset, age, and gender on a high school student's first online course. Quantitative data was summarized using a one-way ANOVA, Pearson correlation, independent t-test, and multiple regression. Chapter V addresses gaps in the literature and how this research contributes to filling those gaps.

Chapter V

Discussion

"It always seems impossible until it's done."

—Nelson Mandela

Introduction

This research focused on potential predictors of student success in his or her first online high school course. The variables studied included age, gender, grit, mindset, and course grade. Chapter V addresses the purpose of this study, a brief methodology review, a summary of the results, recommendations for future research, and implications for professional practice.

Background

Online education for high school students began in 1991 and by the early 2000s, several high schools started offering their core classes online; students could often choose which modality they wanted for their education, whether that be a public, private, or charter school; traditional, blended, or online (Pape, 2016; Smith, 2015; Tonks, 2013).

Around 2001, there were roughly 40,000 to 50,000 high school students enrolled in an online course, and this increased to 1.5 million students by 2010 (Barbour, 2012). From 2009 to 2014, there was a 50% increase of school districts offering online or blended courses and a 58% increase in full-time online public schools (Connections Academy, 2015; Speak Up, 2015). Smith (2015) showed that 316,320 students attended fully online schools in 2013–2014. Connections Academy (2015) showed from 2009 to 2014 an increase in students taking online and blended courses from 1.5 million to 2.7 million. Thirty states and Washington, D.C., have fully online schools open to high school students statewide (Smith, 2015). According to

Connections Academy (2015) about one in four high school students across the United States is taking online courses.

Due to the popularity and increasing need for online-course skills, Michigan was the first state to require an online course as a graduation requirement in 2006; since then, several other states have followed that requirement (Tonks, 2013). The states that currently require an online course for graduation are Michigan, Virginia, Florida, Alabama, and Arkansas; Georgia, New Mexico, and West Virginia recommend but do not require it (Leventoff, 2015).

If these courses are so attractive to students, why do some succeed in their online courses and others do not? Traditionally, student success has been measured by cognitive ability, grade-point average (GPA), and scores on standardized tests including both national and state tests (Cognitive, 2013). Studies have been completed regarding the role of intelligence in school success, but little research exists exploring why some people accomplish more than others with the same intelligence level. Recently, personality factors have been researched that influence online-student success (Meredith, 2011). Some predictors of success have already been identified, such as: relationships with others, resilience, adaptability, high emotional intelligence, and motivation level.

Duckworth (2007) in all her studies, indicates that grit is the personality trait that is the key characteristic in predicting success. Across six studies, grit was found to be a better predictor of success than an individual's level of intelligence (Duckworth, 2007). Grit has been shown to predict success in education, the military, business, and the National Spelling Bee (Duckworth, 2007; Zorana, 2014; Strayhorn, 2014). However, grit has not been thoroughly researched with high school students, specifically students taking an online course.

Understanding the role of grit in the success of students taking their first online class will help high school administrators guide students through online courses. It can also play a role in early identification of those who may struggle online so they can be given support and it may suggest that schools could help students by offering education designed to increase grit through building a growth mindset. Duckworth (2016) said the way to develop grit is by practicing and viewing failed attempts as practice and knowing that it is alright to fail provided one does not give up.

Specifically, this study examined whether grit and mindset predict academic performance in a student's first online high school course. Several educational institutions have used student-readiness surveys to predict the likelihood of success in an online course. However, there is a lack of studies that confirm whether these surveys predict online success in a student's first online high school course (Picciano & Seaman, 2007; Wladis & Samuels, 2016; McVay, 2011; Parnell & Carraher, 2003; Smith, 2005; Smith, Murphy, & Mahoney, 2003; Watkins, Leigh, & Triner, 2004; Bernard, Brawer, Abrami, & Surkes, 2004; Kerr, Rynearson, & Kerr, 2006; Pillary, Irving, & McCrindle, 2006; Mattice & Dixon, 1999). This study adds to the literature in this area and provides information for researchers who are interested in learning more about online-course success for high school students.

Summary of the Study

This quantitative study examined whether grit, mindset, age, and gender could be identified as predictors of a student's success in his or her first high school course. In this research, academic success was defined by completing the course at a 60% or higher. The study examined the differences in grit and mindset scores in relation to grade as a way to gauge whether or not grittier students or those with a growth mindset had higher course grades.

The research questions addressed in this study included:

1. What are the relationships among grit, mindset, age, gender, and a student's first online high school course grade measured by percentage?

   The sub-questions included:

   a. Does course grade vary by grit category, mindset category, or gender?

   b. Is there a correlation between grit, mindset, or age and course grade?

2. What combination of factors (grit, mindset, age, gender) best predict success in a student's first online high school course?

The study analyzed 55 students participating in their first online high school course. The data-collection instruments used were the 8-item Grit-S Scale and the 8-item mindset survey. The background demographic of gender and age were also collected from the students directly. A one-way ANOVA was used to analyze the course grade to identify if it varied by grit category and mindset category. An independent t-test was used to examine the relationships between gender and course grade. Pearson correlation was used to measure the linear correlation between grit, mindset, and course grade. A stepwise multiple-regression analysis was used to determine the combination of factors (grit, mindset, gender, age) that best predict success within a student's first online high school course.

Discussion

There was an above average response rate of 35.7% from all who were sent the survey, which indicates that the survey was easily accessible. The average response rate for email surveys has been reported to be 10-24% (Fluid Surveys, 2014; Fryrear, 2015). School A consisted of 90% of the response rate and School B was 10% of the response rate. That could have led to skewed data; however, after taking out incomplete surveys, duplicates, and outliers

the schools had almost even participation. School A had 49% of the participants and School B made up 51% of the participants. The gender ratio, course offerings, and grading scale were similar between the two schools (see Table 12). The differences were that School A ran asynchronous and allows students to sign up for an online course anytime between August and March and they have until the end of April to finish the course. This school is primarily a face-to-face, traditional brick and mortar school and teachers instruct partially online. School B has a synchronous course design and is a full-time online school. School A includes teachers who create their own material to teach online. School B consists of teachers who only focus on facilitating online courses and use curriculum purchased from textbook companies. These differences could have led to the drastic difference in completion rate. School A had a pass rate of only 8.3% at the time of data collection while School B had a pass rate of 97.3% (see Table 10).

Course completion could be affected by the teacher and the type of course. For example, in School A, the completion rate for Art was 0%; whereas, the completion rate for Art in School B was 80%. Physical education was the most popular course in School A; however, it was the least popular course in School B. The asynchronous design of School A allows students until the end of the school year to complete the course. Consequently, 43% of the students were "incomplete" and 48.7% had dropped at the time of this study. Students may have procrastinated which resulted in high percentages of incompletion and dropout.

Student success could have been affected by course design at each location. Perhaps asynchronous flexibility did not work for students, which resulted in the low completion rate, and synchronous may be a better course design for student success. Considering that the teachers at School A teach both face-to-face and online teachers may be focused on face-to-face

classes more than online classes, which contributed to online student's failure; whereas, at School B the teachers sole focus is teaching online. Most of the teachers at School A are more comfortable with face-to-face courses and have not had a great deal of online course training. Designing a course for face-to-face classes is very different than designing an online course. The lack of professional development in the area of online course development could contribute to student failure. Synchronous and asynchronous are very different modalities and more research is needed on predictors of success within different course designs.

Research Question 1.

Research Question 1 measured the relationships among grit, mindset, age, gender, and a student's first online high school course grade measured by percentage through a one-way ANOVA, Pearson correlation, and an independent t-test. This question was answered with two sub questions.

Findings from Research Question 1a

Research Question 1a measured the relationships between grit category, mindset category and a student's first online high school course grade measured by percentage through a one-way ANOVA. The purpose of this research question was to understand if grit and mindset could be predictors of student success in an online high school course. As shown in Tables 22 and 25, the significance value of the ANOVA was higher than the alpha of .05 in both grit category (.337) and mindset category (.217) which suggests that when compared to grade neither was statistically significant.

Table 17 indicates that the majority of high school students fall into the "moderately gritty" category (66.1%), regardless of whether they completed or dropped the course. Table 19 reveals that the majority of high school students who completed fall within the F1 category

(32.3%). The majority of those who did not complete or dropped out are in category G1 which is in the middle of the mindset scale. The mindset scoring guide indicates that if one is in the F1 or G1 category they are unsure about whether they can change their intelligence and they care about their performance and want to learn, but don't really want to have to work too hard for it (Mindset Works, 2012). This supports findings that grit and mindset scores did not predict a student's course grade in his or her first online course. It is possible that the participant group was too small to show a statically significant difference. It is also possible that students at this age are confused and the prediction of their success and failure do not depend on grit or mindset.

Similar to the findings of this study, Batres (2011) observed grit in relation to high school students in face-to-face class and did not find a statistically significant difference; however, course attendance was associated with grit and GPA. Similarly, Cross (2013) found no significant differences in grit scores for students who successfully defended their dissertation proposals and Stewart (2015) examined grit and academic performance within a college students first academic semester and indicated no relationship was identified.

These researchers determined that, in the environments they studied, grit did not impact success in relation to defending a dissertation proposal or academic performance at the secondary and collegiate levels in face-to-face courses (Batres, 2011; Cross, 2013; Stewart, 2015). Conversely, Chang (2014) indicates that grit was a significant predictor of a college students first year GPA. Likewise, Duckworth et al. (2007) found that grit was a good predictor of student success. However, in Duckworth's study a pre-grit test was given to participants, their progress was tracked, and then the outcomes were compared with their individual grit scores. Grit may be a significant predictor of success over a long period of time instead of a short research period such as was the focus of this study. Similar to this dissertation research, studies

that found no significant relationship between grit and grade also had low sample sizes, which could be a factor in why a significant difference was not found. Duckworth et al. (2007) found that age and grit were correlated and that as age increased so did grit. Cross (2013) also found that there were significant differences in mean grit scores for age and that older students tended to be grittier than younger students.

This study failed to find a significant difference between mindset and grade. Young (2017) stated that in 99% of mindset psychological tests, researchers have reported small effects if any and struggle to show any statistical significance. Young (2017) explained that intelligence is innate and IQ can fluctuate and if you put effort into something you will do better; however, claiming that performance in a cognitive task is dictated by how hard a person tries and is not based at all on genetics is false. Bates, a psychology professor, stated that he has been trying to replicate Dweck's findings, that one's self-theory about intelligence has a profound influence on his or her motivation to learn, for several years and the results show no statistical significance (Chivers, 2017). Dweck has explained that these failures are because the psychologists do not create the correct experimental environment (Young, 2017). If researchers are having a difficult time replicating Dweck's study, it could be challenging for teachers to replicate it in his or her classroom. It is possible that gaining a growth mindset and grit are a long term process. Teachers could begin the work but may not be able to see the difference in a student for several years. If teachers find it difficult to teach growth mindset because of the short-term nature of their courses, then this will affect the growth of grit in students. Perhaps growth mindset could be taught in elementary-school looping classes where the teacher stays with his or her students as they increase in grade level and it could be built upon during the student's junior high and high school years.

Duckworth (2016) stated that students with a growth mindset showed higher grit scores which was confirmed in this study. However, as grit and mindset increased, the course grade did not increase in the student's first online class. This could be because of the short time span for this study. Perhaps grit and mindset cannot measure success in one semester; however, a longer study over the course of a year or longer may show an increase in grade or GPA. The length of time a student is analyzed may be the key to finding out if grit and growth mindset can be predictors of success in an online program.

An independent t-test on course grade categorized by gender showed a significance level of .088 which is above the .05 alpha level; therefore, course grade is not statistically different when grouped by gender (see Table 26). It is interesting that gender and course grade did not have a significant relationship. Males were underrepresented in this study compared to females (School A: 25%; School B: 38%). Lederman (2013) found that males have a more negative effect from online courses than women (Lederman, 2013). Males consisted of 69% of the students who dropped their course in this dissertation research. Males grit mean was 3.0, standard deviation .4 and females was 3.7, with a standard deviation of .5. Males mindset mean was 29.7 with a standard deviation of 6.8. Females mindset mean was 31.9 with a standard deviation of 5.1. The males in this study are within the 20th percentile compared to a large sample of American adults (Duckworth, 2016). The females on average are in the 50th percentile compared to the same sample (Duckworth, 2016). Both genders scored within the G1 category which means these students are unsure about whether they can change their intelligence. They care about their performance and they also want to learn, but they do not really want to have to work too hard for it.

Findings from Research Question 1b

Research question 1b analyzed if there was a correlation between grit, mindset, age, or course grade. There was a significant correlation at the 0.05 level between age and course grade (r = -.280). There was a significant correlation at the .01 level between grit and mindset (r = .485). However, there was not a significant relationship between grit or mindset and a student's first online high school course grade as shown in Table 27. The correlation between age and course grade shows that as age decreased course grade increased. This could be caused by School B having more students who had completed their course at the time of data collection and the mean age being lower than School A.

Even though there was not a significant difference through the ANOVA with course grade and age, there was a significant correlation between course grade and age (-.280) found in Table 27). However, the finding was the grade increased as the students age decreased. This could be due to the fact that the majority of individuals in this study were younger students with an average age of 14.9 years. Also, the younger students were more likely to be in School B which used a synchronous model, whereas, the older students were more likely to be in School A which used an asynchronous model. Dropout rates are substantially higher in asynchronous courses versus synchronous courses online (Murphy, Rodriguez-Manzanares, & Barbour, 2011).

Findings from Research Question 2

The final question of this study analyzed the combination of factors (grit, mindset, age, gender) that would best predict success within a student's first online high school course. A multiple-regression analysis was used, and a total regression had an r-squared value of .168, suggesting that the combination of independent variables studied only attribute to 16.8% of the variance in course grade (see Table 29). An ANOVA showed that the significance value for the

regression was .053, which is slightly higher than the alpha value. While statistical significance may indicate that this combination of variables is effective in predicting student success, over 83% of student grade variance was still unaccounted for. Thus, although marginally significant, it would likely not be practical to collect grit, mindset, age, and gender information from students to predict student success in their first online class, based solely on the findings of this study.

A subsequent stepwise regression showed that only age was predictive for course grade. Age was the only variable that the stepwise method indicated was predictive, with an r-squared value of .078 (Table 29). This indicates that 7.8% of the variance in course grade could be attributed to the variation in age. The majority of the variation cannot be explained by gender, grit, or mindset. This could be because the average age of the participants was 14.9 and the majority of students who completed his or her course were from School B with an average age of 14.1.

The ANOVA calculated from the stepwise regression comparing age and course grade showed a significance value of .038, which is less than the alpha value of .05 and an F value of 4.5 which indicates that the average mean difference between age groups is similar to the difference within age groups. There is a statistically significant difference, although .038 is fairly close to .05. The beta value was -1.565 which concludes that the lower the students age the higher his or her first online high school course would be. This may be attributed to the fact that School A had an older participant pool and a lower completion rate and School B had a younger participant pool and a very high completion rate. The course grade of those who completed the course did lower as student age increased.

One reason grit may not have had an impact in this study is because it is self-reported. A student could have shown response bias by embellishing or understating answers on the survey.

Duckworth stated that one of the limitations of the grit survey is that one can "fake" a higher grit score without much effort (Duckworth, 2016). Also, when a student is taking the grit or mindset survey, depending on how they think about each statement, the answer may change. It was not indicated in the grit literature to have an instructional lead to tell students to think about school or work while they took this survey. For example, "I am a hard worker," is a question on the grit survey. If a student is thinking about school, they may answer "not like me at all." However, if a student is thinking about his or her after school job they may answer "somewhat like me." Again, if a student is thinking about his or her weekend hobby they may answer "very much like me."

Perhaps the questions on a grit survey used in research should be altered to specific environments or an instructional lead informs students to envision school as they take the survey. Instead of the statement "I finish whatever I begin" it would be interesting to find out if students answered differently to a statement "I finish whatever I begin in my schoolwork". Another option is to have the students' parents and teachers fill out the grit survey about the student and use an average of the surveys in addition to the students self-reported survey to reduce response bias.

Duckworth stated that if one is gritty in one aspect of his or her life, that does not mean that he or she will be gritty in other areas (Duckworth, 2016). Mindset is also self-reported; however, there have not been any studies that show a concern with self-reporting. The questions are worded in a way that is clearer about a specific target such as working "I like my work best when it makes me think hard," or "I like work that I'll learn from even if I make a lot of mistakes." Further analysis needs to be completed on this topic.

Conclusion

As online education increases, finding predictors of student success becomes extremely

important. Online education is being used at the collegiate level and for training in the workplace and high school students should be prepared to succeed in an online setting (Haynie, 2013; Mann, 2017; Reiner, 2012). While other studies have presented predictors of success in collegiate online schooling and in traditional face-to-face high school classrooms, less research has been done in high school online courses (Kupczynski, 2014; McVay, 2000; McVay, 2001; Meredith, 2011; Muse, 2003; Salmon-Nembhard, 2015; Sekar, 2009). This study examined potential predictors, specifically grit, mindset, age, and gender, in a high school students first online class.

The evidence from this study showed that there was not a significant difference in course grade when analyzed in relation to grit or mindset categories. To better understand if grit and mindset can play a role in student success, it may be beneficial to study online schools that have similar characteristics, such as a synchronous course design, and a similar timeframe for course completion. Because School A and B were drastically different in the course design and length of time they give students to complete a course, it may be beneficial to compare synchronous courses together and asynchronous courses together in separate studies to determine if results differ from what was discovered here. A larger sample size as well as a longitudinal design would allow opportunity to test grit in relation to student success in an online program.

The correlations between the dependent variable and independent variables in this study were not significant with the exception of age. The multiple regression also found that only age was predictive in a student's score. Age showed an interesting pattern with course scores that as age decreased, grade score increased. Further research with similar course designs and various age ranges should be conducted to determine if this study's results were skewed or if younger ages can reliability lead to an increase in course score. The results of this study are limited to the

students who completed this survey; however, this study began the process of filling a gap in the literature by examining if grit, mindset, age, or gender could be potential indicators of success in a student's first online high school course.

Recommendations for Future Research

"Innovation is the key to the future, but basic research is the key to future innovation."

—Jerome Isaac Friedman

It is important to keep studying the growth of online education and how educators can help students succeed in this new model of education at the high school level. Further research is necessary to increase student success in online education. There is a wide range of reasons for attrition. Other factors should be researched in online high school courses, such as course design, how much professional development the teacher has had, the course topic, and whether the course is synchronous or asynchronous.

Additional studies may focus on a replicated study with a larger population of students to be able to better generalize the findings, perhaps considering a single age or gender, course type, or synchronous versus asynchronous. Another aspect to focus on is if the student is in a full-time online school or if he or she is just taking a few online classes. Whether or not the student is in a class model that uses synchronous or asynchronous may be studied to see if there was any significance in the dropout rate due to online-course modality. A longitudinal study following grit and grade across a long-term online program may show a correlation between grit and grade.

If growth mindset can be taught, future research should look at how long it takes a high school student to change from a fixed to a growth mindset or from a lower growth mindset category to a higher category. Do educators have the time necessary to teach growth mindset

during the course of a student's high school experience?

Implications for Professional Practice

Prior to enrolling a student in an online course, it is recommended that the counselor or school prepare the student for how an online course will be conducted as well as course requirements. This can make the student feel more confident going into the course and can increase course grade (Haynie, 2014).

School A, as well as any others following this model, may want to rethink the asynchronous course design. The asynchronous model may have contributed to the high dropout rate because these students were able to enroll any time from August until March and had until the end of April to complete the course with no other due dates. The high pass rate in the synchronous course design indicates that this structure is more effective for high school students. A synchronous course provides due dates, smaller class size, eliminates isolation and fosters a sense of community, makes class discussion easier to facilitate, and allows instructors to provide timely feedback (Haslam, 2017).

References

Allen, I., & Seaman, J. (2007). Online Nation: Five years of growth in online learning. Report. The Sloan Consortium.

Allen, I. & Seaman, J. (2008). *Staying the course: Online education in the United States, 2008*. Needham, MA: Sloan Consortium.

Alstete, J., & Beutell, N. (2004). Performance indicators in online distance learning courses: A study of management education. *Quality Assurance in Education, 12*(1), 6-14.

Artino, A. R. (2008). Promoting academic motivation and self-regulation: Practical guidelines for online instructors. *TechTrends: Linking Research & Practice to Improve Learning, 52*(3), 37-45. doi: 10.1007/s11528-008-0153-x

Baker, B.D., & Bathon, J. (2012). Financing online education and virtual schooling: A guide for policymakers and advocates. Boulder, CO: National Education Policy Center. Retrieved May 4, 2016, from http://nepc.colorado.edu/publication/financing-online-education.

Barbour, M. K. (2014). *A history of international K-12 online and blended instruction.* In R. Ferdig & K. Kennedy (Eds.), Handbook of Research on K-12 Online and Blended Learning (pp. 25-50). Pittsburgh, PA: Entertainment Technology Center Press, Carnegie Mellon University.

Batres, I. (2011). *The relationship of grit, subjective happiness and meaning in life on alternative education students' GPA and attendance.* La Verne, CA: Univeristy of La Verne. Retrieved from http://books.google.com/books/about/The_Relationship_of_Grit_Subjective_Happ.html?id=D0g6MwEACAAJ.

Bayrak, T. & Gulati, A. (2015). The role of gender on student success. *International Journal of Information and Communication Technology Education, 11*(4).

Bawa, P. (2016). Retention in online courses. *Sage Open, 6*(1).

Bernard, R.M., Brawer, A., Abrami, P.C., & Surkes, M. (2004). The development of a questionnaire for predicting online learning achievement. *Distance Education, 25*(1), 31-47.

Black, K. (2014). *Grit in college students: Associations with achievement and parental influences.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (1573292).

Bond, H. (2013). Online education. *Sociology of education*, 548-550.

BPCS. (2017). Planning the methodology: Limitations and delimitations. Retrieved from https://www.bcps.org/offices/lis/researchcourse/develop_writing_methodology_limitations.html.

Bressler, L., Bressler, M., & Bressler, M. (2010). Demographic and psychographic variables and the effect on online student success. *Journal of Technology Research.* Retrieved from http://www.aabri.com/manuscripts/10435.pdf

Carnevale, D. (2003). The virtual lab experiment: Some colleges use computer simulations to expand science offerings online. *The Chronicle of Higher Education, 49*(21), A30.

Carrier, A. (2014). *Teaching and fostering qualities related to grit.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3636966).

Cash, P., Jones, D., & Richardson, M. (2014). Evaluation of the high school virtual program in a North Texas school district. *Journal of Case Studies in Education, 5*(1), 1-14.

Cavanaugh, C., Gillan, K.J., Kromrey, J., Hess, M., & Blomeyer, R. (2004). *The effects of distance education on k-12 student outcomes: A meta-analysis.* Retrieved from http://www.eric.ed.gov/PDFS/ED489533.pdf

Chang, W. (2014). *Grit and academic performance: Is being grittier better?* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3681407).

Chivers, T. (2017). A mindset "revolution" sweeping Britain classrooms may be based on shaky science. Retrieved from https://www.buzzfeed.com/tomchivers/what-is-your-mindset?utm_term=.mcm2K0z0Wd#.reeDl8W83w.

Clark, T. (2001). Virtual schools: Trends and issues – a study of virtual schools in the United States. San Francisco, CA: Western Regional Educational Laboratories. Retrieved from http://www.wested.org/online_pubs/virtualschools.pdf

Clay, M.N., Rowland. S., & Packard, A. (2009). Improving undergraduate online retention through gated advisement and redundant communication. *Journal of College Student Retention, 10*(1), 93-102.

Connections Academy. (2015). Growth of K-12 digital learning. Retrieved from www.connectionsacademy.com/news/growth-of-k-12-online-education-infographic

Crede, M., Tynan, MC, Harms, PD. (2016). Much ado about grit: A meta-analytic synthesis of the grit literature. *J Pers Soc Psychol*.

Cross, T. (2013). *Staying the course: Grit, academic success, and non-traditional doctoral students*. (Doctoral dissertation). Retrieved from ERIC (ED558318).

Darwin, F. (1887). *Life and letters of Charles Darwin.* New York: D. Appleton and Company.

Diaz, D. (2002). As distance education comes of age, the challenge is keeping the students. *Chronicle of Higher Education,* p. A39.

DiRienzo, C., & Lilly, G. (2014). Online versus face-to-face: Does delivery method matter for undergraduate business school learning? *Business Education & Accreditation, 6*(1), 1-11.

Dray, B., Lowenthan, P., Miszkiewicz, M., Ruiz-Primo, M., Marczynski, K. (2011). Developing an instrument to assess student readiness for online learning: A validation study. *Distance Education, 32*(1), 29-47.

Drysdale, J. (2013). *Online facilitators and sense of community in K-12 online learning*. (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3613327).

Duckworth, A. (2013, May 13). Angela Lee Duckworth: The key to success? Grit [video file]. Retrieved from https://www.youtube.com/watch?v=H146BuluwB8

Duckworth, A. (2016). Grit: The power of passion and perseverance. New York City, NY: Scribner.

Duckworth, A.L. (2009). Development and validation of the short Grit scale. *Journal of Personality Assessment, 91*(2), 166-174.

Duckworth, A.L., Peterson, C., Matthews, M.D., & Kelly, D.R. (2007). Grit: Perseverance and passion for long-term goals, *Journal of Personality Assessment, 92*(6), 1087-1101.

Duckworth, A., Quinn, P. (2009). Development and validation of the short grit scale (Grit-S), *Journal of Personality Assessment, 91*(2), 166-174.

Dweck, C.S. (2006). Mindset. New York, NY: Ballantine.

Dweck, C.S. (2008). *Mindset and math/science achievement.* Carnegie Corporation of New York-Institute for Advanced Study Commission on Mathematics and Science Education. Retrieved from http://www.nationalnumeracy.org.uk/resources/114.index.html

Dweck, C. & Sorich, L. (1999). Mastery oriented thinking. In C. Snyder (Ed.), *Coping: The psychology of what works* (pp. 243-251). New York: Oxford University Press.

Editors, H. (2016, December 5). Beyond grit: The science of creativity, purpose, and motivation. Retrieved from https://heleo.com/conversation-beyond-grit-the-science-of-creativity-purpose-and-motivation/11918/.

Educause. (2017). Massive open online course (MOOC). Retrieved from https://library.educause.edu/topics/teaching-and-learning/massive-open-online-course-mooc.

Farmer, A. (2014). Got Grit?. *Perspectives: A Magazine for and about women lawyers*, *23*(1), 4-7.

Finkel, E. (2015). Online education enters the mainstream. *Community College Journal*, *86*(1), 26-30.

Flood, J. (2002). Read all about it: Online learning facing 80% attrition rates, *TOJDE*, *3*(3). Retrieved 12/5/2006 from http://tojde.anadolu.edu.tr/tojdeb/articles/jimz.htm.

Fluid Surveys. (2014). Response rate statistics for online surveys-What number should you be aiming for? Retrieved from http://fluidsurveys.com/university/response-rate-statistics-online-surveys-aiming/.

Friedman, J. (2016). Study: Enrollment in online learning up, except at for-profits. Retrieved from https://www.usnews.com/education/online-education/articles/2016-02-09/study-enrollment-in-online-learning-up-except-at-for-profits.

Fryrear, A. (2015). Survey response rates. Retrieved from https://www.surveygizmo.com/survey-blog/survey-response-rates/.

Garofalo, A. (2016). *Teaching the character competencies of growth mindset and grit to increase student motivation in the classroom.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (10119261).

Gold, S. (2001). A constructivist approach to online training for online teachers. *JALN*, *5*(1).

Grubb, M. (2011). *Predictors of high school student success in online courses.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3462834).

Haslam, J. (2017). Synchronous vs. asynchronous learning. Retrieved from https://www.elearners.com/education-resources/degrees-and-programs/synchronous-vs-asynchronous-classes/.

Hawkins, A., Graham, C., Sudweeks, R., & Barbour, M. (2013). Academic performance, course completion rates, and student perception of the quality and frequency of interaction in a virtual high school. *Distance Education*, *34*(1), 64-83.

Haynie, D. (2013). Consider online college courses in high school. Retrieved from https://www.usnews.com/education/online-education/articles/2013/07/16/consider-online-college-courses-in-high-school.

Haynie, D. (2014). Why online students should bother with orientation. Retrieved from https://www.usnews.com/education/online-education/articles/2014/05/13/why-online-students-should-bother-with-orientation

Hendricsen, F. (2014). *A comparison of at-risk student course completion rates in online and traditional high schools.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3621099).

Herbert, M. (2006). Staying the course: A study in online student satisfaction and retention. *Online Journal of Distance*, *9*(4).

Hernandez, R., Shewchuk, R. (2008). Online education. *The Journal of Health Administration Education*, *25*(4).

Heyman, E. (2010). *Overcoming student retention issues in higher education online programs: A Delphi study.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (748309429).

Hochanadel, A. & Finamore, D. (2015). Fixed and Growth Mindset in education and how Grit helps students persist in the face of adversity. *Journal of International Education Research, 11*(1), 47-50.

Hogan, M. & Larkin-Wong, K. (2013). Grit and Mindset: Implications for women lawyers. *Women Lawyer Journal, 98*(3), 10-19.

Hong, Y., Chiu, C., Dweck, C.S., & Sacks, R. (1997). Implicit theories and evaluative processes in person cognition. *Journal of Experimental Social Psychology,* 33, 296-323.

Huerta, L., King-Rice, J., & Rankin-Shafer, S. (2014, March 4). *National Education Policy Center*. Retrieved May 4, 2016, from nepc.colorado.edu:http://nepc.colorado.edu/publications/research-briefs.

Hughes, J. E., McLeod, S., Brown, R., Maeda, Y., & Choi, J. (2007). Academic achievement and perceptions of the learning environment in virtual and traditional secondary mathematics classrooms. *The American Journal of Distance Education, 21*(4), 199-214.

Hung, M.L., Chou, C., Chen, Z., & Own, Y. (2010). Learner readiness for online learning: Scale development and student perceptions. *Computers and Education, 55*, 1080-1090.

Hussain, S. (2015). Community college leaders' support for growth of online education: A case study approach. ProQuest 3732622.

Hyllegard, D., Deng, H., & Hunter C. (2008). Why do students leave online courses? Attrition in community college distance learning courses. *International Journal of Instructional Media, 35*(4), 429.

Irvin, M., Jordan, A., Hannum, W., & Farmer, T. (2014). Reasons for student dropout in an online course in a rural K-12 setting. *Journal of Distance Education, 35*(3), 324-344.

James, W., & Wilber, K. (1989). *Theories of consciousness, human development, and potential*. Australia: Macquarie University.

Jaggars, S.S. (2011). Online learning: Does it help low income and underprepared students? (Report No. 26). New York: Columbia University.

Jaschik, S. (2014). Virtually no difference. Retrieved from https://www.insidehighered.com/news/2014/02/19/study-finds-little-difference-academic-success-students-who-do-and-dont-submit-sat.

Jordan, G. (2012). *Advantages and disadvantages for developing and implementing an online course using computer literacy.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (1510161).

Jordan, K. (2014). Initial trends in enrolment and completion of massive open online courses. *International Review of Research in Open and Distance Learning, 15*(1), 133-160.

Kearns, J. (2015). *The examination of Grit in California superintendents.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3738522).

Kerr, M.S., Rynearson, K., & Kerr, M.C. (2006). Student characteristics for online learning success. *The Internet and Higher Education, 9*(2), 91-105.

Khanlarian, C., & Singh, R. (2014). An exploratory study of the online learning environment. *Issues in Accounting Education, 29*(1), 117-147.

Kruger-Ross, M., & Waters, R. (2013). Predicting online learning success: Applying the situational theory of publics to the virtual classroom. *Computers and Education, 61*, 176-184.

Kupczynski, L. (2014). The relationship between gender and academic success online. *The Journal of educators online, 11*(1).

Larkin-Wong, K. (2015). Grit, Growth Mindset, and being a great trial lawyer. *Woman Advocate, 20*(2), 3-6.

Laurel Springs School (2013). *About us.* Ojai, CA: Author. Retrieved from http://laurel-springs.com/aboutus.

Lederman, D. (2013). Who benefits from online ed? Retrieved from https://www.insidehighered.com/news/2013/02/25/study-finds-some-groups-fare-worse-others-online-courses.

Leventoff, J. (2015). Five states require online coursework amid debates about its effectiveness. Retrieved from https://www.equalfuture.us/2015/02/25/online-coursework-debate/.

Levy, Y. (2007). Comparing dropouts and persistence in e-learning courses. *Computers & Education, 48*(1), 185-204.

Lykourentzou, I. Giannoukos, I., Nikolopoulos, V., Mpardis, G., & Loumos, V. (2009). Dropout prediction in e-learning courses through the combination of machine learning techniques. *Computers & Education, 33*(3), 950-965.

Maddix, M. (2013). Developing online learning communities. *Christian Education Journal, 10*(1), 139-148.

Mann, J. (2017). How online school prepares students for success. Retrieved from https://www.thebridgeschool.net/news/online-school-students-success/.

Mattice, N.J., & Dixon, P.S. (1999). Student preparedness for distance education (Research Report). Santa Clarita, CA: College of the Canyons.

Mbuva, J. (2014). Online education: Progress and prospects. *Journal of Business and Education Leadership, 5*(1), 91-101.

McCullough, K. (2015). The difference between 'fixed' and 'growth' mindsets. *Hockey Weekly, 41*(16), 25.

McVay, M. (2000). Developing a web-based distant student orientation to enhance student success in an online bachelor's degree completion program. Unpublished practicum report presented to the Ed.D. Program. Florida: Nova Southeastern University.

McVay, M. (2001). How to be a successful distance education student: Learning on the Internet. New York: Prentice Hall.

Mendenhall, R. (2009). Online education. *Change, (41)*4, 8.

Meredith, B. (2011). *Personality types as an indicator of online student success and retention.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3449391).

Mgutshini, T. (2013). Online or not? A comparison of students' experiences of an online and an on-campus class. *Curationis, 36*(1), 1-7.

Miltiadou, M, & Yu, C.H. (2000). Validation of the online technologies self-efficacy scale. Retrieved from https://eric.ed.gov/?id=ED445672.

Mindset Works (2012). Mindset assessment profile tool. Retrieved from http://schools.nyc.gov/NR/rdonlyres/9CFE0C88-2B48-4ED2-BF39-7D6D4E43CB15/0/MindsetAssessmentProfile.pdf.

Morrison, D. (2003). E-learning strategies: How to get implementation and delivery right first time. Chichester, UK: John Wiley & Sons.

Murin, A., Tenuta, D., & Keckler, K. (2012). 21st century skills: Implementing online course requirement policies for high school graduation. Retrieved from

http://www.inacol.org/resource/21st-century-skills-implementing-online-course-requirement-policies-for-high-school-graduation/.

Murphy, E., Rodríguez-Manzanares, M., & Barbour, M. K. (2011). "Asynchronous and Synchronous Teaching and Learning in High-School Distance Education: Perspectives of Canadian High School Distance Education Teachers." British Journal of Educational Technology, 42(4), 583-591

Muse, H. (2003). The web-based community college student: An examination of factors that lead to success and risk. *Internet and Higher Education, 6*(3), 246-261.

Myers, C., Wang, C., Black, J., Bugescu, N., Hoeft, F. (2016). The matter of motivation: Striatal resting-state connectivity is dissociable between grit and growth mindset. *Social Cognitive and Affective Neuroscience, 11*(10), 1521-1527.

Nelson, P. F. (2006). Student retention in online education at the community college. Retrieved from ProQuest. (UMI 3222374)

Noble, J. V. (2004). For science and math, skip the online course. *Communications of the Association for Computing Machinery*, 47(10), 12-13.

Nora, A., & Snyder, B.P. (2009). Technology and higher education: The impact of e-learning approaches on student academic achievement, perceptions and persistence. *Journal of College Student Retention: Research, Theory, & Practice, 10*(1), 3-19.

Oblender, T.E. (2002). A hybrid course model. *Learning & leading with technology, 29*, 42. Retrieved from http://www.learningandleading-digital.com/learningandleading

O'Connor, J. (2012). In K12 courses, 275 students to a single teacher. Retrieved from https://stateimpact.npr.org/florida/2012/09/16/in-k12-courses-275-students-to-a-single-teacher/.

OEDb (2012). 10 advantages to taking online classes. Retrieved from http://oedb.org/ilibrarian/10-advantages-to-taking-online-classes/.

Paden, R. R. (2006). A comparison of student achievement and retention in an introductory math courses delivered in online, face-to-face, and blended modalities. Retrieved from ProQuest. (UMI 3237076)

Palloff, R.M., & Pratt, K. (2007). *Building online learning communities: Effective strategies for the virtual classroom.* San Francisco, CA: Jossey-Bass.

Pape, L. (2016). *Choosing online education*. Retrieved April 29, 2016, from http://thevhscollaborative.org/resources/resource/choosing-online-education.

Parnell, J.A., & Carraher, S. (2003). The management education by Internet readiness (Mebir) scale: Developing a scale to assess personal readiness for Internet mediated management education. *Journal of Management Education, 27*(4), 1-446.

Parsad, B., & Lewis, L. (2008). *Distance education at postsecondary institutions: 2007-07*. Washington, DC: National Center for Education Statistics.

Patterson, B., & McFadden, C. (2009). Attrition in online and campus degree programs. *Online Journal of Distance Learning Administration, 12*(2).

Perry, B., Bowman, J., Care, W.D., Edwards, M., Park, C. (2008). Why do students withdraw from online graduate nursing and health studies education? *The Journal of Education Online, 5*(1).

Perry, E., & Pilati, M. (2011). Online learning. *New Directions for Teaching and Learning, 128*, 95-104.

Picciano, A., & Seaman, J. (2007). K-12 online learning: A survey of U.S. school district administrators. Needham, MA: The Sloan Consortium.

Pillary, H., Irving, K., & McCrindle, A. (2006). Developing a diagnostic tool for assessing tertiary students' readiness for online learning. *International Journal of Learning Technology, 2*(1), 92-104.

Pintrich, P.R., Smith, D.A.F., & Garcia, T. (1993). Reliability and predictive validity of the motivated stragies for learning questionnaire (MSLQ). *Educational & Psychological Mesaurement, 53*(1), 801-813.

Prensky, M. (2001). Digital native's digital immigrants. *On the Horizon, 9*(5), 1-6.

Rees, C., & Monrouxe, L. (2010). Theory in medical education research: How do we get there?. *Medical Education, 44*(4), 334-339.

Reiner, D. (2012). Four ways online high school prepares teens to succeed in college. Retrieved from http://blog.connectionsacademy.com/4-ways-online-high-school-prepares-teens-to-succeed-in-college/.

Robinson, W. (2015). *Grit and demographic characteristics associated with nursing student course engagement.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3718182).

Salazar, J. (2010). Staying connected: Online education engagement and retention using educational technology tools. *Clinical Laboratory Science, 23*(3).

Salmon-Nembhard, S. (2015). *Black middle school students' mindsets and mathematics success.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3704524).

Savoia, L, (2015). *Superintendent perceptions of the advantages and disadvantages of incorporating online courses in order to meet graduation requirements in Monmouth County, New Jersey.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3701165).

Sekar, S. (2009). *A study of the predictors of academic success of high school English language learners in one Tennessee urban school district.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing.

Silpakit, C., Silpatki, O, & Chomchuen, R. (2015). The validity study of the mindset assessment scale. *Journal of Mental Health of Thailand, 23*(3).

Sinibaldi, F. (2016). The two mindsets that determine our destinies. Retrieved from https://medium.com/@fabiosinibaldi/the-two-mindsets-that-determine-our-destinies-a3f87e6c7da7#.fha8f9q46.

SmarterMeasure. (2017). Learning readiness indicator. Retrieved from www.smartermeasure.com.

Smith, B. (2010). *E-learning technologies: A comparative study of adult learners enrolled on blended and online campuses engaging in a virtual classroom*. (Doctoral dissertation. Retrieved from ProQuest Dissertations Publishing.

Smith, D. (2015). Online education. *Journal of Health Administration Education, 32*(4), 419.

Smith, G. G., Heindel, A. J., & Torres-Ayala, A. T. (2008). E-learning commodity or community: Disciplinary differences between online courses. *Internet and Higher Education, 11*, 152-159.

Smith, P.J. (2005). Learning preferences and readiness for online learning. *Educational Psychology, 25*(1), 3-12.

Smith, P.J., Murphy, K.L., & Mahoney, S.E. (2003). Towards identifying factors underlying readiness for online learning: An exploratory study. *Distance Education, 24*(1), 57-67.

Sparkman, L, Maulding, W., & Roberts, J. (2012). Non-cognitive predictors of student success in college. *College Student Journal, 46*(3), 642-652.

Speakup. (2015). Online education. Retrieved from www.tomorrow.org/speakup

Spieth, M. (2009). *Optimizing online student success: Strategies utilized by technical college students.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3357137).

Stewart, S. (2015). *Grit and self-control as predictors of first-year student success.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3722559).

Strayhorn, T. (2014). What role does grit play in the academic success of black male collegians at predominantly white institutions? *Journal of African American studies, 18*(1), 1-10.

The Journal (2004). Faculty training for online teaching. Retrieved from https://thejournal.com/articles/2004/09/01/faculty-training-for-online-teaching.aspx.

Tiene, D. (2000). Online discussions: A survey of advantages and disadvantages compared to face to face discussions. *Journal of Educational Multimedia and Hypermedia, 9*(4), 371.

Tonks, D., Weston, S., Wiley, D., & Barbour, M., (2013). Opening a new kind of high school: The story of the Open High School of Utah. *International Review of Research in Open & Distance Learning, 14*(1), 255-271.

UCLA (2017). What does Cronbach's alpha mean? SPSS FAQ. Retrieved from http://stats.idre.ucla.edu/spss/faq/what-does-cronbachs-alpha-mean/.

U.S. Department of Education, Office of Planning, Evaluation, and Policy Department, Policy and Program Studies Service. (2009). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. (Contract number ED-04-CO-0040 Task 0006). Retrieved from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Vollmer, J.R. (2010*). Schools cannot do it along: Building public support for America's public schools.* Fairfield, Iowa: Enlightenment Press. Retrieved from: Kindle Fire.

Wagner, H., & Mejia, M. (2014). *Online learning and student outcomes in California's community colleges.* Retrieved from www.ppic.org/main/publication.asp?i=1096

Watkins, R., Leigh, D., & Triner, D. (2004). Assessing readiness for e-learning. *Performance Improvement Quarterly, 17*(4), 66-79.

Willging, P.A., Johnson, S.D. (2009). Factors that influence student's decision to drop out of online courses. *Journal of Asynchronous Learning Networks, 13*(3), 115-127.

Wilkins, P. (2014). *Efficacy of a growth mindset intervention to increase student achievement.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (3642232).

Wilson, C. (2016). *A mixed-method case study of growth mindset, grit, and reading scores in a Midwest public elementary school.* (Doctoral dissertation). Retrieved from ProQuest Dissertations Publishing (10240018).

Wladis, C. & Samuels, J. (2016). Do online readiness surveys do what they claim? Validity, reliability, and subsequent student enrollment decisions. *Computers & Education, 98*(1), 39-56.

Xing, W., Chen, X., Stein, J., & Marcinkowski, M. (2016). Temporal predication of dropout is in MOOCs: Reaching the low hanging fruit through stacking generalization. *Computers in Human Behavior, 58*, 119-129.

Young, T. (2017). Schools are desperate to teach 'growth mindset'. But it's based on a lie. Retrieved from https://www.spectator.co.uk/2017/01/schools-are-desperate-to-teach-growth-mindset-but-its-based-on-a-lie/.

Zhao, Y., Lei, J., Yan, B., Lai, C., & Tan, H.S. (2005). What makes the difference? A practical analysis of research on the effectiveness of distance education. *Teachers College Record, 107*(8), 1836-1884.

Zorana, I. (2014). Predicting school success: Comparing conscientiousness, grit, and emotion regulation ability. *Journal of Research in Personality, 52*, 29-36.

Appendix A

Informed Consent/Student Assent

Dear Parents and Students,

My name is Brooke Martinez and I am a teacher at _____. I am also a student in a doctoral program at Northwest Nazarene University in Idaho. Part of my degree involves conducting research to benefits student education. My research will involve determining how Grit and Mindset impact student success in online classes. Grit relates to how willing a person is to continue a challenge when obstacles arise. Mindset refers to whether an individual believes intelligence is something that can change over time or not. Both of these concepts have been studied in K-12 settings previously.

I am asking for your help because we don't know very much about what affects a student's ability to complete their first online high school class. Results will be beneficial in determining how students in online classes can be best supported to help them succeed.

The research will involve each student answering a short online survey about Grit and Mindset as well as a few demographic questions. This survey should take the student approximately 20 minutes. At the end of the semester the school will provide the students final course grade so this can be compared to the surveys. Grades will be coded so that the student name is kept confidential. I will not release the students, grade, or survey responses in any way that would identify them.

Your participation is voluntary and if you choose not to be a part of this study it will not impact the students grade. I need parent's/guardians permission for each student to participate if you choose. You can ask me questions about this study at any time. If you decide at any time not to continue you may stop participating. The student name is only asked to match up with the student grade with survey responses. Students names will then be changed to a code so that it is confidential.

The questions we will ask are only about what each student thinks. There are no right or wrong answers because this is not a test.

By continuing on to the next page, it means that you have read this and that you want to be in the study. If you don't want to be in the study, simply close the browser. Being in the study is up to you, and no one will be upset if you don't participate or if you change your mind later.

Sincerely,

Brooke Martinez

Appendix B

Grit Survey

The grit questions can be found at https://www.sas.upenn.edu/~duckwort/images/8-item%20Grit%20081011.pdf.

This survey is available free through the Duckworth Lab for research purposes.

Appendix C

Mindset Survey

The mindset questions can be found at http://schools.nyc.gov/NR/rdonlyres/9CFE0C88-2B48-4ED2-BF39-7D6D4E43CB15/0/MindsetAssessmentProfile.pdf.

This survey is available free through the Project for Education Research (PERTS).

Appendix D

Confidentiality Agreement

Title of Research Project: Grit and mindset as predictors of student success in a first time online high school course

Local Principal Investigator: Brooke Martinez

As a participant in data collection for this research project I understand that I may have access to confidential information about study sites and participants. By signing this statement, I am indicating my understanding of my responsibilities to maintain confidentiality and agree to the following:

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

Signature	Date	Printed name

Signature of local principal investigator	Date	Printed name

Appendix E

Ethical Research Training

Certificate of Completion

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

Date of completion: 01/29/2016.

Certification Number: 1978473.