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## The Impact of Testing Context of Computer-Adaptive High Stakes Testing on the Performance of Elementary Students of Poverty

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Concordia University–Portland  
College of Education  
Doctorate of Education Program

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The Impact of Testing Context of Computer-Adaptive High Stakes Testing on the  
Performance of Elementary Students of Poverty

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Concordia University–Portland

College of Education

Dissertation submitted to the Faculty of the College of Education

in partial fulfillment of the requirements for the degree of

Doctor of Education in

Transformational Leadership

Angela Owusu-Ansah, Ph.D., Faculty Chair Dissertation Committee

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2017

## Abstract

The purpose of this study was to determine the impact of testing context, on the academic performance of third-grade students, with a particular interest in schools of poverty.

Testing context is the use of technology as a tool in computerized-adaptive standardized testing, students' technology skills, and the adequacy of school computer lab facilities.

Using a causal-comparative design, the researcher examined 54 northwestern elementary schools, ranging in classification from "not applicable under *Free Meal by Direct Certification*" (low poverty schools) to 95% applicable (high poverty schools). The study found a positive relationship between teachers' rating of testing conditions and the performance of third graders on statewide-standardized computer-adaptive tests in math and language arts. The study found a negative relationship between teachers' rating of testing conditions and the level of poverty of a school. Additionally, the study's findings included a predictive relationship between the teacher's rating of testing conditions and student performance (pass/no pass) on standardized computer-adaptive tests in Math.

*Keywords:* testing context, students of poverty, Bronfenbrenner ecological systems theory, computer-adaptive testing.

## **Dedication**

To my mother Rosemary Abron, my father in law Dave Morales and Godmother Bobby Moore who started this journey with me but who God wanted home so they were not able to ride the full journey with me. All three of you are an inspiration and will forever be an inspiration to me forever. To my wonderful wife of 20 years, I thank you for your support, understanding, and most of all your patience. To my five amazing kids, thank you for the kindness and love you have given me over these past four years. To my two older brothers, thank you for your guidance not only as brothers but for taking the role as a father figure in my life at an early age and always keeping education and self-respect as a core value in my life. I am thankful for all that, you do. To my Rosa Parks Elementary family, I thank you for your love, support, and prayers. To all those who have supported my vision to help all children, I thank you.

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I would also like to thank Concordia University and its wonderful professors; I chose this university because of the faculty commitment to each individual student's growth. I have grown as a lifelong learner in education and Concordia has made me realize that service to the community is my biggest asset. I will always hold Concordia University in my heart.

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## **Chapter 1: Introduction**

The use of computer adaptive testing in standardized tests in K–12 schools has increased (Common Core, 2010). However, students of poverty are inadequately prepared to use computers as a testing tool in place of paper and pencil (Murnane, 2008). In addition, computer-adaptive testing, administered in schools attended by students who live in poverty, may more likely have poor testing conditions (Domond, 2015). Students in schools of poverty, particularly third grade students who are taking computer-adaptive assessments for the first time, may be at a disadvantage.

There is no doubt that the rationale for computer-adaptive testing (CAT) is for the benefit of all students, including students of poverty. Computer-adaptive testing was designed to assess all students equitably and to do so more efficiently and accurately than paper and pencil (P&P) testing. According to State Educational Technology Directors Association (2011), the (CAT) process is used to diagnose any flaws or gaps in student learning, making it valuable for all students (Common Core, 2010).

Thompson and Weiss (2011) state that the purpose of a computer adaptive test is to mimic automatically what a wise examiner would do. Specifically, if an examiner asked a question that turned out to be too difficult for the examinee, the next question asked would be considerably easier. This stems from the observation that we learn little about an individual's ability if we persist in asking questions that are far too difficult or far too easy for that person. We learn the most when we accurately direct our questions at the same level as the examinee's proficiency. An adaptive test first asks a question in the middle of the prospective ability range. If it is answered correctly, the next question asked is more difficult. If it is incorrectly answered, the next one is easier. This continues until the computer-adaptive test

has established the examinee's proficiency within some predetermined level of accuracy (Thompson & Weiss, 2011).

Several studies conducted to compare computer adaptive tests (CAT) to paper and pencil (P & P) administration have found computer adaptive tests to produce more accurate scores on several abilities and provide: (a) a more accurate measure of academic growth of students (Hoff, 2007); (b) a shorter length of test (Thompson & Weiss, 2011); and (c) shorter testing times (Thompson & Weiss, 2011). However, these studies did not differentiate the results for students in schools of poverty. According to the Smarter Balanced Assessment Consortium (SBAC) computer adaptive tests have not taken into consideration relevant, contextual, cultural influences, such as proficiency of students of poverty in using a computer as a tool (Smarter Balanced Consortium, 2013).

Contextually, schools in neighborhoods of poverty often do not have a designated computer lab space (Cheryan, Ziegler, Plauf, & Meltzoff, 2014). Most of the schools have to find space available to accommodate computers, and these spaces can be situated next to the noisy cafeteria or adjacent to the school bus loading zone (Personal Communication, Principal of Title I school). The schools often share a technology instructor with other schools in the district, have limited access to technology lab use, and may have antiquated computers (Principal of Title I School, personal communication, August 5, 2016). Consequently, students of poverty taking a test in a lab with poor conditions, especially third graders participating in high stakes testing for the first time, may be unable to perform at their best on the test (Cheryan, Ziegler, Plauf, & Meltzoff, 2014).

Specifically, there are three factors that the research related to computer adaptive tests does not consider about schools of poverty, and they include: (a) students' preparedness in

using a computer as a tool in place of paper and pencil; (b) the students' technology skills needed to take the test accurately and efficiently; and (c) the appropriateness of the academic space or facility allotted to house the computers. These three make up the testing context.

### **Conceptual Framework**

According to D'Aoust (2008), elementary students in high poverty schools are continually confronted with a variety of challenges, the most recent being the use of technology as a tool to take high stakes tests (Davis, 2012). Technology, which is a staple in many homes and schools above the poverty line is not a standard feature in many homes or schools where students live below the poverty line. High poverty students taking computer-adaptive "high stakes" tests are consequently being assessed not only on their academic ability and content proficiency, but also on their capacity to use technology as a tool for taking tests. For students in poverty-stricken neighborhoods and who typically do not fare well on standardized high-stakes testing (Self, 2013), using technology as a testing tool compounds the issues associated with academic performance. In schools of poverty, to understand the intersectionality of low academic performance of students of poverty, the use of technology as a testing tool in standardized high stakes tests, and the inadequacy of the testing conditions in the computer labs, it is important to examine each variable.

There is increasing evidence, which supports the connection between socioeconomic status and educational outcomes. Students from low socioeconomic homes, score at least 10% lower than the national average on national achievement scores in mathematics and reading (Hochschild, 2003). Typically the low academic performance of students living in poverty and attending schools in high poverty neighborhoods are attributed to a variety of reasons, none of which include limited proficiency in using technology as a testing tool



(National Forum on Education Statistics, 2015). Some of the common factors contributing to the low academic performance of students of poverty include frequent moves, stress, teacher's educational level, absenteeism, the negative effects associated with frequent moves and school changes (Smitherman, 2016), chronic stress, and neighborhood impacts. Families in poverty often relocate as a response to job loss, a change in household composition, or eviction (Oregon DH Office, 2015, p. 5). Children who move multiples times during an academic school year, according to the U.S. Government Accountability Office, are often disadvantaged children in schools (Ashby, 2010), and are more likely to experience academic and social challenges in school (Gordon, 2011, p. 47).

Students of poverty also often experience acute and chronic stress, because they lack the exposure to the curriculum being taught, which adversely affects their academic performance (Almeida, Neupert, Banks, & Serido, 2005). The lack in curriculum may be attributed to what NCES reports as teacher educational attainment and professional certification variations by school poverty level. For both elementary and secondary schools, a smaller percentage of teachers working in high-poverty schools had earned at least a master's degree and a regular professional certification than had teachers working in low-poverty schools (NCES, 2010). Additionally, the stress may also be explained by Gallo's Reserve Capacity model which, demonstrates how "stressful versus positive experiences and environments are unequally distributed according to SES. Individuals in disadvantaged circumstances endure more frequent exposure to risk, threat, conflict, ambiguity, daily hassles, and major life events" (Gallo, 2008, p. 2).

According to Sheridan and McLaughlin (2016), low socioeconomic status and exposure to hardship are related to decreased educational accomplishment. In addition, the

experiences students encounter early in their lives as well as the environmental influences can have a permanent bearing on learning linguistic, cognitive and socioemotional skills (Shonkoff & Garner, 2012). Children from disadvantaged homes typically begin kindergarten with notably less linguistic skill (Purcell-Gates, McIntyre, & Freppon, 1995). Inability to cope in school is a contributing factor for explaining why impoverished children are much more prone to absenteeism from school during their educational experiences (Zhang, 2003), further intensifying the achievement gap between them and their more affluent peers. As a result, adolescents from impoverished families enroll in high school with average literacy skills, which lag at least five years behind those of high-income students (Reardon, Valentino, & Shores, 2013). And whereas the national high school dropout rates have progressively declined, those for students living in disadvantaged settings have steadily increased. Low-income students fail to graduate at five times the rate of middle-income families and six times that of higher income youth (National Center for Education Statistics, 2016).

The characteristics of the neighborhoods where children live and attend school has a significant impact on their academic performances (Ingram, 2013). Wolf, Magnuson, and Kimbro (2017) examined how family poverty and the associated neighborhoods predicted the academic achievement of students of poverty. According to the Urban Child Institute (2010)

A poor neighborhood is not just an area where poor people live—it is an area that is poor in resources like good schools, quality child care, and safe recreation. Children need these resources in order to thrive. On average, growing up in an area of concentrated poverty means poorer health, lower school achievement, and worse adult outcomes. (p. 85)

With respect to technology, neighborhoods of schools in poverty tend to have fewer computers and access to technology compared with schools located in neighborhoods that are more affluent with more educators and higher levels of computers literacy (Barrett, 2013; Bird, 2009; Chappell, 2012; Geyer, 2007; Lee, 2013; Pack, 2013; Ryan, 2006; Talley, 2012; ).

### **Testing Contexts: Technology as a Tool in High Stakes Testing, Technology Skills and Inadequacy of Computer Labs**

According to the National Center for Education and Statistics (NCES, 2010), 20% of elementary schools in the nation are considered high poverty. Furthermore, in high-poverty elementary schools across the United States, 76%–100% of students are eligible for free or reduced-price lunch (FRL) through the National School Lunch Program (NSLP). High poverty schools often do not prioritize technology because of restrictions of resources. Technology teachers at high poverty schools are often asked to teach technology as an extracurricular activity for students, if funding is available (Stegman, 2014). In addition, inadequate funding of schools in neighborhoods of poverty results in schools' inadequate facilities, resources, and circumstances (Moore, 2011). School districts set the millage rate; the tax levied on the property of the community, each year to meet its budget needs (Womack, 2014). Schools' millage rates are tied to property values. Property values are a reflection of the socio-economic status of the community, and with federal funding depending on the academic performance of students, funding of schools in high-poverty communities is often insufficient (Jennings, 2014). Resources, such as technology, specifically computers are expensive investments (Davis, 2012), and schools of poverty have difficulty affording and maintaining them for their students and staff (Maringa, 2013). Most high poverty schools have limited to “no technology”, little technology instruction, and do

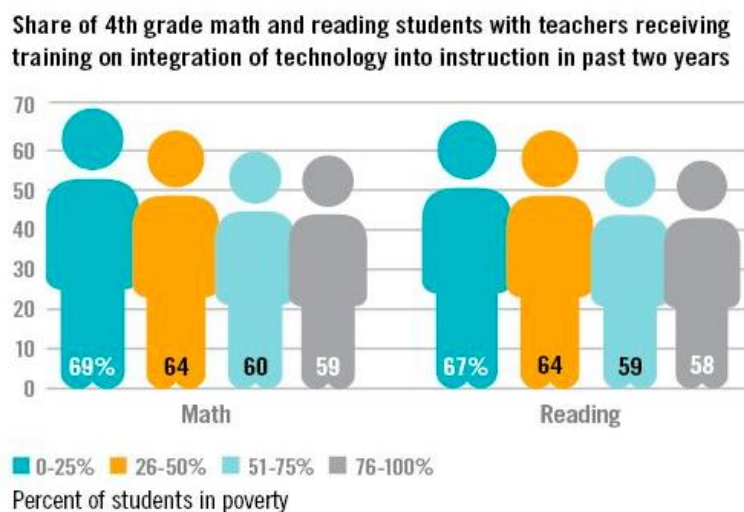
not have the opportunity to consistently practice using technology as a tool to learn or navigate high-stakes tests (Jensen, 2015).

Furthermore, schools in poverty have difficulty attracting and maintaining technology teachers (Stegman, 2014) causing students in high-poverty schools to lack adequate access to technology instruction and technology teachers. Technology teachers serve as resource teachers for a district, often with one teacher serving five to ten schools (Anderson, 2014). With limited instructional time on the use of educational software, very little, if any, time is spent on teaching students how to use technology as a test-taking tool. Teachers may have the ability to maximize the effectiveness of technology and increase achievement rates, but many are wary of fully implementing technology into their classrooms (Klamik, 2005).

According to Leonard (2012), schools of poverty have poor facilities for technology-based testing. The facilities of many schools of poverty were not configured to have a space designated for a computer lab. According to the U.S. General Accounting Office (1996), 50% of schools reporting 40% or higher in Free and Reduced-Price Lunch (FRL), reported inadequate facilities for technology labs, compared to schools with 20% or less students enrolled in the free or reduced lunch program who report only 20% of their computer labs as inadequate. In the 2016 report of the U.S. General Accounting Office (GAO-16-375SP 2016 Annual Report) even when some schools of poverty were converted to magnet schools, there were no upgrades to the facility. A magnet school offers specialized instruction and a curriculum, which other schools do not offer to attract a more diverse student body. A rare exception was a magnet school, which was funded by private donations “at a level significant enough to fund the technology focus of this school . . . and had a state-of-the-art facility with Wi-Fi, computers for every student, and 3D printers ” (Leonard, 2012, p. 32). However, in

general, students in schools of poverty are faced with the challenge of limited technological resources (Davis, 2012), teachers' lack of training on why and how to use technology as a tool, an unfavorable technological testing culture, limited access to technology at school, and inadequate facilities (Leonard, 2012).

The Digital Divide affects the technology skill level of students of disadvantaged families. According to a new Education Week Research Center Analysis, "students in high poverty schools are less likely than their counterparts in wealthier schools to have teachers receiving training in how to integrate technology, into the classroom instruction (Herald, 2017, para. 9). See Figure 1.



SOURCE: National Assessment of Educational Progress, 2015

*Figure 1.* Percentage of teachers receiving technology training with percentage of students in poverty.

### Related Theory

The theory of Bronfenbrenner's Ecological Systems served as the primary theoretical framework. According to Bronfenbrenner (1994), the ecological models of human development are comprised of two propositions experienced in five inter-related systems

(microsystem, mesosystem, exosystem, macrosystem and chronosystem). The first proposition states that human development is a process, which progressively and reciprocally moves from the simple to the complex in the immediate environment. For the interaction to be effective, it must be fairly regular and enduring over an extended period as a proximal process. In the microsystem, the relationship between a developing person and the immediate environment is the most influential in the development of a person. Bronfenbrenner explains the direct relationship of the microsystem with the example of one's family and the school the child or children attend, in which students have direct interaction on a consistent everyday basis.

The microsystem is embedded within many layers of interacting systems including the mesosystem. The mesosystem where the linkages and processes between settings such as school and home occur. The exosystem, where the linkages and processes between school and educational state departments who decide on testing, occur. The macrosystem, which is the broader cultural and belief system that impacts the individual, such belief in technology as an appropriate testing tool; and the chronosystem, which relates changes over time, represent all the layers in the Bronfenbrenner model, and are always interacting and influencing each other (Bronfenbrenner & Morris, 1998).

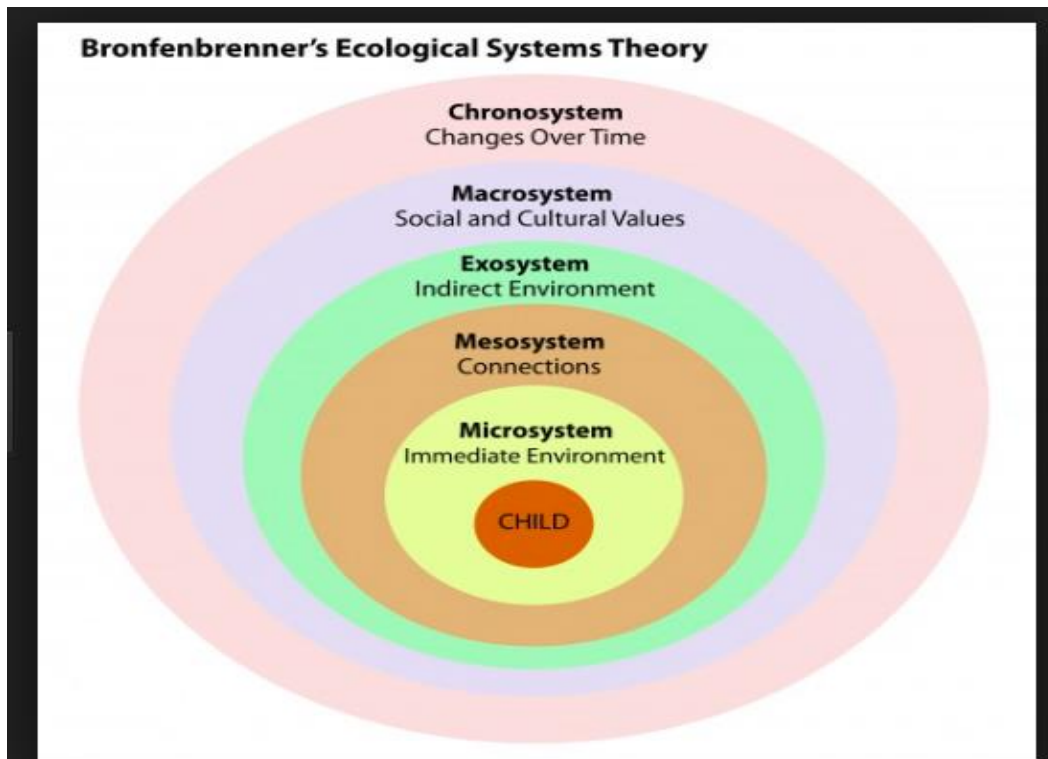


Figure 2. Bronfenbrenner Ecological Model Theory.

Bronfenbrenner's (1994) second proposition identifies three sources of the form, power, content, and direction of the proximal processes. The three sources include: the joint function of characteristics of the individual; the environment of the process, immediate (microsystem) and remote (exosystem); and the nature of the outcomes desired. For the purposes of the present study, the researcher is using Bronfenbrenner's reference to the characteristics of the individual, to refer to the characteristics of students in poverty. His reference to the environment of the process is reflected in the computer adaptive testing lab, and the testing process. The nature of the outcomes desired refers to the resulting test scores. Consequently, the inadequacy of these three factors can be explained by Bronfenbrenner's microsystem and exosystem.

Bronfenbrenner's ecological theory of human development is beneficial because the framework covers many aspects of early childhood education and will coincide with

childhood poverty if a child is living in poverty. According to Bronfenbrenner (1995), the ecological models of human development comprise of two propositions experienced in five inter-related systems (microsystem, mesosystem, exosystem, macrosystem and chronosystem). The first proposition states that human development is a process, which progressively and reciprocally moves from the simple to the complex in the immediate environment. In addition, for the interaction to be effective, it must be fairly regular and enduring over an extended period as a proximal process. In bioecological systems approach of Bronfenbrenner, the body is part of the microsystem. The body's effects on the other parts of the microsystem are reciprocated by the effects of the immediate external system.

Bronfenbrenner also explains human development transpires through processes of progressively complex reciprocal interactions between active, evolving human beings. Ecological models include a body theory and research, which focuses on “the processes and conditions that govern the lifelong course of human development in the actual environments in which people live” (Bronfenbrenner 1994, p. 37). There is reciprocity within the microsystem between the individual taking the computer-adaptive test and the environment. The reciprocity is such that when a student goes through an unpleasant experience in the lab, for example, noise, excessive temperature, etc., during testing, Bronfenbrenner states that the student will likely respond with unpleasantness. In the case of the study, the third grader may most probably give off their worst on the test outcomes.

Kepler's (2012) explanation of the necessity of familiarity with technological tools of testing reflects Bronfenbrenner's macrosystem of belief and states:

Technology provides students with universal twenty-first-century skills needed presently and in the future. Technology plays a major role in the students' education.



The interface between technology and utilizing computers as an assessment tool, allows educators to assess student's ability to understand the content and demonstrate critical problem-solving techniques. All students must be computer and technology competent and have an abundant amount of information on technology and the use of it as a tool. (p. 37)

### **Problem Statement**

Over the last five years, at least 20 states have started to conduct high stakes tests using computer-adaptive testing (Hensley, 2015), yet no formal considerations have been given to the availability of adequate computer lab facilities in schools which are located in poverty stricken neighborhoods, nor the ability of students who live in poverty to use technology as a tool in testing. Of particular concern to this study are students in third grade who are being tested on high stakes testing for the first time. The adequacy of the testing labs and the amount of practice on using technology as a tool is considered. In schools of poverty, these three technology-related testing factors or "testing context", may adversely affect the academic performance of the third graders. The researcher's primary hypothesis is that a limited technological skillset, inadequate testing facility and the lack of student knowledge on the use of computers as a testing tool contribute to the low performance of high poverty elementary students on computer-adaptive high stakes testing is (Gordan, 2011).

### **Purpose**

The purpose of the study is to determine whether a relationship exists between the use of technology as a tool in computerized adaptive standardized testing, students' technology skills, the adequacy of school computer lab, and academic performance of third-grade

students taking the CAT standardized test for the first time, and the level of poverty of the school.

### **Research Questions**

The main research question of the study is as follows: What is the impact of the *testing context* (proficiency in technology use, ability to use technology as a testing tool, and the conditions of the computer lab) on the outcomes of a CAT-based assessment of third grade students in high-poverty schools?

Relating to the performance of third graders on statewide-standardized high stakes computer-adaptive Math and Language Arts tests, the sub-questions include:

1. What is the relationship between: (a) time spent on practicing how to use technology as a testing tool, (b) students' proficiency in using technology in class, (c) rating of testing conditions, and the performance of third graders on statewide-standardized high stakes computer-adaptive Math and Language Arts tests?
2. What is the relationship between (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in a class (c) rating of testing conditions, and the level of poverty of a school?
3. What is the relationship between the variation in academic performance of third graders in (a) standardized high stakes computer-adaptive tests in math and (b) standardized high stakes computer-adaptive tests language arts, with respect to testing context (the time spent on practicing how to use technology as a testing tool, students' proficiency in using technology in class, and rating of testing conditions)?

Restated, the study hypotheses include:

H1: There is no relationship between (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class

(c) rating of testing conditions, and the performance of third graders on statewide-standardized high stakes computer-adaptive math and language arts tests.

H2: There is no relationship between (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in a class (c) rating of testing conditions, and the level of poverty of a school.

H3: There is no relationship between the variation in academic performance of third graders in (a) standardized high stakes computer-adaptive tests in math and (b) standardized high stakes computer-adaptive tests language arts, with respect to the testing context (time spent on practicing how to use technology as a testing tool, students' proficiency in using technology in class, and rating of testing conditions)

Using a causal-comparative study, the researcher examined the impact of the *testing context* on third grader students' academic performance on computer adaptive tests. Testing context refers to the level of use of technology as a tool in computerized adaptive standardized testing, proficiency in using technology, and the adequacy of school computer lab facilities. The study surveyed 3rd grade teachers and building administrators in 54 elementary schools that range in classification from "not applicable to free-and-reduced-lunch" to "95% free-and-reduced-lunch." The researcher measured the following indicators from the perspective of third-grade teachers and their school principals:

- Number of hours on average third graders practice how to use technology as a tool in a computerized adaptive test (practice taking computer adaptive testing)
- Average rating of the testing conditions for third graders during the computerized adaptive testing
- Average rating of the technology skill of third graders

- Average performance of third graders on computer-adaptive tests in Math and English Language Arts.

The researcher developed and used a survey, titled the Testing Context Survey, to collect the data from the administrators and third-grade teachers of the 54 elementary schools identified. A pilot study was not used prior to conducting the study, however a pretest was conducted with two teachers. In addition, both the university's and school district's institutional review boards, provided suggestions for clarity. Also, a teacher and two administrators, who have expertise in testing processes, affirmed the content of the survey and that provided content validity.

### **Limitations**

The participating schools' socioeconomic status was to be based on the schools' free and reduced breakfast and lunch percentages (FRL) for the 2015–2016 school year (National Center for Educational Statistics, 2013). However, at the time of data collection, the 2016–2017 data was available and the more current data was collected instead. Additionally, a more accurate measure for socioeconomic status was available, the Free Meal by Direct Certificate (FMDC), and that was used instead. There is a limitation associated with these changes because the participants were under the impression the FRL and achievement scores for 2015–2016 would be used in the study. In addition, participating teachers and administrators were selected from one school district's website information from a previous school year, as the updated district contact information was not available. Participants voluntarily responded to the survey. Also, the study was limited, because the targeted elementary schools were both K-6 and K-8 schools. Lastly, the Testing Context Survey was

developed and pretested by the researcher, and it was put through a content validity exercise, but it did not undergo full-scale development.

### **Delimitations**

This study was delimited to 54 elementary schools in a northwestern state. The information relating to testing outcomes was collected through the state's report card for the 2016–2017 school year. The study was delimited to represent one school district.

### **Definitions**

For the purpose of this study, the following definitions will be used:

*Academic Performance:* This term is defined as the achievement scores of third graders on standardized state computerized adaptive testing in Math and English Language Arts, specifically the statewide assessment created by the Smarter Balanced Assessment Consortium.

*Computer Adaptive Testing (CAT):* This term is defined as a form of computer-based assessment that adapts to the student's responses in real time. CAT draws on a bank of questions or prompts to provide students with testing items. The CAT is customized for each student for a more accurate measurement for every student. To accomplish this, the computer-based test adjusts the difficulty of questions throughout the assessment based on the student's response. If a student answers a question correctly, the next question will be harder; if a student answers incorrectly, the next question will be easier. This is why CAT is also known as tailored testing. Smarter Balance Assessment is an example of CAT.

*Schools of Poverty:* This term is defined as a school with at least 75% of the students eligible for the federal free or reduced lunch program. For this study's purpose, the proportion of students receiving free or reduced lunch (FRL) defines a school's poverty levels. Students

qualify for FRL if the family's income is beneath 130% of the federal poverty level, and for reduced price lunch if their income is between 130% and 185% of that poverty level.

(Clotfelter, Ladd, Vigdor, & Wheeler, 2007; & U.S. Department of Agriculture, 2008). FRL were used to identify the schools of poverty and the more accurate index, called Free Meal by Direct Certificate (FMDC), was used to measure socioeconomic status of the participating schools because FMDC is a more accurate measure of the poverty level of a school.

*Smarter Balance Assessment Consortium:* This term is defined as a summative or end of the year test which measures student achievement in grades 3-8 and in high school math, Language Arts, and science. Third grade is the first opportunity that students are exposed to the smarter balance assessment.

The Practice Test is available in each grade and is comparable in format and structure to the actual Smarter Balance Assessment. The Training Test is available in three grade bands (3–5, 6–8, and high school) and provides a sample of each kind of question students might see on the assessment, allowing them to become familiar with the testing software and navigation. The practice test provides students with an opportunity to practice the drag and drop routine, which is an essential part of the Smarter Balance Test. Some of these tools present barriers for students who have not done computer-adaptive testing before.

*Students of Poverty:* This term is defined as the students who qualify for free or reduced lunch at school under the National School Lunch Program guidelines, because they are from families whose income is 130% or more below the federal poverty level.

*Testing Context:* This term is defined as a researcher–coined term to represent the combined contributions of: (a) the school's computer lab facility testing conditions, (b) students' technology skills, and (c) students' opportunity to practice using technology as a tool in

testing. Computer lab facility testing conditions refers to the state of the computer facility used for computer-adaptive testing. Students' technology skills include the ability to use a computer to send email, type documents, reading information, and browse the internet. Students also use a computer for accounting, creating spreadsheets, managing data, making presentations, and more (Baldauf, Amer, & Gower-Winter, 2014). Technology as a tool in testing is the use of technology to facilitate and accomplish a task or a test, where the purpose of using technology as a tool is to navigate the test and create responses.

Students' opportunity to practice using technology as a tool for testing describes the varying degrees of opportunity that students in different schools to practice using technology as a tool specifically for testing. Some students have direct access to technology throughout the school day. They may interface with a computer or with a device attached to a computer system by using a computer at home, work, or school or in a public setting, such as a library or school (Graves, 2009).

### **Significance of Study**

Computer testing and computer lab facility issues remain a challenge in high poverty schools nationwide (Jensen, 2015). A benefit of this study is to provide insights on how the testing context affects the academic performance of students in high poverty schools. Another benefit of this study is to draw attention to the role that the adequacy of a computer lab facility plays in the performance of students who are assessed using computer adaptive testing. The results from this quantitative study may inform educators and stakeholders' on areas for improvement in the administration of computer adapted testing for students of poverty who attend schools of poverty. This study could assist educators and instructors of technology on the importance and ways to increase the awareness of using technology as a

tool. This research study may provide educators, stakeholders, and policymakers with pertinent information that could inform their choices in setting mandatory policies on the use of computer-based tests. Test designers, education departments of state, legislators, elementary school principals and teachers may find the results useful.

### **Summary**

In modern day high-stakes testing, the intersectionality of technology usage and factors that impact the academic achievement of students of poverty presents an opportunity to test equitability. Chapter 1 introduced the problem and the conceptual framework, which guides the research on students of poverty and the testing context they experience at school. Chapter 2 provides a review of the literature review, which shapes and supports the research study. Chapter 3 illustrates the methodology used to collect data, the purpose of the study, the research questions, the research design, and the participants in the study. Chapter 4 consists of the findings and results of the research study. Chapter 5 comprises the summary and the conclusion of the research study.



## Chapter 2: Literature Review

The purpose of this study is to examine the impact of the testing context of computer-adaptive testing, as it relates to the performance of third grade, first-time high-stakes test-takers, particularly, students of poverty. The testing context in this study refers to third graders' skill in technology use, the ability to use technology as a testing tool, and the testing conditions of the technology lab used for standardized testing in schools.

Typically, high poverty students perform poorly on high stakes tests. Schools of poverty often lag behind schools that are more affluent, in standardized student achievement scores. Currently, there has been a change in the mode of testing where some states conduct high stakes tests using computer-adapted testing (Hensley, 2015). Students in third grade through eighth grade and high school eleventh graders are assessed once a year on computer-adapted standardized high stakes tests. According to Buonomo (2012), "The results are used to measure students' academic proficiency and to evaluate effectiveness of schools" (p. 12). There are several factors that contribute to the poor performance of students in poverty including frequent moves, low parental involvement, and teacher education level (Gordan, 2011). The researcher further proposes that one of the factors that attribute to the low performance of high poverty elementary students on computer-adapted high stakes testing is the limited technological skillset and the use of computers as a testing tool. The researcher has chosen to focus on the impact of computer adaptive testing on third graders, because that is the first time students take a high stakes test.

However, these studies did not differentiate for students of poverty in schools of poverty. Researchers of CAT have not taken into consideration relevant, contextual, cultural influences such as proficiency of students of poverty in using a computer as a tool or the

location of the computers in schools of poverty where students take CAT high stakes standardized tests. Specifically, two factors that CAT does not consider in relation to schools of poverty include students' preparedness in using a computer as a tool in place of paper and pencil and the appropriateness of the school space or facility allotted to house the computers. Contextually, high poverty schools were not designed with a computer lab, and most of those schools have to find space available to accommodate computers; these spaces can be situated next to the noisy cafeteria or adjacent to the school bus loading zone (Principal of Title I School, personal communication, August 5, 2016). Students of poverty taking a test in a lab with poor conditions, especially third graders participating in high stakes testing for the first time, most of whom have not had adequate practice or familiarity with navigating the various options of a computer as a tool in testing, may consequently be unable to perform at their best on the test, because of these contributing factors.

### **Computer Adaptive Testing as Standardized Tests: History of CAT**

For over 150 years, students in the United States have undergone testing to determine student learning (NEA, 2009). According to the National Education Association (2009), testing in American schools before the eighteenth century was in the form of oral assessments. Pre-Civil War schoolteachers tested student learning on select subjects using written examinations, which were externally mandated and used to inform decisions on policy and administration of schools. From 1875 to the end of World War I, several standardized tests were developed and administered to measure the mental ability of soldiers, and the industrial revolution caused factories to replace school-age children working on farms. The result was a combination of three factors: the awareness of different formats of testing other than essays; an increase in students in schools, making essays a tedious form of

assessment; and an existing culture of external testing. This caused standardized testing to emerge (Fletcher, 2009) as an efficient way to assess students in schools.

In 1922, John Dewey spoke to no avail against the influence of the mechanical and industrialized testing and its over-emphasis on averages and percentages, for classifying students instead of the development mental habit (NEA, 2009). The Scholastic Aptitude Test (SAT) and the Iowa Test of Basic Skills are examples of national standardized examinations, which emerged from 1922 to 1929. By 1930, the efficiency and objectivity of multiple-choice tests made them the preferred tests in schools, despite the criticism that students guessed responses and memorized to pass these tests. In 1935 punch-card systems were used in administering testing, and the cost per test was a tenth of the original cost (from \$5.00 to \$0.50 per test) and by 1958 Iowa testing was computerized. In 1965, computerized testing was found to be useful in testing students with special needs under the *Elementary and Secondary Education Act (No Child Left Behind Act of 2001)*.

Over the past 50 years, technology, in various forms has been incorporated in testing, in general as Computer-Based Testing (CBT). The increasing use of technology in testing has been a natural progression in assessment practices. One of the current uses of technology in assessment is a specialized version of CBT, Computer-Adaptive Testing, CAT, which was designed in 1970, by Lord (1970, 1980).

### **The Customizing Ability of Computer Adaptive Testing**

According to Davey (2011), the main principle of adaptive testing is to “avoid asking questions that are much too difficult or much too easy for the student being tested” (p. 4). Because we are sure, but not certain, that able students will answer easy items correctly and that struggling students will stumble on hard questions, and relatively little is learned from

such responses. Students learn much more by administering questions that challenge, but do not overwhelm, the student. Correctly, identifying and then presenting these questions is the goal of every adaptive test (Davey, p. 4).

There are different types of adaptive tests, however, the focus of this study is on the commonalities among them, which are *question selection* and *score estimation*. Both of these actions are repeated each time a question (or collection of questions) is presented and answered on an adaptive test. Question selection determines the most appropriate question (or collection of questions) to administer next, given what is currently known about the test-taker's performance level. Questions are selected from a pool, which contains more questions than any single student is asked (Davey, 2011).

The pool contains test items of varying difficulty. Initial items are presented at the estimated ability level of the test taker, which is estimated based on his or her age or the results of several practice test questions. As the CAT test progresses, if the test taker responds correctly, the next item is slightly more challenging. If the test taker responds incorrectly, the subsequent item is slightly less difficult (Daggett, Gendron, & Heller, 2010; Tamayo, 2010).

Score estimation uses the responses to the questions previously answered to refine the test taker's score or performance estimate. This allows the questions asked next to be more appropriate still. This cycle continues until either a specified number of questions have been administered, or some measure of score precision is reached (Davey,2011) Once a test taker encounters several items at a certain level of difficulty that they answer incorrectly, this the presumed to be the test taker's ability level (Daggett et al., 2010; Tamayo, 2010).

## **Benefits of Computer Adaptive Tests**

Computer Adaptive Testing reflects the current times. Technology has become a relevant factor for engaging students in modern classrooms all over the country. Students are using desktops, laptops, iPods, Chromebooks, cell phones, and classroom blogging (Daggett et al., 2010; Tamayo, 2010). Students today have multiple choices with the use of technology to enhance their learning. The convergence of technology and its use in the classroom seemed almost effortless. Technology and classroom instruction has merged in hopes of enhancing student's overall learning and engagement. As technology has become more relevant in education, computer adaptive tests are making student assessment more accessible for educators and stakeholders to collect larger amounts of data more accurately at an efficient rate (Meador, 2014).

In the 21st century, one of the main goals in education assessment is the accurate estimation of the test taker's learning ability. Capturing this form of cognitive ability gives students and educators crucial information in learning patterns, which help support students' learning, and teacher instruction (Meador, 2014). Computer-Adaptive Tests meet this goal.

Computer-Adaptive Tests offer multiple benefits for students, educators, and stakeholders. For students, CAT provides individual, leveled testing differentiated at their learning level and provide immediate, specific feedback. Educators enjoy the automaticity and of the instant results and the experience, and expertise of using computer adaptive test. Stakeholders appreciate the data computer adaptive testing provides. Computer adaptive testing has many advantages over traditional standardized assessment because it is shorter, records academic status and growth, and provides immediate feedback on student scores (Wang, McCall, Hong, & Harris, 2013). Also, the CAT format can assess knowledge and

provide data that identify the learning gaps for each student in a responsive and dynamic testing format (Martin & Robinson, 2009).

There are several advantages offered by CATs that remediate some of the concerns present with annual high-stakes testing. Items are calibrated to the ability level, performance of each examinee so testing time is reduced and less time is spent on questions that are either too easy or too difficult. Numerous assessments can be given during an academic year to assess student progress (Martin & Robinson, 2009). According to Davey (2011), writing of adaptive tests,

Adaptive tests are designed to maximize measurement efficiency, or the precision of test scores in relation to test length. This means an adaptive test can either save time by being shorter than a conventional test of equal precision or improve score quality by being more precise than a conventional test of equal length. The students with the most to gain are those at either the high or the low extremes of the performance continuum. They are poorly served by conventional tests, which are generally designed to fit the average student. (p. 5)

According to Thompson's (2016) article "Computer Adaptive Testing: Big Data and Algorithmic Approaches to Education," there is a fast moving rise of data associated with education. This rise in the use of data in education affects how assessments in the digital infrastructure are used. Thompson argues that education has been a major site where data is heavily used to measure student's performance in core subject areas such as English Language Arts, literacy, and math. Thompson refers to the term *datafication* (p. 834), meaning 'the objective quantification of all kinds of human behavior and sociality,' which represents a new standard in education policy (Williamson, 2015). Because data is accepted

in education to be the foundation for improving educational outcomes for student performance through improved innovation and accountability, this supports the use of standardized testing and computer-adaptive testing to collect and produce data.

Thompson covers a variety of things CAT is capable of, including that CAT can respond more promptly to students' learning patterns than a teacher is able to on a conventional test. CAT measurement systems are based on how accurate the students' responses are to the questions within the academic domain. Using this method of learning is supported by prior student knowledge and the ability not only to measure the answer but the amount of time the student took to respond to the question. According to Thompson, an accurate student learning profile can be created by the amount of time it takes a student to answer a question. This data provides students and educators with more information that can be beneficial to both. Teachers can provide students with immediate feedback and focus on areas of learning, which need support. Many cost-reduction benefits can result when moving from traditional test to computer-adaptive test. More school districts can test more often and track student performance more accurately because computer-adaptive tests are shorter than traditional tests (Thompson, 2016).

Shapiro and Sarah (2012) make a valid point on how CATs have developed as a practical option for summative testing for students in the 21st century. To increase aptitude on high-stakes assessments, school districts all over the country seek new and innovative programs, tools and procedures for instruction and intervention to maximize student growth in learning. Schools are seeking techniques by which they can determine student progress at any point in time during the academic school year, so that annual performance on the high-stakes tests can be improved. Such tools include formative assessments and benchmark

assessments, both of which contribute to the knowledge of student progress toward high-stakes assessments. Computer adaptive testing comes in the form of both summative and formative assessments (Heritage, Kim, Vendlinski, & Herman, 2009).

### **CAT and Student Assessment Mandates**

Assessment of student learning has become a staple of school practice because of federal and state mandates toward accountability for student achievement. These mandates have ensured that only a small percentage of students are exempted or participate in alternate forms of summative assessment. Not only have these mandates influenced the practice of assessment, but school districts are also examining their instructional practices and more rigorously providing remediation strategies for students who are not making sufficient progress in the general education curriculum. Mandates were put in place to help students succeed in education, and the CAT was used to help enhance students learning opportunities (Heritage, Kim, Vendlinski, & Herman, 2009). CAT has been recognized by federal operations as an effective alternative to measuring student learning. In conjunction with President Obama's challenge, the Secretary of Education pledged a \$350 million grant as part of the Race to the Top Initiative (RTTT), for the development of computer-based assessments aligned to the Common Core standards.

CAT has a federal use. Steered by both *No Child Left Behind Act* (2002) , and the *Individuals with Disabilities Education Act, 2002* (IDEA, 2002), the assessment framework and movement, known as *Response to Intervention* (RTI, n.d.) evolved to support the varying needs of students so that they would make sufficient educational progress according to a chosen standard of proficiency. Using this framework, schools began to use data not only to determine the levels of student achievement but to assist in determining the degree of need



for and types of support that any one student might need to make meaningful educational gains. Within a multi-tiered system of supports, an essential primary step has been to identify those students who are at risk for not meeting academic proficiency and who may require changes to instruction or further interventions. According to the research conducted at WestEd (2008),

In Virginia, adaptive testing is designated for at-risk students. The online computer adaptive Algebra Readiness Diagnostic Test (ARDT) is administered to students identified as at risk of failing the Algebra I end-of-course test . . . . North Carolina and the District of Columbia have piloted computer-adaptive tests designed to meet the unique needs of students with disabilities. From 2000 to 2002, North Carolina implemented an adaptive version of its state reading and mathematics assessments for special education students. (p. 3)

Traditional testing of essays, oral responses, and observation of learning have become less easy to implement with the increase of student enrollment, various learning abilities, and community expectations.

### **Internal and External Factors Affecting Achievement**

According to Ertmer (2012), there are internal and external factors that affect student achievement. External factors are the factors that seemingly affect students' performance, but are out of control of the school. Federal mandates, such as the No Child Left Behind Act of 2001 (NCLB; U.S. Department of Education, n.d.), and incentive programs, like *Race to the Top*, (citation needed here) are forcing schools to take a look at student achievement data and make improvements more closely (White House, 2010). These initiatives are being enforced in a way not previously required by the federal government, and there are real

consequences for schools that do not comply (U.S. Department of Education, n.d.). The issue in most schools is that each year since the inception of NCLB, schools have had the task of making adequate yearly progress. Making adequate yearly progress (AYP) means to have growth in the number of students who pass state-mandated tests in a certain number of subgroups (U.S. Department of Education, n.d.). The problem is that schools need to make sure that students continue to build on their success. Schools are now responsible for improving student achievement, as defined by the number of students who are successful at meeting or succeeding grade level marks when taking high-stakes computer adapted test selected by their state (Chappuis et al., 2009; Dunn & Allen, 2009; U.S. Department of Education, n.d.).

The federal government made the incorporation of and provision of improved computer technology for all students a mandated part of the National Educational Technology Plan (2012) merged into the No Child Left Behind Act of 2001. Having access to computer technology and the impact on academic achievement is an important aspect of education that needs attention, as computer integration becomes a pivotal point in American education, culture, and business (Mahlamud & Pop-Eleches, 2011).

The policy of No Child Left Behind Act of 2001 requires that States implement statewide accountability systems and penalizes schools that consistently perform low academically (U.S. Department of Education 2011). These systems are based on the state's common core standards in mathematics and literacy, annual testing for students in grades 3–8, and annual statewide progress to assure all groups of students reach proficiency within a 12-year period. State progress and assessment results are sectioned by poverty, ethnicity, race, disability and English proficiency to make sure no group lacks progress.

School districts and schools which fail to make adequate yearly progress (AYP) toward statewide progression objectives proficiency goals will be subject to sanctions, such as the restructuring of school personnel and other corrective measures (U.S. Department of Education 2011). Adequate yearly progress (AYP) is the minimum level of improvement schools who have a failing grade must make under federal guidelines (U.S. Department of Education, 2011). The (NCLB) was a pioneer holding the nation accountable for teaching children to meet or exceed their states common core standards of learning (Chenoweth, 2007).

The statement of purpose of NCLB (2012) declares that its implementation “is to ensure all children have a fair, equal, and significant opportunity to obtain a high-quality” (p. XX). This statement of purpose developed out of concern for underrepresented subgroups of students, which include students who live in poverty. The NCLB Act of 2012 attempts to ensure all students, regardless of their socioeconomic backgrounds receive an adequate and quality education. Turning high-poverty schools into high-performing schools are critical because of the sanctions enforced by NCLB to increase opportunities and choices for parents of children attending schools that are not failing to meet common core state standards to attend schools that are not failing which may include charter schools within the district. Districts are bound by the NCLB Act to provide transportation to the school of the parents’ choice and must use at least 5% of its Title I funds especially for this purpose (U.S. Department of Education, 2011).

The No Child Left Behind Act of 2001 was the reauthorization of legislation, which provides resources such as funding for students who come from low-socioeconomic backgrounds. The NCLB Act of 2001 requires schools increase the achievement of a

particular population of subgroups of low-income, minority, and special education students and make progress each year in literacy and or mathematics. If schools fail to reach these requirements under the new reauthorization act of (NCLB), it will result in penalties for the school or district (U.S. Department of Education, 2011).

Standardized examinations are generally used to measure the students' level, whether they should remain or proceed to the next academic level. Advocates of the NCLB policy are concerned in improving students' academic achievements in language arts and mathematics. The main component of the NCLB policy is the adoption of computer adaptive standardized tests (NCLB, 2001).

### **Every Student Succeeds Act**

President Obama on December 10, 2015, and represents good news for our nation's schools signed the Every Student Succeeds Act (ESSA). This bipartisan measure reauthorizes the 50-year-old Elementary and Secondary Education Act (ESEA), the nation's national education law and longstanding commitment to equal opportunity for all students. The (ESSA) is meant to improve the academic achievement of the disadvantage students. By proving better school improvement for low-income schools this will allow resources for upgraded technology labs and technology teachers to make sure students have the skill set to take computer adaptive tests. Recognizing this fact, in 2010, the Obama administration joined a call from educators and families to create a better law that focused on the clear goal of fully preparing all students for success in college and careers. The Every Student Succeed Act (ESSA) includes provisions that will help to ensure success for students and schools.

Listed below are some of the provisions of (ESSA). The law:

- Advances equity by upholding critical protections for America's disadvantaged and high-need students.

- Requires—for the first time—that all students in America be taught to high academic standards that will prepare them to succeed in college and careers.
- Ensures that vital information is provided to educators, families, students, and communities through annual statewide assessments that measure students' progress toward those high standards.
- Helps to support and grow local innovations—including evidence-based and place-based interventions developed by local leaders and educators—consistent with our Investing in Innovation and Promise Neighborhoods
- Sustains and expands this administration's historic investments in increasing access to high-quality preschool.
- Maintains an expectation that there will be accountability and action to effect positive change in our lowest-performing schools, where groups of students are not making progress, and where graduation rates are low over extended periods of time

The Every Student Succeeds Act (ESSA, 2015) primary focus is to concentrate on providing resources to schools in low socioeconomic neighborhoods, which serve students who come from low-income families. Yet difficult, with the challenges of accountability, high stakes testing, and the required mandate of the Every Student Succeeds Act (ESSA) to meet the goal of ensuring all students experience academic progress. By providing teachers, students, their families, and the community with more resources so students are better prepared to meet higher standards in education regardless of their social economic backgrounds and the neighborhood school, which students' attend. The challenges continue to be more prominent in schools with high rates of poverty.

## **Standardized Testing**

Standardized testing continues to be the current way students are tested for knowledge of English, language arts, literacy and math. Advocates of standardized testing claim it has impartiality and the ability to measure individual student achievement, effectively. Many educational experts believe standardized tests will play a more significant role in education in the near future than it does now. Students must be measured at pivotal points in their education, and educational experts view standardized testing as the valuable tool in education (Gooden, 2013). Educational leaders stress that standardized tests can help educators and administrators make choices regarding teaching instructional practices and help schools measure how students in any particular school perform in relation to other schools in other states, which take the same standardized tests. Standardized testing holds educators accountable for teaching students what they are required to know (Fletcher, 2009).

Fletcher states (2009), “Standardized testing is not a new concept. It has been utilized in the United States educational system for many years” (p. 37). Fletcher referenced 1905 as an important historical landmark as French psychologist Alfred Binet developed an intelligence test, which would later become the Stanford-Binet Intelligence Test used by numerous schools for comparison and placement (Fletcher, 2009). Further stated during World War I, standardized testing became a commonly used practice (Fletcher, 2009). Aptitude tests were given to Army recruits to determine job placement during the war (Fletcher, 2009). The most widely used standardized assessments in the United States for educational purposes today are the American College Test (ACT) and Scholastic Aptitude Test (SAT), entrance examinations for colleges and universities; however, states have adopted various measures to meet current testing guidelines articulated through legislation.

The reality is that NCLB (2002) has turned state testing into a high stakes event where schools and districts must demonstrate adequate yearly progress (AYP).

Standardized testing continues to be the current paradigm for measuring student achievement no matter what ethnic group or social, economic background they come from under NCLB (Kahn, 2008). Despite drastic efforts at educational reform, minority student populations at the elementary level continue to exhibit difficulty passing science-standardized tests. According to the U.S. Department of Education (2008), minority achievement reflects a greater disparity in standardized test scores for science than in reading or math. Standardized tests measure student performance in math, reading, and science. Standardized tests do not take into account the students' life experiences or economic backgrounds.

Low academic performance by students has been blamed on poverty for decades (Davis, 2008). Poverty may have a high impact on achievement although it is not always an easily identifiable variable as it is entangled with racism, social status, and stereotypes about minority values (Burney & Beilke, 2008). Reports from the National Center for Children in Poverty state children who grow up in impoverished conditions have less contact with learning materials, which stimulate the brain. These children also had less access to educated adults who could help them with schoolwork. Further, they had lower levels of school attendance. Moore explains, “The lack of learning capital present in the lives of poor children has a negative impact on academic achievement, and concentrated poverty in schools exacerbates the issue” (Moore, 2011, p. 138).

The primary goal of standardized testing is to measure the progress of a particular student over time (Holmes, 2009, p. 11). High-poverty schools usually score lower than

schools that are more affluent. Reports from the National Center for Children in Poverty (2008) indicated children who grew up in impoverished conditions had less contact with educational resources such as reading materials and access to computers. These children also had less access to educated adults who could help them with schoolwork. Further, they had lower levels of school attendance. Moore (2011) contends, “The lack of learning capital present in the lives of poor children has a negative impact on academic achievement, and concentrated poverty in schools exacerbates the issue” (Moore, 2011, p. 138).

Standardized testing in educational settings has been present in U.S. schools for decades. However, as testing moved into the realm of high-stakes, meaning achievement below a set standard resulted in negative consequences, stakeholders in public education representing both advocates and opponents began in earnest a national discussion of the benefits and costs that are still ongoing today (Starr & Spellings, 2014). No matter the deliberation of educational critics, standardized testing is here, and students must have the skills to perform at their best. As it exists, standardized testing is quantifiable and an easy means of collecting a significant amount of student information. This is useful in many ways. Both domestically and internationally, standardized tests have provided information on the school and non-school factors that influence the quality of education, and provided a standard for comparative purposes (The Teaching Company, 2015). It has also served as a country’s guide to action toward improvement of education when indicated through test scores (The Teaching Company, 2015).

### **Common Core and CAT**

The transition from traditional assessment to digital assessment systems has been influenced by many factors: increased expectations for student achievement in reading, math,



science, and communication; increased teacher accountability; adoption of Common Core State Standards (CCSS); and the creation of college and career readiness benchmarks (Luther, 2015). These changes in testing practice have led to the preference of CAT, because of its ability to tailor the administration of items to the ability of the examinee (Reckase, 2011).

A key obstacle in instituting a CAT is the misnomer that it is grade level testing. When technology merges with assessments, a different product emerges offering a new form of design, a new mode of administration, and a new form of score reporting. CAT covers expected student learning outcomes, such as the Common Core State Standards (Common Core Standards, 2016a).

Computer adaptive test gives the students items, which target the students' learning level as opposed to traditional computer-based testing only delivers the same items of question fixed in length and order. Computer adaptive test draws questions from the Common Core, which cover the content areas in math and English with sufficient detail to provide an accurate score it adjusts the level of difficulty of questions based on student responses to access the strengths and weaknesses of each student (Luther, 2015).

Furthermore, formal assessments for Common Core Standards (2010) are expected to have one of the testing formats as adaptive online tests. To meet the standards and enhance the readiness of high school graduates for the future, it is foreseeable that computer adaptive testing and sub scoring instrument will continue to be in great demand from participating states for its diagnostic values. In the meantime, test developers must be aware that additional assessments particularly designed for diagnostic purposes are not very adaptable in practice considering the incremental testing frequency and expenses.

CAT lends itself to the possibility of pulling the diagnostic information out of the conventional large-scale assessments as well as maintaining the original test purposes and specifications. The CAT meets attempts made to figure out some approaches to deriving both total scores and sub scores from the same large-scale assessments at one time and simultaneously achieving the desired accuracy and reliability of both types of scores (de la Torre & Song, 2009)

### **A Commonly Used Large Scale Computer Adaptive Test: SBAC**

There are several CAT tests used in K–12 testing. The Northwest Evaluation Association (NWEA, 2009) has Measures of Academic Progress (MAP) as an example of a CAT that has become widely used among school districts. Another computer adapted testing, which has become practical because of many large-scale assessments is the Smarter Balance Assessment Consortium (SBAC, 2010). Many other school districts and states have gradually adopted computerized adaptive testing (CAT) as a testing format with the aid of advanced testing and computer technology.

The SBAC is the focus of this study. The SBAC is designed to measure the states' newly adopted, more challenging and rigorous standards, Common Core Standards. The standards require that students deeply understand the subject matter and content, “think more critically, and apply their learning to the real world” (NWEA, 2009, p. 16).

To measure these new state standards, educators from Smarter Balanced states worked together to develop new, high-quality assessments in English and math for grades 3–8 and high school. These Smarter Balanced assessments provide more accurate and meaningful information about what students are learning by adapting to

each student's ability, giving teachers and parents better information to help students succeed in school and after. (SBAC)

Like all CAT tests, SBAC is customized testing where student responses to test questions determine the level of difficulty of subsequent tests. When students get the question correct, the next question gets harder, and when students answer incorrectly, the subsequent question gets easier. This enables students to demonstrate what they know. SBAC is designed to provide supplementary supports, which make it accessible to students with disabilities and English language learners. Teachers have access to resources in SBAC's Digital Library to support student learning. The use of optional and flexible interim practice formative tests to monitor student progress throughout the year; professional development materials and instructional resources to use all year to meet students' individual needs; and summative tests to "measure student achievement and growth in English and math in grades 3–8 and high school" (SBAC website, para. 1).

The validation and reliability of SBAC are important because of its high-stakes role. According to the developers, the essential validity elements of SBAC constitutes critical evidence "relevant to the technical quality of a testing system" (AERA et al., 2014, p. 22). Validation is an ongoing, virtually perpetual endeavor in which additional evidence can be provided, but one can never absolutely "assert" assessment is perfectly valid (Haertel, 1999, p. 3). This is particularly true for the many purposes typically placed on tests. Program requirements are often subject to change and the population's assessed change over time. Nonetheless, at some point decisions must be made regarding whether sufficient evidence exists to justify the use of a test for a particular purpose. A review of the purpose statements

and the available validity evidence determines the degree to which the [SBAC] principles . . . have been realized.

### **Educators Negative Perceptions of CAT**

Computer-adaptive testing (CAT) is a relatively new assessment system in the K-12 setting that developed from computer-based assessment. The use of computers for high-stakes testing has been received with mixed reviews. Dewey and some other researchers believe that CAT is mechanical and industrialized testing with over emphasis on averages and percentages, for classifying students instead of the development mental habit (NEA, 2009).

According to Dunkel (1999):

Although support for and use of computerized testing is gaining momentum, the more dispassionate supporters, as well as the dubious skeptics, voice concern about the trend toward greater use of computers in the assessment process. Some are concerned about the appropriacy of CBTs for assessing particular skills such as reading comprehension (Bernhardt, 1996); others are worried about the fidelity and comprehensiveness of computerized tests (McNamara, 1996). Still others are concerned about the degree to which construct-irrelevant (or nuisance-ability) variables, such as computer-familiarity or computer anxiety, might be injected into the assessment process to impact examinee performance in negative ways. (p. 78)

The consequence of not understanding how to use technology to enhance student learning is a fundamental part of self-growth in the stages of learning. For students in poverty-stricken neighborhoods and who typically do not fare well on standardized high-

stakes testing (Self, 2013), using technology as a testing tool compounds the issues associated with academic performance and the digital divide.

Paper-Pencil tests, replaced by Computer Adaptive Testing (CAT) are not comparable, because not only is the medium of administration changed but there is an added algorithm, and the additional technological skill sets needed to successfully experience testing. With Computer-Based Test (CBT) a linear experience occurs, “the items on both versions, PPT and CBT, are identical in general, and scoring methods and procedures are the same”. The change from PPT to CBT, therefore, only involves the change of administration mode (Wang & Shin, p.1). According to Wang and Shin (2010) “when CAT is compared to its PPT counterpart, the mode effect and paradigm effect are confounded with each other.” (p. 1). The comparability between PPT and CAT should not be assumed as the same, to make sure that examinees are not treated unfairly because of the added complications.

Computer adaptive high stakes standardized tests do not take into consideration outside factors, which have an impact on high-stakes test such as the digital divide in environments of poverty. Accountability through standardized assessment increased excluding many students who are not successful in the application of taking and doing well on the computer adapted high-stakes standardized test. Standardized tests do not take the variety of experiences of students into consideration when it comes to standardized test or outcomes of the test. Low academic students’ performance in high-poverty schools has been a widespread, systematic problem in the public school system.

### **Students and Schools of Poverty**

One out of every five children lives in poverty (Hernandez, 2011). Since the year two-thousand, children living in poverty is increasing. According to the American

Community Survey (U.S. Census Bureau, n.d.), familiarities common in poverty populations include single-parent households, generational poverty, exposure or experiences to neighborhood violence, and alcohol or substance abuse by adults' figures. All of these bring their own share of challenges and can be overwhelming to deal with for low-income children adolescents already dealing with common development stressors related to puberty, peer-related stress, and motivation to achieve academically (Cross, 2010).

Over 16 million children in the U.S. exist in families that are suffering from poverty-related issues, and 5.7 million of those children are under the age of six (Jiang, Ekono, Skinner, 2015; National Center for Children in Poverty, 2006). Poverty is defined as the level at which a family's annual income is considered below what is deemed necessary for the family size to live (Burney & Beilke, 2008). A family is considered to be below poverty if the income for the year is below the threshold number assigned the family based on its size (Burney & Beilke, 2008). This supports the relationship between student achievement and family economic status. Research is clear that the achievement gap persists between upper and lower socioeconomic groups of middle school students (Mullis et al., 2012; NCES, 2006, 2010)

The scope of students living in and attending schools in poverty is staggering and a challenge for which the teaching profession must address. According to Woodard, 2012, "One in four children were living in poverty in 2012, and one-fifty were homeless living in shelters, motels, cars or shared housing" (p. 13). Schott Foundation (2009) states, all children, regardless of skin color, ethnicity or socioeconomic status, deserve access to high-quality education and a fair and substantive opportunity to learn. For many children living in poverty or born into poverty are connected to the economic hardships of their parents or

caregiver. Consequently, they encounter cultural and social differences and limited access to basic living conditions, which include shelter, education and basic health care, (Houston, 2011; Ladd, 2012).

### **Types of Poverty**

Jensen (2009) defines six types of poverty. *Situational* poverty is a sudden onset presented by an event such as death, divorce, illness, or disaster. *Generational* poverty is poverty, which spans over two generations within a single family. *Relative* poverty means a family has funds “insufficient to meet society’s average standard of living” (Jensen, 2009, p. 6). *Urban* poverty occurs in metropolitan areas of 50,000 people or more, generally characterized by overcrowded living conditions, violence, and a great demand on inadequate public services. Areas with populations less than 50,000 are rural and can have limited access to services and support. *Rural poverty* occurs in nonmetropolitan areas with small populations under 50,000. *Absolute poverty* involves a lack of resources like food, water, shelter. Families who live in these conditions are focused on day-to-day survival.

Regardless of the type of poverty, when experienced for a lifetime, it affects cognitive ability early in a child’s life (Jensen, 2009). Stress factors that accompany poverty sometimes result in impaired parenting skills that result in neglectful, sometimes harsh, parenting styles that are not as nurturing or rich in intellectual stimulation as those of in higher income brackets parents (Jensen, 2009). Intellectual stimulation in the early pre-school years is essential to academic achievement later in life. Therefore, early neglect of children damages cognitive growth and brain development, which may lead to specific learning disabilities, learning disorders and even attention deficit hyperactivity disorder (Jensen, 2009).

## **Poverty and Health**

Gorski (2013) states, children living in high-poverty environments have been found to have more neglected and untreated health conditions, which include exposure to violence, hunger, lead poisoning, and higher incidence of asthma than children who come from wealthier backgrounds. Researchers have linked health factors connected with living in poverty have the potential to negatively impact the learning ability of children who live in poverty (Reglin, Akpo-Sanni, & Losike-Sedimo, 2012). Darling-Hammond (2013), explains, these factors were correlated with lower attention spans, cognitive reasoning, development, and reasoning may be a predictor of poor academic performance for children of poverty.

Research has emphasized the potential negative effect poverty has on young children's health and brain development at such a young age (Schmit, Matthews, Smith, & Robbins, 2013). Families of poverty without consistent food, clothing, and shelter cause great stress for not only the adults but the children too. The experience of childhood poverty has been linked with lower academic attainment, developmental delays, and biological alteration to the child's brain (Ladd, 2012; Shonkoff & Gardner, 2012). The research literature on poverty and the well-being of children demonstrate how exposure to disadvantaged environments has negative long-term effects on child development and academic achievement (Amatea & West-Olatunji, 2007; Dixon & Frolovra, 2011).

## **Education and Poverty**

Socioeconomic status levels can be determined by the percentage of the student population, which receive free or reduced lunch during any academic school year. Title I funding is related to the percentage of free or reduced lunch. Educational leaders have



curricular opportunities for low-performing students to make academic gains, predominantly in Title I high-poverty schools (Ladd, 2012).

Marquis-Hobbs (2014) states that in the United States, “one of every five public schools is classified as a high-poverty school as reported by the U.S. Department of Education” (p. 34). Marquis-Hobbs also specifies the amount of high-poverty schools has significantly increased over the past decade. Children that live in poverty have lower academic test scores, lower academic performance, and higher dropout rates and are less likely to enroll in higher education such as universities and colleges (Herbers, et al., 2010; Ho, Li, & Chan, 2014).

Educators who teach in high-poverty schools must deal with the inefficient amount of resources allotted for providing quality education to children who live in poverty. These children come to school with developmental delays in learning, psychological disorders, and emotional behaviors because of the environment they come from. As a result, educators who serve children in high-poverty schools have a shortage of resources and are still required to meet the demand of state mandated initiatives such as high-stakes testing for students (Brown, 2015).

Poverty is a constant issue that continues to rear its negative impact, and its effects on students remain when it comes to education. Brown (2015) stated,

Students who live in poverty come to school at a handicap, arriving at their classrooms with more intensive educational needs than their middle-class and wealthy classmates. Students who live in poverty are behind in academically as opposed to their peers who come from backgrounds that are more affluent. (para. 1)

Poverty effects are numerous and can affect physical and mental development before they enter school as well as during the years in school and their futures. The complications of students living in poverty are devastating. There are abundant amounts of factors associated with the development of students who live in poverty. Several factors that contribute to the low performance of students in poverty include the negative effects associated with frequent moves and school changes (Smitherman, 2016); some negative characteristics of the neighborhoods; lack in high-poverty schools; school funding restraints; lack of cutting edge technology; and limited technology instructors.

Traditionally, children of poverty who attended high-poverty schools and come from a lower socioeconomic background scored lower on computer adaptive testing, had higher school dropout rates, and acquired lower paying jobs than students who attend lower-poverty schools (Jensen, 2009). Age is a big factor when it comes to poverty it is very significant. Students who experience poverty at an early age in their education, such as preschool through second grade, are less likely to complete high school than children who experience poverty only later in their school career (Jensen, 2009).

Consequently, the less time a child spends in poverty, the less his or her academic career is affected. The Adequate Yearly Progress (2015) states poverty has an adverse effect on children's academics, specifically during the beginning stages of childhood. Jensen (2009) separated the main risk factors affecting families in poverty into four major clusters: emotional and social challenges, acute and chronic stressors, cognitive lags, and health and safety issues (p. 7). Countless number of students who live in poverty face: mental, social, and emotional unsteadiness due to an insufficiency of sturdy, stable, and emotional adults or care-takers within the household; unsafe and unstable environments; insufficient amounts of

time each week experiencing harmonious, reciprocal interaction; and poor levels of personalized, increasingly complex activities (Jenson, 2009).

Morgan et al. (2009) stated, “children who come from lower social, economic backgrounds are about twice as likely as those from higher SES homes to display behavior problems, which are largely attributed to the effects of having a mother with a low educational level” (p.401). Children who live in poverty have a greater risk of academic and behavior problems; they have a higher chance of not being successful academically. Frequent absences result in students who have more academic challenges than peers who have better attendance.

One factor is disadvantaged students are commonly taught by the least effective educators (DeLuca, Takano, & Hinshaw, 2009; Feng, 2010). The NCLB Act addresses this issue by categorizing teachers as “highly qualified.” The federal definition of a Highly Qualified Teacher (HQT) is one who meets all of the following criteria: holds at least a bachelor degree from a 4-year institution; fully certificated or licensed by the state; and demonstrates competence in each core academic subject area in which the teacher teaches. Teacher quality adds to student success in high-poverty schools. The success of depends on the motivation and capacities of school leaders.

The perception that students who live in poverty do not perform as well as their peers who come from backgrounds that are more affluent is not new. Coleman (1967) observed a large sample of students from across the country and found that students who attended high-poverty schools did not perform academically as well as students who attended school with students who came from the more prosperous background. The same type of pattern became apparent again in 1983, where concerns were elevated with the release of *A Nation at Risk*

(1983) a national report that noted substantial concerns with the American education system (as cited in Ladd, 2012).

Eric Jensen's (2009) "Teaching with Poverty in Mind" addresses crucial aspects of how poverty affects academic performance for students who live in poverty or come from a low socioeconomic background. Jensen covers the stages from birth to the early childhood through theory and research.

### **Poverty, Caregivers and Cognitive Development**

Children who grow up in poverty are less likely to have durable and dependable caregivers who can provide consistent care, attention, guidance, and unconditional love. They tend to be overworked and overstressed and very dictatorial with children in their care (Jensen, 2009). According to Jensen (2009), many caregivers who live in poverty have an insufficient amount of education themselves and do not participate in school or after school activities with their child. These caregivers are short with positive, warm emotions, which are beneficial to the emotional and social development of a child. They have a hard time forming a strong, healthy relationship with their child. These parents often have low self-esteem, depression, and they feel powerless within society and have trouble dealing with their own negative issues. These feelings are often passed down to the child, which may, later on, cause teenage depression for the child.

Along with these issues, children who come from low socioeconomic backgrounds also face social instability. They tend to watch too much television with little social interaction with peers, which in the long term will cause socioemotional consequences for the child. Children who come from a low socioeconomic background deal with poor nutrition,

lack of medical care, high mobility, dysfunctional family life, lack of enrichment outside the home, and are susceptible to higher dropout rates (Jensen, 2009).

Jensen (2009) makes it clear that any deficits in these areas, which impede the ability to produce new brain cells and modify the path of a child's maturation. This will lead to underdevelopment brain cells, which causes social and emotional dysfunction early on in a child's life. Children who grow up with the solid, trustworthy, and secure relationship will provide children with needed social behavior and provide a structure for building lifelong social skills, which are important in school behavior and performance.

Jensen (2009) wants readers to understand that low socioeconomic status has a strong correlation with children's cognitive ability and are indicators future of grade retention and standardized achievement test. There is a strong learning disparity for children who come from less socioeconomic backgrounds than their peers who come from backgrounds that are more affluent. Cognitive stimulation is a huge part of child development and many children raised in poverty enter the early years of education already behind their wealthier peers. Children who come from poverty receive less cognitive stimulation from parents and the environment they lived in the deficits lead to children brains being underdevelopment socially and emotionally due to the lack of interaction and challenged intellectually by caregivers on a consistent basis.

*In Teaching With Poverty In Mind: What Being Poor Does to Kids' Brains and What Schools Can Do About it*, Eric Jensen (2009) explains the impacts poverty has on the brain. Students who come from low-socioeconomic backgrounds are five times more likely to episodes of anxiety and undernourishment, and improper medical care. Jensen (2009) also states that students in poverty are more often to react to stressful circumstances in an

educational setting. Development of social and emotional issues are critical stages for children but from those who come from poverty they may lack a comprehensive range of health and physical emotions such as low birth rate less optimal brain growth will affect school performance in the future. Poverty can affect learning in a many ways. There has been a tremendous amount of studies dedicated to learning more about how poverty effects education.

### **Testing Context: Access, Tool, and Skill**

Students of poverty are inadequately prepared to use computers as a testing tool in place of paper and pencil, and schools of poverty are not designed properly for computer labs. As a result, computer-adaptive testing administered in schools of poverty may have poor testing conditions. There is no doubt that the rationale for computer adaptive testing (CAT) is for the benefit of all students, including students of poverty. Computer adaptive testing was designed to assess all students equitably and to do so more efficiently and accurately than paper and pencil (P&P) testing. According to Wainer (2000), the CAT process allows it to diagnose any flaws or gaps in student learning, making it valuable for all students.

Several studies conducted to compare CAT to P&P administration have found CAT to produce more accurate scores on several ability levels. It is a better measure of the academic growth of students (Hoff, 2007). Teacher computing skills are critical for student learning and development. Educators must incorporate all that technology offers into their instruction. Technology has revolutionized education in many ways having educators with skill-sets in technology is critical for students who attend high poverty schools (DeLuca, Takano, & Hinshaw, 2009; Feng, 2010). To prepare students for the workforce as well as

college, teachers must have the ability to integrate technology into the classroom. However, many schools of poverty lack educators who hold these skill-sets, which has a negative profound effect on children who live in and attend schools of high poverty. Even when computers are available to students who live in poverty, teachers must have the expertise to successfully teach and integrate these skills successfully in the classroom (NCLB, 2001).

Limited technology access is often referred to as the Digital Divide. Warschauer and Matuchniak (2010) described the impact of the digital divide issues as transforming to the school environment:

The larger and growing role of new media in the economy and society serves to highlight their important role in education, and especially in promoting educational equity. On the other hand, differential access to new media, broadly defined, can help further amplify the already too large educational inequities in American society. On the contrary, it is widely believed that effective deployment and use of technology in schools can help compensate for unequal access to technologies in the home environment and thus help bridge educational and social gaps. (p. 180)

School experience with computer technology improves computer knowledge and skills; not having access to computer technology creates gaps in learning. Students who are not in a school setting further increases the learning gap between students who have adequate access to computer technology and students who do not have access at home (Vigdor & Ladd, 2010; Wei, Teo, Chan, & Tan, 2010). According to Boxer, Goldstein, DeLorenzo, Savoy, and Mercado (2011), “Economically disadvantaged children are perceptive to barriers they face to succeed at the same level as children from non-disadvantage communities, and thus might be disengaged from education and less likely to pursue higher education” (p. 610).

According to Takeuchi's (2012) case study research young children's access to and interest in technology are shaped by cultural, institutional, interpersonal, children need developmental stimulation and access, and to technology, so their individual learning can progress. For children who live in poverty, summer months harder for them, than for students who do not live in poverty, due to the lack of academically rich language, social events such as museums, zoos, private tutoring, and camps. Since these children are not exposed to enough literature and vocabulary over the summer months, these factors contribute to the learning gap along with limited access to technology (Takeuchi, 2012). Although school experience with technology increases technology skills, access disparities away from school, preserve the knowledge gap, between students with access to technology and students who do not have access to technology on a consistent basis (Vigdor & Ladd, 2010; Wei, Teo, Chan, & Tan, 2010).

Another factor, which contributes to underperformance by students, is the difficulty of assessing the effectiveness of technology in schools of poverty and the amount of support provided to educators when it comes to technology in schools of poverty. Because of the lack of support, technology implementation is not a priority for students or teachers. Many educators do not have adequate training in technology due to the lack of professional development in computer technology (Ertmer, 2012). It is important to know what effective leadership practices look like to understand the direct impact on student achievement. This begins with strong leadership who value technology and strive to have highly qualified technology teachers. As part of outcome expectancy for NCLB, leaders are required to facilitate effective teaching and learning (NCLB, 2001).



Students who live in poverty and attend elementary schools located in impoverished neighborhoods normally do not do well on standardized test. Standardized testing is a way to measure student performance in Language Arts and Mathematics. The computer-adapted test includes questions that adapt to each student's performance and feature "performance tasks" these tasks mimic real world application of students' knowledge in both math and language arts in which students who live in poverty may not have had an opportunity to experience. Students who live in poverty face an uphill battle with a standardized test (Clotfelter, Ladd, Vigdor, & Wheeler, 2007).

Technology is infused into modern education for students to gain 21st-century skills depends on the attitudes educators have towards technology. To understand the intersectionality of low academic performance of students of poverty, and schools of poverty using technology as a testing tool in standardized high stakes, it is important to examine each variable and related theories. Typically the low academic performance of students living in poverty and attending high poverty schools, are attributed to a variety of reasons, none of which include limited proficiency in using technology as a testing tool (Ertmer, 2012).

High poverty schools are characterized by many factors. According to the National Center for Education and Statistics (NCES, 2010), the percentage of elementary schools students enrolled in or eligible for free or reduced-price lunch (FRL) through the National School Lunch Program (NSLP) is 76%–100% of students. Twenty percent of elementary schools in the nation are high poverty (NCES, 2010). Currently high poverty schools are labeled Community Eligibility Provisioning (CEP) schools. Through (CEP), the federal government provides free meals to all student, including those who would not normally qualify for free meals. The aspect of the use of the free and reduced lunch designation as a

measure of socioeconomic status in research is a source of debate; however, it continues to be used as an established part of the educational quantitative research.

Additionally, NCES reports teacher educational attainment, and professional certification varies by school poverty level. For both elementary and secondary schools, a smaller percentage of teachers working in high-poverty schools had earned at least a master's degree and a regular professional certification than had teachers working in low-poverty schools (NCES). High poverty schools often do not prioritize technology because of restrictions of resources. Technology teachers are also used at poverty schools to teach technology as extra enrichment for students if funding is available (Stegman, 2014).

Furthermore, schools in poverty have difficulty attracting and maintaining technology teachers (Stegman, 2014) causing students in high-poverty schools to lack adequate access to technology instruction and technology teachers. Technology teachers serve as resource teachers for a district, often with one teacher serving 5 to 10 schools (Anderson, 2014). With limited instructional time on the use of educational software, very little, if any, time is spent on teaching students how to use technology as a test-taking tool. Teachers may have the ability to maximize the effectiveness of technology and increase achievement rates, but many are wary of fully implementing technology into their classrooms (Klamik, 2005). Students in schools of poverty are faced with the challenge of limited technological resources (Davis, 2012), teachers' lack of training on why and how to use technology as a tool, unfavorable technological testing culture, limited access to technology at school, and inadequate facilities (Leonard, 2012).

Poverty limits the possible future of students who live in poverty. Schools located in poverty neighborhoods do not provide the necessary skills based curriculum, technology,

coursework, or effective teachers to assist students who live in poverty succeed in education early in their educational journey. Bronfenbrenner's Ecological System (1965) states, the microsystem encompasses the relationships and interactions a child has with her immediate surroundings. Structures in the microsystem include family, school, neighborhood, or childcare environments. At this level, relationships have impact in two directions - both away from the child and toward the child. If the child is living in poverty, it has a direct effect on child because poverty is a part of the everyday environment. If the structure of poverty is normal in the child's life the child will adapt to the environment and the relationships which surrounds the child. Within Bronfenbrenner's Ecological System Theory my study encompassed the microsystem. The micro system's setting is the direct environment children have in their lives. Which includes family, friends, classmates; teachers, neighbors and other people who have a direct contact with you are included in your micro system. The micro system is the setting in which we have direct social interactions with these social agents. Within the social interactions and the social agents, the layers of microsystem, which directly affects the child my study, will be testing in Bronfenbrenner's Ecological System Theory. All parts are integrated when it comes to computer adaptive testing. The microsystem foundation will test the abilities of the child's strength when it comes to using technology as a tool on standardized tests.

According to Stuart et al., (2011), a school's location, neighborhood factors, or level of academic achievement do not clearly parallel with perceptions of school safety. Therefore, if students perceive they are not in a safe place, they will not fully reach their academic potential. Rourke and Coleman (2010) piloted a case study on scaffolding with digital learning using technology. Through the research, it concluded students who develop

the scaffolding process are more self-directed and independent through education while understanding that instruction guides the application of technology (Rourke & Coleman, 2010).

Equity and access are huge issues in the modern public school systems when it comes to technology. Technology has become a channel for providing stability, equity in education through accessibility. Education professionals (in particular, technology educators) are responsible for guaranteeing that technology resources and equipment furnished to local educational agencies provide equal access and opportunity for all students no matter their socioeconomic background. Technology has become a prevalent part of the overall educational system and computer adaptive testing has many benefits. All students' social economics should not deter and limits students who live and attend schools located in areas of poverty (Weber & Dixon, 2007).

With technology tools such as the web blogs, wikis, learning management systems, and podcasts, education might be utilized more effectively. The evolution of technological advances has transformed the way members of every generation communicate, work, learn, acquire information, and create (Weber & Dixon, 2007). Although school experience with technology improves digital skills, access disparities among schools, especially schools of poverty, perpetuate the knowledge gap between students with access and students without access at home (Vigdor & Ladd, 2010; Wei, Teo, Chan, & Tan, 2010).

Lack of access compounds difficulty for students. Having early exposure to computers in schools can reduce the gap in children's computer skills due to lack of access before entering school (Sackes, Trundle, & Bell, 2011). Sackes et al. (2011) suggested socioeconomic status and having a computer at home were predictors of computer skills at

the beginning of kindergarten, but the availability of computers beginning with kindergarten classrooms served to reduce initial skill-gaps over time, particularly by third grade. Thus, computer experiences in elementary schools are critical to closing the digital divide by helping students from impoverished communities develop computer skills (Sackes et al., 2011). Digital equity will be achieved “when all students have an equal opportunity to benefit from modern information, communication, and productivity tools” (Williamson, 2011, p. 12) essential to maximizing instructional and social outcomes for students (Chan, 2011).

Decisions regarding dispersal of technology have the greatest potential to affect equity at the elementary level. Because the student population of elementary schools is drawn from a smaller geographic area and therefore from fewer neighborhoods, student demographics and socioeconomic levels vary from one elementary school to another in a more extreme manner than in secondary schools. This difference reflects the fact that secondary schools serve much larger numbers of neighborhoods than are served by elementary schools. Therefore, elementary schools are more likely to serve students in a high poverty area or students in a low poverty area than are secondary schools (Chan, 2011).

Access, computer usage, and the Internet are critical tools that allow an opportunity to gather information, learn, communicate, and compete in the field of education. The digital divide is a fundamental wedge separating both individuals and people from under-represented groups from accessing and using information provided through technology in education. The digital divide provides more opportunity for those who have access to technology. The educational opportunities students encounter different for each student. Educators use technology in all aspects of student learning: developing lessons, delivering

instruction, assessment and content remediation. Technology can be a valuable tool used in the school of high poverty, which can increase active student engagement in the learning process. The use of technology will play a pivotal role in the education of all students no matter what socioeconomic background (U.S Department of Education, 2015).

The National Council of Teacher of Mathematics lists computer technology as one of its six principles according to the (National Council of Techers of Mathematics, 2015). The National Council of Teachers of English lists a position statement entitled “Beliefs about Technology and the Preparation of English Teachers” to guide English educators in education and in-service areas on the focus areas and implications of technology (National Council of Teachers of English, 2015).

Leu, Kinzer, Coiro, Castek, and Henry (2013) agreed when they argued the importance of schools integrating new literacies into classrooms if students are to be prepared for the literacy futures they deserve. “Social forces and the technologies they produce define the changing nature of literacy” (Leu et al., 2013, p. 151).

Since of this evolution in technology use in society, technology integration in the classrooms has also been increasing rapidly. Countless schools around the country have some form of computer access for their students. Schools are beginning to provide and expose students to a greater level of technology. Students are developing experience with these tools and are having more exposure at a younger age than previous generations (Leu, Kinzer, Coiro, Castek, and Henry, 2013).

Technology has become a valued part of the classroom. Although it is not needed in, every lesson, technology is becoming more predominant in classrooms of the 21st century. Teachers used technology in everyday classrooms in some capacity or another. Technology

continues to provide new information about learning. The diverse learning needs, abilities, demographics of students vary widely around the nation. The abilities of all students must include technology and the need to practice and prepare for computer adapted standardized testing (Leu, Kinzer, Coiro, Castek, and Henry, 2013). According to Livingstone (2012), educators should be uncertain of one-dimensional thinking and that it seems simple to think that increasing the use of Instructional Technology Tool (ITT) would guarantee student achievement and critical thinking skills when using technology. White (2014) states, depth of knowledge Chart to help determine the depth of knowledge that students were engaged in through the use of Instructional technology methods and used as a tool to enhance student assignment performance.

### **Technology Today and Tomorrow**

In the 21st century, many educators assume all students are technology skilled. Children are exposed to technology such as iPads and other learning devices at a young age. Children who live in poverty and do not attend preschool or do not have access to technology are already starting out behind. This creates the digital divide amongst students who have had experience with technology and those who have never touched a form of technology (O'Hanlon, 2009). According to O'Hanlon technology is one of the ways in which school districts all over the country are teaching students of low socioeconomic status (O'Hanlon, 2009). Educational leaders are always searching for ways to engage students and maximize learning potential. Some of the evidence educational leaders strive for include enthusiastic ways to engaging students' learning, innovative instructional strategies, a strong disciplinary foundation in educational teacher leadership and pedagogy, and teaching tools used in the classroom. Other evidence includes student involvement and participation, the interaction

between teachers and students, and overall evidence of learning. Engagement and confidence are some of the most important characteristics of learning in schools that incorporate technology (Scherer, 2011).

The primary focus of educational reform since the national legislation of NCLB has been on improving teacher performance and instruction to increase student academic achievement measured by standardized tests. Educators must provide students with adequate practice time with technology. Technological advancements are driving an expansion of instructional opportunities for all students at all levels of education; it is important to assess influences effecting student motivation which technology provides. This can lead to academic achievement and high academic scores on a standardized test (NCLB, 2001).

Much effort has gone into strategies to improve the academic achievement of low SES students, including the use of additional federal Title I funds for technology integration and various teaching programs designed to improve student learning (Baker & Johnston, 2010). Another factor common in low school achievement is the loss of academic accreditation and re-staffing of schools who do not meet the national report card with adequate progress over time. This consequence can be psychologically damaging to all stakeholders and especially to students (Baker & Johnston, 2010).

Technology in education has given educators, students, stakeholders a forward way of thinking. Educators must acknowledge the skill-set of students when it comes to technology in today's classrooms. There are digital learners in classrooms all across the country these students have attained acquired sufficient technology skills. According to Murcia (2008), technology is needed in classrooms today more than ever before to engage and motivate students in an increasingly technological world. Gasparini & Culen (2012) explain the new



classroom ecology is a system, which consists of teachers, educational leaders, student practices, and technology. This kind of educational environment means educators use the technology devices such as computer devices within classrooms (Gasparini & Culen, 2012). In most schools of poverty, educators and teachers have not been able to focus on the development and improvement of teaching methods using computer technology as a technological tool, because of lack of computers and technology teachers. Consequently, there is a lack of development and contribution in the investigation and support of the goals of the curriculum (Barrett-Greenly, 2013).

In education, school leaders and educators must create an abundant amount of opportunities for students to acquire access to technology in the 21st century. However, for students who live in high-poverty, they are the exception. The integration of technology into instruction and scaffolding students in the learning process will benefit students. This process will allow students to be nurtured and expand critical thinking skills, problem-solving skills, creativity, and skill building. The solution consists of the incorporation of advances in pedagogy in technology and the way students engage with technology in a school setting. If educators apply the right balance of technology instruction along with student engagement and participation, the learning will come to students no matter their socioeconomic background (Fullan, 2013, p. 15). With the scarcity of technology teachers in school districts of poverty, students of poverty and their teachers are unable to incorporate comprehensive technology and do so with regularity. The many applications and tools used to gather content, delivering information and instruction are accessible which can attract students to study the content and provide more skill building using technology as a learning environment for students (Shepherd & Reeves, 2012).

Students of poverty are at a disadvantage because of their lack of technology skills when it comes to CAT, according to Wang (2010). Computer adaptive high stakes testing remain a challenge in high poverty schools. Computer-lab facility issues are also a challenging factor for schools located in poverty neighborhoods.

### **Testing Context: Conditions of Facilities Used For Computer Labs in Schools of Poverty**

The testing conditions influence on test performance continues to be researched because the results has been mixed. According to Cheryan, Ziegler, Plaut, and Meltzoff (2014),

The physical classroom environment influences student achievement. “The building’s structural facilities profoundly influence learning. Inadequate lighting, noise, low air quality, and deficient heating in the classroom are significantly related to worse student achievement. Over half of U.S. schools have inadequate structural facilities, and students of color and lower income students are more likely to attend schools with inadequate structural facilities. (p. 4)

However, according to Ulrick and Bowers (2011), there is no relationship between high school facility quality and student achievement. In their study, Ulrick and Bowers used a large, nationally representative U.S. database of student achievement and school facility quality Bowers and Urick tested facility maintenance and disrepair, [to see] If there is a relationship, addressing facility disrepair from the school, district or state level could provide a potential avenue for policymakers for school improvement. [They] analyzed the public school component and the facilities checklist of the ELS:2002 survey (8110 students in 520 schools) using a 2-level hierarchical linear

model to estimate the independent effect of facility disrepair on student growth in mathematics during the final two years of high school controlling for multiple covariates at the student and school level. [They] found no evidence of a direct effect of facility disrepair on student mathematics achievement. (p.72)

Uline and Wolsey, (2011), “School buildings are complex places that influence the occupants even as those occupants adapt to the environment” (p. 24). According to the National Center of Education Statistics (1999):

The percent of schools, reporting at least one unsatisfactory environmental condition, varied by locale and concentration of poverty. [...] Schools with the highest concentration of poverty were more likely than those with the lowest concentration of poverty to report at least one unsatisfactory environmental condition. (para. 4)

According to Hudley (2013), “in general teachers in high-poverty schools more often report having to work with outdated textbooks in short supply; outdated computers and other kinds of technology; and inadequate or nonexistent science equipment, materials and labs” (para. 2). It appears, poverty plays a role in the effect of poor facilities on students’ achievement.

## **Summary**

The following literature was expounded upon in this chapter: (a) computer adaptive testing; (b) testing context: technology as a tool in high stakes testing, (c) testing context: technology skills, (d) testing context: adequacy of computer labs for testing, and (e) students and schools of poverty

### **Chapter 3: Methodology**

The intent of this chapter is to provide information about the methodology of the study and the method used to collect data to determine what, if any, relationship exists between school climate, standardized testing, and technology in high-poverty urban elementary school settings. The independent variable is students who live in poverty attend schools located in economically disadvantaged neighborhoods. The methodology used for this is a quantitative design called causal-comparative. Methods of collecting data include research and observation of post data and surveys. The data collected occurred during the 2015-2016 school year.

#### **Permission to Conduct the Study**

The first step in this research process was to complete the Institutional Review Board (IRB) process outlined by the university institution for permission to conduct the research and its purpose. Once the IRB had granted permission, the researcher sought the permission of the elementary schools whose teachers would be asked to participate in the study. The researcher understood that data from these schools would not be collected until permission to move forward to conduct the study was granted by the IRB. The researcher anticipated documentation from the school district to conduct this study. After permission was granted, the researcher presented each school's administration and third-grade teachers a survey, which was pivotal in the research process. All schools involved in the study were kept confidential.

#### **Statement of the Problem**

Since many states have adopted the Smarter Balanced high stakes computer-adaptive test (Hensley, 2015), yet no formal considerations have been given to the availability of

adequate computer lab facilities in schools of poverty, nor the ability of students of poverty to use technology as a tool in testing. Of particular concern to the researcher are students in third grade who are being tested on high stakes testing for the first time, with very little practice on using technology as a tool, and who are going to be administered the test on computer-adaptive testing, in a space not suitable to serve as a technology lab. These two technology-related testing factors or testing context, in a poverty setting may adversely affect the academic performance of the third graders. Factors which contribute to the low performance of high poverty elementary students on computer-adaptive high stakes testing is because of lack of technological knowledge, access, proficiency in technology skillset on the use of computers as a testing tool (Gordan, 2011). A secondary hypothesis was that the poor conditions of the computer labs in schools of poverty also adversely affect the performance of students tested in that space.

### **Purpose of the Study**

The purpose of the study was to determine what, if any, relationship exists between the use of technology as a tool in computerized adaptive standardized testing, students' technology skills, the adequacy of computer lab facilities, and academic performance of third-grade students (first-timers in standardized testing) on level of poverty of the elementary school.

### **Research Questions**

Three research questions were developed for the present study. The data was collected through a survey and then analyzed.

1. What relationship exists between (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class (c)

rating of testing conditions and the performance of third graders on statewide-standardized high stakes computer-adaptive math and language arts tests?

2. What relationship exists between (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in a class (c) rating of testing conditions, and the level of poverty of a school?

3. How much variation in academic performance of third graders in (a) standardized high stakes computer-adaptive tests in math and (b) standardized high stakes computer-adaptive tests language arts, can be attributed to the time spent on practicing how to use technology as a testing tool, students' proficiency in using technology in class, and rating of testing conditions?

### **Null Hypotheses**

H1: There is no relationship between (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class (c) rating of testing conditions, and the performance of third graders on statewide-standardized high stakes computer-adaptive math and language arts tests.

H2: There is no relationship between (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in a class (c) rating of testing conditions, and the level of poverty of a school.

H3: There is no relationship between the variation in academic performance of third graders in (a) standardized high stakes computer-adaptive tests in math and (b) standardized high stakes computer-adaptive tests language arts, and the time spent on practicing how to use technology as a testing tool, students' proficiency in using technology in class, and rating of testing conditions.

Using a causal-comparative study, the researcher plans to examine in a northwestern state, the impact of the testing context on third graders academic performance in high stakes tests of 58 elementary schools that range in classification from “not applicable to free-and-reduced-lunch to 95% free-and-reduced-lunch.” Testing context refers to the level of use of technology as a tool in computerized adaptive standardized testing and the adequacy of school computer lab facilities, in this study, and the following indicators will be measured from the perspective of third-grade teachers and their school principals’ records:

- Number of hours on average third graders practice how to use technology as a tool in a computerized adaptive test (practice taking computer adaptive testing)
- Average rating of the testing conditions for third graders during the computerized adaptive testing
- Average rating of the technology skill of third graders
- Average performance of third graders on computer-adaptive tests in Math & Language Arts

The researcher developed a fact-gathering tool to collect the data from the administrators and third-grade teachers of the 54 elementary schools identified. The purpose of the study was to determine the degree to which the skill and use of technology as a testing tool (independent variables) contribute to the performance of third graders on statewide standardized high stakes computer-adaptive tests (dependent variable). The researcher also conducted a logistic regression to determine how much variation in academic performance can be attributed to mastery of the use of technology as a testing tool and the impact of testing conditions of computer labs.

## **Research Design**

The research design used in this study is a non-experimental, causal-comparative study. According to Creswell (2014), one type of non-experimental quantitative research is causal-comparative research in which the investigator compares two or more groups regarding a cause (or independent variable) that has already happened. This type of research design was used to explore causal relationships among independent variables that cannot be manipulated. The independent variables for this study are the state of poverty of the elementary schools, student access technology to practice for test and use of technology as a tool, the level of technology proficiency of the students, and the testing conditions of the facility. The dependent variables are student scores on math and English language arts standardized computer- adapted test. Causal-comparative research design attempts to determine reasons, or causes, for the existing condition. A causal-comparative design also “seeks to discover possible causes and effects of a behavior pattern or personal characteristics by comparing individuals in whom it is present with individuals in whom it is absent or present to a lesser degree” (Gall, Borg, & Gall, 1996, p. 380). A causal-comparative design was chosen over an experimental design because the researcher was not be able to manipulate the independent variables.

This was a multi-site study using a survey because I collected data from over 50 elementary schools. The population data collected for the purpose of this study was third grade teachers and their schools’ principals, in the target school district. Third grade teachers and administrators were selected because in third grade students take their first computer-adaptive standardized test. With this being the first time for the students, this would give the researcher a highly non-confounded result on the testing context, that is, impact of



technology as a tool, skill in technology use, and the conditions of the computer lab testing conditions.

The data collected include information gathered from the school district webpage (specifically Smarter Balanced 2015–2016 third grade Math and English Language Arts scores and the percentage of free and reduced lunch), and the Testing Context Survey (TCS), distributed via Qualtrics. The quality of the data will be comprehensive and unmodified, since the measurements used include a quantitative survey questions and factual data on the school district website.

### **Participants**

The target population of the study consists of a variety of elementary schools located in one Northwest region in the United States. The elementary schools ranged in classification from “not applicable to free meal by direct certification to 95%. I examined 54 elementary schools within one school district in the Northwest part of the country. I surveyed all 3<sup>rd</sup> grade teachers and administrators in one Northwest state in one school district.

The characteristics of the participants are as follows. See Tables 1, 2, and 3:

Table 1

*Average Years of Experience of Teachers per School*

# of Schools	Average years of Experience
2	7 years or less
32	7.1–12
15	12.1–15
5	15.1 or above

Table 2

*Percentage of Teachers with Graduate Degrees*

# of Schools	Teachers with Graduate Degrees
4	50–59%
14	60–69%
16	70–79%
16	80–89%
4	90% & above

Table 3

*Full Time Teacher Employees*

# of Schools	Full-Time Employee (FTE)
7	10–19
32	20–29
15	30 & above

The researcher focused on teachers and administrators of third graders, because that is the first time students take a computer adaptive high stakes test, and he is most likely to have the least threats to internal validity of participants in a testing context than in any of the other grades. The researcher used a non-random sample method to choose the elementary schools for this study. The elementary schools for this study were selected using the 2015-2016 and 2016-2017 school year national report card based on the schools free and reduced price meals eligibility and Free Meal by Direct Certificate.

Participation in this study by all participants was voluntary. The participants consist of third grade teachers and school principals in the northwest school district targeted. The researcher anticipates 50 educators (third grade teachers and school principals) that participating in the study. Specific inclusion and exclusion criteria are explained below.

Inclusion criteria:

1. Third grade teachers in Portland Public Schools
2. Principals who serve as administrators in schools with a third grade
3. A “yes” selection on the signature line of an informed consent included in web based survey
4. Clicking on submit button in the consent form represents signed inform consent

Exclusion criteria:

1. Non-Third grade teachers in Portland Public Schools
2. Principals who do not serve as administrators of schools with a third grade
3. No selection of “yes” in the signature line of an informed consent included in web based survey
4. Not clicking on submit button in the consent form to represents signed inform consent

## **Instrumentation**

The researcher, based on the data identified for collection, devised a survey named *Testing Context Survey*, which used to collect data from 58 elementary schools throughout the school district. No experts were consulted to help with the validity of this new measure. The survey consists of four short questions on the context of standardized testing within elementary schools. The purpose of this survey is to determine the impact of the testing context on the performance of third graders taking computer-adaptive tests in math and language arts. Testing context refers to the average time third graders spend on practicing how to use technology as a testing tool, third graders' use of technology in class, and the testing conditions during computer-adaptive testing of third graders.

The researcher developed the 4-item survey, Testing Context Survey, (TCS) and aligned three survey items with the study's three research questions, almost identically, to attempt to ensure that what the survey measured was what the study intended to measure, i.e., validity. The first three survey items measured each of the three variables identified in the study\_ testing conditions of the testing lab, technology proficiency of third graders, and time spent practicing how to use technology to take computer adaptive tests. In addition, the three items were literature based. The survey instrument had content validity based on the review of two principals and a third grade teacher, who had 60 years' experience in education between them. One was female and one had experience with Title I schools. All three reviewers were knowledgeable about high stakes testing processes and testing changes that had occurred the past two decades. The fourth survey item asked for the name of the school, where the teacher worked. The name of the school was used to determine two factors online on the district's website, the school's average third grade math and English language arts

performance scores on a high stakes computer adaptive test and the school's Free Meal by Direct Certificate Free and Reduced Lunch (FRL) percentage. In addition, the researcher had two additional teachers pretest the survey and they indicated that it was easy to understand. However, the two teachers asked that the fourth question, which offered two response options, be modified and simplified to exclude one of the options.

The survey, TCS, was formatted as a semantic differential scale, which according to Verhagen, Hooff, and Meents (2015) is one of the most suitable methods to assess the strength and preferences of respondents' opinions, attitudes, and meaning of concepts and which linguistically makes it more meaningful than the Likert scale of levels of agreement. Empirical study results reveal that semantic differential scales reduce survey completion time and outperform Likert-based scales on reliability and validity (Verhagen, Hooff, and Meents, 2015). On the TCS, the researcher included in-depth literature-based descriptions, at the two polar ends of each item, to heighten consistency in meaning, that is, reliability.

The survey is set up in a technological software system, named Qualtrics, where responses recorded and presented as an aggregated matrix of participating schools. Participant names were not recorded anywhere in the system or data collection process. Their responses were confidential and the information was used for research purposes only.

The survey is based on a 7-point Likert scale provided to respond to three of the four questions.

Score Ratings:

Not at all	Minimal	Moderate	High	Very High
1	2 or 3	4	5 or 6	7

For each of the three statements, participants were provided a description of the variable being measured. They were to select one point of the 7-point scale to show their response to each statement. The fourth is an open-ended question on the survey and it asks participants to name their school. The researcher needed the name of the school to search the school district website for the CAT test scores in Math and ELA for third graders who took the SBAC tests in 2015-2016 and the percentage free/reduced lunch percentages of each school.

The three survey items include the following and each item has descriptors (See Appendix A for full survey). The fourth item is also included:

1. My students are proficient in using technology in class
2. On average, when preparing for the Smarter Balanced Test each year, my students practice how to take computer-adaptive tests using computers in school for the following number of hours (approximately)
3. My students have these testing conditions during the Smarter Balanced Test.
4. What is the name of your school?

The survey takes approximately 2–5 minutes to complete.

The dependent variables of my study are Academic Performance of Third Grade Students (with respect to the level of poverty of the students) math and Language Arts Scores in Smarter Balanced Consortium high stakes test.

### **Procedure and Data Analysis**

The researcher used a 4-item survey, named the Testing Context Survey, (TCS) to collect data in Qualtrics. The researcher acknowledges that by asking for the school name, it may have threatened anonymity of participants and schools in the study. Consequently, the

researcher did all he can to ensure confidentiality. To maintain the integrity of the study the researcher was committed to the following:

1. The researcher only used the school name to look up the 2015/2016 and available 2016/2017 Smarter Balanced scores and percentage of free and reduced lunch eligibility and Free Meal by Direct Certificate of the schools online.
2. The school name was immediately discarded after this use
3. Schools were labeled in the dataset using non-identifying codes
4. The scores were included in the aggregated data, but not the school name.

With no identification of the school included in the stored and analyzed data, anonymity was upheld. The survey was sent out to third grade teachers and their schools' principals as an email link via Qualtrics, which aggregates the information collected and maintains the confidentiality and/or anonymity of the participant.

Smarter Balanced Scores are in both categorical and continuous data forms. The researcher planned to conduct cross tabulations to determine associations between categorical variables and correlations to determine associations among the continuous data. The researcher also planned to conduct a multiple regression with continuous data to determine how much variation in academic performance can be attributed to mastery of use of technology as a testing tool, technology skill, and the impact of testing conditions. The results will serve to inform schools, teachers, parents and administrators of whether or not to factor in the testing context in preparing students for testing. It may also offer a possible explanation for some of the academic performance scores in schools of poverty.

The researcher sent the survey to the teachers and administrators via Qualtrics email after IRB of both institutions approved the study. The link will include a cover letter

explaining the study (See appendix), and an informed consent for the participants. This study data collection was conducted over a 2–3 week period approximately.

### **Limitations**

Both free and reduced breakfast and lunch percentages and Free Meal by Direct Certificate, formed the basis of classifying participating schools' socioeconomic status, and not an actual socioeconomic status report. The participating teachers and administrators were selected from school website information, which may or may not be accurate. Actual participants were volunteers from the selected sampling.

### **Assumptions**

I assumed that the participants understood the survey. I also assumed that they responded honestly to the survey. I also assumed that the principals were knowledgeable about the test preparation for third graders.

### **Internal and External Validity**

Self-selection was a potential threat to the internal validity of the study, however since the sample was not compared to another sample; the effects of self-selection are reduced. There was an attempt to increase external validity in my study design because I invited all possible participants of the target population to participate from every school in the district. Consequently, the results could be generalized to all types of schools and school settings.

### **Summary**

After getting permission from Concordia University Internal Review Board and the school district research evaluation department, I collected data using a survey from the self-selected participants. They consisted of third-grade elementary teachers and building administrators in one Northwest Region of the United States. The participants gave their



perceptions of the testing context and the 2015/2016 and 2016/2017 school year national report cards of 54 schools. The plan for collecting data, using Qualtrics and analyzing data using SPSS, was indicated in this chapter.

## **Chapter 4: Results**

In this chapter, the researcher presents what the study revealed through the analysis of numerical data and testing of each null hypothesis. The results of each hypothesis testing is stated and used to respond to each research question. The results are stated objectively and descriptively without bias, evaluation, or discussion of the results. Where relevant, tables, graphs, and charts are used present results clearly. In addition, the actual processes or experiences during sampling, data collection, instrumentation, and changes from what was intended in Chapter 3, are justified in this chapter. The research questions, hypotheses, purpose of the study, and limitations are restated to provide context for the study results. Additional analyses, which were not originally part of the study, are included because the ancillary results produced are related to the primary inquiry and may contribute to the credibility of the results.

### **Introduction**

The purpose of the study was to determine the degree to which three testing-related factors affect the performance of students on a test. The three factors include: (a) practice in the use of technology as a testing tool (in lieu of pencil and paper), (b) skill in technology usage, and (c) testing conditions of the testing facility. The researcher refers to these three factors or variables, collectively as Testing Context. The study sought to determine how these factors of testing context contributed to the performance of third graders on statewide-standardized high stakes computer-adaptive tests, by asking teachers and school principals. The researcher used a 4-item survey, named the Testing Context Survey, (TCS) to collect data. Three of the items ask for data on perceptions of teachers and school principals on testing context in their classrooms and schools, respectively.

Participation in this study was voluntary. The participants consisted of third grade teachers and school principals in a large public school district in the northwest of the United States. The researcher chose to focus on third graders, because it is in third grade that the elementary students take a computer adaptive high stakes test for the very first time. With this being the first time for the students, this would give the researcher a highly non-confounded result on the testing context, i.e., impact of technology as a tool, skill in technology use, and the conditions of the computer lab testing conditions.

Specific delimitations to participant inclusion criteria were as follows:

1. Third grade teachers in the selected public schools district
2. Principals who serve as administrators in schools with a third grade
3. A “yes” selection on the signature line of an informed consent included in web based survey
4. Clicking on submit button in the consent form represents signed inform consent

The research used a causal comparative design in this study. According to Creswell (2014), in a non-experimental causal-comparative quantitative research study the investigator compares two or more groups in terms of a cause (or independent variable) that has already happened. The independent variables for this study were the use of technology as a tool in computerized adaptive standardized testing, third grade students’ proficiency in technology use, and the adequacy of school computer lab facilities, in elementary schools. The dependent variable was academic performance of third grade students (first-timers in standardized testing) in Math and English Language Arts Computer Adaptive Testing. Causal-comparative research design attempts to determine reasons, or causes, for the existing condition. A causal-comparative design was chosen over an experimental design because the

researcher was not able to manipulate the independent variables and did not use randomization to select school participants.

### **Description of the Sample**

The researcher targeted all 54 elementary schools in a school district and the total number of principals and third grade teachers in the 54 schools the researcher identified online was 158. All 158 third grade teachers and school principals were invited to participate. The teachers in this district had an average of 11.5 years of experience, Survey information was sent to teachers and administrators via Qualtrics email upon approval from the Research and Evaluation Department of the selected school district and the Concordia University approval Institutional Review Board approval. The Qualtrics link included a cover letter explaining the study, and an informed consent form for the participants. Out of the 158 possible participants, 34 chose to participate, making a response rate of 22%. According to Sheehan (2001), response rate in the social sciences is most likely to be 30%–40%.

### **Summary of the Results**

The results revealed that out of the three concepts that make up testing context, (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class, (c) rating of testing conditions, there is a moderate positive relationship between the perceptions of third grade teachers and elementary school principals' rating of testing conditions and performance of third graders on statewide-standardized high stakes computer-adaptive in math and English language arts. The results also revealed that there is a negative relationship between the perceptions of third grade teachers and elementary school principals' rating of testing conditions and the level of poverty in the school. The testing conditions can predict whether a third grader passes or fails

the statewide-standardized high stakes computer-adaptive in math. The other two testing context factors, time spent on practicing how to use technology as a testing tool and students' proficiency in using technology in class had no relationship with performance of third graders on statewide-standardized high stakes computer-adaptive in math and English language arts, or the level of poverty of the school.

It is important to note that the researcher had planned to collect and analyze 2015–2016 data on participant perceptions and school data. However, during the period of data collection the 2016–2017 academic year data was released, and the researcher was able to collect and analyze current 2016–2017 data. The researcher also collected data on the Free Meal by Direct Certificate (FMDC) instead of the intended Free and Reduced Lunch data. The FMDC is a more accurate measure of the poverty of students and consequently a more accurate measure of the poverty level of each school. I maintained the literature and research on Free and Reduced Lunch data, because it was still relevant, and there appears to be no or limited research on FMDC relevant to my study. I also made these modifications in my attempt to reduce threats to internal and external validity, to help reduce the likelihood of other plausible explanations of the results.

The data collected with TCS was ordinal and so the appropriate statistical analyses conducted to determine relationships and predictors included Spearman's Rho and Discriminant Analyses, instead of Pearson's Correlation and multiple regression.

### **Detailed Analysis**

The study was used to test the following null hypotheses to arrive at responses for the study's research questions. The null hypotheses include:

- There is no relationship between the average (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class, (c) rating of testing conditions, and the performance of third graders on statewide-standardized high stakes computer-adaptive Math and Language Arts tests.
- There is no relationship between the average (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class, (c) rating of testing conditions, and the level of poverty of a school
- There is no variation in academic performance of third graders in (a) standardized high stakes computer-adaptive tests in Math and (b) standardized high stakes computer-adaptive tests Language Arts, that can be attributed to the time spent on practicing how to use technology as a testing tool, students' proficiency in using technology in class, and rating of testing conditions.

In addition, the hypotheses allow the researcher to explore and determine the responses to the following questions:

- What is the relationship between the average (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class, (c) rating of testing conditions, and the performance of third graders on statewide-standardized high stakes computer-adaptive Math and Language Arts tests?
- What is the relationship between the average (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class, (c) rating of testing conditions, and the level of poverty of a school?

- How much variation in academic performance of third graders in (a) standardized high stakes computer-adaptive tests in Math and (b) standardized high stakes computer-adaptive tests Language Arts, can be attributed to the time spent on practicing how to use technology as a testing tool, students' proficiency in using technology in class, and rating of testing conditions?

### **Relationship Between Testing Context and High Stakes Academic Performance**

Spearman's Rho correlational analysis was conducted to investigate the relationship between the average (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class, (c) rating of testing conditions, and the performance of third graders on statewide-standardized high stakes computer-adaptive math and English language arts tests. There was a statistically significant positive relationship between the performance of third graders on statewide-standardized high stakes computer-adaptive in math and the rating of testing conditions  $r(32) = .342, p = .048$ . Also there was a statistically significant positive relationship between the performance of third graders on statewide-standardized high stakes computer-adaptive in English language arts tests and rating of testing conditions  $r(32) = .362, p = .035$ . This indicates a moderate positive relationship between academic performance in math and English and the rating of testing conditions. That is the higher the rating of the testing condition, the higher the academic score in math and English language arts. There was no relationship between the average (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class and the performance of third graders on statewide-standardized high stakes computer-adaptive Math and Language Arts tests. The null hypothesis was rejected. See Table 4.

Table 4

*Relationship among the Participants Perceptions of the Testing Context and High Stakes Academic Performance of Third Graders (N=34)*

Testing Context Concepts	Math Performance	English Language Arts Performance
Time spent on practicing how to use technology as a testing tool	.200	.299
Proficiency in using technology in class	-.175	-.007
Rating of testing conditions	.342*	.362*

\* $p < .05$

### **Relationship Between Testing Context and Level of Poverty in Schools**

A Spearman's Rho correlational analysis was conducted to investigate the relationship between the average (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class, (c) rating of testing conditions, and the level of poverty of a school. There was a statistically significant relationship between the level of poverty of a school and the rating of testing conditions  $r(32) = -.427, p = .012$ . This indicates a moderate negative relationship between the rating of testing conditions and the level of poverty of a school. In general, the more poverty experienced in a school the less the adequacy of the testing conditions, and the less poverty experienced at a school, the more adequate the testing conditions of the school. There was no relationship between the average (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class and the level of poverty of the school. The null hypothesis was rejected. See Table 5.



Table 5

*Relationship among the Participants Perceptions of the Testing Context and Level of Poverty of Schools (N=34)*

Testing Context Concepts	Free Meal by Direct Certificate <i>r</i>
Time spent on practicing how to use technology as a testing tool	.143
Proficiency in using technology in class	.029
Rating of testing conditions	-.427*

\* $p < .05$

### **Testing Context as a Predictor of High Stakes Academic Performance**

A discriminant analysis was conducted to determine whether the three factors making up the Testing Context – time spent on practicing how to use technology as a testing tool, students’ proficiency in using technology in class, rating of testing conditions could predict academic performance, specifically school passing rate in math and school passing rate in English language arts in computer adaptive high stakes tests. The Wilks’ lambda was significant for math performance of third graders,  $\Lambda = .72$ ,  $\chi^2(3, N=34) = 9.82$ ,  $p = .020$ . A follow up analysis revealed that the rating of testing condition as a predictor was statistically significant. See Table 6. The null hypothesis that there is no variation in academic performance of third graders in (a) standardized high stakes computer-adaptive tests in Math and (b) standardized high stakes computer-adaptive tests Language Arts, that can be attributed to the time spent on practicing how to use technology as a testing tool, students’ proficiency in using technology in class, and rating of testing conditions, was rejected. The effect size or eta squared for math was .28, a moderate effect size. Accordingly, 28% of the variability of the math scores associated with pass or fail is accounted for by differences among the testing conditions.

The Wilks' lambda was not statistically significant for English language arts performance of third graders,  $\Lambda = .80$ ,  $\chi^2 (3, N = 34) = 6.61$ ,  $p = .085$ , as regards to any of the three testing context.

Table 6

*Follow-up Multiple Comparisons For Predictors of Math Pass or Fail Status*

	Wilk's Lambda	F (df1, df2)	p
Technology tool Practice hours	.904	3.31(1, 31)	.078
Testing Conditions	.857	5.18 (1, 31)	.030*
Technology proficiency	.924	2.54 (1, 31)	.121

\* $p < .05$

The third grade students' technology proficiency and the students practicing for the test, using technology in place of paper and pencil, could not account for whether the students pass or did not pass English or math. However, the testing conditions could be a predictor for whether the students passed or did not pass math, the testing condition, however, was not a predictor for the English Language Arts.

### Chapter 4 Summary

This chapter presents the analyses of my study to investigate the relationship between the average (a) time spent on practicing how to use technology as a testing tool (b) students' proficiency in using technology in class, (c) rating of testing conditions, and the performance of third graders on statewide-standardized high stakes computer-adaptive math and English language arts tests. There was a statistically significant relationship between both the performance of third graders on statewide-standardized high stakes computer-adaptive in math and the performance of third graders on statewide-standardized high stakes computer-adaptive in English language arts tests, with rating of testing conditions. In addition, there

was a statistically significant negative relationship between and rating of testing conditions and poverty. The testing conditions could be used as a predictor of math pass-fail performance and it accounted for 26% of the math score.

## **Chapter 5: Discussion and Conclusion**

The purpose of the chapter is to discuss, evaluate and interpret the results in connection to the argument of the researcher and to provide understanding of the researcher's reasoning. In this chapter, connections will be made to practice and related and relevant literature. The researcher will attempt to confirm existing knowledge or link new knowledge to existing knowledge. Lastly, it will explain the response to the research questions, suggest future research that builds on or replicates the study, and state the implications for practice, policy, and perhaps theory, within the limitations of the study.

### **Discussion of the Results in Relation to the Literature**

#### **Discussion of the Relationship Between Testing Context and High Stakes Academic Performance**

The analyses of the results indicate that there is a moderate positive relationship between the perceptions of third grade teachers and elementary school principals' rating of testing conditions and performance of third graders on statewide-standardized high stakes computer-adaptive in math and English language arts. The other two testing context factors, time spent on practicing how to use technology as a testing tool and students' proficiency in using technology in class had no relationship with performance of third graders on statewide-standardized high stakes computer-adaptive in math and English language arts.

Studies by Uline, Tschannen-Moran, and Wolsey (2009) and Durán-Narucki, (2008) have alluded to a relationship between testing conditions and student test scores, yet none have been conclusive. Uline et al established a connection between school building quality, achievement, and school climate as depicted by Figure 3.

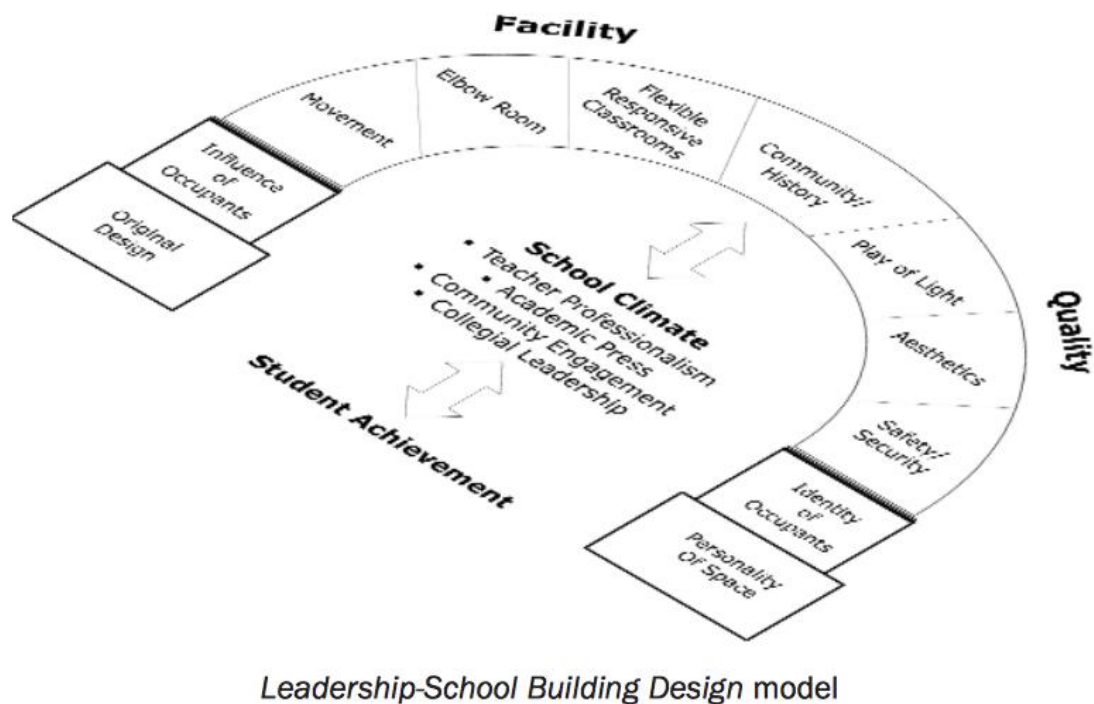


Figure 3. Uline and Wosley, 2010. Leadership-School Building Design model.

According to Bronfenbrenner, there is reciprocity between a child’s immediate environment and their responses to the environment. Positive environments produce positive reactions, such that when testing conditions are poor, students tend to give back poor performances on the test and vice versa. The results of the study are supported by Bronfenbrenner’s theory.

### **Discussion of the Relationship Between Testing Context and Level of Poverty**

The results revealed a relationship between the testing conditions and the level of poverty of the school. The relationship was moderate and negative between the rating of testing conditions and the level of poverty of a school. In general, the more poverty experienced in a school the less the adequacy of the testing conditions, and the less poverty experienced at a school, the more adequate the testing conditions of the school. The results are supported by Cheryan, Ziegler, Plaut, and Meltzoff (2014):

Evidence demonstrates that classrooms' structural features (e.g., noise, lighting) and symbolic features (e.g., everyday objects that signal who belongs in the classroom) can facilitate or hinder student learning and achievement... The majority of U.S. public schools have building-quality issues, with poor lighting, acoustics, temperature regulation, or air quality. This is particularly true for schools that serve students from lower income families and have a large population of students of color. These students may be bearing the brunt of inadequate infrastructure. (p. 6)

### **Discussion of the Testing Context as a Predictor in High Stakes Academic Performance**

The results revealed that testing context, specifically, the rating of testing conditions by third grade teachers and elementary school principals, could predict academic performance of a school's passing rate in math and but not the passing rate in English Language Arts, on computer adaptive high stakes tests. Furthermore, the study found that 28% of the likelihood to pass or fail math could be attributed to the condition of the testing building or room as determined by the third grade teachers' perception of the testing room.

According to the National Research Council (2007) there are several seminal studies on the impact of testing conditions of a building and its impact on test performance, and these include studies by Cash (1993), Hines (1996), Lewis (2000), and Pigus et al. (2005). Some of the studies showed a relationship and some did not, consequently the correlating studies were not adequate to conclude a relationship between conditions of a building and test scores.

However, the seminal study by Cash (1993) which, surveyed public school teachers on the relationship between certain school building conditions, student achievement, and student behavior in rural high schools, showed a relationship. Similar to this study, Cash's

study had the condition of the building as the independent variable, and student achievement (standardized test) as a dependent variable. Cash's study is different from the researcher's current study because she controlled for students on free and reduced lunch. The factors of testing conditions in Cash's study were similar to the conditions the researcher used in the current study on testing context. Cash's study testing conditions were as follows:

The factors that were looked at included air-conditioning, classroom illumination, temperature control, classroom color, graffiti, science equipment and utilities, paint schedules, roof adequacy, classroom windows, floor type, building age, supporting facilities, condition of school grounds, and furniture condition. The presence or absence of these factors or, in some cases, their quality or adequacy determined the condition category of the building: substandard, standard, and above standard.

(National Research Council, 2007, p. 122)

Cash found that the standard of the building affected test scores. She found statistically significant differences in the test scores of students in substandard or above standard buildings. The difference in the test scores in Cash's study were 2 to 5 percentile points and this depended on whether it was math, reading, or another subject.

According to the National Research Council (2007), Hines replicated Cash's study in 1996 in an urban high school setting. The results were similar; students in above standard schools were "9 points higher for writing and science, 15 points higher for reading, and 17 points higher for mathematics" (p. 122). Hines' study, like the researcher's current study, showed the most impact of testing conditions on math scores.

In addition, a study conducted in Virginia middle-schools study, found that teachers could predict students' standardized tests scores, based on their rating of the quality of school

facilities. The schools with poor facilities were predicted to perform worse in testing and the prediction was accurate (Uline, Tschannen-Moran, & Wolsey, 2009). Moreover, in a study in New York City, elementary schools with the worse school-building conditions predicted lower academic achievement (Durán-Narucki, 2008). These findings support the findings of this study of predicting test scores based on testing conditions.

### **Limitations**

There are a few limitations to this study. First, the data collected in the study spans 2015–2017, and not just 2015–2016 as originally planned. At the time of data collection—May of the academic year 2016–2017—the information from the year 2015–2016 was the most current and complete academic year data. Participants were told the study was using data from 2015–2016, specifically the 2015–2016 high stakes computer-adaptive test data and the free and reduced lunch data for 2015–2016. Also at the time of data collection, the participating schools may or may not have completed the 2016–2017 high stakes computer-adaptive testing, since the 2016–2017 test, could be taken anytime during the testing window beginning the second week in February through the first week in June. Additionally, at the time of analyzing the data the 2016–2017 high stakes computer-adaptive testing (SBAC) results for 2016–2017 were not available to the public. The participants’ perceptions of the testing context, namely time spent on practicing how to use technology as a testing tool (b) students’ proficiency in using technology in class, and (c) rating of testing conditions, likely included the intended 2015–2016 and possibly 2016–2017, depending on the testing schedule of the participating school.

Second, the response rate was 22%, which was lower than the expected response rate in the social sciences of 30%–40% (Sheehan, 2001).



Third, the Testing Context Survey (TCS) developed by the researcher has content validity and is supported by research but does not have reliability values. To promote reliability and validity of the survey, and to help reduce the likelihood of other plausible explanations of the results, the researcher did the following: Designed the 4-item survey to collect descriptive data that did not have constructs; aligned the three main survey items with the study's three research questions, almost identically, to attempt to ensure that what the survey measured was what the study intended to measure. Pretested the survey with a couple of third grade teachers who made suggestions to improve the clarity of the survey; used the semantic differential survey format, which is one of the most suitable methods to assess the strength and preferences of respondents' opinions, attitudes, and meaning of concepts. This provides detailed description of the meaning of concepts being tested and makes it more meaningful than the Likert scale of levels of agreement (Verhagen, Hooff, and Meents, 2015); and used the survey to collect ordinal data and determined relationships and predictors using Spearman's Rho and Discriminant Analyses.

### **Implications of the Results for Practice, Policy, and Theory**

The implications of the study's results can influence practice and policy. In practice, the school designers and builders should be made aware of the importance of building and testing room effects on testing to ensure it is taken into consideration during design and building. School administrators should be made aware of the importance of testing conditions in their building and they should make sure that testing rooms are not substandard. Policy makers could develop policy about the type of rooms that can be used for testing.

According to Bronfenbrenner's ecological systems theory, the more encouraging and nurturing a place is, the more favorable the child's reaction will be to the immediate

experience in the place. Consequently, when a third grader is in a location where the testing conditions are unfavorable, that is, temperature is either too hot or cold, too noisy, etc. the child will reciprocate and give back unfavorable socioemotional reaction to the experience, leading to poor performance on test. “When the immediate microsystem breaks down the child will not have the tools to explore his or her environment” (Paquette & Ryan, p. 3).

### **Recommendations for Further Research**

The researcher believes that his work could be built on, extended, strengthened, or modified to provide new prospects for additional research, inquiry, and learning, and recommends the following:

1. One recommendation would be to conduct the study immediately following the end of the computer adaptive testing window, so the data collected could be specific to the just concluded testing period.
2. Another recommendation would be to use an existing survey that allows for inferential analysis of its constructs.
3. Determine the quality of the test preparation time and collect qualitative data in addition to the hours spent practicing how to use technology as a tool in testing.
4. Identify the technology skills needed to take the computer-adaptive test and determine whether there is a relationship between the proficiency in those skills and test scores.

### **Conclusion**

The study sought to examine computer–adaptive tests which are a common feature in over 20 states (Hensley, 2015), and their impact on students of poverty. The researcher hypothesized that the performance of high poverty students on high stakes tests, was

impacted by how familiar the student was with technology use, using computers as a tool in assessing student learning, and the state of the technology testing lab. In addition, he believed that high poverty students taking computer-adaptive “high stakes” tests were consequently being assessed on more than their academic ability and content knowledge, but on testing context as well. According to Cheryan, et al. (2014) the computers used in testing are often housed in poor facilities in schools of poverty and technology instruction is also often lacking in these schools. And for these testing context reasons, the use of technology as a tool to take high stakes tests, poses yet another test performance challenge for elementary students in high poverty schools (Davis, 2012).

In this study, the researcher found no relationship between testing practice of the *use of technology as a testing tool* in place of paper and pencil and students’ test scores or poverty. Upon careful reflection, the researcher noted that time spent practicing, irrespective of the poverty level of the school, cannot be equated with the quality of the practice, or the comprehensiveness of the practice. Also, the survey only measured the practice time and not the quality of the practice or the comprehensiveness of the practice, which would have been a more accurate measure. In addition, there was no measure of the differences in the content of the practice experiences of the students of the different schools.

The researcher further found that, even though the practice tests were available on the SBAC website online, since the inception of the Smarter Balance Testing for students in third through eleventh grade, not all teachers were aware that the practice tests could be accessed outside of the District’s Public Schools website. The Smarter Balance Assessment Consortium website provided the training, practice, and performance test for each grade

level. Navigating to access these resources remain unyielding and counterintuitive, and so the practice tests are often underutilized (Personal Communication, August 4, 2017).

The researcher also found that third graders having basic technology skills, such as word processing and Internet or email skills, which the study measured using the survey, do not appear to impact students' performance on taking the computer adaptive testing. The computer or technology skills students need to take the CAT, involve the ability to drag-and-drop, save, and return to respond to saved survey items. The study measured a broader scope of technology skills, which may have not focused specifically on the technology skills used in SBAC or CAT.

The researcher found that of the three factors that he tested for a relationship with student academic performance, testing conditions were the most impactful on testing scores, in math and English Language Arts. It appeared that the greater the poverty of the students, the greater the inadequacy of the testing facility and vice versa. According to Cheryan, Ziegler, Plaut, and Meltzoff (2014),

The physical classroom environment influences student achievement. "The building's structural facilities profoundly influence learning. Inadequate lighting, noise, low air quality, and deficient heating in the classroom are significantly related to worse student achievement. Over half of U.S. schools have inadequate structural facilities, and students of color and lower income students are more likely to attend schools with inadequate structural facilities. (p.4).

Testing conditions could also predict performance on math tests, pass or no pass, but it could not for English Language Arts (ELA). The Common Core based ELA percentile test scores compared to the Common Core-based math percentile test

scores, in Figure 4 present the overall English language arts (ELA)/literacy and mathematics scaled scores for the 5th, 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, 90th, and 95th percentiles for grades 3. See Appendix

The scaled scores for ELA and math span a variance of 146 and 131 respectively. The scaled score at each presented percentile in math was greater than each corresponding percentile scale score for ELA. The researcher deduces that the normed scale scores in math were higher at each point, making the pass no pass, with respect to testing conditions, more crucial.

Testing conditions are easy identifiable factors, such as lighting, noise, and temperature. Testing occurs once a year. The leadership in schools should and could reduce or eliminate the adverse testing conditions. Students of poverty have complex challenges to attain their full academic potential, and most of the challenges are also complicated to resolve, for example, neighborhood factors, the digital divide, and so on. However, designating an appropriate space for conducting computer adaptive testing and minimizing poor testing conditions ought to be one of the lesser complicated factors for schools, in particular schools of poverty, to correct.

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## Appendix A: Survey

### Testing Context Survey (TCS)

The purpose of this questionnaire is to determine the impact of testing context on the performance of third graders taking computer-adaptive tests in Math and Language Arts. Testing context refers to the average time third graders spend on practicing how to use technology as a testing tool, third graders' use of technology in class, and the testing conditions during computer-adaptive testing of third graders.

The questionnaire is set up in a system (Qualtrics) where responses will be recorded and presented as an aggregated matrix of participating schools. Your name will not be recorded anywhere in the system or data collection process. Your responses will be confidential and the information will be used for research purposes only. Your participation in this study is greatly appreciated.

Kindly use the 7-point Likert scale provided to respond to three of the four questions. For each of the three statements you have been provided a description of the variable being measured. Select one point of the 7-point scale to show your response to each statement.

**Score Ratings:**

<b>Not at all</b>	<b>Minimal</b>	<b>Moderate</b>	<b>High</b>	<b>Very High</b>
<b>1</b>	<b>2 or 3</b>	<b>4</b>	<b>5 or 6</b>	<b>7</b>

<b>1. My students are proficient in using technology in class</b>						
1	2	3	4	5	6	7
Students do not know basic skills and word processing; use and edit email, internet and web browsers, troubleshooting, printers and printing, windows operating system, external social device social networking, digital camera, e-books, file management, and can create and manipulate digital music, videos, etc.						Students know basic skills and word processing; use and edit email, internet and web browsers, troubleshooting, printers and printing, windows operating system, external social device social networking, digital camera, e-books, file management, and can create and manipulate digital music, videos, etc.



<b>2. On average, when preparing for the Smarter Balanced Test each year, my students practice how to take computer-adaptive tests using computers in school for the following number of hours (approximately)</b>						
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1 hour or less	2 to 4 hours	5 to 6 hours	7 to 8 hours	9 to 10 hours	11 to 13 hours	14 or more hours

<b>3. My students have these testing conditions during the Smarter Balanced Test.</b>						
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
Noise, traffic of people moving around, testing room is next to the cafeteria, the proctor's instructions are inconsistent, students have opportunity to cheat, the temperature of the room is extreme, furniture is uncomfortable, etc.						Quiet, negligible movement of people, testing room is in a separate soundproof room, proctor is experienced and consistent, students have no opportunity to cheat, the temperature in the room is comfortable, furniture is comfortable, etc.

<b>4.</b>
What is the name of your school? _____

Optional. Feel Free to make comments on Testing Context in the space below:

THANK YOU FOR YOUR PARTICIPATION

## Appendix B: Cover Letter

Curtis R. Wilson III  
Concordia University  
Doctoral Candidate  
2811 NE. Homan St. Portland, Oregon 97211  
(503) 764 9932  
cuwilson@mail2.cu-portland.edu

My name is Curtis Wilson III and I am the principle investigator for a proposed study, *The impact of Testing Context in Computer Adaptive High Stakes Testing on the Performance of High Poverty Elementary Students*. The purpose of the study is to determine the degree to which three testing-related factors impact the performance of students on a test. The three factors include (1) practice in the use of technology as a testing tool (in lieu of pencil and paper), (2) skill in technology usage, and (3) testing conditions of the testing facility. The researcher refers to these three factors or variables collectively as **Testing Context**. The study intends to determine how testing context contributes to the performance of third graders on statewide standardized high stakes computer-adaptive tests.

The researcher will use a 4-item survey, named the *Testing Context Survey*, (TCS) to collect data on testing context by asking for the perceptions of third grade teachers and school administrators who volunteer to respond to the survey. The survey should not take more than 5 minutes to complete.

Third grade teachers and school administrators were selected because it is in third grade that students take their first computer-adaptive standardized test. With this being the first time for the students, this would give the researcher a relatively high non-confounded result on the testing context, i.e., impact of technology as a tool, skill in technology use, and the conditions of the computer lab testing conditions.

The researcher is particularly interested in the impact of testing context on high poverty third graders on the newly initiated Smarter Balanced tests. Consequently, information will be gathered from the PPS webpage, specifically Smarter Balanced 2015/2016 third grade Math and English Language Arts scores (performance scores) and the percentage of free and reduced lunch (an index of poverty).

The significance of the research contributes to a couple of PPS priorities, namely\_

- Disaggregating all student data by race in order to recognize and address patterns to support success for all students.
- Ensure that the School Building Improvement Bond continues tracking on time and on budget and delivers innovative, 21st century schools.

Typically, high poverty students perform poorly on high stakes tests. Schools of poverty often lag behind more affluent schools in standardized student achievement scores. Currently, there has been a change in the mode of testing where some states, like Oregon,

conduct high stakes tests using computer-adapted testing (Hensley, 2015). The rationale for computer adaptive testing (CAT) is its benefits of all students, including students of poverty. Several studies conducted to compare CAT to P&P (paper and pencil) administration have found CAT to produce more accurate scores on several abilities (Meijer & Nering, 1999); better measure of academic growth of students (Hoff, 2007); shorter length of test (Kosty et al., 2006) and shorter testing times (Rudner, 1998).

However, these studies did not differentiate for students of poverty in schools of poverty. Students of poverty are inadequately prepared to use computers as a testing tool in place of paper and pencil, and their schools of poverty are not designed to efficiently allocate space to serve as computer labs (poor testing conditions).

The main research question is *what impact does the ability to use technology as a testing tool and the conditions of the computer lab have on the high stakes testing performance of elementary third grade students of poverty?*

The sub-questions include:

1. What is the relationship between (a) time spent on practicing how to use technology as a testing tool (b) students use of technology in class (c) rating of testing conditions, and the performance of third graders on statewide standardized high stakes computer-adaptive Math and Language Arts tests? (*Cross-tabulation statistical analysis*)
2. What is the relationship between (a) time spent on practicing how to use technology as a testing tool (b) students use of technology in class (c) rating of testing conditions, and the level of poverty of a school? (*Cross-tabulation statistical analysis*)
3. How much variation in academic performance of third graders in (a) standardized high stakes computer-adaptive tests in Math and (b) standardized high stakes computer-adaptive tests Language Arts, can be attributed to the time spent on practicing how to use technology as a testing tool, students use of technology in class, and rating of testing conditions? (*Multiple regression statistical analysis*)

The significance of the study may include a broader understanding of the degree to which each aspect of testing context \_ technology as a testing tool, skills in technology use, and testing conditions \_ could affect 3<sup>rd</sup> grade academic performance. The information could inform how schools of poverty could be equitably supported in computer adaptive testing and school building improvements.

## Appendix C: Informed Consent

**Research Study Title:** The Impact of Testing Context in Computer-Adaptive High Stakes Testing on the Performance of High Poverty Elementary Students

**Principal Investigator:** Curtis Wilson III

**Research Institution:** Concordia University

**Faculty Advisor:** Angela Owusu-Ansah

### **Purpose and what you will be doing:**

The purpose of the study to determine whether testing context, which is student technology skill, use of technology as a testing tool (instead of paper pencil), and testing conditions of testing lab, contributes to the performance of third graders on statewide standardized high stakes computer-adaptive tests.

I kindly ask for your participation and your expertise in a short survey. No one will be paid to be in the study. We will begin enrollment to participate on April 19th, 2017 and end enrollment on May 19th, 2017.

To be included in this study:

1. I would need you to “sign” this consent form by clicking on “yes” to submit the completed survey.
2. I would need you to complete all four items in the survey

Participation involves taking a survey. The survey focuses on administrators and third grade teacher perceptions of (a) time spent on practicing how to use technology as a testing tool (b) students use of technology in class (c) rating of testing conditions and the average performance of your third graders on statewide-standardized high stakes computer-adaptive Math and Language Arts tests.

To take the survey, click below. Your survey answers will be collected anonymously, using a computer survey software system called “Qualtrics”. You will not be asked personally identifiable information in Qualtrics. Once the survey is completed and submitted, your survey answers will come back without me being able to track which teacher or principal it arrived from.

### **Risks:**

There is no risk in taking this computer survey other than your being on your computer. No personal identifying information will be requested. If you happen to write something that might suggest your personal identity, I will keep this confidential. Any personal information you provide will be coded so it cannot be linked to you. The software and all computers I use will be firewall protected and password protected. I will not write your name or your school employer name in any report or publication. All study documents and files will be destroyed three years after the study is concluded.

**Benefits:**

You may gain a broader understanding of the degree to which technology as a testing tool, skills in technology use, and testing conditions, could affect 3<sup>rd</sup> grade academic performance.

**Confidentiality:**

This information will not be distributed to any other agency and will be kept private and confidential. The data will be reported in aggregate.

**Right to Withdraw:**

Your participation is greatly appreciated. Your participation is voluntary. You may skip any questions you do not wish to answer. You may withdraw at any time you wish, without negative repercussions. To withdraw, do not hit the submit button or if you do submit, email me and I will not include your responses in the study.

**Contact Information:**

Please print a copy of this consent form. If you have questions you can talk to or write the principal investigator Curtis Wilson or email [cuwilson@mail2.cu-portland.edu](mailto:cuwilson@mail2.cu-portland.edu). If you want to talk with a participant advocate other than the investigator, you can write or call the director of our institutional review board, Dr. OraLee Branch (email [obranche@cu-portland.edu](mailto:obranche@cu-portland.edu) or call 503-493-6390).

**Your Statement of Consent:**

I have read the above information. I volunteer my consent for this study.

To participate you need to click “yes” before moving on to take the survey. This gives your consent to participate in the study.

**Appendix D: Statement of Original Work**

I attest that:

1. I have read, understood, and complied with all aspects of the Concordia University- Portland Academic Integrity Policy during the development and writing of this dissertation.
2. Where information and/or materials from outside sources has been used in the production of this dissertation, all information and/or materials from outside sources has been properly referenced and all permissions required for use of the information and/or materials have been obtained, in accordance with research standards outlined in the *Publication Manual of The American Psychological Association*

*Curtis R Wilson III*

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Digital Signature

Curtis R Wilson III

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Name (Typed)

November 3, 2017

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Date

## Appendix E

English Language Arts/Literacy																						
Grade	N	Mean	StDev	Percentiles																		
				5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3	835430	2420.1	88.9	2278	2303	2322	2338	2354	2368	2382	2395	2408	2420	2433	2445	2458	2471	2485	2500	2517	2538	2566

Mathematics																						
Grade	N	Mean	StDev	Percentiles																		
				5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3	838317	2428.7	81.3	2292	2326	2347	2362	2376	2388	2399	2410	2421	2431	2441	2451	2462	2472	2484	2497	2511	2531	2560

Comparing ELA and Math third grade performance.

These data are derived from data aggregated across the Smarter Balanced members that submitted de-identified student results data for the 2015–16 assessments. The following Consortium members provided results data: Bureau of Indian Education, California, Delaware, Hawaii, Idaho, Michigan, Montana, North Dakota, Nevada, Oregon, South Dakota, Vermont, Washington, and West Virginia.

[www.smarterbalanced.org/assessments/development/percentiles/](http://www.smarterbalanced.org/assessments/development/percentiles/)