PREDICTORS OF HIGH SCHOOL STUDENT SUCCESS IN ONLINE COURSES

A Doctoral Thesis Presented to the
Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree

Doctor of Education

by

Mark S. Grubb

May, 2011

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ABSTRACT

As the use of online learning in high schools continues to increase, more research needs to be conducted on how students with different skills, abilities, and attributes perform in online courses. Not all students are successful at online learning, and they should be reviewed on an individual basis to see what strengths and weaknesses these students possess before enrolling them into online courses. This study identifies critical characteristics shared by successful online high school students using quantitative historical data collected from a large urban district's summer school program in 2010.

Student responses to an online pre-course evaluation instrument were compared to their course grades at the end of the semester. A multiple linear regression model using the stepwise method was calculated using 119 responses to predict the students' final grades in their online courses based on their Individual Attributes, Learning Styles, Technical Competency, Technical Knowledge, Reading Rate, Reading Recall, Typing Speed, and Typing Accuracy as reported by the constructs of an online evaluation instrument. Based on the results, Typing Speed and Reading Recall were found to contribute with statistical significance as predictive constructs to the final grade earned by the students. A significant regression equation was found ($F(2,116) = 14.039$, $p < .001$), with an adjusted R^2 of .181. Research suggests that high school students given pre-course evaluative instruments before taking online courses can tell us more about online

learning predictors, and how to better improve implementation of online learning for all high school students.

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Introduction

Background Study of the Problem

Online learning has evolved a great deal over the last two decades. In fact, the spread of public and free Internet access, increased school district investments in classroom technology, and the development of online courses by both school districts and private companies has removed many of the barriers that restricted online learning in the past. Some research predicts that, due to factors like cost and flexibility, over half of all high school courses could be online in as early as 2019 (Christensen, C. M., Horn, M. B., & Johnson, C. W., 2008). Given the advances in online course access and technology, there needs to be a shift in thinking from "How can we get students access to distance education?" to "Is this student prepared to take an online course?" Students' access to online courses alone does not necessarily mean they possess the appropriate skills for this learning format. Not all students are successful at online learning, as demonstrated with the higher than average withdrawal rates (Bernard & Amundsen, 1989; Cyrs, 1997; Dille & Mezack, 1991; Parker, 1999; Wojciechowski & Palmer, 2005).

Many studies have been conducted on traditional learning methods, but there is still comparatively very little research covering online learning at the high school level. Online learning needs to be reviewed on a student-by-student basis just as other alternative learning methods are evaluated for their appropriateness. The goal of this study is to identify critical predictive characteristics shared by students who are

successful in online learning courses by examining the quantitative historical data collected from high school students in a large urban district who completed online courses in a 2010 summer school program.

Statement of the Problem

The expansion of online learning at the high school level means more research needs to be conducted on how students with different skills, abilities, and attributes perform in online courses. Studying what these successful online students have in common will allow us to learn more about how to effectively tailor and implement online learning methods for high school students.

Purpose of the Study

The purpose of this study is to identify what predictive skills, abilities and attributes that successful online students share. Once these shared abilities are found and categorized, they can help educators identify which students may be at risk of having difficulty learning in an online environment and build a better model for implementing online learning. The purpose of this study is not to state that any pre-course evaluation instrument can be used to predict the grade a student will earn in an online course, or that a student's academic success in an online course can be solely attributed to any one measurable instrument. There are many variables that affect a student's ultimate success in an online course, including a student's aptitude in the subject area, whether or not a student has had the course before, internal and external motivational factors, and their online e-teacher to name just a few.

Research Question

Do the SmarterMeasure constructs of Learning Style, Personal Attributes, Reading Rate, Reading Recall, Typing Accuracy, Typing Speed, Technology, and Technical Competency, serve as statistically significant predictors of high school student success in an online course?

Importance of the Study

This study will contribute to the body of educational knowledge and educational research literature by providing more insight into the attributes that successful online learners possess. The large urban school district from which the data for this research was gathered currently uses the SmarterMeasure instrument to evaluate students before they take online courses. This information is very student-centered, and is meant to assist the students by identifying their strengths and weaknesses at a local level. Ultimately, the results of this study can be used by districts to build more structured remediation and student assistance policies that focus on skills found to be critical in online learning environments.

The ability to pre-evaluate a students' aptitude for online courses can also assist teachers in focusing the monitoring, support, and reinforcement of students who are at risk of not completing an online course (Diaz, 2002). If such intervention proves unsuccessful, an alternative learning path can be identified much sooner and more accurately for these students. A pre-evaluation may also help identify students who had not originally been considered for online learning as a viable option according to Sunal, Sunal, Odell, and Sundberg (2003). If students have high scores in the areas discovered,

they may be potential candidates for taking online courses for the following reasons: (1) for original credit at an accelerated rate, (2) AP and dual credit courses that would give students a head start on college, or (3) additional electives that are not offered at their school.

The SmarterMeasure instrument is currently being used in the large urban school district where this study was conducted to give students feedback on their strengths and weaknesses as they relate to taking an online course. Then, students are provided with online resources that assist and strengthen their weaker skills in order to prepare them for taking their online courses. There is also a second use of the SmarterMeasure instrument in the large urban school district where this study was conducted – namely, to alert monitoring teachers to students' specificied areas of possible weakness, and subsequently provide any further instructional and technical support needed. Widespread acceptance and use of this instrument has yet to catch on, but perhaps more research mirroring the present study will provide increased support for expanded programmatic development and implementation in schools throughout this district as well as others.

Creating a predictive model poses many challenges; most notably, how it should be used. It should be clearly outlined that pre-course evaluative instruments should not be used to screen students who do not meet certain criteria. These instruments should be used to quickly identify areas of weakness for online, at-risk students, and specific interventions should then be applied that provide extra assistance the students may need. Blocking the registration of students into online courses based solely on the results of a predictive model would be an inappropriate and unethical use of a valuable resource.

Many factors contribute to a student's success in online courses, including prior knowledge of content, academic ability, etc. It would be a great disservice to exclude a potentially successful online learner on the basis of a single instrument, especially without first offering appropriate support in these areas where weakness is found.

Scope of the Study

The data for this study was collected from students who participated in online courses within a large urban school district during the summer of 2010. The study began with data for 216 students taking 273 courses in the program. The data was cleaned for duplicates and partial data submissions. Analysis was then conducted on the results from the students' pre-course SmarterMeasure evaluations and their final course grades.

Definition of Terms

Asynchronous Communication: A form of computer-mediated communication (CMC) that supports information exchange and group interactions through a variety of electronic communication tools such as electronic mail (email), bulletin boards, class listservs, and online discussion forums (Bodzin & Park, 2000).

At-Risk: Any student meeting one or more of the following criteria are classified as being "at-risk" in this research: (1) The student qualifies for free or Reduced lunch; (2) The student qualifies as an ESL or Bilingual student; (3) The student has ever failed a course or grade level; (4) The student is pregnant or a parent; or (5) The student has ever been placed in a Discipline Alternative Education Program (DAEP). These qualifications are based on the Public Education Information Management System (PEIMS) definition of at-risk students for the State of Texas (Texas Education Agency, 2009).

Blended Learning: "A blended learning experience combines offline and online forms of learning where the online learning usually means "over the Internet or Intranet" and offline learning happens in a more traditional classroom setting" (Singh, 2003).

Distance Education: "A formal educational process in which the majority of the instruction occurs when student and instructor are not in the same place. Instruction may be synchronous or asynchronous. Distance education may employ correspondence study, or audio, video, or computer technologies" (Commission on Colleges and Schools, 2000).

E-teacher: An online teacher that fulfills all of the duties of the Teacher of Record, but all interaction is from a distance - online or by phone.

Final Course Grade: This is the grade that is reported on the students' transcripts. It is calculated by taking the Quality of Work grade x .75 + the Final Exam Grade x .25.

Final Exam Grade: The grade that a student receives on their Final Exam. All final exams taken for online courses are proctored. The final exam grade is weighted at 25% of the students' Final Course Grade.

Multiple Regression: "Multiple regression is a statistical technique that allows us to predict someone's score on one variable on the basis of their scores on several other variables" (Brace, N., Kemp, R. & Snelgar, R., 2000).

Online Learning: "Any class that offers its entire curriculum in the online course delivery mode, thereby allowing students to participate regardless of geographic location, independent of time and place" (Harasim, Hiltz, Teles, & Turoff, 1995).

Public Education Information Management System (PEIMS): The state-wide data management system that encompasses all data requested and received by Texas Education Agency about public education, including student demographic and academic performance, personnel, financial, and organizational information (Texas Education Agency, 2009).

Quality of Work Grade: The average of all grades given for assignments in a course except for the final exam. This is weighted at 75% of the students' Final Course Grade.

SmarterMeasure: This online portal was created by the company SmarterServices to provide a sequence of activities to measure the degree to which students possess the traits needed for success in studying at a distance through online courses.

Synchronous Communication: A form of online communication that is based on real-time interaction between two or more people. Some examples include live text, voice, and video chatting online.

Teacher of Record: A teacher that grades coursework throughout the program including the final exam grade and final course grade. These teachers must be considered Highly Qualified – i.e., must be certified in the grade level and subject matter by the state of Texas for which they are the Teacher of Record.

Overview of the Study

Chapter one of this study begins by discussing the expansion of online learning. In addition, the chapter introduces the problems caused by not properly evaluating the

appropriateness of online learning for students. There are pre-course evaluation instruments that have been used to measure a student's aptitude for online learning. These instruments identify critical areas that contribute to a student's success in an online course. The purpose this study is to evaluate how effective the SmarterMeasure instrument predictors are when compared to a student's success in an online course based on the student's final grade. Further, the research question is stated, and the scope of the study is outlined along with a list of defined terms that will be used throughout the study.

Chapter two provides an evaluation of online learning and how it can be defined. The historical foundations of distance education are examined in the United States in order to frame its evolution into online learning. A very important differentiation is made between instructional mediums and instructional programs. Instructional mediums only describe the method by which information is transferred to and from the learner, and instructional programs are inclusive of all the components that are necessary for distance education to occur. The next section covers different views on the advantages and disadvantages of online learning, as well as new legislative and social developments that will make online learning a more important option for students in the future. Next, online persistence and evaluative instruments are reviewed; Transactional Distance is explored; and then the theoretical framework surrounding the use of the SmarterMeasure instrument and this research is discussed.

Chapter three provides the rationale for the study's approach of using linear regression. It specifically describes the research design, sources of data used, the

participants, and a description of the evaluation instrument that includes a review of research validity and reliability.

Chapter four disaggregates the results from the analysis of the SmarterMeasure instrument and student grades by utilizing descriptive statistics to answer the research question. This chapter concludes with a summary of these results are then presented.

Finally, chapter five discusses the results of the study, and its limitations. Based on a review of the literature and data derived from the study, implications for educational implementation are offered through several recommendations. The chapter closes with suggestions for further research and conclusions.

Chapter Two

Review of the Literature

Introduction

The review of existing literature for this study includes four main sections. The first section discusses and defines online learning. The second section provides a historical overview of the foundations of online learning and how distance education has evolved in the United States. The third section will examine the difference between instructional mediums and instructional programs. The fourth section looks at differentiated instruction and the benefits that online learning provides through differentiated instruction, as well as recent events that have created a new demand for the flexibility online learning provides. The advantages and disadvantages of online learning will also be covered within this section. Lastly, the fifth section explores the theoretical framework that forms the basis of this study. Existing literature that evaluates online learning persistence and other distance education theories will also be explored in this section.

What is Online Learning?

Distance Education is a term that covers the broad use of education when the learner and instructor are not in the same location. Online Learning can be viewed as a subset of distance education that specifically addresses learning over a distance though the Internet. Communication can occur synchronously in online learning through live instant messaging, using a microphone and speakers to talk over the Internet, using a

video camera to project video over the Internet, or a combination of all three. In addition, asynchronous communication is often utilized in online learning through emails and threaded discussion boards. Both asynchronous and synchronous communication is needed for an online course to be successful. According to Wang and Newlin (2001), "The type of interaction fostered by online chat rooms will enhance and clarify the information that is gathered via asynchronous interactions. Both types of information delivery systems are needed."

Some programs are completely online, while others implement a blended learning approach. "Blended learning" is used as a broad term that describes instruction that takes advantage of both online learning and face-to-face instruction. Clark (2003) skillfully delineates the offline and online components of blended learning, as well as how they fit together. The key concept that runs throughout Clark's research is communication, and how "Optimal Blends" of blended learning can be found using different methods of offline and online learning to transfer information to students.

The Role of an E-Teacher in Online Learning.

There are three main components to online learning: (1) the online content, which is the actual course material that is delivered through a Learning Management System; (2) the physical computer and Internet access that allow a student to access and view materials, submit assignments, and communicate with their e-teacher and other students; and, finally, (3) the e-teacher. The e-teacher wears many hats, and is very important to the overall learning experience of an online student. E-teachers serve as the Teacher of Record who grades, communicates through asynchronous and/or synchronous

communication methods, and gives feedback to students as they progress through the course. Wilson and Stacey (2004) identified the various e-teacher roles into the following: manager/administrator (by facilitating any issues a student may have while registering, maintaining security and integrity of the online course, keeping records of grades and communication logs, etc.), technical (assisting the students with accessing the online courses, course navigation, and submitting documents), pedagogical, and social (providing support to the students as they develop their online identities).

Historical Foundations of Online Learning

Distance Education in the US began with correspondence courses used to educate people living in rural areas that could not travel to urban areas. Rural Free Delivery was established by the US Postal system in 1896, which truly helped to facilitate college correspondence courses. Later, as radio developed, it was licensed to over 200 Colleges and Universities in the years between the World Wars (Hinkle, 2007). Radio was tried as an educational medium, but it ultimately failed. This failure gave way to the use of television and the delivery of recorded lectures. The Ford Foundation has played an important role in the support of television broadcasts and their use in international studies within American higher education. In 1956, Gale Childs initiated a study with a Ford Foundation grant to examine the application of television instruction in combination with correspondence courses. From this study, Childs concluded "television instruction is not a method. Television is an instrument (delivery platform) by means of which instruction can be transmitted from one place to another" (Almeda, 1988). This is a very important

concept that continues to elude many educators and administrators today. The separation between an instructional medium and an instructional program will be discussed later.

By the mid-1960s, funding for instructional television dramatically decreased, and the Ford Foundation shifted its funding support to public television. Most of the blame for this shift was placed on the mediocre quality of the instructional programming, which was often little more than a teacher delivering a lecture. Other reasons included teacher resistance to televisions in the classroom, the expense of the television systems, and the inability of television alone to meet the various requirements for student learning (Reiser, 1987).

Modern distance education programs in the United States still incorporate all of these past and present technologies. K-12 schools and universities around the country have courses that are completely online, a hybrid of online, and/or classroom lectures. For example, Texas Tech University (2010) still offers courses that are completely by correspondence as well as those that use both the US mail as well as email. Houston Community College offers courses that students check out on DVDs. Online course offerings and number of student enrollments are expanding rapidly in postsecondary schools. This is evidenced by a growth rate of 9.7 percent for online enrollments as compared with a growth rate of 1.7 percent for the overall higher education student population (Allen & Seaman, 2007).

Online learning continues to grow in realm of K-12 area through private companies that offer courses directly to schools and school districts, as well as through state-led initiatives. As of 2009, there are 27 states with a state virtual school program.

In the 2008-09 school years, these state virtual schools provided roughly 320,000 course enrollments (one student taking one semester-length course) in for-credit courses (Watson, Gemin, & Ryan, 2009). Another option for students is to attend an online school as a full-time student. The number of states with these full-time schools is growing, and there are now 24 states with these schools operating across the country. Approximately 175,000 full-time students attend these online schools, and 45 of the 50 states (including Washington D.C.) have either a state virtual school or online initiative, full-time online schools, or both (Watson, Gemin, & Ryan, 2009). The Florida TaxWatch Center for Educational Performance and Accountability (2007) conducted a comprehensive assessment of the Florida Virtual School system as a viable alternative to their traditional school system. When looking at both student achievement outcomes and cost-effectiveness, they found it earned high marks in both categories.

Online learning will continue to grow in popularity as an educational resource for high school students. Some research predicts that, due to factors like cost and flexibility, over half of high school courses could be online as early as 2019 (Christensen, 2008). Identifying the skills and attributes needed to be a successful online learner will become increasingly important as the popularity of online courses continues to grow.

Instructional Mediums vs. Instructional Programs

Instructional mediums are quite different than an instructional program. Instructional Mediums describe the method information is presented, and usually consumes the focus of distance education discussions. The method of knowledge transfer is only a small part of what makes a successful program. Instruction – whether delivered

by written correspondence, radio, television, or the Internet – only describes the medium used to convey information. Some of these methods facilitate two-way (i.e., synchronous) communication, but they ultimately serve in the same capacity as an electronic textbook, and nothing else. Instructional Mediums may have moving pictures, sound, or be written on paper, but they do not describe the instructional program as a whole.

Distance Education Instructional Program Implementation.

An instructional program is the complete framework within which learning occurs. This includes: (a) what support structures or scaffolding are provided to the student; (b) is there live technical support; (c) does the e-teacher hold "Virtual Office Hours"; (d) does the e-teacher have a Virtual Attendance Policy; and (e) what are the feedback policies and expectations from the e-teachers?

Other Instructional Program components include how the student is evaluated. Some of the evaluation inquiries may include: Are the assignments and exams proctored; what is the weight given to final exams; and are there minimum scores on proctored exams that disqualify students from continuing?

It is also vitally important to consider how an instructional program, which is based on distance learning, is integrated with traditional programs. The questions here may include: how are grades submitted to the educational system; are they included with the same weight and value in students' GPA as traditional courses; and is the traditional campus expected to give students time during the regular school day to complete their online courses while they are at school?

McAlister, Rivera, & Hallam (2001) proposed that the following questions affect most distance education programs, and that such questions should be answered before program implementation:

1. Will the Web curriculum offered be congruent with the institution's mission and strategy?
2. Do you have administrative support?
3. Are there institutional obstacles to adopting a Web curriculum?
4. How will you compensate instructors for offering or administering Web courses?
5. Do you have clear, well-defined criteria for selecting the classes to be offered through the Web?
6. What facilities or capabilities are available to assist in the preparation and delivery of course materials?
7. What methods will be used to deliver class content?
8. How will student progress be assessed?
9. Do your students have the skills necessary to use the Web and participate in class?
10. Where will the class materials be maintained?

The primary purpose of a pre-course evaluation instrument is meant to answer question number nine on the above item list. All other questions on this list can be answered by the administration implementing the program. Without evaluating the students, there is no definitive way to know if they possess the skills and abilities necessary to be successful online learners.

Evaluation of Online Learning

Advantages to Online Learning.

Online Learning allows for the flexibility of both location and time. Students can work on their coursework from home, school, or anywhere with an Internet connection. Through asynchronous communication, students can communicate with their e-teachers to hold conversations on their own schedule through e-mail, message boards, and texts. Synchronous communication is also an option for live web chats and instant messaging. The temporal and spatial differences between students and e-teachers, which will be further explored in the Transactional Distance section of this paper, provide additional benefits as well.

One of the many benefits to schools is the ability to offer a variety of courses to students, without the traditional restrictions that limited these offerings. Not all schools have teachers certified in all course-content areas for which students would like to enroll. Finding a certified teacher for Advanced Placement, Foreign Language, or some elective courses can limit students' options. Another common problem that campuses often face is low student course enrollment, which can lead to course cancellation. Even if a campus has a teacher certified to teach the course, it may not be feasible for them to hold the class. This problem can also manifest itself in another form: Sometime you have thirty-five or forty student that apply for the same class and not enough physical room to accommodate them all, or enough students to make a second class. Online learning can help to alleviate these problems in several ways. Teachers of Record do not need to be in the same location at the same time with students in order to facilitate learning. They can

grade work and answer questions from another school, home, or anywhere. Using asynchronous communication, they can answer students' questions at any time as well.

Online learning allows for many different beneficial educational strategies to be implemented. Online learning provides the transfer of knowledge through several different mediums, such as audio files, videos, and written text. These methods allow for different learning styles to be acknowledged and accommodated as discussed in Howard Gardner's *Multiple Intelligences* (Gardner, 1983). Differentiated instruction, in its many forms, has been a proven method of educating students at varying levels in the same classroom. Waldron & McLeskey (Walther-Thomas, C. & Brownell, M.T., 2001) explain that, "differentiating instruction means that teachers will create different levels of expectations for task completion within a lesson or unit." According to Tomlinson & Kalbfleisch (1998), differentiated classrooms are "responsive to students' varying readiness levels, varying interests, and varying learning profiles." Online learning is an ideal environment for differentiated instruction because students can progress at their own individual learning speed. This allows students move quickly through the subject matter they have already mastered, and slow down and truly understand those concepts that present more difficulties for them.

Disadvantages of Online Learning.

Many criticisms exist for online learning. Some of these criticisms can be resolved through policy and implementation, while others are simply inherent to the nature of online learning as a medium of education.

One disadvantage cited is the lack of face-to-face communication that can cause a disconnect from other students. Bullen, (1998) conducted a case study examining critical thinking and student participation in an undergraduate college course that used computer-mediated conferencing. Some students felt a strong sense of disconnectedness and cited the lack of face-to-face communication and non-verbal cues as a leading cause.

Another disadvantage of online learning critics cite is both the lack of academy integrity and increased ability for students to cheat. How do you know that students are not having their friend, brother, or parent do all of the work for them at home? A few of the suggested solutions to this problem include: affixing a camera on the students' computers, recording them as they take the test, and recording or locking down their desktop to prevent academic dishonesty. Yet, a much simpler solution to handling this problem is through proper policy procedures and how the online program is implemented. Having one or more proctored exams throughout the course assures that the student is learning the material covered. Should a student who is turning in exceptional work throughout the course suddenly score very poorly on these exams, it would alert e-teachers to possible unethical behavior or violations of academic integrity. Some distance education programs even place a minimum score requirement on these proctored exams that students must meet in order to earn credit for the course. A student who is cheating throughout the course and not learning the material required, will not perform well on these exams and fail the course even if they have exceptional work throughout the rest of the semester.

Adequate access to technology and the skills to use this technology are another disadvantage and hurtle that distance education programs must overcome. The problem of a "digital divide" was first pointed out in a survey by the US Department of Commerce, (1995) titled "Falling Through the Net: A Survey of the 'Have Nots' in Rural and Urban America". While they did not use the term "digital divide" in their paper, the term was linked to the gap between those with access to technology and those without such access. The term "digital divide" has evolved over time to include not only the access to technology, but also the additional resources that allow people to use the technology. Warschauer (2002) explains, "…the original sense of the digital divide term - which attached overriding importance to the physical availability of computers and connectivity, rather than to issues of content, language, education, literacy, or community and social resources - is difficult to overcome in people's minds." Students who fall into this category (and are not as technically literate) can hopefully be identified through a pre-course instrument, and be provided the appropriate and necessary instructional support before enrolling into an online course.

New Need for Online Learning.

A new development that will increase the need for flexible learning in The State of Texas very soon is the 4x4 plan, as implemented by the state legislature. The Texas State Board of Education (TSBE) approved amendments to graduation requirements, beginning with the 2007-2008 school year at their November 2006 board meeting. The revised graduation requirements include the addition of a fourth year of math and a fourth year of science to the Recommended High School Program (RHSP) and the

Distinguished Achievement Program (DAP). Details can be found in the TEA Correspondence "To the Administrator" (2007). These graduation requirements went into effect with students who entered ninth grade in the 2007-2008 school year. This means that the first group of students affected is graduating in May of 2011 with two full years of additional core credits needed. Earlier mention was made that online courses provide a flexible alternative to traditional learning. The ability to move quickly through familiar material may be an ideal solution for graduating seniors who need to make up credits.

Online Persistence and Evaluative Instruments

Introduction to Online Persistence.

One of the barriers that keeps online learning from being a prolific educational option is the higher than average withdrawal rate among its students. The rates of student withdrawal from educational courses have been researched and measured for many years. Tinto (1975) developed a predictive model of retention in higher education. His model found that student interaction with the institution and other student-centered factors played an important role in students' overall rate of course withdrawal. Other researchers have expanded on this study to develop predictive models that focus on the retention factors that affect distance education students. The main reason for this is online courses have been found to have higher dropout rates than traditional courses (Bernard & Amundsen 1989; Cyrs 1997; Dille & Mezack 1991; Parker 1999; Wojciechowski & Palmer 2005), with some studies finding rates to exceed 40% in some institutions (Carr & Ledwith, 2000). Frankola (2001) found that institutions are seeing dropout rates ranging

from 20% to 50% for distance learners. These student percentage numbers were confirmed in the review of the Florida Virtual School (2007). This data was ten-to-twenty percent higher than the dropout rate in traditional classrooms (Wojciechowski & Palmer 2005). Unfortunately, such trends are not a new phenomenon and are not limited to any particular type of course or course provider. A Florida Virtual School study in the 2005-2006 and 2006-2007 school years revealed high school student withdrawal rates of 42.8% and 36.9% respectively, prompting the hiring of a full time person to specifically address this issue (Florida Tax Watch, 2007). These findings took into account the withdrawals of students in the four-week trial period during which no penalty is assessed (Hawkins & Barbor, 2010).

An area of great concern is the reason why these students drop out. Suggested solutions include shorter term classes (Diaz & Cartnal, 2006), or focus on course design or interaction within the online environment (Fredericksen, Pickett, Shea, Pelz, & Swan, 2000). Course design, management, and interaction are all important, but they are only part of the equation. An evaluative pre-course instrument that could accurately predict with a high confidence level a students' strengths and weaknesses in areas critical to online learning would provide the opportunity to offer support before problems arise, and not afterwards.

Timing and Other Life Factors.

While support can be provided in order to better prepare students for online learning, sometimes there are other factors that have a greater impact on their success. Diaz (2002), as well as Bolam (2003), agree with the following:

> "[M]any online students who drop a class may do so because it is the 'right thing' to do. In other words, because of the requirements of school, work, and/or family life in general, students can benefit more from a class if they take it when they have enough time to apply themselves to the class work … they may be making a mature, well-informed decision."

This decision does not eliminate the need to identify potential areas of weakness before students enroll in online courses; rather, it actually increases the need for pre-evaluation. A student who is well-informed about his or her potential strengths and/or weaknesses can better judge the degree of difficulty he or she may face in the online course, and make a much more informed decision. Furthermore, students can better relate their perceived abilities and weaknesses in relation to other obligations and life factors, such as school, work, or social situations that may reduce their time and effort they can expend working on their courses.

Building an Evaluative Instrument.

What areas need to be looked at when building an evaluative instrument? Some studies have focused on social cognitive constructs (Miltiadou & Saveyne, 2003), which examine individuals' perception of themselves, locus of control, goal orientation, and other aspects of motivation. Other studies have used past performance, such as GPA, attendance, previous withdrawals from classes, and previous online course experience (Wojciechowski & Palmer 2005). Roblyer and Davis (2008) used study data collected to build a model with the purpose of predicting online student success. They used logistic regression analysis to obtain a combination of factors that yielded the best prediction of

success and failure. The best combination of variables that maximized both success and failure in their model correctly predicted 93% of those who were successful, but only 30.4% of those who failed

One very interesting aspect of the Roblyer and Davis (2008) study is that it also contained a meta-analysis of other studies using pre-course evaluation instruments. They found that the results of each study pointed to different influential factors including: GPA, high internal locus of control, higher self-discipline and motivation, higher skills using multimedia content, gender (females), class rank, Internet technology experience, content area ability and experience, computer confidence, virtual learning communities, and in some cases, no differences at all. What should be gleaned from this research is there are many reasons that have been attributed to success in online learning. Many of these results are based on the methods used to evaluate the students, as well as the variety of populations researched. There is much interest in the topic of identifying skills and attributes of successful online learners, but the prior research conducted has a long way to go before reaching any uniform standards of evaluative constructs.

Online learning may not be the best instructional method for everyone based on reflections garnered from the above research literature, however, there may be certain qualities or characteristics that successful online students have in common. Identifying which of these characteristics are important allows us to evaluate the deficiencies online students may possess before enrolling them into online courses, and work to strengthen these areas as a preventative measure to increase the persistency and success rate in online learning.

Transactional Distance.

Why might skills needed for online learning be any different from those needed for traditional learning? This is where the importance of Transactional Distance comes in. Boyd (1966) and Boyd & Apps (1980) explained that Transactional Distance "connotes the interplay among the environment, the individuals and the patterns of behaviors in a situation." The concept was based on the work Dewey and Bentley (1949), and further explained by Michael Moore (1993) in that "Distance education is not simply a geographic separation of learners and teachers, but, more importantly, is a pedagogical concept. It is a concept describing the universe of teacher-learner relationships that exist when learners and instructors are separated by space and/or by time." The importance of this theory is that the "distance" in Distance Education is not necessarily spatial or temporal; rather, it is transactional in nature. Moore (1993) describes the physical difference in space that is inherent in distance education: "With separation there is a psychological and communications space to be crossed, a space of potential misunderstanding between the inputs of instructor and those of the learner. It is both the psychological and communications space that define Transactional Distance."

Students who are taking courses online may be in the same school down the hall, at another school, in another state, or on another continent from their Teacher of Record. Hence, it is Transactional Distance itself that brings up the need to evaluate this educational method differently. Moore and Kearsley (1996) state, "The separation actually dictates that teachers plan, present content, interact, and perform the other processes of teaching in significantly different ways from the face-to-face environment."

The researcher would argue that if distance education requires teachers to adjust their process of teaching significantly, then a different process of learning might be needed for the students as well.

Theoretical Framework

The theoretical framework for this study is based, in part, on a study by Roblyer and Marshall (2002-2003), in which they developed an Educational Success Prediction Instrument (ESPRI) in the form of a survey given to students at the beginning of the semester. Their purpose was to measure four particular areas to find which one might be the most influential in predicting successful online learning (i.e., Achievement and Self-Esteem Beliefs, Responsibility/Risk Taking, Technology Skills and Access, and Organization and Self-Regulation).

The Kolb Learning Style Inventory (LSI) is another example of an instrument that has been used as a pre-course evaluation instrument for online learners. Kolb (1984) suggests that students develop a preference for learning in a certain way. The style of learning identified by the LSI is only a preference, and students may adopt different learning styles in different situations, but they tend to favor some learning behaviors over others. The LSI explores two key dimensions: Perceiving and Processing. Perceiving describes the learners preferred means of acquiring new information ranging from Concrete Experience to Abstract Conceptualization. Processing refers to how the learner makes sense of things, ranging from Active Experimentation to Reflective Observation. Based on the learner's responses to the instrument, their learning styles fall on a spectrum in four quadrants:

1. *Divergers* - view situations from many perspectives and rely heavily upon brainstorming and generation of ideas.
2. *Assimilators* - use inductive reasoning and have the ability to create theoretical models.
3. *Convergers* - rely heavily on hypothetical-deductive reasoning.
4. *Accommodators* - carry out plans and experiments and adapt to immediate circumstances.

Dille and Mezack (1991) used Kolb's LSI to identify predictors of high risk among community college distance learning students. When they compared the results of the pre-course instruments to the student success rates, their findings revealed that successful students had lower scores on their preferences for concrete experiences than did the unsuccessful students. In addition, these researchers theorized that abstract learning without concrete experiences is an important aspect of distance education. Like the Dille and Mezack study, it is the intent of this study to evaluate students using a pre-course evaluation instrument to measure student attributes and compare it to their success in online courses.

Online Learning Theory – Technical skills.

One of the studies Roblyer and Marshall (2002-2003) evaluated found that students with higher skills in using multimedia content had higher achievement in web-based courses. Therefore, a student's ability to interact and navigate through the learning environment in which they are placed in, and the ability to measure a student's aptitude in

this environment beforehand, is very important. Other research has also expanded on these findings, such as that done by Dupin-Bryant (2004).

Dupin-Bryant (2004) conducted a study that focused on building a predictive model for online student retention. Her guiding research question was as follows: "Are there pre-entry variables—such as prior computer experience or prior educational experience—that distinguish individuals who complete university online distance education courses from those who do not?" This study involved four hundred and sixty-four college student participants who enrolled in distance education courses. Three of the six statistically significant variables related to retention were based on technical training the student had received, which included searching the Internet training, operating systems and file management training, and Internet applications training. The number of years of computer experience variable was not found to be significant, which points towards the type of training and skills that a student possesses, and not just the amount of time working and exposed to computers, makes a difference. The SmarterMeasure instrument evaluates a student's actual knowledge of a technical subject area by asking multiple choice questions that require the use of the application of technology, and not just self-reported experiences. The researcher believes this factor gives the instrument an advantage in the accuracy of reporting a student's technical abilities.

Online Learning Theory – Internal and External Locus of Control.

Waschull (2005) created an online pre-course questionnaire covering seven personal characteristics and delivered it to two Introductory Psychology courses and a Human Growth and Development course in the university where she was instructing.

She discovered the following: “Only self-discipline/motivation significantly correlated.” An interesting fact that arose from this research was that “access to technology and technology experience” had less to do with “online course performance” than did self-discipline (p. 192).

Many other studies have looked into self-control and how students with internal or external Locus of Control perform in online courses. Rotter’s 1966 I-E scale of general locus of control has been widely used as a means of classifying individuals as having internal or external locus of control. “Internal versus external control refers to the degree to which persons expect that a reinforcement or an outcome of their behavior is contingent on their own behavior or personal characteristics versus the degree to which persons expect that the reinforcement or outcome is a function of chance, luck, or fate, is under the control of powerful others, or is simply unpredictable. Such expectancies may generalize along a gradient based on the degree of semantic similarity of the situational cues” (Rotter, 1966).

Dille & Mezack (1991) found that “Learners with an internal locus of control, defined as one who holds the belief that the outcome of a situation is contingent on his or her own behavior, appear to have higher rates of completion.” Other studies by Wang & Newlin (2000) and Baynton (1992) have found that successful students had higher external locus of control. These researchers found different results from their studies, but because this factor continues to show statistically significant relevance, evaluating the locus of control a student possesses has been shown to be an important part of a pre-course evaluative instrument for online learners.

Online Learning Theory – Reading Skills and Comprehension.

The RAND Reading Study Group's report (2002) define reading comprehension as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language." One major difference between traditional learning and online learning is the way information is transferred to students. Even though many online learning courses contain audio and video components, the main method of knowledge transfer is through reading information on the screen and comprehending it. Based on this, reading comprehention skills may be the most important skill an online learner requires to be successful. But are traditional reading comprehention evaluations adequate measurements of online learners?

English Language Learners.

Some online course providers are building in language support to assist students that have difficulty with their reading skills, but a basic level of reading and comprehension is still required. Difficulties related to reading skills and comprehension can cause an additional learning obstacle for students whom English is not their native language. Squire (2008) states, “English Language Learners (ELL) is a broad term used to describe an active learner of the English language who may benefit from various types of language support programs. This term is used mainly in the U.S. to describe K–12 students.” Title III of the No Child Left Behind Act (NCLB) requires that states report this demographic as a subgroup for accountability reasons. More specifically, the National Education Association (Meet the Needs, 2006) stated the following:

> "The NCLB definition gives states considerable flexibility in defining their ELL subgroup, which has led to inconsistency across districts and schools regarding the designation of ELL." (Squire, 2008) Without a solid definition for English language learners means that "…a student may be considered an English language learner in one district or state but not in another. States or districts may define limited English proficiency according to their capacity to provide services."

The importance of reading comprehension in an online course, coupled with such broad terms for defining those students that may need additional reading support, creates an educational gap into which many students may fall. Hence, the need for standardized assessments that measure reading skills and abilities when assessing the appropriateness of online learning for students.

Standardized Reading Instruments.

There are several standardized instruments that are regularly administered to grade-school students that measure reading comprehention and ability. For example, the Texas Assessment of Knowledge and Skills (TAKS) is a test with a specific section that measures students' reading ability. "The Texas Assessment of Knowledge and Skills (TAKS) measures a student's mastery of the state-mandated curriculum, the Texas Essential Knowledge and Skills (TEKS)" (Texas Education Agency, 2010). Another example is the Stanford Diagnostic Reading Test (Karlsen, Madden, & Garner, 1976). The provider of the Standford Diagnostic Reading Test, Pearson, provides a description of this instrument on their website. The instrument is described as "group administered

diagnostic assessment of the essential components of reading in order to determine students' strengths and needs" (Pearson, 2011). The website continues to describe the instrument as having both criterion-referenced and norm-referenced scores, individual diagnostic reports with Skills Analysis indicating skills on target or needing intervention, and a class summary report to quickly determine strengths and needs of a group, and a lexile student reading pathfinder report for grades 2-12 with titles matched to each student's reading level.

While these instruments were designed to measure standard reading and recall abilities, online learning may have a need for a different type of assessment. In Coiro's 2003 study, she proposed that the reading comprehention skills required for online learning may be different from those needed in the traditional classroom. One example of a non-traditional reading skills built into online learning includes nonlinear hypertext links. Coiro points out five different types of hyperlinks that she found on a standard page embedded into a NASA website for children called StarChild: A Learning Center for Young Astronomers (http://starchild.gsfc.nasa.gov/docs /StarChild/StarChild.html). These hyperlink types include word definitions, associated supporting topics, activities based on the topic being discussed, an e-mail message to the webmaster, and a NASA security statement. Inforamtion that is presented with these kinds of nonlinear learning tools may require a completely different classification of reading skills. Other studies seek do define and explore this new literacy as well. Leu, Zawilinski et al. (2007) define new literacies for online reading comprehension around five major functions that include: identifying important questions, locating information, analyzing information,

synthesizing information, and communicating information. These five major functions incorporate new methods of processing information that go beyond traditional reading comprehention skills.

Synthesis of Literature Review

While various studies have been conducted on many different types of pre-course evaluation instruments, the conclusions appear to identify many differing constructs. One common theme throughout this research, however, is that finding predictors of student success in online courses is an important endeavor. A very important differentiation was made between instructional mediums and instructional programs. Furthermore, methods for predictive instrument implementation within the instructional mediums will shape how instructional programs are structured, and to what degree they are effective. Different views on the advantages and disadvantages of online learning were covered, as well as new legislative and social developments that will make online learning a more important option for students in the future. It is the flexibility of online learning that allows it to span the transactional distance between teachers and students; thus, allowing it to bridge these gaps, but only if used in the appropriate way for the right students.

Next, the theoretical framework surrounding the use of the SmarterMeasure instrument and this research were discussed. Many studies have been based on the research that Roblyer and Marshall (2002-2003) conducted on what they called Educational Success Prediction Instruments (ESPRIs). The importance of online pre-course evaluations will continue to expand as more research is conducted on predictive instruments like this. Those students labeled English Language Learners (ELLs) face

additional barriers to reading comprehension, which makes evaluation of their skills even more important. Using a pre-course evaluative instrument for ELL's will help identify what additional support structures are needed.

Finally, Coiro (2003) and others research suggests that the versatility the Internet provides will require our current methods of reading comprehension evaluation to evlolve. The current methods of evaluation, such as the TAKS Reading and SDRT tests, may not be suitable for evaluating the different reading comprehention and recall skills required of students enrolled in online learning courses.

Chapter Three

Methodology

Description of the Research Design

This study is an ex-post facto study using archival data. The purpose of this study is to identify what predictive skills, abilities and attributes that successful online students share by evaluating the responses of the SmarterMeasure instrument and the final grades in their online courses. This process is completed by comparing the scores of the students' responses to the SmarterMeasure instrument in each of the different constructs. Then the researcher searched for statistically significant correlations to the student's final grades in the online courses they completed. A multiple linear regression using stepwise analysis was used in order to see which constructs significantly contributed to the final grade and by how much.

The first source of data that will be used is a pre-course evaluation instrument called SmarterMeasure, which is provided by SmarterServices. This instrument is an online assessment that is divided into eight constructs that measure *Individual Attributes*, *Learning Styles*, *Technical Competency, Technical Knowledge, Reading Rate, Reading Recall, Typing Speed,* and *Typing Accuracy.* Instructions for each of these sections can be found in Appendix A. Some results rely on self-reported analysis by the student and others actually measure the students' ability to respond to the questions, such as those measuring typing speed and accuracy. Since this research was conducted on archival data, the purpose of this research was not to evaluate the construction of the SmarterMeasure instrument; rather, to evaluate the instrument constructs as defined by

SmarterServices as it was administered to the students in 2010. Other methods of item analysis, such as a principal components extraction method with varimax rotation, could be used in an exploratory method to evaluate the constructs and items selected; however, such methods fall outside of the scope of this research. That being said, no methods for item or construct analysis were conducted by the researcher other than the methods already completed by SmarterServices, such as the content and construct validity and reliability as noted below.

The second source of data used in this study is the final grade each student received in their course. Students' final grades are determined by their quality of work grade calculated from their work throughout the semester and their final exam grade.

Research Question

Do the SmarterMeasure constructs of Learning Style, Personal Attributes, Reading Rate, Reading Recall, Typing Accuracy, Typing Speed, Technology, and Technical Competency, serve as statistically significant predictors of high school student success in an online course?

Description of the Population

The participants in this study consisted of students in grades 8 through 12 taking high school courses that were enrolled through a large urban school district's summer school program in 2010. This tuition-based program cost $200/course and lasted from June 14 to July 23. There were a total of 273 courses taken by 216 students. There were 204 courses taken for original credit and 69 taken for credit recovery. 151 of the students taking courses were from the large urban school district, and 65 were from a variety of

schools from the surrounding area. The gender of the population in the program was 114 female students and 102 male students. Data on student ethnicity was not available. Students were offered 10 extra-credit points if they completed the SmarterMeasure instrument. This equated to the value of one daily assignment.

Description of the Participants

Students attempted to complete the SmarterMeasure assessment 166 times. Any duplicate attempts by students or attempts that resulted in less than 100% completion of the survey were removed. Students that withdrew from the program before completing their final exams were also removed. After this process, a total of 119 courses remained in the data set.

Procedures

The following procedures explain how the historical data for this research was collected. Students were given instructions both on paper and online explaining the format for completing the SmarterMeasure instrument when they registered for summer school courses. Next, students were to complete the pre-assessment before they began their studies, although several students completed the assessment after they had already started their coursework. Students completed the instrument and their results were saved in a database. These results were displayed in charts and graphical formats to show the students their strengths and weaknesses. Once the students completed their courses, their final grades were entered into an Access database that was used to create their transcripts. These transcripts were sent to the students' home school, and their grades were entered into each student's historical record file. Each student who completed the

SmarterMeasure instrument had their final grade entered into an Excel database that held the results of their SmarterMeasure scores.

Data Analyses

The data was analyzed using multiple linear regressions. The study's dependent variable was the students' end of course grade, and the eight SmarterMeasure constructs were the independent variables.

Description of the Instrument

The scoring procedures of SmarterMeasure instrument is broken down into eight constructs. These constructs cover the described areas and have the following number of questions in each section.

1. Personal Attributes (academic record, help seeking, persistence, procrastination, time management, and locus of control) is made up of twenty-four questions on a five-point Likert scale.
2. Learning Styles is based on the multiple intelligences model (Gardner, 1983) and consists of thirty-five questions on a three-point Likert scale.
3. On-Screen Reading Rate is measured by how long it takes the student to complete reading the selection and click the button to continue.
4. The Reading Recall uses the reading selection from the On-Screen Reading Rate section, and asks ten questions on it in a four-option multiple choice format. There are two questions covering each of the following types: sequence of events, factual, inferential, cloze, and main idea.

5. Technical Competency is made up of ten questions that cover computer and Internet competencies.
6. Technical Knowledge section contains twenty-three questions that are mostly in a four-option multiple choice format. The areas covered include technology usage, technology in the student's life, and technology vocabulary.
7. Typing Speed is measured by how quickly a student can re-type a paragraph that is given to them on the screen.
8. Typing Accuracy is measured by how many errors a student makes when they are retyping the paragraph they are given. How accurate the student is in their typing is then measured and calculated.

The scoring for each of these sections is based on a Points-Earned out of Points-Possible evaluation. Lastly, this research paper compares the summary of students' scores in each of the SmarterMeasure constructs to their end of course grades.

Another important part of the SmarterMeasure instrument is the support sections built into the student feedback reports. The support mentioned throughout this research can take many different forms. Some of the possibilities include direct intervention and tutorials by instructors, while others are more self-directed. The SmarterMeasure instrument provides students with support that is built into the descriptive results they receive upon completion of the pre-course diagnostic instrument. For each of the areas – or constructs – a student is found to be weak in teachers may provide materials, websites, and exercises to enhance their individual areas of difficulty.

For a student who scores lower in the Personal Attributes construct of the SmarterMeasure instrument, information is initially provided on the areas that make up this construct, including Academic Attributes, Help Seeking, Persistence, Procrastination, Time Management, and Locus of Control. Next, students are directed to websites that help them improve upon specific areas, such as note-taking skills, and building a study skills checklist.

The Learning Styles construct is based on informing the student of the type of learner category that he or she may align with. The specific learner types are as follows: Aural, Social, Visual, Physical, Verbal, Logical, and Solitary. There are no correct or incorrect answers to this section; it is only meant to provide information to the student. Once the instrument identifies what area or areas the student may be strong in, it provides study habits that build off of these strengths.

The Reading Rate and Recall constructs provide students with their reading speed, as well as their score on the questions asked about the reading passage. The support provided helps with on-screen reading comprehension and reading rate tests and techniques.

The Technical Competency construct evaluates how well a student can maneuver through the Internet and other basic skills needed to participate in an online course. Support provided to the student includes basic computer tutorials, as well as an outline of computer literacy skills.

The Technical Knowledge construct measures a student's technology usage and includes questions on technical areas such as vocabulary. In addition, this construct also

provides questions about whether or not students own a computer and have Internet access from home. Support for this construct includes additional computer literacy tutorials and skill practices.

The final constructs of Typing Speed and Accuracy are measured by how long it takes and how accurately a student re-types a paragraph of text. The support provided by the SmarterMeasure instrument for this construct includes websites that direct students to typing practices, typing tutorials, and a typing game to enhance student speed and accuracy skills.

Content Validity of the Study

The pre-course evaluation instrument that was used to measure student attributes is the 105 item SmarterMeasure Learning Readiness Indicator instrument. Each section of this instrument is based on research conducted by specialists in their field.

The Learning Styles construct is based on Howard Gardner's *Multiple Intelligences* (Gardner, 1983) – namely, where he breaks down the seven different ways to demonstrate intellectual ability. The questions used in this instrument were adapted from a larger instrument developed by The Memletics Project (Memletics, 2003).

The Personal Attributes construct is based in part on Dr. Julia Hartman's (2001) work identifying the individual attributes, which are significant predictors of success in an online learning environment. The cited attributes are variables such as motivation, procrastination, time availability, and willingness to seek help. The individual attributes section of SmarterMeasure measures these variables which are indicators of success in an online course environment.

The Reading Rate section is based on the Flesch-Kincaid Readability Tests. The Flesch–Kincaid scale, which assigns a score on the basis of the minimal grade level required to read and understand English text, ranges from 0 to 12. According to Ressler (1993), the Flesch-Kincaid readability metric is defined as:

GradeLevel = 0.39 * AvgNumberWordsPerSentence +

11.80 * AvgNumberSyllablesPerWord −15.59

The reading section used in the Reading Rate and Reading Recall sections was rated using the Flesch-Kincaid readability metric at the 8th grade level.

The Reading Recall construct was developed with the help of the National Institute for Literacy's project called Literacyworks (2010). Since participants are not allowed to view the reading passage while they are taking the quiz, reading recall (and not reading comprehension) is assessed. "The intention of this component of SmarterMeasure is to measure the degree to which a person can read academic information on-screen and then recall that information on a quiz. This is a task that is frequently replicated in online and technology rich courses" (SmarterMeasure, 2011).

The Technical Competency and Knowledge sections were developed by Dr. Mac Adkins, who developed the Department of Education's Technology Course of study for the state of Alabama. Dr. Adkins was one of the authors of the Alabama Course of Study in Technology used by all public schools in Alabama. He was also a participating writer for the National Education Technology Standards for Teachers document published by

the International Society for Technology in Education. He worked with SmarterServices to develop these instrument items.

The Typing Speed and Accuracy sections are based on the research of Teresia R. Ostrach (1997). With over 27 years' experience in the staffing industry, the scales developed to measure average typing speed are based on her research in conjunction with Dr. Alan Lloyd.

Construct Reliability of the Study

The construct reliability for an instrument measures how well the items are grouped using Cronbach Alpha coefficients. Applied Measurement Associates of Tuscaloosa, Alabama was commissioned in 2008 to conduct reliability coefficient calculations for the questions in SmarterMeasure. For the purpose of this study, an expected range for Cronbach Alpha reliability coefficient values was expected to be from .70 to .95 to indicate a reliable assessment. Cronbach Alpha coefficients for three of the tested areas that are still in the current instrument were rated as follows: Technical Usage (85), Learning Styles (82), and Personal Attributes (76). The other sections scored lower on this evaluation; yet, the reason for this was attributed to different scale types being used. According to SmarterMeasure (2011), "This scale type resulted in lower levels of variability among the possible answers thus reducing the measurement of reliability."

Construct Validity of the SmarterMeasure Instrument

Construct validity refers to whether an assessment instrument measures a construct as defined by the researcher. In the case of SmarterMeasure, construct validity is a measurement of the degree to which SmarterMeasure is an indicator of a learner's

level of readiness for studying online. The items are grouped into several different constructs based on the related areas they measure. In 2007, Atanda Research, located in Alexandria, VA, was commissioned to analyze the data gathered during a study concerning the relationship of SmarterMeasure (then called READI) scores and measures of academic success and goodness of fit of distance education as a measure of construct validity. This report found that there were 42 statistically significant correlations between SmarterMeasure variables and measures of academic success and goodness of fit. Individual Attributes was the construct found to have the highest correlation with academic success, and goodness of fit out of the eight constructs measured by SmarterMeasure. The variable of the participants' individual attributes scores were statistically significant at the .001 level with all measures of academic success and goodness of fit. The variable with the strongest correlation in the study was relationship between Grade Point Average and Reading Comprehension (Decade Consulting, 2007).

In 2008, another research study was replicated by Atanda Research as a part of the dissertation research. This particular research involved 2,622 students who had taken SmarterMeasure representing over 300 schools. Interestingly, this study yielded stronger results than the original study. Seventy-four of the 105 possible correlations measured were found to be statistically significant. Academic success was correlated with individual attributes, which yielded correlations in each of the eight categories which were statistically significant at the .01 level. This finding mirrored the finding from the 2007 study, which also indicated that individual attributes were the strongest indicator of goodness of fit of distance education.

Reliability of the SmarterMeasure Instrument

An internal study was conducted by SmarterServices, LLC, the provider of the SmarterMeasure product, on 209,025 students from July 1 2009, to June 30, 2010. Several statistically significant differences were found between the means of the variables of gender, ethnicity, institution type, age range and number of prior online courses taken as they relate to student readiness for online learning. Due to the large size of the dataset, a random sample of 2% (N=4104) of the full data set was selected for analysis. The random sample tool in Statistical Program for Social Sciences (SPSS) was used to select random cases (SmarterMeasure, 2010). The random selection analyses revealed the following statistically significant differences:

- **Gender**: Females were found to have statistically significant higher mean scores on the constructs of individual attributes and typing accuracy. Males were found to have statistically significant higher mean scores on the constructs of reading rate and technical knowledge.
- **Ethnicity**: Statistically significant differences in means were reported in five of the eight constructs based on ethnicity. Caucasian/White reported the highest mean scores for technical knowledge, typing speed and reading recall. Asian or Pacific Islander reported the highest mean scores for typing accuracy. American Indian reported the highest mean scores for individual attributes.
- **Age Range**: Significant differences existed in five of the eight of the constructs measured. In general, there were group differences on the variable of age between older and younger students. Older students had the highest mean scores for

constructs related to personal maturity, and younger students had the highest mean scores for constructs related to technical matters.

- **Number of Courses**: The results demonstrated that experience matters with online learning. In all eight constructs measured, students who reported having taken five or more prior online courses also reported the highest mean scores. The differences in the means were statistically significant in four of the eight groups. The greatest difference in mean scores from students with no prior online course experience and those who had taken five or more courses was in the area of technical knowledge. This indicates that with experience students can learn to use the technology required for online courses.
- **Institution Type**: Analysis of Variance (ANOVA) was calculated to determine if differences exist between students of different types of institutions. Significant differences did exist on four of the eight constructs measured. Baccalaureate Institutions had a statistically significant higher mean in the constructs of learning styles and individual attributes while Special Focus Institutions had the highest means for reading recall and technical knowledge.

Discussion of the Face Validity

Every effort was made to reduce threats to the face validity of this study. The following items demonstrate such efforts:

- **Confounding** – Because this research is not experimental in design, there is no causal relationships being stated. This research is only reporting on the comparison of the mean scores in the sub-sections.
- **Instrument Change** – The instrument did not change at any time during the evaluation.
- **Maturation** – The SmarterMeasure instrument was completed by most of the students before they started their courses, although a few students completed after starting their coursework. Working in their online courses for a short period of time might have marginally increased some of their responses, but there is no reason to believe completing the instrument after beginning their courses had any significant effect on their results, or that a significant number of students in this group had any effect on the overall results of the study.
- **Mortality** – Data was recorded at the beginning of the semester in the SmarterMeasure instrument.
- **Selection Bias** – All students enrolling into the summer school program were given the instructions for completing the SmarterMeasure instrument.

Discussion of the External Validity

The sample population for this study consisted of a wide variety of students from various areas within a large urban city, as well as the surrounding areas. Other than the initial tuition cost of $200, there were no barriers to enrollment into this program. This research could be reproduced by any researcher or institution using the SmarterMeasure instrument to evaluate the outcomes of the students enrolled in an online course.

Chapter Four

Results

Research Question

Do the SmarterMeasure constructs of Learning Style, Personal Attributes, Reading Rate, Reading Recall, Typing Accuracy, Typing Speed, Technology, and Technical Competency, serve as statistically significant predictors of high school student success in an online course?

Data Analysis

A multiple linear regression model using the stepwise method was calculated to predict the students' final grades in their online courses based on their Individual Attributes, Learning Styles, Technical Competency, Technical Knowledge, Reading Rate, Reading Recall, Typing Speed and Typing Accuracy as reported by the SmarterMeasure online evaluation instrument. This approach was selected to evaluate which constructs had the greatest predictive effect, and to what degree they were successful in predicting the resulting student grades.

Survey results were analyzed using descriptive statistics (SPSS 18.0) to represent the mean, standard deviation, and number of responses to each SmarterMeasure construct. Table 4.1 contains a list of descriptive statistics of the participants. Cases were excluded list-wise, resulting in 119 surveys included in the calculations.

Table 4.1

Participant Descriptive Statistics (Mean and Standard Deviation)

	Mean	Standard deviation	Sample size
Course Grade	82.48	14.9	119
Learning Styles PCT	67.19	9.99	119
Personal Attributes PCT	76.78	6.9	119
Reading PCT	76.47	17.88	119
Reading WPM	212.34	99.82	119
Typing Accuracy	94.92	8.18	119
Typing Adjusted WPM	28.79	16.14	119
Tech Knowledge PCT	69.18	9.72	119
Tech Competency PCT	92.94	8.37	119

Table 4.2 describes the order in which the variables were entered and removed. Based on these results, Typing Speed and Reading Recall were added, and no variables were removed.

Table 4.2

Denotation of Entry and Removal of Variables

Model	Variables Entered	Variables Removed
1*	Typing Adjusted WPM	N/A
2*	Reading PCT	N/A

Note. * = Stepwise Method (Probability-of-F-to-enter < .050, Probability-of-F-to-remove >= .100.).

In Table 4.3, the first data model includes only Typing Speed, where Typing Speed accounts for 12.7% of the variance based on the R Square results. The inclusion of Reading Recall in data model 2 resulted in an additional 6.8% of the variance being explained. This means that 19.5 % of the variance for the final grade can be explained by the predictors of Typing Speed and Reading Recall.

Table 4.3

Model Summary of Statistically Significant Variables

					Change Statistics				
	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df 1	df 2	Sig. F Change
Model 1	357	0.127	0.12	13.973	0.127	17.088	1	117	0.000**
Model 2	441	0.195	0.181	13.480	0.067	9.717	1	116	0.002***

** p< .000 *** p= .002

Table 4.4 and Table 4.5 contain the ANOVA results for the two models, which will let us know if using the two constructs identified in the models is significantly better at predicting the final grade than just using the means. Based on the results of these

tables, each of the two suggested regression models led to results that were not obtained by chance at a statistically significant level. The value of *F* is 17.088 for the first model using only the typing speed construct were very unlikely to happen by chance ($p < .001$). The value of *F* is 14.039 for the second model, which is also highly significant ($p < .001$). These results can be interpreted to mean that the final model significantly improves our ability to predict the outcome variable of a student's final grade.

Table 4.4

ANOVA for the Regression Equations Used in Model 1

	Sum of Squares	df	Mean Square	F
Regression	3336.26	1	3336.262	17.088**
Residual	22843.44	117	195.243	
Total	26179.7	118		

** p< .000

Table 4.5

ANOVA for the Regression Equations Used in Model 2

	Model 2			
	Sum of Squares	df	Mean Square	F
Regression	5101.844	2	2550.922	14.039***
Residual	21077.85	116	181.706	
Total	26179.7	118		

** p< .000 *** p= .002

Table 4.6 covers the parameters of the model. The *b* values found in Table 4.6 describe the relationship between a student's final grade and each predictor construct. Since these *b* values are positive, this tells us there is a positive relationship between the constructs and the student's final grade. This means that as both Typing Speed and the score in Reading Recall increase, so does the student's final grade. The *b* values also tell us that if all other predictors are held constant, to what degree each of the predictor constructs affect a student's grade.

The *t*-test associated with each *b* value has a significance of less than .05, and therefore each of the constructs makes a significant contribution to the model. The standardized beta values tell us the number of standard deviations that the outcome will change as a result of one standard deviation change in the predictor constructs. Therefore, the final grade of a student will be changed by .282 standard deviations for every standard deviation of change in the Typing Speed construct, and .270 standard deviations for every standard deviation of change in the Reading Recall construct.

Table 4.6

Summary of Multiple Regression Analysis for Models with Significance

	B	SE	β	T	Sig.
Typing Adjusted WPM	0.329	0.080	0.357	4.134	0.000**
Typing Adjusted WPM Reading PCT	0.225	0.072	0.270	3.117	0.002***

** p<.000 *** p=.002

Table 4.7 and Table 4.8 contain the data for the constructs excluded from the two models in Table 4.6. These constructs were not included because their t-values in model

2 all have significance above .05, and therefore do not significantly contribute to the models in Table 4.6. While the Learning Style construct does show a slight significance when coupled with only Typing Speed, it loses this significance when the Reading Recall construct is added in Model 2. Since Reading Recall contributes much more significantly, it is added to Model 2 instead of Learning Style.

Table 4.7

Values of Excluded Constructs From Model 1

					Collinearity Statistics
	β In	T	Sig.	Partial Correlation	Tolerance
Model 1					
Learner Style PCT	.180	2.033	0.044	0.186	0.932
Personal Attributes PCT	.013	0.148	0.883	0.014	0.911
Reading PCT	.270	3.117	0.002	0.278	0.922
Reading WPM	.054	0.591	0.556	0.055	0.882
Typing Accuracy	.116	1.201	0.232	0.111	0.792
Tech Knowledge PCT	.109	1.233	0.22	0.114	0.951
Tech Competency PCT	-.041	-0.444	0.658	-0.041	0.893

Table 4.8

Values of Excluded Constructs From Model 2

Model 2	β In	T	Sig.	Partial Correlation	Collinearity Statistics Tolerance
Learner Style PCT	.157	1.825	0.071	0.168	0.924
Personal Attributes PCT	.019	0.215	0.831	0.020	0.911
Reading WPM	.022	0.241	0.810	0.023	0.869
Typing Accuracy	.054	0.562	0.575	0.052	0.753
Tech Knowledge PCT	.031	0.344	0.732	0.032	0.864
Tech Competency PCT	-.102	-1.135	0.259	-0.105	0.855

Results

A multiple linear regression using the stepwise method was calculated to predict the students' final grades in their online courses based on their Individual Attributes, Learning Styles, Technical Competency, Technical Knowledge, Reading Rate, Reading Recall, Typing Speed and Typing Accuracy. Analysis by stepwise multiple regression found Typing Speed and Reading Recall to be significant predictors of Final Grade ($F(2,116) = 14.039$, $p < .001$), with an adjusted R^2 of .181. The regression equation was Final Grade = 57.769 + .260 (Typing Speed) + .225 (Reading Recall). Significant variables are shown below:

Predictive Variables	**Beta**	***p***
Typing Speed	.282	p=0.002
Reading Recall	.270	p=0.002

(Individual Attributes, Learning Styles, Technical Competency, Technical Knowledge, Reading Rate, and Typing Accuracy were not a significant predictor in this model).

Summary of the Results

Based on the multiple linear regression results, two of the seven SmarterMeasure constructs were found to contribute with statistical significance as predictors to the final grade earned by the students. The percentage of deviation that can be explained by this relationship is 18.1%.

Typing Speed, while found to be the most significant predictive construct in this study, should not be viewed as a predictor that stands by itself when looking at online learning success in high school students. One explanation for the results of this significance is that students exposed to more technology through having a computer at home, or frequently using computers at school, possessed other skills that contributed to their success in their online courses. The question of "Do you own a computer" is an item in the Technical Knowledge construct in this instrument, however, when combined with the results from the other questions in this construct, there was no significance to the responses found. Technical Knowledge is broken up into four sub-constructs of Technology Usage, Technology in your Life, Technology Vocabulary, and Personal Computer / Internet Specifications. There was still no significance found when evaluating the sub construct of Personal Computer / Internet Specifications where this

item was located. Based on this result, it can be assumed that either having a computer ad home was not a significant explanation of why the Typing Speed construct was found to be significant, or the other questions in the Personal Computer / Internet Specifications sub-construct diluted the significance of this item on the instrument. Typing Speed might be a predictive variable in measuring a student's familiarity and experience with using computers that goes beyond self-reported items on a questionnaire.

Another variable that Typing Speed may affect is the ability of students to communicate through online synchronous communication, such as Instant Messaging. Students that can communicate more easily with their e-teacher may have an added advantage that results in better final grades. The use of Instant Messaging was not measured in this study, and therefore cannot be verified, but it may be another explanation for the predictive value of this construct.

Reading Recall was also found to be a significant predictor of online learning success in this study. This correlates with the Atanda Research study in 2007 (Decade Consulting, 2007) on the SmarterMeasure instrument, where they found the strongest correlation between the Reading Comprehension and Grade Point Average variables. Reading Recall is a skill that is frequently used in online courses when asked to read information on the screen and then recall that information for use on quizzes and exams.

Chapter Five

Discussion

Introduction

The purpose of this study was to identify what skills, abilities, and attributes successful online students share. The expansion of online learning in high schools will require more research in regard to how students with different skills, abilities, and attributes perform in online courses. Studying what successful online students have in common will allow educators, program developers, and researchers to learn more about how to best implement online learning for high school students. Student responses to an online pre-course evaluation instrument were compared to their course grades at the end of the semester. A multiple linear regression model using the stepwise method was calculated using 119 responses to predict the students' final grades in their online courses based on their Individual Attributes, Learning Styles, Technical Competency, Technical Knowledge, Reading Rate, Reading Recall, Typing Speed, and Typing Accuracy as reported by the online evaluation instrument. This study identified two critical characteristics: Typing Speed and Reading Recall. These two characteristics were shared by successful online high school students using quantitative historical data collected from a large urban district's summer school program in 2010. The following chapter discusses the results of the study as framed by the literature review, in addition to a review of implications for practice and future research.

Findings for the Research Question

Reading Recall and Typing Speed constructs were found to contribute with statistical significance as predictors of the final grade earned by the students. These results are consistent with findings from previous research on the SmarterMeasure instrument. Other studies conducted on online pre-course evaluative instruments discussed earlier in this study found similar results on the importance of reading comprehension.

Summary

The SmarterMeasure instrument is currently being used in the large urban school district where this study was conducted to provide students with feedback regarding their strengths and weaknesses as they relate to taking an online course. Subsequently, students are also provided resources that assist and strengthen their weaker skills in order to prepare them for taking their online courses. The second use of the SmarterMeasure instrument is to alert teachers monitoring students as to their possible areas of weakness and need, and to provide sufficient instructional and/or technical support.

As mentioned at the beginning of this study, the purpose of pre-course evaluative instruments is to quickly identify areas in which online at-risk students may experience weakness, and to apply specific interventions that provide them the extra assistance needed. They should be used not be used to screen students that do not meet certain criteria. Furthermore, blocking the registration of students into online courses based solely on the results of a predictive model would be an inappropriate and unethical use of a valuable resource. Since many factors contribute to student's success in online courses,

it would be a great disservice to exclude a potentially successful online learner on the basis of a single instrument, especially without offering the appropriate support needed.

Study Limitations

There were several limitations related to the study's generalizability due to the population sampled, the variability introduced by different e-teachers, and the changes over time to the survey used. In addition, due to the population of the large, urban/suburban school district, its results may not be representative of students in other school districts, such as suburban or rural, or school districts with a more homogeneous student population. This could be a threat to the external validity of the study.

As stated previously, e-teachers play a very large and integral role in online learning. Every effort was made to equalize this effect by providing the same extensive training to all e-teachers in this program. All of these e-teachers had at least two years of experience working with online students, and had attended annual training sessions to continuously improve their online learning skills. Further research needs to be conducted on this data to discover whether students' e-teachers had any significant effect on their final grades.

A large sample of students participated in the online summer school program, but not all of the students completed the pre-course assessment. Thus, the lack of data for those students not completing the pre-course assessment cannot be explained.

Another limitation of this study concerns the time period in which students completed the survey. Students taking online courses over the summer consist of a different demographic than students taking online courses during the regular school year.

In particular, students that take courses on a tuition basis over the summer in this program are predominately taking courses for original credit. Therefore, a follow-up study should be conducted using the same parameters with students working in either the fall or spring semesters where credit recovery courses are taken at a more evenly distributed rate.

The Online Summer School program is a tuition-based program. Hence, the fact that students have to pay tuition might affect the pool of students registered for these courses. Further study should be conducted on students that enroll into online courses on a non-tuition basis.

Finally, while several studies have been conducted using the SmarterMeasure instrument over the last several years, it has evolved and changed as SmarterServices has modified it based on feedback received from these studies. Data on the validity and reliability of the instrument constructs has been hard to verify due to these changes. However, studies such as this will continue to validate it.

Recommendations for Educational Practice

Based on the review of the literature and data obtained from the research, the researcher offers the following recommendations:

1. With the Reading Recall construct identified as a predictive indicator of student success in online courses, educators need to be more aware of their students' aptitude in this area when considering online learning as an educational option.
2. Students that are English Language Learners may need additional support structures and evaluations conducted before enrollment into online courses. Additionally, any reading support that is already built into the Learning

Management System's software should be highlighted and fully explained to these students. Having the students demonstrate their knowledge of how to use the support at the beginning of the course would be beneficial as well.

3. Typing Speed was identified as a significant predictor of student success, but it is unclear if the significance of this construct is related to other computer use and experience, or solely the rate at which students can type. Typing skills as they relate to speed and accuracy are no longer taught with the same emphasis that they once were. With the amount of work done on computers these days, educators may do well to bring back typing tutorials to the classroom.
4. The results of this study should change the use of the SmarterMeasure instrument in the large urban school district where the research was conducted by expanding the use of this instrument to more students before enrolling them into online courses.

Recommendations for Further Research

The findings from this study may serve as a useful framework for how to conduct similar research on other populations of students. Future research may also concentrate on the following areas:

1. Typing speed was one of the constructs identified by this study as a predictive construct in online student success. This might be attributed to student familiarity to working with computers, or even having a computer at home. Future research should include instrument items that cover these questions in order to better define how student typing speed affects student success in online courses.

2. The results used from the SmarterMeasure instrument were summary scores of each construct. Further research should be conducted by breaking down the individual item scores within each construct to examine whether they are good indicators of student results, or if they should be re-categorized into another construct.
3. Reading Recall was identified as a critical area found to be predictive of a student's success in an online course. Future research should delve deeper into this area by looking into any correlations that might be made with other instruments that are commonly used (i.e., TAKS or Stanford-type testing methods) to evaluate a student's reading abilities.
4. The reading skills of online learners may need to be measured by new instruments not yet developed. As identified by Coiro (2003), online reading skills and comprehension contain many more dimensions than just understanding linear words on a page. Hyperlinks, multimedia, and other supporting tools built into the content presented to online learners will require different methods of evaluating students' reading comprehension abilities. The ability to utilize additional supporting structures within online content, such as hyperlinks, may be a skill in itself that needs to be both taught and measured.
5. Previous research using pre-course evaluation instruments found significant results with smaller populations of students, but more variance when larger populations (Roblyer & Marshall, 2002-2003) Further research should be

conducted using larger populations in order to confirm any statistically significant results found.

6. Future research should focus on limiting the self-reported information provided by the students if it can be obtained from other reliable sources, such as grade point average.
7. Some of the predictors evaluated in the meta-analysis contained in Roblyer and Davis (2008) study, such as grade point average and content area ability, would most probably be beneficial predictors to students in traditional courses. It would appear that these variables should actually be used as control variables in future research if the purpose of a pre-course online evaluative instrument is meant to measure those skills unique to online learning. Shouldn't students who already have a better content area ability and grade point average be expected to do better in whatever course they are enrolled? Therefore, any student that expresses a negative correlation between these variables and their success in an online course should be scrutinized as to what other measured variables set them apart from the norm.
8. Typing Speed may contribute to the success of a student in an online course because it facilitates easier synchronous communication between a student and e-teacher through the use of Instant Messaging. Future studies should evaluate the use of Instant Messaging and evaluate whether such skills correlate to a student's ability to quickly and easily type.

Conclusions

The goal of this study was to identify critical predictive characteristics shared by students who are successful in online learning courses by examining the quantitative historical data collected from high school students in a large urban district who completed online courses in a 2010 summer school program. The multiple linear regression results of this study identified the Reading Recall and Typing Speed constructs of the SmarterMeasure instrument as statistically significance predictors to the final grade earned by the students.

The role and importance of pre-course evaluations for online students was highlighted through this research, along with how to provide structure and support to the online skills in which students are found to be weak. The results of this data provided the researcher with information on how the predictive constructs that make up the SmarterMeasure instrument can be used and interpreted by educators. Furthermore, the results also provided information needed to make recommendations for educational practices using pre-course evaluative instruments. Lastly, recommendations for future research were based on the literature and findings from this study.

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Appendix A

SmarterMeasure Instrument Section Instructions

Personal Attributes

This section measures items such as time management, procrastination, persistence, academic attributes, locus of control, and willingness to ask for help. There are no "right" or "wrong" answers. Indicate the answer choice which best describes how you really are, not how you may feel you should be or how you may feel the school would like for you to be.

Learning Styles

This section measures your preferred learning style. People learn in different ways. Some like to learn alone, others prefer groups. Some like to listen to new information, some prefer reading new information. There is no "right" or "wrong" learning style, and all learning styles can be effectively used in the learning process. Indicate the answer choice which best describes how you really are, not how you may feel you should be or how you may feel the school would like for you to be.

Reading Rate & Recall

When you are ready to begin this section, click the "Start Reading" button below so the reading passage will appear. As soon as you have finished reading it, click the "Done - Stop Time" button to stop the timer. Immediately following the text, you will be asked to answer questions from memory to determine how much information you

retained from the passage. READ VERY CAREFULLY BECAUSE YOU WILL NOT BE ALLOWED TO GO BACK AND REREAD THE PASSAGE**.**

The reading section is timed. The amount of time it takes you to read the passage is being recorded as part of your score. Read at your normal rate, do not try to speed read.

Reading Recall

For a better score, answer in harmony with the contents of the previous reading test passage. Your own knowledge or opinion may somehow differ from the facts and numbers provided. To answer, click the corresponding button. Make sure all questions are answered.

Technical Competency - Choose Operating System

We have detected that you are using the Windows operating system. If this is not the operating system you are currently on, or if you typically do not use Windows, please select a different version below.

Technical Knowledge

This section measures your levels of knowledge about technology as well as levels of the usage of technology in your life. It also allows you to report some information about the primary computer you will use to take your courses.

Typing Speed & Accuracy

A student does not have to be an expert typist to succeed in a course. However, the faster you can type and the fewer errors you make will impact your ability to participate in online courses.

Type the upcoming passage at your normal typing pace. If you make a mistake you may correct it, but realize that this will increase your time. Immediately after you are finished typing, click the “Done” button. Click this button only once. There may be a slight delay as your individual score report is generated.

Appendix B

Approval from the University of Houston

to Conduct Research

UNIVERSITY of HOUSTON

COMMITTEES FOR THE PROTECTION OF HUMAN SUBJECTS

December 7, 2010

Mr. Mark Grubb
c/o Dr. Steven D. Busch
Educational Leadership & Cultural Studies

Dear Mr. Grubb:

Based upon your request for exempt status, an administrative review of your research proposal entitled "Analysis of the Statistical Differences between Students that Pass, Fail, and Withdraw from Online Courses" was conducted on October 18, 2010.

At that time, your request for exemption under **category 4** was approved pending modification of your proposed procedures/documents.

The changes you have made adequately respond to the identified contingencies. As long as you continue using procedures described in this project, you do not have to reapply for review.* Any modification of this approved protocol will require review and further approval. Please contact me to ascertain the appropriate mechanism.

If you have any questions, please contact Alicia Vargas at (713) 743-9215.

Sincerely yours,

Enrique Valdez, Jr.
Director, Research Compliance

*Approvals for exempt protocols will be valid for 5 years beyond the approval date. Approval for this project will expire **September 1, 2015**. If the project is completed prior to this date, a final report should be filed to close the protocol. If the project will continue after this date, you will need to reapply for approval if you wish to avoid an interruption of your data collection.

Protocol Number: 11039-EX

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