Fall 10-2015

An Investigation of the Relationship of Teachers' Attitudes Towards a Computer-Based Assessment System and Student Achievement

Felicia M. Griffin
Lindenwood University

An Investigation of the Relationship of Teachers' Attitudes Towards a Computer-Based Assessment System and Student Achievement

by

Felica M. Griffin

A Dissertation submitted to the Education Faculty of Lindenwood University

in partial fulfillment of the requirements for the

degree of

Doctor of Education

School of Education

An Investigation of the Relationship of Teachers' Attitudes Towards a Computer-Based Assessment System and Student Achievement

by

Felica M. Griffin

This dissertation has been approved as partial fulfillment of the requirements for the degree of

Doctor of Education

at Lindenwood University by the School of Education

Dr. John Henschke, Dissertation Chair	10/23/15 Date
Dr. Sherrie Wisdom, Committee Member	10/23/2015 Date
Dr. Suzanne DeZego Committee Member	10/23/2015 Date

Declaration of Originality

I do hereby declare and attest to the fact that this is an original study based solely upon my own scholarly work here at Lindenwood University and that I have not submitted it for any other college or university course or degree here or elsewhere.

Full Legal Name: Felica M. Griffin

Signature:  Date: 10/23/15

Acknowledgements

First, I would like to thank God for keeping me on path and blessing me with the individuals who supported me through this journey of writing my dissertation and completing my doctoral degree. This journey has been one of perseverance and a true testimony of Philippians 4:13, “I can do all things through Christ who strengthens me.”

I would like to wholeheartedly express my appreciation for my committee chair, Dr. John Henschke. His patience and encouragement, along with his guidance and knowledge have been amazing. I would like to thank my committee members, Dr. Suzanne DeZego and Dr. Sherrie Wisdom, for helping me design my study and for helping with the data and statistics. Also, thank you to those instructors who helped me during writing lab.

I would like to thank the district and participants of this study. Without approval from the district and teachers taking the survey and questionnaire, this study would not be possible. I also thank the staff and faculty of the district, who periodically asked about the progress of my study.

Last but not least, I would like to thank my family and friends. Without my dad, Mr. Willie L. Griffin, Jr., I would not have aspired as high as I have. His love, guidance, and support kept me through the years and motivated me to be the best I can be. Tiffany C. Slater, Angelicia Hughes, Kimberly Kelly, and Sheilah Fitzgerald, thank you all for constantly encouraging me; listening to me; and staying on me when I didn’t think I would finish. I appreciate the time and support from so many who have not been mentioned in this acknowledgement.

Abstract

Since the introduction of No Child Left Behind (NCLB), districts across the country implemented computerized benchmark, or interim assessments, into their curriculum as a means to monitor and improve student achievement. Often, a change in curriculum entails a demand of educators' time, whether through professional development or lesson planning, and therefore affects teachers' attitudes. The purpose of this study was to determine what, if any, relationship there was among middle school teachers' attitudes, monthly computerized benchmark assessments, and student scores on the Missouri Assessment Program (MAP). Educators of the communication arts and mathematics content areas from one middle school were administered a survey and questionnaire to address two questions: 1) What are teachers' attitudes regarding the use of the Tungsten Learning System in the areas of reading and mathematics, and 2) How, if at all, do teachers change their behaviors in regards to the monthly reports of the Tungsten Learning System? Both assessment tools addressed categories of Training or Comfort Level, Use of Tungsten Feedback, Teachers' Perceptions of Tungsten, Accountability, and Student Preparation and Motivation. To observe if there was a difference in student achievement, as measured by the MAP, test scores of students from two middle schools of the same district, since the implementation of the Tungsten Learning System, were analyzed using ANOVA. In conclusion, the study found there was a difference in student achievement in mathematics MAP scores. Also, based on the survey and questionnaire responses, teachers did not believe Tungsten Learning System was a good predictor of student achievement. However, overall they favored computerized benchmark assessments if not administered monthly, aligned with the

curriculum, provided student feedback and effective re-teaching tools, and they felt they were adequately trained. Teachers did believe their attitudes had more of an effect on their students' attitudes than on students' achievement.

Table of Contents

List of Tables

Chapter One: Introduction

Preface

During my first year as a teacher, I recall sitting in meetings where the words benchmark, assessments, proficient, Missouri Assessment Program (MAP), Adequate Yearly Progress (AYP), and Tungsten were used in just about every other sentence. There were also whispers and an overwhelmed look amongst the faculty present in the meetings. I was familiar with all the terms mentioned but one, Tungsten. As a health and physical educator, I did not understand my colleagues' conversations and concerns. By the end of my first year of teaching, I had a better understanding of Tungsten and the conversations during meetings, but wondered how my colleagues' attitudes regarding benchmark assessments affected student achievement on the state-mandated test.

Background of the Study

In the *Nation at Risk* report in 1983, it was stated:

> Each generation of Americans has outstripped its parents in education, in literacy, and in economic attainment. For the first time in the history of our country, the educational skills of one generation, will not surpass, will not equal, will not even approach those of their parents. (Gardner et al., 1983, p. 11)

The *National at* Risk report was one of the first to bring forth attention to what would eventually become a crisis in the American education system. Years later, the No Child Left Behind Act of 2001 (NCLB) was a reauthorization to the Elementary and Secondary Education Act (ESEA) (U.S. Department of Education, 2002, p. 9). Up until 2001 ESEA was the main law governing the education of students in grades kindergarten through 12th. There were four pillars to NCLB: accountability for student achievement, offering

more choices to parents in educating their children, increased state and local control of educational decisions, and an emphasis on using scientific research to make decisions (U.S. Department of Education, 2002). NCLB caused quite a stir in the political and educational arenas. School districts across the nation were forced to examine the effectiveness of instruction that occurred in their classrooms.

Districts were developing Comprehensive School Improvement Plans (CSIP) to address deficit areas of student achievement. No longer could districts look at overall performance, but instead due to NCLB, district leaders had to address the lack of achievement from various subgroups of students. School leaders were accountable for ensuring that all subgroups meet a certain level of excellence. Therefore, school districts across the nation searched for ways to better meet the needs of all students and to raise achievement levels across poverty, racial, educational ability. NCLB was built on the premise that all states would have a high quality assessment system in place. The expectation was for schools to collect data on student achievement and use it to determine the successes of the district (U.S. Department of Education, 2002). During the 2006 Education Trust's Dispelling the Myth Award Ceremony, the former U.S. Secretary of Education Margaret Spellings noted,

> Keeping America competitive in the 21st Century depends on leaving no child behind. We can't prepare students for the global economy if we don't get them to grade level first. Ninety percent of the fastest-growing jobs require postsecondary education. And, we can't help more students realize the dreams of college if we don't teach them how to read and do math first. (U.S. Department of Education, 2006, p. 1)

Schools leaders have identified that frequent assessment can be used as a measure to gauge where students are. This practice has its benefits and drawbacks. Frequent assessment requires many people and time to grade them. Often these assessments are lengthy and grading can be a daunting task.

Educators across America are gathering data about student achievement. Walk into any district office and they can produce data. Ask any school principal about student achievement data and they can rattle off surface information. The problem is no longer gathering the data, but effectively using it to bring about educational reform that will demonstrate marked improvements in student achievement.

When used appropriately, data can help determine long term and immediate goals. It is safe to say that district level administrators and principals are comfortable with analyzing data, but what about the teachers? Schools are tapping into resources such as the Tungsten Learning System to assist teachers with giving formative assessments aligned to the state standards of but the key question is how the results from the assessments are being used.

Schmoker (1999) stated, "School improvement is not a mystery. Incremental even dramatic, improvement is not only possible but probable under the right conditions" (p. 1). He later contended results are contingent upon three foundations: meaningful teamwork, measurable goals, and collecting and analyzing performance data.

According to Schmoker (1999), changes within an organization must be systemic if meaningful results are to be achieved. It is time to move away from establishing processes to using these processes to determine if the desired results are being achieved. "Educators need to re-conceptualize how processes and results interact and refine

processes both before and during implementation. Emphasizing only one major or untested process, without careful frequent analysis, can be disastrous" (p. 5). Simply put, organizations that focus on how process affects achievement are likely to be successful.

In addition to effectively using data to drive improvements in student achievement, it was believed that teachers' attitudes of Tungsten also affected the outcome of the monthly assessments. A teacher's approach to the monthly assessments, the environment in which the assessments occurred, and how teachers used the results may all have impacted students' attitudes regarding the Tungsten Learning System.

The Tungsten Learning system was a data driven system based on monthly formative assessments focused on communication arts and mathematics. The system provided teachers with data that could be used to determine if students were making progress towards scoring proficient or above on the Missouri Assessment Program (MAP) tests given in grades three through eight. According to McIntire (2005),

> A typical correlation would state that if a student scores consistently above 78 percent on the benchmarking system, then they are almost certain to score proficient or above on high-stakes test and conversely, if they score below 62 percent, they are very likely to score below proficient. (p. 2)

With this in mind, this study set out to determine whether students at a northwest St. Louis County middle school in Missouri made the purported gains touted by McIntire (2005), then Vice President of Edison Schools, Inc. McIntire drew the conclusion that formative assessments were the most effective means of data that could affect positive changes in student achievement. The assessments should be stringently in alignment with

the state standards and ask high level questions of students required to respond to high stakes testing, such as MAP.

This study determined whether there was a difference in student achievement as measured by the MAP test scores of middle school students, since implementation of the Tungsten Learning System within the study district.

Statement of Problem

Like other school districts throughout Missouri and across the nation, the district discussed in this study was faced with the challenge of meeting Adequate Yearly Progress (AYP). Observation of the district's overall status, as reported by the Missouri Department of Elementary and Secondary Education (MODESE), revealed that from 2003 to 2007 the district failed to meet AYP in both mathematics and communication arts, with the exception of mathematics in 2004 (Missouri Department of Elementary and Secondary Education, [MODESE], "Study District Report Card," 2012). With increased pressure from local, state, and federal government, the district had to find a remedy to resolve declining MAP scores and failure to meet AYP. As a result, the district adopted the Edison Schools' Tungsten Learning System, a computer-based tool utilized to assess students' mathematics and reading level achievements, into its curriculum in 2004 as a means to contribute to an increase student achievement.

As identified in Chapter Two of this study, there were benefits of computer-based assessments on student achievement. According to Edison Schools (2009), student achievement increased with use of the Tungsten Learning System, "So, Tungsten Learning partners with schools districts to provide the brightest and most reliable

achievement solutions, helping raise student achievement through proven, customized, and cost-effective programs" ("A Message for Our Clients," p. 1).

Initially the district implemented the Tungsten Learning System in one of its elementary schools and both middle schools. In 2003, both elementary and middle schools met AYP in communication arts; however, only the elementary school met AYP in mathematics (MODESE, "Study District Report Card," 2012). In 2007, the district developed the strategic plan entitled, Our Call to Action: Challenging Every Child, to improve academic achievement for all students. This plan called for all schools in the district to develop specific goals that would result in student achievement. Many of the schools within the district cited Tungsten monthly assessments as a means for monitoring student achievement.

Purpose of Study

The purpose of this study was to determine what, if any, relationship there was among middle school teachers' attitudes about monthly computerized benchmark assessments and students' scores on the Missouri Assessment Program (MAP).

Research Questions

The research questions of this study were:

1) What are teachers' attitudes regarding the use of the Tungsten Learning System in the areas of reading and mathematics?
2) How, if at all, do teachers change their behaviors in regards to the monthly reports of the Tungsten Learning System?

Hypotheses

The primary hypothesis of this study was:

There will be a difference in student achievement as measured by the MAP test scores of middle school students, since implementation of the Tungsten Learn System.

The alternative hypotheses to support the primary hypothesis were:

H_{a1}. There will be a difference in year-to-year proportion of students performing proficient and advanced, in comparing results from the years 2006 - 2011.

H_{a2}. There will be a difference in proportion of students performing proficient and advanced, for individual comparison of pre-to-post, for the years 2006 and 2011.

H_{a3}. There will be a difference in proportion of students performing proficient and advanced, in comparing results when following students to the next year.

H_{a4}. There will be a difference in proportion of students performing proficient and above for samples 1 (students entering sixth grade in 2006) and 4 (students entering sixth grade in 2009).

H_{a5}. There will be a difference in proportion of students performing proficient and advanced for grades six and eight.

Definition of Terms

Definitions of key terms used herein are provided to ensure understanding of the context of this research study.

Achievement Gap. For the purpose of this study, and defined by the researcher, the term was used to delineate the difference between how well the underserved populations, low-income, and minority children perform on standardized tests as compared with their peers.

Adequate Yearly Progress (AYP). An individual state's measure of yearly progress toward achieving state academic standards. Adequate yearly progress is the minimum level of improvement that states, school districts, and schools must achieve each year, as set forth in requirements of the No Child Left Behind Act (U.S. Department of Education, 2002).

Assessment. Assessment is another word for 'test.' Under No Child Left Behind, tests were aligned with academic standards and provided information to be used as feedback to modify teaching and learning activities (Black & Wiliam, 1998).

Benchmark Assessment. For the purpose of this study, and defined by the researcher, benchmark assessment is monthly, or quarterly assessments given to students to measure their growth in specific academic content areas.

Comprehension. For the purpose of this study, and defined by the researcher, the term means the ability to understand and gain meaning from what has been read.

Corrective Action. When a school building within a school district did not make the adequate yearly progress requirement, the state had the power to place it under a Corrective Action Plan. The plan could include resources to improve teaching, administration, or curriculum. If a school continued to be identified as in need of improvement, the state had increased authority to make any necessary, additional changes to ensure improvement in academic achievement of the students enrolled (MODESE, 2009).

Disaggregated Data. For the purpose of this study, and defined by the researcher, the term means sorting test results into subgroups based on the categories of free and reduced lunch, students with disabilities, ethnic make-up, or English language learners.

This allowed administrators, students, and parents to see how each group performed in comparison to the whole group.

Elementary and Secondary Education Act (ESEA). ESEA was created in 1965 as a law that had the most impact on educating student in grades kindergarten through 12. This law was reauthorized as the No Child Left Behind Act (U.S. Department of Education, 2002).

Missouri Assessment Program (MAP). An assessment given to Missouri students in grades three through eight to show how well students were mastering Missouri's Show Me Standards, utilized at the time of this study (MODESE, 2009).

Missouri Show Me Standards. Seventy-three standards created by Missouri Educators and adopted by the Missouri School Board Association in 1996. These standards detailed what students should know and be able to do upon completion of high school (MODESE, 2009).

Student Achievement. For the purpose of this study, and defined by the researcher, this term was used to describe how well students performed on standardized tests in comparison to their peers.

Tungsten Learning System. Assessment system created by Edison Schools. Students were given monthly assessments used as a gauge to predict student achievement. The assessments were aligned to a particular state's standards. Teachers and students were provided with instant feedback on how students were performing in reading and mathematics (Edison Schools, 2009).

Limitations

This study had the following limitations:

1) Population and sample size contributed to the limitation of study results. While the number of participants for the quantitative portion of this study was greater than 30, the participants of the qualitative portion was not. Participants of the survey and questionnaire were limited, due to the small number of educators teaching the assessed content of mathematics and reading, at the time of the study.
2) This study consisted of analysis of MAP scores from the years 2006 through 2011. The MAP scores and school data were collected from the Missouri Department of Education (MODESE) website. It was assumed the study school district reported the MAP scores and data according to MODESE guidelines. The author of this study assumed the MAP was administered according to instructions and standards set by the state of Missouri.
3) The scoring system for the MAP changed during the years analyzed in this study.
4) Potential inconsistency of how teachers administered the Tungsten Learning System to students posed a potential limitation. Unlike MAP, there were no set instructions or guidelines on how to administer the Tungsten Learning System.
5) Research on computer-based assessments was limited, as well as background information and specific data on the potential Tungsten Learning System's success.

Summary

Since the implementation of NCLB, results of high-stakes testing made district administrators more accountable to not only the government, but to local communities. Districts considered and implemented various resources, strategies and interventions to contribute to an increase in student achievement. Many turned to computerized interim

assessments as a means to monitor and increase students' performance on high-stakes tests. Over the years there were mixed opinions of the effectiveness of such assessments. Many looked at the predictability of computerized assessments, but never considered other factors that could affect students' achievement.

This study report consists of four additional chapters: Chapter Two: Literature Review; Chapter Three: Methodology; Chapter Four: Findings and Results; and Chapter Five: Discussion and Conclusion. Each chapter was outlined and designed so the reader could follow the study and so that the study could be replicated.

In Chapter Two, the researcher reviews literature, which defines and identifies various types of assessment, the purpose of assessments, formats, perceptions of computerized assessments, training, data-driven decisions, and high-stakes testing. Through the review of the available literature, and lack of, the researcher also designed the methods used in this study. In Chapter Three, the researcher discusses the procedures used to conduct this research study. The organization of the chapter includes rationale, research questions, hypotheses, demographic background, qualitative procedure, quantitative procedure, confidentiality, validity of the data collection, and summary. In the fourth chapter, the researcher organized the results beginning with teachers' questionnaire responses and an overview of the survey results to respond to the research questions. Then finally analysis of students' MAP test scores to address the hypothesis. The analysis of MAP test scores includes results from analysis of variance (ANOVA) and *z*-tests for difference in proportion. The researcher organized the last chapter by beginning with a review of methodology, followed by the addressing of the hypotheses, research question one and research question two in separate sections, respectively:

Questionnaire and survey data analysis and MAP scores data analysis. Each section includes discussion and implications. The fifth chapter concluded with a conclusion, recommendations for future studies, and a summary.

Chapter Two: Literature Review

Since the implementation of No Child Left Behind, most state level Boards of Educations developed some type of standardized testing to assess student achievement. Schools across the nation were expected to meet specified progress markers, set by each individual state, or be held accountable. Many schools were faced with the reality that all students in all subgroups were not achieving AYP. Consequently, school districts scrambled to find resources and tools that teachers could use to help assess students and to identify and implement effective teaching strategies. A national trend, at the time of this study was to utilize computer-based assessments to monitor students' progress. In Florida, Curda, Martindale, and Pearson (2005), stated that many schools faced the high-stakes accountability by utilizing computer-based and online instruction. Many schools across the nation were providing instruction and practicing for the standardized tests through use of computers.

Accountability in education was measured by students' achievement on standardized tests; therefore in this chapter, the researcher discusses literature regarding assessments. Specifically, the types of assessment, purposes, formats, perceptions of computerized assessments, perceptions of training, perceptions of data-driven decisions and instructional changes, and perceptions of high-stakes testing and accountability, ending with a summary of the literature review. The literature reviewed in this section helped the researcher develop the research questions and qualitative tools administered in this study.

Assessments

In 1988, Bunderson stated in regards to educational measurement, "It can be used to diagnose problems in velocity and acceleration and provide information for timely instructional intervention. Good educational measurement can provide data for profiling the characteristics of individuals and their progress in an achievement space" (p. 14). In 2005, Stiggins and Chappius identified four conditions to be satisfied in order to ensure the effective use of assessment to reduce achievement gaps: 1) assessment development must be guided by a clear purpose, 2) assessment must accurately reflect the learning expectations, 3) assessment methods must be capable of reflecting the intended targets and also act as a tool for teaching to proficiency, and 4) communication of assessment results to students must be timely, understandable, and helpful. For Bunderson's (1988) statement to be true and to develop an effective assessment system, educators must know the types of assessments and their purposes.

Types of Assessments

Three types of assessments were identified through literature review: formative, summative, and interim. Formative assessments occurred in the natural course of teaching and learning. They were built into classroom instructional activities and provided teachers and students with ongoing daily information to improve learning gaps (Perie, Marion, Gong, & Wurtzel, 2007b). Whereas summative assessments were given at the end of a semester or year to measure students' performance against district or state content standards. These usually were part of an accountability system and were not designed to provide teachers with timely information about current students (Perie et al., , 2007b). An interim assessment fell between summative and formative assessments and

were used to predict student performance on the end-of-year summative, provided evaluative information about the curriculum, or offered instructional information to help diagnose students' strengths and weaknesses (Perie et al., 2007b). The term benchmark assessment was often used interchangeably with interim assessment.

Purpose of Assessments

Just as the proper type of assessment should be used for educational measurement, the proper purpose should also be identified. In the report by Perie et al. (2007b), *The Role of Interim Assessment in a Comprehensive Assessment System*, three purposes were identified for assessments: instructional, evaluative, and predictive. The first purpose, instructional, enriched the curriculum, identified strengths and weaknesses of individuals or groups of students, or used to motivate and provide specific feedback to students about their learning (Perie et al., 2007b, p. 6). Evaluative purposes provided information to teachers and others on various levels within an educational organization to allow learning about instructional choices and action to improve the program (Perie et al., 2007b, p. 6). Assessments used for predictive purposes were designed to determine each student's performance on end-of-year tests. It was important to know how to use benchmark testing for distinctive purposes. When used to fulfill too many purposes, benchmarks would rarely fulfill any purpose (Perie et al., 2007b, p. 6). Goertz, Nabors Olah, and Riggan (2009) stated that assessments should be chosen to serve a single purpose (p. 8).

Format: Paper-Pencil versus Computerized Assessments

Once the purpose and type of assessment were determined, educators selected the format of the assessment. Traditionally, pencil-paper tests were administered. However,

over time with the development of technology, computers were used increasingly more often for administering assessments. Prior to the use of computers, Reckase (1986) pointed out that in either large or small-scale assessments, computer technology was frequently used as a test preparation and product tool, rather than as a learning tool to enhance higher-order skills. Although computers were used during Reckase's time, the technology was not advanced enough to allow evaluation of specific skills of individuals. It was also believed computers were not a practical alternative for administering the National Assessment of Educational Progress (NAEP). Advantages of computer assessment procedures in 1986 were flexibility, efficiency, security, and clerical processing power (Reckase, 1986). A disadvantage of computer assessments was the need for computer hardware for presenting the test items and processing the results, which required substantial processing power and computer storage. The quality of the presentation of the test materials on the CRT screen was an issue, as well (Reckase, 1986).

In 1997, Russell and Russell (1997) reported that teachers were reluctant to replace traditional paper-based assessments with computer assessments, because computer usage did not always allow a printed basis to which a teacher could assess a student's performance. Although there was hesitance regarding computerized testing, in 2000, the following was stated:

> Part of the appeal of computerized measures centers on their perceived advantages over paper-and-pencil measures in producing immediate score reports and interpretations; in reducing costs for test production, administration, and scoring; in increasing test security; in yielding greater uniformity in test

> administration conditions; in motivating respondents; and in providing greater uniformity in test administration conditions; in motivating respondents; and in providing greater flexibility in changing test items and scoring algorithms when measures are revised and renormed. (Vispoel, 2000, p. 130)

Springer, Pugalee, and Algozzine (2007) believed the differences achieved with technology were more a function of personalized practice and progress monitoring than presentation of content. Since 2000, test publishing companies offered interim, formative, or benchmark assessment products. Products were flexible, gave instant feedback, and provided diagnostic information on areas which needed further instruction (Perie, Marion, & Gong, 2007a, p. 13). However, these systems generally failed to provide rich diagnostic feedback regarding student thinking (Perie et al., 2007a, p. 13). When selecting quality technology-based assessments, the following characteristics should be included:

- An easy-to-use, highly accessible system for delivering assessment, and communicating results
- Instructional resources that enable teachers to reinforce concepts and provide opportunities for intervention
- Alignment to state, district, or other local standards to provide a common framework for understanding student progress
- Progress tracking before critical high-stakes state assessments are administered
- Data that can immediately be acted upon to affect student progress
- Support for customization and training

- Flexible systems that can accommodate and integrate with varying levels of technology in classrooms, schools, and districts. (CTB/McGraw Hill, 2008, p. 2)

As previously stated by this researcher, with education in the United States perceived as being in a state of jeopardy, districts across the country chose computerized benchmark assessments as a means to help guide improvement in student achievement. Districts had to be aware of the purpose for purchasing and implementing computer-based assessments, as well as assuring the development of an effective assessment system. Otherwise, the district could be under scrutiny for more than not improving student achievement. When looking at the usefulness of interim assessments, it was found there was not the same kind of empirical base for the publishers' claims that interim assessments had the same power as classroom-based assessments (Christman et al., 2009, p. 2). Because interim assessments did not occur at the time of instruction, they may not have provided the kind of immediate feedback useful to teachers and students. Also, they were standardized tests that almost always relied on a multiple-choice format that may not lead to adequate information about how students understand. When looking at cost, there was controversy as districts' budgets shrank, and there was little empirical evidence about the assessments improving student achievement (Christman et al., 2009, p. 2).

In reviewing the literature, there was no definite research uncovered that implied that the use of computer-based assessments significantly improved student achievement (Cole, MacIsaac, & Cole, 2001). The main implications of the study by Cole et al., (2001) found "that web-based administrations could be used in place of paper-administrations, thus saving precious instructional time, reducing the administrative overhead associated with testing, grading, and photocopying thus cutting the cost

associated with large scaled data collection" (p. 17). Further, web-based administrations offered information to educators that paper-based administration could not.

Zandvliet and Farragher (1997) and Poggio, Glasnapp, Yang, and Poggio (2005) came to the same conclusion when comparing computer-administered and written tests. There was no significant difference between student achievement on computer-based and written tests, measured by student scores. Zandvliet and Farragher (1997) and Nguyen, Hsieh, and Allen (2006) concluded that further studies on the influence of web-based assessment on students' performance should be conducted in different schools and at different grade levels to determine if there were benefits of online assessments.

Though there was limited statistical data that supported the notion that web-based testing yielded higher test scores, there existed definite benefits to using such programs (Bugbee, 1996). Computerized testing could be more flexible and allow for a more student-centered teaching approach. Because computerized tests could provide instant feedback to the teacher and students, teachers could adjust their teaching practices to best meet the needs of the students. Teachers could also look at the data to determine if trends or patterns of learning existed and could generate reports for individual students, classes, and grade levels to monitor daily, weekly, or monthly progress (Bugbee, 1996). Computers were said to be more effective because they provided results and feedback almost instantly and students were able to learn and adjust from the instant feedback (Bugbee, 1996). Additionally, Bugbee's (1996) study found, when testing, computers reduced testing time, were more secure, and tests could be easily administered in comparison to pencil-based tests.

One study by Gretes and Green (2006) found computer-assisted assessment to benefit student achievement on pencil-based assessments. The researchers conducted a study on improving undergraduate learning with the use of computers. In this study, all students of a specified course were taught how to utilize the computer for practice testing prior to written exams. Students were allowed to practice on computers one week prior to their midterm and cumulative tests. It was found that those students who took advantage of the additional computer assisted practice scored half a letter grade better than those who did not complete the computerized practice tests (Gretes & Green, 2000). Since there was no control in the study, the authors conducted another study, this time looking specifically at Scholastic Assessment Test (SAT) scores of those students who did and did not utilize the computerized practice. The second study found that those with higher SAT scores were likely to take advantage of the computer-assistance than those with lower scores. This led Gretes and Green to believe that students would do better, not only because of the additional practice, but because they were higher in aptitude and motivated. Also questioned concerning the study outcomes, were the subjects' comfort levels with using computers, given the subjects ranged in age from 19-years-old to 43-years-old.

Computerized testing benefits the students, as well as instructors. Students could instantly see what items were missed and what the correct answers should have been. This would help them in terms of thinking about the correct response. Nguyen et al. (2006) found in survey results related to students' perception and evaluation of web-based assessment that the immediate feedback and instant scoring appeared to be the most attractive feature of web-based learning. Their findings supported the notion that students

desired instant confirmation of their understanding and knowledge of how well they were performing. "With the immediate feedback and instant scoring, the web-based assessment and practice not only plays the role of measurement or evaluation, but it also plays the role of instruction, reflection, and reinforcement" (Nguyen et al., 2006, p. 274). In addition, students' responses could quickly be disaggregated to determine what each student knew and needed to learn next, which allowed customized instruction for students' individualized learning needs. Local, state, and the federal government were putting greater demands on schools in their need to be more accountable for student learning and achievement. Using computerized testing could speed up the return of test results to teachers, enabling them to make more informed decisions about instruction. Paper-pencil testing programs provided results too slowly to guide state policy or classroom instruction effectively (Bennett, 2002). Besides enabling testing to inform instruction, the new technology offered some practical educational benefits. Moving information electronically was generally easier and faster than moving information physically (Bennett, 2002).

With evidence of computer-based assessment provided more benefit to students than more traditional assessment methods, researchers decided to examine the attitudes and learning styles of students, which also may have been a factor in student achievement. Nguyen et al. (2006) found that:

> across multivariate and factor analyses and the transcripts of interview notes, results of the study indicate that with the opportunities of drilling and practicing on the computer and receiving instant scores and adapted feedback, students had gained

> interest in doing mathematics, and formed a perception that they became smarter in problem-solving. (p. 251).

With the perception of being smarter students were often motivated to keep trying their best, and therefore increasing achievement.

Additionally, taking computerized formative tests could reduce students' anxiety before taking summative tests (Wang, Wang, Wang, & Huang, 2006). The results of the study by Wang, Wang, Wang, and Huang (2006) indicated that both learning style and formative assessment strategy significantly affected student achievement in web-based learning. While learning style was a key factor to student achievement, so was diversity of formative assessments. The more strategies used in Web-based formative assessments, the greater the learning effect obtained by the students.

Computer-based formative assessments should not only include multiple-choice items, but also critical thinking and constructive response items. The lack of open-ended questions on benchmark assessments was a limitation that provided no clear indication of where confusion existed for students, therefore making it impossible to use results for re-teaching and adaptation of instruction (Christman et al., 2009). In addition to construction of formative assessments to include diverse items, they should also be administered to students frequently to allow frequent feedback for students. Butler (2003) stated assessments should be given at least weekly, instead of monthly. If instructors waited a month to give assessments, feedback was not effective, and more than likely there was not enough time to re-teach or review content. As a result of delayed assessments, an increase of student achievement may not be noted (Butler, 2003). However, interim

benchmarks, a type of formative assessment, checked for understanding several weeks after initial introduction of content (Marshall, 2008).

While this researcher found benefits of computer-based assessments reported, review of the literature sited that school leaders and teachers could become distracted by the predictive uses of benchmark assessments instead of focusing on the instructional and evaluative purposes, which could potentially strengthen instructional capacity (Christman et al., 2009, p. 29). While the goal was to improve student achievement, focusing solely on predicting outcomes on state assessments could inadvertently cause a school to not meet its goal. Christman et al. also found growth could be positively affected if school leaders and faculty felt accountable to one another, they were diligent in monitoring student progress, and they were willing to use data as a starting point for inquiry (p. 44).

In a study conducted by Babo, Tienken, and Gencarelli (2014), the purpose was to determine how well results from one pretest and posttest interim assessment product predicted performance on state-mandated tests. The study specifically looked at commercially prepared pre- and post-interim assessments' ability to predict eighth grade performance in Language Arts Literacy (LAL) and mathematics on the state assessment; and how well the same pre- and post-interim assessments could predict performance for eighth grade students eligible for free lunch on the state assessment in both contents. While the study showed there was some predictability, the odds ratio gains were minimal, and it appeared as though it were unnecessary to give both pre- and post-interim assessment, due to the mathematics pre-interim assessment being the strongest statistically significant predictor for both eighth grade mathematics students and free lunch students. The researcher wondered if well-trained teachers could predict which

students might need more intervention prior to the state test with greater accuracy than test publishers.

In Pereira and Tienken's (2012) evaluation, of the influence of interim assessments on eighth grade students' achievement in mathematics and language arts, it was revealed that each of the four schools produced a combination of site-specific results and that interim pre-tests accounted for the same, or almost the same amount of variance, in state test scores as interim post-tests. Specifically, the influence of interventions or computerized benchmark assessments, differed across sites due to contextual factors, and one size does not fit all in terms of interventions and influence on achievement. The context in which a product was developed may not be the same as it is used in a school; therefore the results may not be the same as marketed (p. 11).

In another study, conducted in Indiana, the researchers analyzed the effects of using two diagnostic assessment tools on mathematics and reading modified to align with the state assessment. The study consisted of two groups: an intervention group of schools that received training to use the tools and support systems and a comparison group that did not receive the assessment tools or training during the year in which the study was conducted (Konstantopoulos, Miller, & van der Ploeg, 2013). One of the tools used for mathematics was pencil and paper, where the teachers entered responses into a computer later for viewing reports and creating inquiries. The other tool used was a software package that consisted of multiple-choice tests in either mathematics or reading and included diagnostic and predictive assessments. The study found that the diagnostic assessment tools did not have a statistically significant impact on general mathematics or

reading achievement for the full sample of students in grades K-8 (Konstantopoulos et al., 2013).

Perceptions of Computerized Assessments. Improved student achievement is the focus of assessment however to accomplish that goal, districts must implement an effective assessment system. A part of developing such system means considering not only purpose, but also all stakeholders. Implementation affects not only students, but teachers as well. Through literature review, it was determined that teachers' perceptions play a key role in implementation and the success of an assessment system, and their concerns should be addressed. Czubai (2004) found that some of researchers' and educators' concerns about cyberspace curricula were centered around insufficient teacher training, insufficient educator involvement in the technology development processes, insufficient funds for cyberspace curricula within school budgets, educators' reluctance to replace traditional paper-based assessments practices with newer computer-based assessment strategies, and problems involving the students' attitudes towards learning when computers were employed in schools.

Dugger (1997) and Cooley (1997) stated teachers must be a part of the decision-making process for usage of technology in the classroom or use and advancement of technology would diminish. Owens, Magoun, and Anyan's (2000) study focused on the implementation of technology in the learning environment and investigated the attitudes toward technology of teachers from three schools in Louisiana. Overall, it was found that teachers felt optimistic about technology. However, female teachers had a better attitude about technology than their male colleagues. Implementation in most any area typically meant training or professional development. Some educators may not feel comfortable

with technology or simply may not welcome new strategies because of the demand on their time.

Another study explored both student and teacher perceptions of computer-based assessment, however for the purpose of this literature review the author mentions only instructors' perceptions. Kim (2015) interviewed 15 professors at a university in Korea, regarding their perceptions of computer-based assessments, and then classified each into one of three categories: (A) CBA Preferred Type, (B) Supplementary Need Type, or (C) Yes-But Mixed Type. The study revealed most of the professors, seven of 15 were type A, or focused on the benefits of CBA and were satisfied with the CBA they adopted, showing a positive view of CBA in general. Four were identified as type B and type C each. Type B recognized then-current CBA needs to be improved, but preferred CBA as a supplementary tool for evaluating students. While type C believed CBA needed to be tailored for each students' characteristic and was more suitable for formative assessment that helped and monitored students, rather than the summative assessment that measured students' academic achievement.

In regards to computer-based interim assessments, one study found they were not considered uniquely burdensome or inconvenient compared to other tests, but added to the cumulative burden. Teachers and district staff had varying perceptions of the time required for testing. District staff only focused on the time it took to sit down and take the tests; whereas, teachers also considered the time required to organize to administer the test, prepare students, offer make-ups to absent students, and score the open-ended questions (Clune & White, 2008). The same study also found that districts often considered assessments to being an inexpensive policy, but the cost of interim

assessments were extremely high when considering the monetary and labor cost in central office, thousands of hours worked by teachers and students, extra pressure on teachers to cover the curriculum, lost instructional time, and lack of alignment with inquiry-based courses. Testing four times a year in addition to the state assessment was especially costly and not clearly worthwhile when many of the instructional changes occurred in future years, rather than immediately after the test (Clune & White, 2008).

Perceptions of Training

When studying teachers' use and perceptions of benchmark assessments, the survey data indicated that a majority of teachers believed the benchmark assessments were a source of useful information about students' learning (Christman et al., 2009, p. 23). However, the same study showed that Philadelphia's school leaders and teachers were not using the benchmark data to generate deep discussions of and learning about the core curriculum, therefore benchmark assessments were not likely to contribute to improved student learning without professional development of teachers and leaders. Clune and White's (2008) study found professional development was viewed as effective in communicating the nature of the test and methods of interpreting the results.

Christman et al. (2009) found most teachers reported that their schools emphasized the proficiency standards in the core curriculum and that they received adequate support for using the core curriculum. Most reported that they received the benchmark data in a timely way and they participated in professional development on how to access data. Additionally, from teachers' perspectives, school leaders had begun to organize school infrastructure to support teachers' use of benchmark data. Teachers reported that they had opportunities to review data with colleagues, and received help

from mathematics and literacy teacher leaders in using data. Whereas, Clune and White (2008) found that effective formative classroom assessment normally depended on deep professional development for teachers and schools in the skills of using student work to orient instruction and motivate students. Although some teachers reviewed points with current students, evidence from the study suggested that the practice was limited. Teachers still expressed problems with integrating results received two weeks after assessment; many of the instructional changes consisted of adjusting content coverage for subsequent years rather than working with then-current students; professional development seemed directed at interpreting data rather than improving instruction; teachers expressed the need for more professional development; and school support seemed highly variable and subject to erosion from budget cuts (Clune & White, 2008).

Perceptions of Data-Driven Decisions and Instructional Changes

According to the U.S. Department of Education (as cited in Christman et al., 2009), with data, educators can decide to make instructional changes geared at improving student achievement such as: prioritizing instructional time; targeting additional individual instruction for students who are struggling with particular topics; more easily identifying individual students' strengths and instructional interventions that can help students continue to progress; gauging the instructional effectiveness of classroom lessons; refining instructional methods; and examining school-wide data to consider whether and how to adapt the curriculum based on information about students' strengths and weaknesses. As new technologies were developed, there was often a lag before rigorous research could identify the impacts of those technologies. As a result, there was limited evidence on the effectiveness of the state of the art in data-based decision making

(Christman et al., 2009). Finally, studies of data-use practices generally looked at a bundle of elements, including training teachers on data use, data interpretation, and utilizing the software programs associated with data analysis and storage. Studies typically did not look at individual elements, making it difficult to isolate a specific element's contribution to effective use of data to make instructional decisions designed to improve student achievement (Christman et al., 2009).

Implementing data-driven recommendations in the classroom should focus on making data part of an ongoing cycle of instructional improvement and teaching students to examine their own data and set learning goals (Hamilton et al., 2009). Making data part of an ongoing cycle included collecting and preparing a variety of data about student learning, interpreting data and developing hypotheses about how to improve student learning, and modifying instruction to test hypotheses and increase student learning. To teach students to examine their own data and set learning goals, educators should explain expectations and assessment criteria; provide timely, specific, well formatted, and constructive feedback to students; and use students' data analyses to guide instructional changes (Hamilton et al., 2009). Abrams, Pedulla, and Madaus (2003) recommended using released commercially-developed preparation materials and teaching test-taking skills, so students could become familiar with item format, thus reducing testing anxiety.

In a study of two New Jersey middle schools, it was determined the most effective use of interim assessments in making data-driven decisions was to implement three principles: "using the assessments to evaluate the rigor of their teaching, doing test-in-hand analysis, and applying targeted action plans when planning lessons" (Bambrick-Santoyo, 2007, p. 46). To evaluate the rigor of their teaching, educators from the two

middle schools shared same interim assessment designed in alignment to state standards, then defined one common level of mastery to which every grade-level teacher should teach. The day after the interim assessment was administered, scores were available and teachers were able to analyze the results by looking at each individual question to determine specifically where students were lacking (Bambrick-Santoyo, 2007). Based on the analysis, educators were then able to create actions plans, typically for the next six weeks, of how to improve student achievement. Lessons plans were then created based on the action plans. Bambrick-Santoyo (2007) mentioned teacher 'buy-in' but stated after seeing the results of implementation teachers welcomed the change in time.

Reed's (2015) study explored how teachers in grades six through eight perceived data from interim assessments of students' reading performance and how they used the information to plan instruction. The researcher conducted two focus group interviews at two different sites, to total 12 teachers. Participants were questioned about the three interim measures and the state assessment of reading. The interviews revealed that the results from the state test were used more than any interim assessment data when planning instruction (Reed, 2015). The educators would focus on the 'weakest' objectives or skills when lesson planning. Teachers admitted they did not use disaggregated results for forming small group or differentiated instruction. Their reason for not using the data was because they did not believe the results accurately reflected students' performance (p. 6). Teachers were not fond of the frequency of administering the benchmark; and, stated they were more apt to rely on teacher generated data with the belief that their own questions guided them to better tell them what students needed (p. 7). One of the focus groups stated their need for more training. Overall, the study found "there is tension

between teachers' knowledge, beliefs, and expectations of assessments and testing policy mandated by the district or state level that seemed to discourage data-based decision making" (p. 8).

According to Christman et al. (2009) teachers' satisfaction with the benchmark data was not a statistically significant predictor of student achievement gains, but when used with core curriculum, there was a clear expectation of what teachers should teach and at what pace. MacIver and Epstein's (1993) study of middle grades showed the content of the curriculum and the nature of instruction fostered or limited students' feelings of achievement and competence. Atkinson (2003) stated, "if children see themselves as competent learners, then they want to learn and are willing to find ways to do so" (p. 4). Brookhart (1997) found a student's perception of a task and the ability to handle the task influenced both effort and achievement. Therefore, instruction should be focused on

> (1) building on what students already know, (2) focusing instruction around the student, (3) providing enriched and varied learning environments, (4) focusing content around key concepts, (5) challenging students to their maximum potential, and (6) connecting the content to the students' lives. (Jackson & Davis, 2000, p. 83)

Nabrs Olah, Lawrence, and Riggan (2010) found that interim assessments appeared to alert teachers to teach differently, but the type of change required did not relate back to the assessments. While many commercially-developed interim assessments provided data on areas in which students were struggling, many did not offer recommended instructional strategies; therefore teachers determined which strategy to

use. In Goertz et al.'s (2009) study, where the focus was on how teachers gathered evidence about student learning; analyzed and interpreted that evidence; used evidence to plan instruction; and carried out improved instruction; it was found that interim assessment data did not substantially change instructional and assessment practices. Teachers mostly used data to decide what content to re-teach and to whom.

There were a few instructional strategies noted in this review of literature. In Faulkner and Cook's (2006) study, 88% of the teachers reported the utilization of cooperative learning activities on a consistent basis, 91% regularly provided opportunities for students to engage in critical thinking activities, 80% incorporated problem-based learning activities, and 97% reported they connected the curriculum to real-life thematic units or integrated curricula. Rieg (2007) reported students believed it would be helpful to have time in class to prepare for assessments, to be told in detail what will be on a test, to have rubrics or checklists in advanced for performance assessments, and to have study guides to help them study for tests. In the same study, some of teachers surveyed did not perceive giving students feedback within three days and making sure students understood why some of their answers were incorrect to be effective assessment practices. However, research supported that these practices were beneficial, and the students perceived these strategies helpful. At one junior high school in the study, teachers believed giving frequent quizzes instead of a few major tests was valuable to the students, but according to the survey results the students did not find this strategy to be as helpful as the teachers perceived it to be (Rieg, 2007). Educators in two New Jersey middle schools created six-week action plans based on analysis of interim assessments results (Bambrick-Santoyo, 2007).. Action plans were used to create lesson plans and

design targeted tutoring sessions and differentiated small groups (Bambrick-Santoyo, 2007).

Perceptions of High-Stakes Testing and Accountability

As mentioned earlier in this review of literature, high-stakes testing and accountability played an important part in the push to improve student achievement and therefore drove the use of computerized benchmark assessments. Historically, high-stakes testing was not viewed favorably. In Jones et al.'s (1999) study, teachers noted several negative effects on education, including a narrowing of the curriculum, increased teaching to the test, lower teacher morale, increased student and teacher stress, and other negative effects on students and teachers. When looking at the positives of high-stakes testing, several articles noted they helped schools set performance goals, provided a focus for the curriculum, revealed academic progress to the public, and potentially provided additional funding support through federal programs (Sloane & Kelly, 2003).

Accountability means being responsible for students' academic success and failures. The purpose of Kurt's (2013) study was to find out the level of biology teachers' beliefs of responsibility for students' success, whether levels of belief of responsibility changed according to variables, and to what extent the biology teachers assumed responsibility for students' success and failures. For the purpose of this literature review, this researcher took interest in the first two of the four research questions: 1) what are the biology teachers' responsibility beliefs regarding students' academic success and failure and 2) what are the biology teachers' views on teachers' responsibility beliefs regarding students' academic success and failure? Kurt found that 57.54% of teachers believed they were responsible for students' academic success, while only 47.9% believed they were

responsible for students' academic failures (p. 318). Overall, there was a 52.72% belief that teachers were responsible for students' academic success and failure (p. 318). Teachers' viewed that they were responsible for students' academic success; however, they could not be held responsible for their failure. A few voiced they were not responsible for students' academic success either (p, 318).

Jones and Egley's (2004) study sited that issues that remained problematic for teachers included: the unfairness of comparing students and schools based on test scores, the negative effects of increased teaching to the test, the large amount of pressure felt by students and teachers, and the lack of reliability of a one-time test (p. 23). However, the results presented showed that teachers were in favor of accountability or believed that accountability was necessary. This is an important finding because it shifted the discussion from whether or not teachers should be held accountable to a discussion of how teachers should be held accountable (p. 24). In conclusion, without support for teachers, high-stakes testing would likely become just another failed education reform (p. 26).

Faulkner and Cook's (2006) study of middle grade teachers' perceptions of how high-stakes testing and state accountability standards influenced instructional strategies used in the classroom identified

> though some found the state assessment to be beneficial and to have little impact on their teaching strategies, the vast majority of those responding to this survey item felt strongly that the assessment weighed heavily on their minds. There was an overwhelming sense that the state assessment dictated their practice and in a

> sense, forced them to use ineffective, teacher-focused instructional strategies. (p. 7)

Teachers from California and Virginia were surveyed about their perceptions regarding the impact of the law on their schools, instructional practices, and curriculum. The majority felt sanctions of the law and adequate yearly progress requirements caused them to deemphasize important aspects of the curriculum and spend more time on subjects that were tested (Sunderman, Kim, & Orfield, 2005).

Findings from Abrams et al.'s (2003) study of teachers' opinions of state-wide testing programs suggested that

> high-stakes state-mandated testing programs can lead to instruction that contradicts teachers' views of sound educational practice. In particular, teachers frequently report that the pressure to raise test scores encourages them to emphasize instructional and assessment strategies that mirror the content and format of the state test, and to devote large amounts of classroom time to test preparation activities. (p. 18)

When looking at the impact on classroom instruction and assessment, 58% of all responding teachers reported that their state-mandated test was based on a curriculum that all teachers should follow (Abrams et al., 2003, p. 23). Similarly, more than half of all teachers (55%) reported that if they teach to the state standards or frameworks, students will do well on the state test (p. 23). Seventeen percent of teachers in states with low-stakes for students strongly agreed that they felt pressure from their building principal to raise test scores (p. 25). In contrast, more than twice that percent of teachers from high-stakes states (41%) reported feeling such pressure (p. 25). These survey results suggested

that teachers who reported feelings of pressure from either their district superintendent or building principal were also likely to work in schools with lower teacher morale. Almost half (45%) of all responding teachers indicated that teacher morale was low in their school (p. 26). Teachers in both high- and low-stakes states rejected the notion that test scores should be used to hold schools and teachers accountable, but responded more favorably when asked about student accountability. For example, 57% of teachers in high-stakes states compared to 37% of teachers in low-stakes states indicated that using test scores to determine whether students should graduate from high school was appropriate (p. 26).

Nichols, Glass, and Berliner (2012) conducted a couple of studies regarding state-level pressure and its effect on student achievement. In their 2006 study, Nichols et al. (2012) revealed that Accountability Pressure Index (APR) was connected most consistently with gains in fourth grade mathematics performance, only slightly connected to gains in eighth grade mathematics, and not correlated with gains in reading at either fourth or eighth grade levels (p. 6). The goal of this study was to look at the ways in which state-level pressure was associated with state-level achievement, as measured by NAEP in reading and mathematics in fourth and eighth grades since the inception of NCLB. In 2012 Nichols et al. found:

> Math and reading NAEP data revealed a few interesting patterns. In math, pre-NCLB achievement gains were greater than post-NCLB gains. Thus, students were progressing in math at a much faster rate before the national high-stakes testing movement spawned by NCLB. By comparison, fourth and eighth grade reading achievement remained relatively stable over time, with the exception of

> small increases for fourth graders (2005-2007) and small decreases for eighth graders (2003-2005) after NCLB. When it comes to NAEP achievement form 2002 to 2009, the institution of NCLB was followed by varied achievement patterns in fourth and eighth grade math. (p. 23)

In that same study, Nichols et al., also found that:

> Although our overall correlations reveal that pressure is more connected with math achievement than with reading, our gains and cohort analysis tell a slight different story. When it comes to math, pressure has no relationship to NAEP changes over time (for either cohorts of students or cross sectional groups of students). By contrast, pressure is positively associated with some student group gain scores in reading. (p. 26)

Goertz et al.'s (2009) study looked at the policies of two districts on the implementation and use of interim assessments. One district mandated the use of a data analysis protocol, while the other district developed interim assessments at the request of teachers. Additionally, principals in the district with mandates were held accountable for ensuring teachers accessed, interpreted, and acted on the results of interim assessments. Educators in that district believed the public sharing of data was undermining the low-stakes. In the other district, where teachers requested and participated in the development, expectations of use of interim assessments were communicated from district curriculum and instruction staff. The level of accountability and implementation of each district affected educator 'buy-in.'

Summary

Many districts purchased web-based assessment programs, such as Tungsten Learning System, which was a computer-based assessment of students' mathematics and reading, with the hope that state-mandated test scores would instantly improve. As outlined in this literature review, many factors were to be considered when deciding if and which computerized-benchmark assessment would be beneficial. There had to be an understanding that the computer-based assessment was just a tool to be used to facilitate improved instruction. While computerized benchmark assessments could free up a great deal of teacher time in terms of grading and desegregation of data, it was up to the teachers to use the data to determine the best instructional path for the students. If the data from interim assessments was not being used appropriately, no improvement would occur.

Although Tungsten was not the same format as the MAP, it covered the same content and curriculum that students were expected to know for the MAP. As in Florida, the state of Missouri also required that schools perform well on a written standardized assessment administered each spring. According to the literature review, students using the computer-based assessment approach to prepare for state standardized tests may not fare any better than those not using computer-based assessments, due to many factors. "Thus, changes in the classroom instruction and assessment practices, and student learning and motivation, professional development, students' and teachers' beliefs about and attitude towards the assessment program could be examined in connection with changes in assessment performance over time" (Stone & Lane, 2000, p. 21).

Educational stakeholders were demanding greater accountability from our schools to improve student performance and achievement. It was painfully clear that American children were not performing as well as students in Europe and Asia. If American students were to keep up in this global society we had to find ways of improving achievement. Schools, at the time of Sullivan's writing were armed with the responsibility of producing students who were internally driven, problem solvers, information managers, flexible thinkers, and effective questioners (Sullivan, 1999).

The results from the literature, existing at the time of this study, were lacking and inconclusive about teachers' attitudes regarding computerized benchmark assessments and student achievement. Therefore, the researcher designed this study as outlined and described in Chapter Three: Methodology. The results of this study may provide a more detailed understanding of what, if any, teachers' perceptions are about computerized benchmark assessments, and if they affect student achievement.

Chapter Three: Methodology

In Chapter Three, the researcher discusses the procedure used to conduct this research study. The organization of the chapter begins with rationale, research questions, hypothesis, and demographic background, and continues with qualitative procedure, quantitative procedure, confidentiality, validity of the data collection, and summary. The purpose of this study was to determine what, if any, relationship there was among middle school teachers' attitudes, monthly computerized benchmark assessments, and student scores on the MAP. Both qualitative and quantitative analysis was performed.

Rationale

This study focused on teachers' attitudes and behaviors regarding the use of computer-based benchmark assessments, the Tungsten Learning System, in the areas of reading and mathematics student achievement. Prior literature surrounding computer-based benchmark assessments and student achievement prompted this study. Through literature review, the researcher found there were some research studies performed regarding computer-based benchmark assessments and student achievement and teachers' attitudes and behaviors regarding high-stakes testing; however, there were few that studied teachers' attitudes and behaviors regarding the use of computer-based benchmark assessments and student achievement (Faulkner & Cook, 2006; Stone & Lane, 2000; Perie et al., 2007a).

To respond to the research questions and test the hypothesis, triangulation of data gathered in a mixed-methods research design was used in this study. In triangulation, the researcher gathered both quantitative and qualitative data, analyzed both datasets separately, compared the results from the analysis of both datasets, and made an

interpretation as to whether the results supported or contradicted each other (Creswell, 2008, p. 557). Quantitative data provides the opportunity to gather data from a large number of people and generalize results, whereas qualitative data permits an in-depth exploration of a few individuals (Creswell, 2008, p. 562). Qualitative analysis was used to address research questions exploring teachers' attitudes regarding the use of the Tungsten Learning System in the areas of reading and mathematics and behaviors in regards to the monthly reports of the Tungsten Learning System. Quantitative analysis was used to address the check for potential differences in student achievement, as measured by the MAP test scores of middle school students since implementation of the Tungsten Learning System. Both qualitative and quantitative analysis included categories of gender, grade level, and subject content. At the time of this study, initial implementation of Tungsten Learning System had passed, so this was a study of the effects following the initial implementation. The research questions and hypotheses were:

Research Questions

1) What are teachers' attitudes regarding the use of the Tungsten Learning System in the areas of reading and mathematics?
2) How, if at all, do teachers change their behaviors in regards to the monthly reports of the Tungsten Learning System?

Hypothesis

There will be a difference in student achievement as measured by the MAP test scores of middle school students since implementation of the Tungsten Learning System.

Null Hypotheses

H_{01}. There will be no difference in year-to-year proportion of students performing proficient and advanced in comparing results from the years 2006 - 2011.

H_{02}. There will be no difference in proportion of students performing proficient and advanced for individual comparison of pre-to-post, for the years 2006 and 2011.

H_{03}. There will be no difference in proportion of students performing proficient and advanced in comparing results when following students to the next year.

H_{04}. There will be no difference in proportion of students performing proficient and above for samples 1 (students entering sixth grade in 2006) and 4 (students entering sixth grade in 2009).

H_{05}. There will be no difference in proportion of students performing proficient and advanced for grades six and eight.

Demographic Background

Two middle schools in an urban school district located in northwest St. Louis County were selected for this study. The school district consisted of six elementary schools, two middle schools, one high school, and two special programs (Study District Website, 2012, "Fact Sheet", p. 1). In 2011, total student enrollment was 6,130 with 44.3% White, 38.9% Black, and 12.7% Hispanic (MODESE, "Study District Report Card," 2012, p. 1). Due to potential small sample size, the percent of Asian and Indian students was suppressed. The student-to-classroom teacher ratio in 2011 was 19 to 1 (MODESE, "Study District Report Card," 2012, p. 1). During the period of 2006-2011, the average enrollment was 6,264 students, and the average student-to-classroom teacher ratio was 18.8 to 1 (MODESE, "Study District Report Card," 2012, p. 1). The average

years of experience for teachers was 12.2, and 73.8% of teachers held a Master's degree or higher (MODESE, "Study District Report Card," 2012, p. 1).

Middle school one's total student enrollment in 2011 was 772 with 44.7% White, 39.8% Black, and 12.3% Hispanic (MODESE, "Study District Report Card," 2012, p. 1). Due to potential small sample size, the percent of Asian and Indians students was suppressed. The student to classroom teacher ratio in 2011 was 18 to 1 (MODESE, "Study District Report Card," 2012, p. 1). During the period of 2006-2011, the average enrollment was 768 students and the average student to classroom teacher ratio was 17.7 to 1 (MODESE, "Study District Report Card," 2012, p. 1). The average years of experience for teachers was 12 and 80% of teachers had a master's degree or higher (MODESE, "Study District Report Card," 2012, p. 1).

Middle school two's total student enrollment in 2011 was 663 with 43.4% White, 39.1% Black, and 13.6% Hispanic (MODESE, "Study District Report Card," 2012, p. 1). Due to potential small sample size, the percent of Asian and Indians students was suppressed. The student to classroom teacher ratio in 2011 was 16 to 1 (MODESE, "Study District Report Card," 2012, p. 1). During the period of 2006-2011, the average enrollment was 694 students and the average student to classroom teacher ratio was 16.2 to 1 (MODESE, "Study District Report Card," 2012, p. 1). The average years of experience for teachers was 12.5 and 73.8% of teachers had a master's degree or higher (MODESE, "Study District Report Card," 2012, p. 1).

Qualitative Procedure

To determine teachers' attitudes regarding use of the Tungsten Learning System, a questionnaire and survey were administered to participants of middle school two in

2011. Participants had the option to respond to both instruments, either electronically or by paper. A participant consent (Appendix A) letter was sent via email with the link to the survey and questionnaire attachment. Completion and submittal of the instruments was considered consent.

The questionnaire consisted of five questions (Appendix B), developed by the researcher. The questions were developed based on repeating themes from studies in the literature review (Clune & White, 2008; Hamilton, et al., 2009; MacIver & Epstein, 1993; Rieg, 2007; Stiggins & Chappius, 2005). Questionnaire participants were strategically selected to represent equal numbers of gender, grade level taught, and Tungsten assessed subject. A total of six teachers were given the questionnaire. Of the six educators, five responded. Table 1 provides demographics of the participants.

Table 1

Teacher Questionnaire Demographic Information

Gender:	Male 1	Female 4			
Highest Level of Education:	BA/BS 1	MA 2	MA+30 2	PhD 0	
Tungsten Assessed Subject:	Math 2	Communication Arts 3			
Grade Level Taught:	(6th) 2	(7th) 1	(8th) 2		
Years teaching TAS:	(0-5) 0	(6-10) 4	(11-15) 1	(16-20) 0	(20+) 0
Years of service as a teacher:	(0-5) 0	(6-10) 1	(11-15) 3	(16-20) 0	(20+) 1
Average Years using Tungsten:	5.8				

All questionnaire participants submitted their responses electronically via email. Common themes amongst the participants' responses were noted, as well as uncommon themes, and are discussed in Chapter Five of this study.

The teachers' survey consisted of a total of 47 questions, with 36 of the questions related to one-of-five categories, and the other 11 questions demographic related. The

five categories were: Training or Level of comfort, Use of Tungsten Feedback, Teachers' Perceptions of Tungsten, Accountability, and Student Preparation and Motivation. Educators were to select (1) disagree, (2) somewhat disagree, (3) somewhat agree or (4) agree as a response for each question (Appendix C). The categories and questions on the survey were developed based on repeating themes observed during the literature review process (Christman et al., 2009; Clune & White, 2008; Hamilton et al., 2009; Owens et al., 2000). The survey was administered to a total of 18 educators who taught mathematics and communication arts. Of those who received the survey, 13 completed the survey either handwritten or electronically. Table 2 provides the demographics of the survey participants.

Table 2

Teacher Survey Demographic Information

Gender:	Male 2	Female 11			
Highest Level of Education:	BA/BS 1	MA 2	MA+30 2	PhD 0	
Tungsten Assessed Subject:	Math 5	Communication Arts 8			
Grade Level Taught:	(6th) 4	(7th) 5	(8th) 4		
Years teaching TAS:	(0-5) 4	(6-10) 3	(11-15) 3	(16-20) 1	(20+) 2
Years of service as a teacher:	(0-5) 3	(6-10) 2	(11-15) 4	(16-20) 2	(20+) 2
Average Years using Tungsten:	4.75				

Teachers were emailed the link and given the paper form of the survey at the last faculty meeting for the 2010-2011 academic school year. Participants were informed they could complete either the paper or online form of the survey, and the deadline was the end-of-year teacher checkout. The researcher entered the responses of those who responded handwritten into Survey Monkey, an online survey product. The researcher

used Survey Monkey to calculate percentages for each question and cross-tabulate the categories of gender, Tungsten-assessed subject taught, and grade level with question categories of Training or Level of Comfort, use of Tungsten Feedback, Teacher's Perception of Tungsten, Accountability, and Student Preparation and Motivation. Using, the disaggregated data from Survey Monkey, the researcher calculated averages for each survey question.

Quantitative Procedure

To address the main hypothesis, there will be a difference in student achievement as measured by the MAP test scores of middle school students since implementation of the Tungsten Learning System, in spring 2012 the researcher collected and analyzed MAP data from 2006 through 2011. To verify reliability, data was collected from the Missouri Department of Elementary and Secondary website for two middle schools of the same district, referred to as school 1 and school 2. Since there were three or more means being compared, to determine the potential difference of MAP data in this study, Analysis of variance (ANOVA) was performed on the data representing the population and samples of both schools in the areas of mathematics and communication arts (Bluman, 2008, p. 604). When needed, *z*-tests were performed to identify potential differences in means. A *z*-test was needed if the test value resulting from application of the ANOVA was greater than the critical value (Bluman, 2008, p. 503).

Both Table 3 and Table 4 represent male and female performances on MAP for school 1 and school 2 from 2006 through 2011. ANOVA was applied to the null hypothesis, there will be no difference in proportion of students performing proficient and above in comparing results from the years 2006-2011 for both mathematics and

communication arts. A *z*-test was performed when necessary to identify which years indicated a significant difference.

Table 3

Performance on Mathematics MAP: School 1and School 2

	2006	2007	2008	2009	2010	2011
Female, 2	28.9	32.9	34.7	42.7	44.6	40.1
Male, 2	27.9	32.7	34.0	36.7	37.6	37.1
Female, 1	28.5	27.5	34.5	35.7	40.8	40.0
Male, 1	33.7	27.9	34.8	32.5	40.3	41.4

Note: Source: MODESE, 2011

Table 4

Performance on Communication Arts MAP: School 1 and School 2

	2006	2007	2008	2009	2010	2011
Female 2	40.8	39.4	37.7	41	42.4	40.4
Male 2	25.7	28.3	28.4	26.6	30.1	27.6
Female 1	31.7	33	36.2	44.6	45.2	42.8
Male 1	25.9	25	26.8	32.1	32.5	34.7

Note: Source: MODESE, 2011

Table 5 and Table 6 show total school performance for each school in both communication arts and mathematics from 2006 through 2011. ANOVA was applied to the null hypothesis, there will be no difference in proportion of students performing proficient and above in comparing results from the years 2006-2011 for both mathematics and communication arts. A *z*-test was performed when necessary to identify which years indicated a significant difference.

Table 5

Total Performance on Communication Arts MAP: School 1 and School 2

	2006	2007	2008	2009	2010	2011
School 1	32.5	28.7	31.2	38	33.8	38.6
School 2	33.3	33.7	33	33.8	35.9	33.8

Note: Source: MODESE, 2011

Table 6

Total Performance on Mathematics MAP: School 1 and School 2

	2006	2007	2008	2009	2010	2011
School 1	31.2	27.7	34.6	34	40.6	40.8
School 2	28.4	32.8	34.3	35.2	40.9	38.6

Note: Source: MODESE, 2011

Table 7 and Table 8 show performance by grade in both communication arts and mathematics from 2006 through 2011 for school 2. ANOVA was conducted twice. The first ANOVA followed the same grade to the next year. The null hypothesis for following the same grade to the next year was: there will be no difference in proportion of students performing proficient and advanced in comparing results from grade to grade. The second ANOVA followed students to the next grade, each year. The data was organized into four samples to represent each sixth grade class beginning with 2006, and through 2009 (Sample 1 = 2006, Sample 2 = 2007, Sample 3 = 2008, and Sample 4 = 2009). Algebra 1 data was not used in the second analysis of mathematics, due to only having recorded data for two years. The null hypothesis for following students year-to-year was: there will be no difference in proportion of students performing proficient and advanced in comparing results when following students to the next year. A *z*-test was performed when necessary to identify which years indicated a significant difference.

Table 7

Grade Performance on Communication Arts MAP: School 2.

	2006	2007	2008	2009	2010	2011
6th	41.1	34	33.5	37.3	32	35.9
7th	31.9	37.6	31.7	33	39.9	28.3
8th	27.8	29.9	33.9	31.2	35.7	39

Note: Source MODESE, 2011

Table 8

Grade Performance on Mathematics MAP: School 2.

	2006	2007	2008	2009	2010	2011
6th	38.4	44.2	42.7	49.8	42.1	45.4
7th	25.9	34.8	37.5	38.4	46.6	32.4
8th	21.9	20	23.7	31.2	34.1	37.7
Algebra 1					59.2	81.6

Note: Source MODESE, 2011

Table 9 and Table 10 show performance by grade in both communication arts and mathematics from 2006 through 2011 for school 1. A single factor ANOVA was conducted twice. The first ANOVA followed the same grade to the next year. The null hypothesis for following the same grade to the next year was: there will be no difference in proportion of students performing proficient and advanced in comparing results from grade to grade. The second ANOVA followed students to the next grade each year. The data was organized into four samples to represent each sixth grade class beginning with 2006, and through 2009 (Sample 1 = 2006, Sample 2 = 2007, Sample 3 = 2008, and Sample 4 = 2009). Algebra 1 data was not used in the second analysis of mathematics, due to only having recorded data for two years. The null hypothesis for following students year-to-year was: there will be no difference in proportion of students performing proficient and advanced in comparing results when following students to the

next year. A *z*-test was performed when necessary to identify which years indicated a significant difference.

Table 9

Grade Performance on Communication Arts MAP: School 1

	2006	2007	2008	2009	2010	2011
6th	29.2	29.3	32.9	38	38.1	33.3
7th	25.4	32.5	31.5	39.3	39.3	42.8
8th	31.6	24.8	29.2	36.8	38.5	39.7

Note: Source MODESE, 2011

Table 10

Grade Performance on Mathematics MAP: School 1

	2006	2007	2008	2009	2010	2011
6th	41.8	33.9	37.8	39.5	46	44.4
7th	26.2	26.2	37.3	36.1	43.4	41.3
8th	27.4	23.8	28.7	25.9	32.3	36.6
Algebra					63.2	82.7

Note: Source MODESE, 2011

Confidentiality

To ensure confidentiality of the participants and data, the researcher did not include identifiable information of any of the educators, and all data was secured at the researcher's home on a computer. The online tool used for the survey allowed anonymity. Surveys submitted in paper form were entered into the online tool by the researcher then locked away in a file drawer at her residence. Participants selected to complete the questionnaire were identified in this study as T1, T2, T3, T4, and T5, for purposes of analyzing responses. The MAP data collected from MODESE did not provide identifiable information of individual students. For analytical and statistical testing, all data were kept on the researcher's computer.

Missouri Assessment Program

In 1993, the Outstanding Schools Act required that Missouri create a statewide assessment system to measure how well students acquire the skills and knowledge, as described in Missouri Show-Me Standards (MODESE, 2015a, "LEA Guide to MAP," p. 4). Originally, MAP was designed to be a grade-span test: Grades 3, 7, and 11 in communication arts, grades 4, 8, and 10 in mathematics, and grades 3, 7, and 10 in science. In 2001, with the implementation of NCLB, student performance or proficiency was used to determine if adequate yearly progress of students at school, district, and state levels was achieved in both reading and mathematics by grades three through eight, and once in high school. In 2008, tests were administered to grades five through eight for the first time and students in high school were administered End-of-Course assessments instead of the previously administered High School Grade Level assessments (MODESE, 2015a, "LEA Guide to MAP," p. 4).

For the purpose of this study, MAP scores in reading and mathematics from 2006 to 2011 were analyzed. During the years observed in this study, MODESE checked reliability and validity of the scores resulting from administration of the state assessments. Each year, a small percentage of tests were scored independently by a second reader. Statistics for inter-rater reliability were calculated for all items at all grades. To determine reliability of scoring, the percentage of perfect agreement and the percentage of adjacent agreement were examined. The results showed good inter-rater reliability for all years analyzed, specifically those related to this study (MODESE, 2014, Assessment Technical Support Materials).

Validity of the Data Collection

The data used in this study were collected using three instruments directly reported by the participants, therefore it is likely the data were valid. The MAP scores analyzed in this study were obtained from the MODESE website. The school district used for this research study was required by the state of Missouri to report scores and other school data to MODESE. Therefore, the information collected has a high probability of accuracy. Both the survey and questionnaire were responded to and submitted by each participant. Only the researcher and participant had access to the instruments used to conduct this study. The survey responses the researcher recorded into the online tool were entered as the participant responded and the responses to the questionnaire were transcribed, as stated. There was a possibility of human error with the reporting and recording of all data.

Summary

This study used triangulation, and both quantitative and qualitative methods, to determine what, if any, relationship there was among middle school teacher's attitudes, monthly computerized benchmark assessments, and student scores on the MAP. The data were carefully collected and the research methods used were designed to ensure reliability and validity of results.

In the next chapter, the researcher shares the results of the study and in Chapter Five, will offer evaluation the data analysis results. The researcher analyzed all data collected through the three instruments and answered the research questions and hypothesis, as reported in Chapter Five.

Chapter Four: Findings and Results

This study determined what, if any, relationship there is among middle school teachers' attitudes, monthly computerized benchmark assessments and student scores on the MAP. This section includes the results of the data that was generated, gathered, and recorded. The findings are presented in a manner to address the hypothesis and research questions. The hypothesis states there will be a difference in student achievement as measured by the MAP test scores of middle school students since implementation of the Tungsten Learning System. The research questions and null hypotheses follow:

Research Questions

1) What are teachers' attitudes regarding the use of the Tungsten Learning System in the areas of reading and mathematics?
2) How, if at all, do teachers change their behaviors in regards to the monthly reports of the Tungsten Learning System?

Hypothesis

There will be a difference in student achievement as measured by the MAP test scores of middle school students since implementation of the Tungsten Learning System.

Null Hypotheses

H_{01}. There will be no difference in year-to-year proportion of students performing proficient and advanced in comparing results from the years 2006 - 2011.

H_{02}. There will be no difference in proportion of students performing proficient and advanced for individual comparison of pre-to-post, for the years 2006 and 2011.

H_{03}. There will be no difference in proportion of students performing proficient and advanced in comparing results when following students to the next year.

H_{04}. There will be no difference in proportion of students performing proficient and above for samples 1 (students entering sixth grade in 2006) and 4 (students entering sixth grade in 2009).

H_{05}. There will be no difference in proportion of students performing proficient and advanced for grades six and eight.

In this chapter, the researcher has organized the results beginning with teachers' questionnaire responses and an overview of the survey results to respond to the research questions. Then finally analysis of students' MAP test scores to address the hypothesis. The analysis of MAP test scores include results from analysis of variance (ANOVA) and *z*-tests for difference in proportion.

Teacher Questionnaire

The questionnaire was given to six teachers, as stated in Chapter Three. Of the six, five were returned. Below are teachers' responses to the questionnaire:

Research Question 1. What are your thoughts about the computer-based Tungsten Learning System?

T1: I like that it provides instant feedback and the tests cover relevant material. The only drawback is lack of buy in on the part of the students.

T2: Tungsten is a good way to assess students on grade level GLEs, but because it doesn't follow our curriculum frameworks, it is assessing students on parts of the curriculum that might not be covered at the time it is assessed. It gives good item analysis feedback, so it is useful for working with small, flexible groups on areas of need. It is a good assessment of how well I've taught a skill/strategy, as well. I like the fact that it has various genres, but it needs a

writing component if we really want to gage how well a student will score on MAP based on their Tungsten score.

T3: The students became frustrated completing the assessment because the test did not correlate to the order in which we taught the skills. For example, the first Tungsten test would have questions over skills that were not taught until later in the year. There was no way for students to get these answers correct. I would like to have seen a test that tested skills in the sequence taught and was cumulative over past skills.

T4: I think that the data from the test is valuable. I am able to assess not only my students but my teaching as well.

T5: Tungsten was a dependable tool to help analyze students' performance. This test was in line with state standards and used the Lexile system to ensure grade appropriateness.

Research Question 2. How did you prepare the students to take the computer-based [Tungsten] assessment?

T1: No response

T2: I teach lessons that follow the school district's curriculum frameworks, so in a way, that is preparing them for any assessment. Since Tungsten does not follow our frameworks by quarter, though, there is no way of preparing students for the skills they will be assessed on in a particular month with Tungsten.

T3: I would review the previous month's assessment with them. I would highlight the questions that pertained to skills I already taught and review those

with them. When we went to take the test, I would have them write down the numbers to the questions that pertained to our current unit and also the numbers to the questions to past units taught. I would explain that those were skills that they should have mastered and those questions they should be getting correct.

T4: I transitioned students from paper tests to computerized tests. When the students first started taking them everyone took it on paper and then went back in to enter their answers. Later, the students had a choice to either take it on computer of paper. Then we made the transition to all computerized tests. Instruction really wasn't affected until after the first test.

T5: Since the Tungsten was in line with the state standards, the skills necessary to do well on the Tungsten were taught in the classroom. Further, the information gathered from the assessment was used to help focus the upcoming lessons. The scores provided an idea of what skills the teacher needed to reiterate and to what students. These scores helped to differentiate so that each student could get the reinforcement needed.

Research Question 3. After students took the computer-based [Tungsten] assessment, how did you use the data?

T1: I re-taught concepts that the students struggled with and had students examine test taking strategies.

T2: I used the data to plan lessons, form small groups, work on test taking strategies with questions/testing vocab students struggled with, and used the data with students/parents at conferences.

T3: I would review the data and look for those students that did not demonstrate mastery in the units already covered. I would target those students and those skills during an E/I time.

T4: I assessed the areas where the students scored low. Determined why they scored low (hadn't taught yet, vocabulary, skill). These topics were addressed wither through bell-ringers, mini-lessons, or later in the school year.

T5: The data was used to help track students' performance on a monthly basis. This data continuously helped monitor progress made or the areas of weakness where the students needed additional help.

Research Question 4. Do you have any additional comments about your experience with the Tungsten Learning System and/or how you believe it relates to student achievement?

T1: It is a decent tool to check student progress but it was given too frequently to be too effective.

T2: No response

T3: I did not like Tungsten. The kids became frustrated quickly when they were asked so many questions over skills not covered.

T4: I believe that if used appropriately Tungsten results can help guide instruction and improve test scores. Time is always a concern. Re-teach or Move on. Evaluating these scores really brings that question to the forefront.

T5: As far as student achievement, taking the Tungsten monthly and learning to read and interpret the data, the students were able to monitor their own progress. Having this information available to the students helped them to further

understand in what areas they needed to concentrate and apply that extra effort in order to achieve higher scores. They were able to set goals for themselves in order to perform better month after month.

Research Question 5. What are your thoughts regarding the discontinuation of Tungsten Learning System and the implementation of Discovery?

T1: I favor Discovery because it is only given 3 times a year.

T2: No response.

T3: Glad to see it. Discovery has many tools we can use as teachers to reteach and re-access our students. The results are broken down into skills so it is easy to see what skills were mastered and which skills need retaught.

T4: I liked the format of the Tungsten tests better. The testing was more user/kid friendly. Discovery provides lots of data that tungsten did not, but that can be overwhelming. Learning a new program will take time. I felt similar about tungsten in the beginning.

T5: At first I was a little apprehensive about Discovery because I had gotten comfortable using the Tungsten Learning System. I had gotten to a point where I was able to help the students understand how to read the data so they could use that information to their advantage. When I learned that we were switching to Discovery and would no longer be using Tungsten, I wanted to know why. Through Tungsten we were provided valuable information and I couldn't understand why we would want to give that up. However, after I began to understand how Discovery works, I soon decided that this is a tool that is just as

useful as Tungsten, and, in some ways, it is a lot better because I can obtain more precise information including charts and graphs.

Overview of Survey Results

As stated in Chapter Three, teachers were given a survey with 47 questions (36 related to perception of Tungsten Learning System). The questions in the survey pertained to Training/Level of Comfort, Use of Tungsten Feedback, teachers' Perceptions of Tungsten, Accountability, and Student Preparation and Motivation. Table 11 display the mean for each question.

Table 11

Teacher's Perception of Tungsten: Survey Averages

Survey Question	Mean
Training/Level of Comfort	
I am comfortable using the re-teaching strategies available on Tungsten.	3.46
I am comfortable setting up custom groups to monitor advanced, proficient, basic, and below basic students.	2.38
I feel comfortable administering Tungsten.	3.83*
I have been well trained on Tungsten.	3.16*
I would like more training on Tungsten.	1.92
I feel more comfortable using Tungsten with each year it's implemented.	2.92
Use of Tungsten Feedback	
I conduct monthly strand analysis of my students' progress.	2.77
My students can communicate their performance on Tungsten with their teachers, parents, peers, or the principal.	3.38
I communicate with students about their progress on the monthly reading and math Tungsten assessments.	3.38
I regularly review missed benchmark items with my student each month.	2.85
I use Tungsten data to adjust or re-teach lessons.	3.42*
I use the re-teaching strategies available on Tungsten.	2.46
My students are made aware of their Tungsten scores.	3.85
I wait until the following year to address low scoring Tungsten strands.	1.54
I address low Tungsten scores by immediately addressing the low scoring strand.	3

continued

Table 11, continued

Teachers' Perceptions of Tungsten: Survey Averages	
I believe Tungsten is an effective predictor of MAP achievement.	2.75*
I believe Tungsten does not predict students' achievement.	2.41*
I believe Tungsten assists me with my class instruction.	3.08*
I would be satisfied if the district removed Tungsten assessment from the curriculum.	2.75*
I believe Tungsten hinders me in delivering effective instruction.	1.83*
I believe Tungsten is a valid tool for assessing student achievement.	2.77
I believe Tungsten has many limitations in predicting student achievement.	3.38
Tungsten prepares students for MAP testing.	2.92*
I dislike Tungsten.	2.58*
I believe my attitude regarding Tungsten affects student achievement.	2.69
I believe my attitude regarding Tungsten affects students' attitudes.	3.08
I think favorably of Tungsten.	2.54
I believe my students believe Tungsten helps predict achievement.	2.15
I prepare my students for taking Tungsten assessment.	3
I believe the parents understand the relevance of Tungsten.	1.54
<u>Accountability</u>	
My principal holds my students accountable for their progress on the monthly reading and math Tungsten assessments.	2.15
My principal holds me accountable for student progress on Tungsten.	3.23
<u>Student Preparation and Motivation</u>	
I communicate the relevance of Tungsten to my students.	3.46
I recognize and celebrate students' growth each month on Tungsten with my students.	3.31
Students are rewarded for making gains each month on Tungsten.	2.92
I believe students understand the relevance of Tungsten.	2.23

Note: 1-Disagree; 2-Somewhat Disagree; 3-Somewhat Agree; 4-Agree. * n=12 instead of n=13

The results of the survey were then categorized in the five areas of Training/Level of Comfort, Use of Tungsten Feedback, Teachers' Perceptions of Tungsten, Accountability, and Student Preparation and Motivation. Percentage of agree/somewhat agree and somewhat disagree/disagree was calculated for each question. Additionally, the researcher observed Tungsten subject assessed, grade level, and gender for each survey question.

Training/Level of Comfort

Table 11

I am comfortable using the re-teaching strategies available on Tungsten.

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	3	6	69.2%	9
Somewhat Agree	1	1	15.4%	2
Somewhat Disagree	1	0	7.7%	1
Disagree	0	1	7.7%	1
		answered question		13
		skipped question		0

Eighty-four point six percent of teachers agree or somewhat agree they are comfortable using the re-teaching strategies available on Tungsten, while 15.4% somewhat disagree or disagree. One of the five mathematics teachers somewhat disagree they are comfortable. One of the eight communication arts teachers disagrees to being comfortable using re-teaching strategies available on Tungsten. One teacher from sixth grade disagree, one teacher from seventh grade somewhat disagree, and all teachers from eighth grade agree. Both male teachers agree but two of the 11 female teachers somewhat

disagree or disagree to being comfortable using re-teaching strategies available on Tungsten.

Table 12

I am comfortable setting up custom groups to monitor advanced, proficient, basic, and below basic students.

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	2	23.1%	3
Somewhat Agree	1	1	15.4%	2
Somewhat Disagree	2	3	38.5%	5
Disagree	1	2	23.1%	3
		answered question		13
		skipped question		0

Thirty-eight point four percent of teachers agree or somewhat agree to being comfortable setting up custom groups to monitor advanced, proficient, basic, and below basic students. 61.6% of teachers somewhat disagree or disagree. Two of the five mathematics teachers agree or somewhat agree while three of the eight communication arts teachers agree or somewhat agree. One teacher from sixth grade agree, two of the five teachers from seventh grade somewhat disagree and one teacher from eighth grade somewhat agree. One male teacher agree, one male teacher disagree, and four of 11 female teachers agree or somewhat agree to being comfortable setting up custom groups to monitor students.

Table 14

I feel comfortable administering Tungsten

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	3	7	83.3%	10
Somewhat Agree	1	1	16.7%	2
Somewhat Disagree	0	0	0.0%	0
Disagree	0	0	0.0%	0
		answered question		12
		skipped question		1

One hundred percent of teachers responded either agree or somewhat agree to being comfortable administering Tungsten. All teachers in each Tungsten assessed subject agree or somewhat agree. All teachers from seventh grade agree, one from each, sixth and eighth grades, somewhat agree. Both male teachers agree, however, two of the 11 female teachers somewhat agree to being comfortable administering Tungsten.

Table 15

I have been well trained on Tungsten

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	3	33.3%	4
Somewhat Agree	2	4	50.0%	6
Somewhat Disagree	1	1	16.7%	2
Disagree	0	0	0.0%	0
		answered question		12
		skipped question		1

Eight-three point three percent of teachers agree or somewhat agree that they have been well trained on Tungsten. 16.7% somewhat disagree. One teacher from each mathematics and communication arts somewhat disagree. One teacher from each sixth and seventh grades somewhat disagree while all teachers in eighth grade agree or

somewhat agree. Both male teachers agree or somewhat agree; however, two of the 11 female teachers somewhat agree that they have been well trained on Tungsten.

Table 16

I would like more training on Tungsten

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	3	23.1%	3
Somewhat Agree	0	0	0.0%	0
Somewhat Disagree	1	2	23.1%	3
Disagree	4	3	53.8%	7
		answered question		13
		skipped question		0

Twenty-three point one percent of teachers agree that they would like more training on Tungsten; 76.9% of teachers somewhat disagree or disagree. All mathematics teachers somewhat disagree while three of the eight communication arts teachers agree. No teachers from sixth grade agree, two from seventh grade agree, and one from eighth grade agree. One male teacher agrees, one male teacher disagree, and two of the 11 female teachers agree they would like more training on Tungsten.

Table 17

I feel more comfortable using Tungsten with each year it's implemented

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	5	38.5%	5
Somewhat Agree	2	2	30.8%	4
Somewhat Disagree	1	1	15.4%	2
Disagree	2	0	15.4%	2
		answered question		13
		skipped question		0

Sixty-nine point two percent of teachers agree or somewhat agree while 30.8% somewhat disagree or disagree that they feel more comfortable using Tungsten each year it is implemented. Two of the five mathematics teachers somewhat agree and one of the eight communication arts teachers somewhat disagree. Two of four teachers from sixth grade somewhat disagree. One teacher from each seventh and eighth grades disagrees. All male teachers agree or somewhat agree and four of 11 female teachers somewhat disagree or disagree to feeling more comfortable using Tungsten with each year it is implemented.

Feedback

Table 18

I conduct monthly strand analysis of my students' progress

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	3	23.1%	3
Somewhat Agree	3	2	38.5%	5
Somewhat Disagree	1	3	30.8%	4
Disagree	1	0	7.7%	1
		answered question		13
		skipped question		0

Sixty-one point five percent of teachers agree or somewhat agree that they conduct monthly strand analysis of students' progress; 38.5% of teachers somewhat disagree or disagree. Three of five mathematics teachers somewhat agree while three of eight communication arts teachers somewhat disagree. All teachers from sixth grade agree or somewhat agree, one of five teachers from seventh grade agree, and one of four teachers from eighth grade somewhat disagree. One of two male teachers somewhat

disagree and four of 11 somewhat disagree or disagree that they conduct monthly strand analysis of students' progress.

Table 19

My students can communicate their performance on Tungsten with their teachers, parents, peers, or the principal

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	4	38.5%	5
Somewhat Agree	4	4	61.5%	8
Somewhat Disagree	0	0	0.0%	0
Disagree	0	0	0.0%	0
		answered question		13
		skipped question		0

One hundred percent of teachers agree or somewhat agree that their students can communicate their performance on Tungsten. One of five mathematics teachers agree and half of communication arts teachers agree. Teachers in all grades agree or somewhat agree. Both male and female teachers agree or somewhat agree.

Table 20

I communicate with students about their progress on the monthly reading and math Tungsten assessments

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	5	46.2%	6
Somewhat Agree	4	2	46.2%	6
Somewhat Disagree	0	1	7.7%	1
Disagree	0	0	0.0%	0
		answered question		13
		skipped question		0

Ninety-two point three percent of teachers agree or somewhat agree that they communicate with students about their progress on the monthly reading and mathematics Tungsten assessment, while 7.7% somewhat disagree. All math teachers agree or somewhat agree and one of eight communication arts teachers somewhat disagree. All teachers from sixth and seventh grades agree or somewhat agree while one teacher from eight grade somewhat disagree. Both male teachers agree or somewhat agree. One of 11 female teachers somewhat disagree that they communicate with students about their progress on the monthly reading and mathematics Tungsten assessment.

Table 21

I regularly review missed benchmark items with my student each month

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	3	30.8%	4
Somewhat Agree	2	4	46.2%	6
Somewhat Disagree	1	1	15.4%	2
Disagree	1	0	7.7%	1
		answered question		13
		skipped question		0

Seventy-seven percent of teachers agree or somewhat agree and 23% of teacher somewhat disagree or disagree that they regularly review missed benchmark items with students each month. Two of five mathematics teachers somewhat disagree while one of eight communication arts teachers somewhat disagree. All teachers from sixth grade agree or somewhat agree, two of five teachers from seventh grade somewhat disagree or disagree, and one teacher from eighth grade somewhat disagree. Both male teachers somewhat agree but three of 11 female teachers somewhat disagree that they review missed benchmark items with students each month.

Table 22

I use Tungsten data to adjust or re-teach lessons

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	2	5	58.3%	7
Somewhat Agree	2	2	33.3%	4
Somewhat Disagree	0	0	0.0%	0
Disagree	1	0	8.3%	1
		answered question		12
		skipped question		1

Ninety-one point seven percent of teachers agree or somewhat agree that they use Tungsten data to adjust or re-teach lessons; and 8.3% of teachers disagree. One of five mathematics teachers disagree but all communication arts teachers agree or somewhat agree. All teachers from sixth and eighth grades agree or somewhat agree however, one of four from seventh grade disagree. Both male teachers agree or somewhat agree while one of 11 female teachers disagree that they use Tungsten data to adjust or re-teach lessons.

Table 23

I use the re-teaching strategies available on Tungsten

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	3	23.1%	3
Somewhat Agree	1	1	15.4%	2
Somewhat Disagree	3	3	46.2%	6
Disagree	1	1	15.4%	2
		answered question		13
		skipped question		0

Thirty-eight point four percent of teachers agree or somewhat agree to using the re-teaching strategies available on Tungsten. 61.6% of teachers somewhat disagree or disagree. One of five mathematics teachers somewhat agree and half communication arts teachers agree or somewhat agree. Two of four teachers from sixth grade agree or somewhat agree, two of five teachers from seventh grade agree or somewhat agree, and one of four teachers from eighth grade agree. Both male teachers agree or somewhat agree and three of 11 female teachers agree or somewhat agree to using the re-teaching strategies available on Tungsten.

Table 24

My students are made aware of their Tungsten scores

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	4	7	84.6%	11
Somewhat Agree	1	1	15.4%	2
Somewhat Disagree	0	0	0.0%	0
Disagree	0	0	0.0%	0
		answered question		13
		skipped question		0

One hundred percent of teachers agree or somewhat agree that their students are made aware of their Tungsten scores. One of five mathematics teachers somewhat agree and one of eight communication arts teachers somewhat agree. All teachers in sixth and seventh grades agree or somewhat agree, however, all teachers in eighth grade agree. All male and female teachers agree or somewhat agree that their students are made aware of their Tungsten scores.

Table 25

I wait until the following year to address low scoring Tungsten strands

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	0	7.7%	1
Somewhat Agree	0	0	0.0%	0
Somewhat Disagree	2	2	30.8%	4
Disagree	2	6	61.5%	8
		answered question		13
		skipped question		0

Seven point seven percent of teachers agree that they wait until the following year to address low scoring Tungsten strands, while 92.3% of teachers somewhat disagree or disagree. One of five mathematics teachers agree and all communication arts teachers somewhat disagree or disagree. All teachers from sixth and eighth grades somewhat disagree or disagree however, one of five from seventh grade agree. Both male teachers somewhat disagree or disagree but one of 11 female teachers agree to waiting until the following year to address low scoring Tungsten strands.

Table 26

I address low Tungsten scores by immediately addressing the low scoring strand

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	5	38.5%	5
Somewhat Agree	3	2	38.5%	5
Somewhat Disagree	0	1	7.7%	1
Disagree	2	0	15.4%	2
		answered question		13
		skipped question		0

Seventy-seven percent of teachers agree or somewhat agree to addressing low Tungsten scores by immediately addressing the low scoring strand; and 23% of teachers somewhat disagree or disagree. Two of five mathematics teachers disagree and one of eight communication arts teachers somewhat disagree. All teachers from sixth and eighth grades agree or somewhat agree and two of five from seventh grade agree. Both male teachers agree or somewhat agree however, three of 11 female teachers somewhat disagree or disagree to addressing low Tungsten scores by immediately addressing the low scoring strand.

Teachers' Perceptions

Table 27

I believe Tungsten is an effective predictor of MAP achievement

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	2	25.0%	3
Somewhat Agree	1	3	33.3%	4
Somewhat Disagree	1	3	33.3%	4
Disagree	1	0	8.3%	1
		answered question		12
		skipped question		1

Fifty-eight point three percent of teachers agree or somewhat agree that Tungsten is an effective predictor of MAP achievement, while 41.7% of teachers somewhat disagree or disagree. Two of four mathematics teachers and three of eight communication arts teachers somewhat disagree or disagree. One teacher from sixth grade disagree and two from each seventh and eighth grades somewhat disagree. Four of ten female teachers somewhat disagree or disagree that Tungsten is an effective predictor of MAP achievement.

Table 28

I believe Tungsten does not predict students' achievement

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	1	16.7%	2
Somewhat Agree	1	3	33.3%	4
Somewhat Disagree	1	2	25.0%	3
Disagree	1	2	25.0%	3
		answered question		12
		skipped question		1

Fifty percent of teachers agree or somewhat agree and the other half somewhat disagree or disagree that Tungsten does not predict students' achievement. Two of four mathematics teachers and four of eight communication arts teachers agree or somewhat agree. Two of four teachers from sixth grade agree or somewhat agree, one teacher from seventh grade somewhat agree and one teacher from eighth grade disagree. Half of each gender agree or somewhat agree.

Table 29

I believe Tungsten assists me with my class instruction

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	4	41.7%	5
Somewhat Agree	2	2	33.3%	4
Somewhat Disagree	0	2	16.7%	2
Disagree	1	0	8.3%	1
		answered question		12
		skipped question		1

Seventy-five percent of teachers agree or somewhat agree while the other 25% somewhat disagree or disagree that Tungsten assists them with their classroom

instruction. One of four mathematics teachers disagree and two of eight communication arts teachers somewhat disagree. All teachers from sixth grade agree or somewhat agree, two of four teachers from seventh grade agree or somewhat agree, and three of four teachers from eighth grade agree. Both male teachers agree and somewhat agree while three of ten female teachers somewhat disagree or disagree that Tungsten assists them with their classroom instruction.

Table 30

I would be satisfied if the district removed Tungsten assessment from the curriculum

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	4	1	41.7%	5
Somewhat Agree	0	2	16.7%	2
Somewhat Disagree	1	1	16.7%	2
Disagree	0	3	25.0%	3
		answered question		12
		skipped question		1

Fifty-eight point three percent of teachers agree or somewhat agree would be satisfied if the district removed Tungsten assessment from the curriculum; and 41.7% of teachers somewhat disagree or disagree. One of five mathematics teachers somewhat disagree while three of seven communication arts teachers agree or somewhat agree. One teacher from each sixth and seventh grades disagree and one teacher from eighth grade agree. Five of ten female teachers agree and one male teacher somewhat agree to the removal of Tungsten assessment from the district's curriculum.

Table 31

I would be satisfied if the district removed Tungsten assessment from the curriculum

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	0	8.3%	1
Somewhat Agree	1	1	16.7%	2
Somewhat Disagree	1	2	25.0%	3
Disagree	1	5	50.0%	6
		answered question		12
		skipped question		1

Twenty-five percent of teachers agree or somewhat agree while 75% somewhat disagree or disagree that Tungsten hinders them giving effect instruction. Two of four mathematics teachers agree or somewhat agree and one of eight communication arts teachers somewhat agree. Two teachers from sixth grade somewhat agree, one teacher from seventh grade agree, and all teachers from eighth grade somewhat disagree or disagree. No male teachers agree or somewhat agree but three of ten female teachers agree or somewhat agree that Tungsten hinders them from giving effective instruction.

Table 32

I believe Tungsten is a valid tool for assessing student achievement

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	3	30.8%	4
Somewhat Agree	1	2	23.1%	3
Somewhat Disagree	2	3	38.5%	5
Disagree	1	0	7.7%	1
		answered question		13
		skipped question		0

Fifty-three point eight percent of teachers agree or somewhat agree and 46.2% of teachers somewhat disagree or disagree that Tungsten is a valid tool for assessing student achievement. Two of five mathematics teachers agree and somewhat agree and three of eight communication arts teachers somewhat disagree. Two teachers from sixth grade and one from eighth grade somewhat disagree. Six of 11 female teachers and one male teacher agree or somewhat agree that Tungsten is a valid tool for assessing student achievement.

Table 33

I believe Tungsten has many limitations in predicting student achievement

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	4	4	61.5%	8
Somewhat Agree	1	2	23.1%	3
Somewhat Disagree	0	1	7.7%	1
Disagree	0	1	7.7%	1
		answered question		13
		skipped question		0

Eighty-four point six percent of teachers agree or somewhat agree and 15.4% of teachers somewhat disagree that Tungsten has many limitations in predicting student achievement. All mathematics teachers agree or somewhat agree and two of eight communication arts teachers somewhat disagree or disagree. One teacher from sixth grade somewhat disagree, one teacher from seventh grade disagree, and all teachers in eighth grade agree. Both male teachers agree or somewhat agree however, two of 11 female teachers somewhat disagree or disagree that Tungsten has many limitations in predicting student achievement.

Table 34

Tungsten prepares students for MAP testing

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	3	25.0%	3
Somewhat Agree	3	3	50.0%	6
Somewhat Disagree	1	1	16.7%	2
Disagree	1	0	8.3%	1
		answered question		12
		skipped question		1

Seventy-five percent of teachers agree or somewhat agree and 25% of teachers somewhat disagree or disagree that Tungsten prepares students for MAP testing. Three of five mathematics teachers somewhat agree and one of seven communication teachers somewhat disagree. One teacher from sixth grade somewhat disagree but all teachers from eighth grade agree or somewhat agree. No male teacher somewhat disagree or disagree but three of 11 female teachers somewhat disagree or disagree that Tungsten prepares students for MAP testing.

Table 35

I dislike Tungsten

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	3	1	33.3%	4
Somewhat Agree	1	2	25.0%	3
Somewhat Disagree	0	1	8.3%	1
Disagree	1	3	33.3%	4
		answered question		12
		skipped question		1

Fifty-eight point three percent of teachers agree or somewhat agree and 41.7% of teachers somewhat disagree or disagree to disliking Tungsten. One of five mathematics teachers disagree and three of seven communication arts teachers agree or somewhat agree. One of four teachers from sixth grade and two of three from eighth grade disagree. No male teacher agree or somewhat agree but seven of 11 female teachers agree or somewhat agree to disliking Tungsten.

Table 36

I believe my attitude regarding Tungsten affects student achievement

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	4	30.8%	4
Somewhat Agree	1	3	30.8%	4
Somewhat Disagree	2	0	15.4%	2
Disagree	2	1	23.1%	3
		answered question		13
		skipped question		0

Sixty-one point five percent of teachers agree or somewhat agree that their attitude regarding Tungsten affects student achievement, and 38.5% of teachers somewhat disagree or disagree. One of five mathematics teachers somewhat agree, one of eight communication arts teachers somewhat disagree. Two of four teachers from sixth grade agree. One male teacher somewhat agree and seven of 11 female teachers agree or somewhat agree that their attitude regarding Tungsten affects student achievement.

Table 37

I believe my attitude regarding Tungsten affects students' attitudes

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	6	53.8%	7
Somewhat Agree	0	1	7.7%	1
Somewhat Disagree	4	0	30.8%	4
Disagree	0	1	7.7%	1
		answered question		13
		skipped question		0

Sixty-one point five percent of teachers agree or somewhat agree that their attitude regarding Tungsten affects students' attitudes, and 38.5% of teachers somewhat disagree or disagree. One of five mathematics teachers agree and one of eight communication arts teachers disagree. Two of four teachers from sixth grade somewhat disagree while two of four agree, three of four teachers from eighth grade agree, and two teachers from seventh grade somewhat disagree. One male teacher somewhat agree and seven of 11 female teachers agree that their attitude regarding Tungsten affects students' attitudes.

Table 38

I think favorably of Tungsten

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	4	38.5%	5
Somewhat Agree	0	2	15.4%	2
Somewhat Disagree	0	1	7.7%	1
Disagree	4	1	38.5%	5
		answered question		13
		skipped question		0

Fifty-three point eight percent of teachers agree or somewhat agree and 46.2% of teachers somewhat disagree or disagree to thinking favorably of Tungsten. One of five mathematics teachers agree and two of eight communication arts teachers somewhat disagree or disagree. One teacher from sixth grade agree, three teachers from eighth grade agree and two teachers from seventh grade disagree. Both male teachers agree or somewhat agree however, five of 11 female teachers disagree to thinking favorably of Tungsten.

Table 39

I believe my students believe Tungsten helps predict achievement

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	0	0.0%	0
Somewhat Agree	1	4	38.5%	5
Somewhat Disagree	2	3	38.5%	5
Disagree	2	1	23.1%	3
		answered question		13
		skipped question		0

Thirty-eight point four percent of teachers somewhat agree and 61.6% of teachers somewhat disagree or disagree that their students believe Tungsten helps predict achievement. One of five mathematics teachers and four of eight communication arts teachers somewhat agree. Three teachers from sixth grade somewhat disagree. One male teacher and four of 11 female teachers somewhat agree that their students believe Tungsten helps predict achievement.

Table 40

I believe students understand the relevance of Tungsten

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	2	15.4%	2
Somewhat Agree	1	3	30.8%	4
Somewhat Disagree	1	1	15.4%	2
Disagree	3	2	38.5%	5
		answered question		13
		skipped question		0

Forty-six point one percent of teachers agree or somewhat agree and 53.9% of teachers somewhat disagree or disagree that their students understand the relevance of Tungsten. One of five mathematics teachers somewhat agree and five of eight communication arts teachers agree or somewhat agree. Two teachers from sixth grade disagree, one teachers from seventh grade agree and three teachers from eighth grade somewhat agree. Both male teachers somewhat disagree or disagree while six of 11 female teachers agree or somewhat agree that their students understand the relevance of Tungsten.

Table 41

I believe the parents understand the relevance of Tungsten

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	0	0.0%	0
Somewhat Agree	0	2	15.4%	2
Somewhat Disagree	0	3	23.1%	3
Disagree	5	3	61.5%	8
		answered question		13
		skipped question		0

Fifteen point four percent of teachers somewhat agree while 84.6% of teachers somewhat disagree or disagree that the parents understand the relevance of Tungsten. All mathematics teachers disagree. Two of the eight communication arts teachers somewhat agree. One teacher from each sixth and seventh grade somewhat agree. All teachers in eighth grade somewhat disagree or disagree. Both male teachers somewhat disagree or disagree. Two of the 11 female teachers somewhat agree that the parents understand the relevance of Tungsten.

Accountability

Table 42

My principal holds my students accountable for their progress on the monthly reading and math Tungsten assessments

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	1	7.7%	1
Somewhat Agree	0	3	23.1%	3
Somewhat Disagree	2	4	46.2%	6
Disagree	3	0	23.1%	3
		answered question		13
		skipped question		0

Sixty-nine point two percent of teachers somewhat disagree or disagree. 30.8% of teachers somewhat agree or agree that their principal holds students accountable for their progress on the monthly reading and mathematics Tungsten assessment. All mathematics teachers (5) disagree, whereas, half of the communication arts teachers disagree. Three teachers from each grade level (9 total) somewhat disagree or disagree. Only one teacher from each grade level somewhat agree. One of the four teachers that agree is male. One of the nine teachers that disagree is male.

Table 43

My principal holds me accountable for student progress on Tungsten

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	4	38.5%	5
Somewhat Agree	2	2	30.8%	4
Somewhat Disagree	1	2	23.1%	3
Disagree	1	0	7.7%	1
		answered question		13
		skipped question		0

Sixty-nine point two percent of teachers agree or somewhat agree that their principal holds them accountable for student progress on Tungsten. 30.8% of teachers somewhat disagree or disagree. Three of the five mathematics teachers somewhat agree. Six of the eight communication arts teachers somewhat agree. Three teachers from each grade level (9) somewhat agree or agree. One teacher, in seventh grade, disagree. All male teachers somewhat agree or agree. Four of the seven female teachers somewhat disagree or disagree that their principal holds them accountable for student progress on Tungsten.

Table 44

I prepare my students for taking Tungsten assessment

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	5	46.2%	6
Somewhat Agree	2	2	30.8%	4
Somewhat Disagree	0	0	0.0%	0
Disagree	2	1	23.1%	3
		answered question		13
		skipped question		0

Seventy-seven percent of teachers agree or somewhat agree that they prepare students for taking Tungsten assessment, while 23% of teachers disagree. Two of five mathematics teachers disagree and one of eight communication arts teachers disagree. One teacher from sixth grade disagree, two teachers from seventh grade disagree and all teachers from eighth grade agree or somewhat agree. Both male teachers agree or somewhat agree while three of 11 female teachers disagree that they prepare their students for taking Tungsten assessment.

Table 45

I communicate the relevance of Tungsten to my students

	Tungsten Assessed Subject			
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	2	6	46.2%	8
Somewhat Agree	1	2	30.8%	3
Somewhat Disagree	2	0	0.0%	2
Disagree	0	0	23.1%	0
		answered question		13
		skipped question		0

Eighty-four point six percent of teachers agree or somewhat agree to communicating the relevance of Tungsten to their students, while 15.4% of teachers somewhat disagree or disagree. Two of the five mathematics teachers somewhat disagree. All communication arts teachers agree or somewhat agree. One teacher from each sixth and seventh grade somewhat disagree. All teachers in eighth grade agree. All male teachers agree. Two female teachers somewhat disagree to communicating the relevance of Tungsten to their students.

Table 46

I recognize and celebrate students' growth each month on Tungsten with my students

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	1	6	53.8%	7
Somewhat Agree	3	1	30.8%	4
Somewhat Disagree	0	1	7.7%	1
Disagree	1	0	7.7%	1
		answered question		13
		skipped question		0

Eighty-four point six percent of teachers agree that they recognize and celebrate students' growth each month on Tungsten with their students; and 15.4% of teachers disagree. One of five mathematics teachers disagree. One of the eight communication arts teachers somewhat disagree. All sixth grade agree or somewhat agree. One in seventh grade disagree and one in eighth grade somewhat disagree. All males agree and two of the 11 females somewhat disagree or disagree to celebrating students' growth each month on Tungsten with their students.

Table 47

Students are rewarded for making gains each month on Tungsten

Tungsten Assessed Subject				
Answer Options	Math	Communication Arts	Response Percent	Response Count
Agree	0	5	38.5%	5
Somewhat Agree	2	2	30.8%	4
Somewhat Disagree	1	1	15.4%	2
Disagree	2	0	15.4%	2
		answered question		13
		skipped question		0

Sixty-nine point two percent of teachers agree or somewhat agree that students are reward for making gains each month on Tungsten. 30.8% of teachers disagree. Two of the five mathematics teachers somewhat agree. One of the eight communication arts teachers somewhat disagree. Two from each sixth and seventh grade somewhat disagree. All teachers from eighth grade agree or somewhat agree. Both male teachers agree while four of the 11 female teachers somewhat disagree or disagree to rewarding students for making gains each month on Tungsten.

Overview of MAP Data Analysis

As stated in Chapter Two, teachers' attitudes have an effect on students' performance on benchmark assessments; and benchmark assessments are to predict student achievement on standardized tests (Perie et al., 2007a). Therefore, in this study, MAP test scores were analyzed, in three categories of gender, subject, and grade level for two middle schools in the same district, to observe if there will be a relationship between teachers' attitudes towards computerized benchmark assessments and student achievement. An analysis of variance was performed on each sample. When indicated, *z*-test was performed to show difference in proportion.

To find potential change in male and female performance on mathematics MAP for school 1 and school 2 a single factor ANOVA was performed. The null hypothesis was there will be no difference in year-to-year proportion of students performing proficient and advanced in comparing results for the timeline 2006 to 2011, measured by the mathematics MAP.

Table 13

ANOVA: Single Factor Male/Female: Mathematics

Groups	Count	Sum	Average	Variance
2006	4	119	29.75	7.1033
2007	4	121	30.25	8.7033
2008	4	138	34.50	0.1266
2009	4	147.6	36.90	18.1600
2010	4	163.3	40.82	8.3091
2011	4	158.6	39.65	3.2966

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	435.8087	5	87.1617	11.4437	.00004	2.7728
Within Groups	137.0975	18	7.6165			
Total	572.9062	23				

Since the test value of 11.44 is greater than the critical value of 2.77, the null hypothesis was rejected. One or more of the years indicates performance that is statistically different from the other years, therefore a *z*-test for difference in proportion was performed. The null hypothesis for the *z*-test was there will be no difference in proportion of students performing proficient and advanced for individual comparison of pre-to-post, for the years 2006 and 2011.

Table 14

Z-Test: Two Sample for Means Male/Female: Mathematics

	2011	2006
Mean	39.65	29.75
Known Variance	3.2966	7.1033
Observations	4	4
Hypothesized Mean Difference	0	
z	6.1397	
P(Z<=z) two-tail	0.000000008	
z Critical two-tail	1.9599	

Since the test value of 6.13 is greater than the critical value of 1.95, the null hypothesis was rejected. There was a statistically significant increase in the proportion of students scoring proficient and advanced in 2011 compared to 2006.

To find potential change in male and female performance on Communication Arts MAP for school 1 and school 2 a single factor ANOVA was performed. The null hypothesis was there will be no difference in year-to-year proportion of the students performing proficient and advanced in comparing results for the timeline 2006 to 2011, measured by the Communication Arts MAP.

Table 50

ANOVA: Single Factor Male/Female: Communication Arts

Groups	Count	Sum	Average	Variance
2006	4	124.1	31.025	50.2091
2007	4	125.7	31.425	39.0425
2008	4	129.1	32.275	29.9425
2009	4	144.3	36.075	67.5025
2010	4	150.2	37.55	54.35
2011	4	124.1	31.025	50.2091

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	163.6720	5	32.7344	0.6847	0.6409	2.7728
Within Groups	137.0975	18	7.6165			
Total	572.9062	23				

Since the test value of 0.68 is less than the critical value of 2.77 the null hypothesis was not rejected. There was no difference in proportion of the students performing proficient or advanced in comparing results from 2006 to 2011, measured by the Communication Arts MAP.

To find potential change in total student body performance on Communication Arts MAP for school 1 and school 2 a single factor ANOVA was conducted. The null

hypothesis was there will be no difference in proportion of students performing proficient and advanced in comparing results for the timeline 2006 to 2011, measured by the Communication Arts MAP.

Table 51

ANOVA: Single Factor Total Student Body Performance: Communication Arts

Groups	Count	Sum	Average	Variance
2006	2	65.8	32.9	0.32
2007	2	62.4	31.2	12.5
2008	2	64.2	32.1	1.62
2009	2	71.8	35.9	8.82
2010	2	69.7	34.85	2.205
2011	2	72.4	36.2	11.52

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	43.4241	5	8.6848	1.4089	0.3408	4.3873
Within Groups	36.9850	6	6.1641			
Total	80.4091	11				

Since the test value of 1.40 is less than the critical value of 4.38 the null hypothesis was not rejected. There was no difference in proportion of the students performing proficient and advanced in comparing results from 2006 to 2011, measured by the Communication Arts MAP.

To find the potential change in total student body performance on mathematics MAP for school 1 and school 2 a single factor ANOVA was conducted. The null hypothesis was there will be no difference in year-to-year proportion of students performing proficient and advanced in comparing results for the timeline 2006 to 2011, measured by the mathematics MAP.

Table 52

ANOVA: Single Factor Total Student Body Performance: Mathematics

Groups	Count	Sum	Average	Variance
2006	2	59.6	29.80	3.92
2007	2	60.5	30.25	13.005
2008	2	68.9	34.45	0.045
2009	2	69.2	34.60	0.72
2010	2	81.5	40.75	0.045
2011	2	79.4	39.70	2.42

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	210.3675	5	42.0735	12.5249	0.0039	4.3873
Within Groups	20.1550	6	3.3591			
Total	230.5225	11				

Since the test value of 12.52 is greater than the critical value of 4.38, the null hypothesis was rejected. One or more of the years indicated a performance different from the others. A *z*-test for difference in proportion was performed on pre-to-post measures to test the null hypothesis there will be no difference in proportion of students performing proficient and advanced for individual comparison of pre-to-post, for the years 2006 and 2011.

Table 53

Z-Test: Two Sample for Means Total Student Body Performance: *Mathematics*

	2011	2006
Mean	39.7	29.8
Known Variance	2.42	3.92
Observations	2	2
Hypothesized Mean Difference	0	
z	5.5603	
P(Z<=z) two-tail	.00000002	
z Critical two-tail	1.9599	

Since the test value of 5.56 is greater than the critical value of 1.95, the null hypothesis was rejected. There was a statistically significant increase in the proportion of students scoring proficient and advanced in 2011 compared to 2006, measured by the mathematics MAP.

To find the potential change in grade performance on Communication Arts MAP for school 2 a single factor ANOVA was conducted. The first analysis of variance follows the same grade to the next year. The second analysis of variance follows students to the next grade each year.

The null hypothesis for following the same grade to the next year was there will be no difference in proportion of students performing proficient and advanced in comparing results for the timeline 2006 to 2011, measured by the Communications Arts MAP.

Table 54

ANOVA: Single Factor School 2: Communication Arts: Grade to Next Year

Groups	Count	Sum	Average	Variance
6th	6	213.8	35.6333	10.6306
7th	6	202.4	33.7333	18.1066
8th	6	197.5	32.9167	16.7896

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	23.3144	2	11.6572	0.7681	0.4812	3.6823
Within Groups	227.6350	15	15.1757			
Total	250.9494	17				

Since the test value of 0.76 is less than the critical value of 3.68, the null hypothesis was not rejected. There was no difference in proportion of the students

performing proficient and advanced in comparing results for the same grade to the next year for the timeline 2006 to 2011, measured by the Communication Arts MAP.

The null hypothesis for following students year to year was there will be no difference in proportion of students performing proficient and advanced in comparing results when following students to the next year for the timeline 2006 to 2011, measured by the Communications Arts MAP.

Table 55

ANOVA: Single Factor School 2: Communication Arts Students: to Next Grade

Groups	Count	Sum	Average	Variance
1st sample	3	112.6	37.5333	12.9633
2nd sample	3	96.9	32.3000	2.2300
3rd sample	3	102.2	34.0666	2.0633
4th sample	3	116.2	38.7333	1.7433

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	80.3491	3	26.7830	5.6385	0.0225	4.0661
Within Groups	38.0000	8	4.7500			
Total	118.3492	11				

Since the test value of 5.63 is greater than the critical value of 4.06, the null hypothesis was rejected and a z-test was performed. The null hypothesis was there will be no difference in proportion of students performing proficient and advanced for samples 1 (students entering sixth grade in 2006) and 4 (students entering sixth grade in 2009) for the timeline 2006 to 2011, measured by Communication Arts MAP.

Table 56

Z-Test: Two Sample for Means School 2, Communication Arts: Students to Next Grade

	4th sample	1st[t] sample
Mean	38.7333	37.5333
Known Variance	1.7400	12.9600
Observations	3	3
Hypothesized Mean Difference	0	
z	0.5421	
P(Z<=z) two-tail	0.5877	
z Critical two-tail	1.9599	

Since the test value of 0.54 is less than the critical value of 1.95, the null hypothesis was not rejected.

To find the potential change in grade performance on mathematics MAP for school 2 a single factor ANOVA was conducted. The first analysis of variance follows the same grade to the next year. The second analysis of variance follows students to the next grade each year.

The null hypothesis for following the same grade to the next year was there will be no difference in proportion of students performing proficient and advanced in comparing results for the timeline 2006 to 2011, measured by the mathematics MAP.

Table 57

ANOVA: Single Factor School 2, Communication Arts: Students to Next Grade

Groups	Count	Sum	Average	Variance
6th	6	262.6	43.7667	14.395
7th	6	215.6	35.9333	47.351
8th	6	168.6	28.1	52.236
Algebra 1	2	140.8	70.4	250.88

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	2875	3	958.215	18.679	0.00002	3.2388
Within Groups	820.8	16	51.2992			
Total	3695	19				

Since the test value of 18.67 is greater than the critical value of 3.23, the null hypothesis was rejected. One or more of the grades indicates performance that is statistically different from the others. Therefore, a *z*-test with null hypothesis of there was no difference in proportion of students performing proficient and advanced for grades six and eight for the timeline 2006 to 2011, measured by the mathematics MAP, was performed.

Table 58

Z-Test: Two Sample for Means School 2, Mathematics: Students to Next Grade

	6th	8th
Mean	38.7333	37.5333
Known Variance	1.7400	12.9600
Observations	3	3
Hypothesized Mean Difference	0	
z	0.5421	
P(Z<=z) two-tail	0.5877	
z Critical two-tail	1.9599	

Since the test value of 4.70 is greater than the critical value of 1.95, the null hypothesis was rejected. There was a statistically significant increase in the proportion of students scoring proficient and advanced in grade sixth compared to eighth for the timeline 2006 to 2011, measured by mathematics MAP.

The null hypothesis for following students year to year was there will be no difference in proportion of students performing proficient and advanced in comparing results for the timeline 2006 to 2011, measured by mathematics MAP.

Table 59

ANOVA: Single Factor School 2, Mathematics: Students to Next Grade

Groups	Count	Sum	Average	Variance
1st sample	3	96.9	32.3000	58.7100
2nd sample	3	112.9	37.6333	42.2633
3rd sample	3	115.2	38.4000	18.4900
4th sample	3	134.1	44.7000	39.3100

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	232.2225	3	77.4075	1.9501	0.2001	4.0661
Within Groups	317.5467	8	39.6933			
Total	549.7692	11				

Since the test value of 1.95 is less than the critical value of 4.06, the null hypothesis was not rejected.

To find the potential change in grade performance on Communication Arts MAP for school 1 a single factor ANOVA was conducted. The first analysis of variance follows the same grade to the next year. The second analysis of variance follows students to the next grade each year.

The null hypothesis for following the same grade to the next year was there will be no difference in proportion of students performing proficient or advanced in comparing results for the timeline 2006 to 2011, measured by the Communications Arts MAP.

Table 60

ANOVA: Single Factor School 1, Communication Arts Students: to Next Grade

Groups	Count	Sum	Average	Variance
6th	6	200.8	33.46667	15.58667
7th	6	210.8	35.13333	41.67467
8th	6	200.6	33.43333	34.41867

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	11.3377	2	5.6688	0.1855	0.8325	3.6823
Within Groups	458.4000	15	30.5600			
Total	469.7378	17				

Since the test value of 0.18 is less than the critical value of 3.68, the null hypothesis was not rejected.

The null hypothesis for following students year to year was there will be no difference in proportion of students performing proficient and advanced in comparing results when following students to the next year for the timeline 2006 to 2011, measured by the Communication Arts MAP.

Table 61

ANOVA: Single Factor School 2, Communication Arts: Students to Next Grade

Groups	Count	Sum	Average	Variance
1st sample	3	90.9	30.3000	3.6300
2nd sample	3	97.6	32.5333	14.8633
3rd sample	3	110.7	36.9000	12.1600
4th sample	3	115.8	38.6000	0.4300

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	132.1500	3	44.0500	5.6686	0.0222	4.0661
Within Groups	62.1666	8	7.7708			
Total	194.3167	11				

Since the test value of 5.66 is greater than the critical value of 4.06, the null hypothesis was rejected and a z-test was performed. The null hypothesis was there will be no difference in proportion of students performing proficient and advanced for samples 1 (students entering sixth grade in 2006) and 4 (students entering sixth grade in 2009) for the timeline 2006 to 2011, measured by the Communications Arts MAP.

Table 62

Z-Test: Two Sample for Means School 2, Mathematics: Students to Next Grade

	4th sample	1st[t] sample
Mean	38.6	30.3
Known Variance	0.43	3.63
Observations	3	3
Hypothesized Mean Difference	0	
z	7.1347	
P(Z<=z) two-tail	0.000000000097	
z Critical two-tail	1.9599	

Since the test value of 7.13 is greater than the critical value of 1.95, the null hypothesis was rejected.

To find the potential change in grade performance on mathematics MAP for school 1 a single factor ANOVA was conducted. The first analysis of variance follows the same grade to the next year. The second analysis of variance follows students to the next grade each year.

The null hypothesis for following the same grade to the next year was there will be no difference in proportion of students performing proficient and advanced in comparing results for the timeline 2006 to 2011, measured by the mathematics MAP.

Table 63

ANOVA: Single Factor School 1, Mathematics Students: to Next Grade

Groups	Count	Sum	Average	Variance
6th	6	243.4	40.57	19.79
7th	6	210.5	35.08	54.32
8th	6	174.7	29.12	21.57
Algebra 1	2	145.9	72.95	190.1

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	2996.5	3	998.8	23.9	0.000037	3.2388
Within Groups	668.56	16	41.78			
Total	3665.1	19				

Since the test value of 23.9 is greater than the critical value of 3.23 the null hypothesis was rejected. One or more of the grades indicates performance that is statistically different from the others. Therefore a *z*-test was performed with null hypothesis of there was no difference in proportion of students performing proficient and advanced for grades six and eight for timeline 2006 to 2011, measured by the mathematics MAP.

Table 64

Z-Test: Two Sample for Means School 1, Mathematics: Students to Next Grade

	6th	8th
Mean	40.567	29.1167
Known Variance	19.79	21.57
Observations	6	6
Hypothesized Mean Difference	0	
z	4.361	
P(Z<=z) two-tail	0.00001	
z Critical two-tail	1.96	

Since the test value of 4.36 is greater than the critical value of 1.96, the null hypothesis was rejected. There was a statistically significant increase in the proportion of

students scoring proficient and advanced in grade 6th compared to 8th for timeline 2006 to 2011, measured by mathematics MAP.

The null hypothesis for following students year to year was there will be no difference in proportion of students performing proficient and advanced in comparing results for timeline 2006 to 2011, measured by the mathematics MAP.

Table 65

ANOVA: Single Factor School 1, Mathematics Students: to Next Grade

Groups	Count	Sum	Average	Variance
1st Set	3	96.7	32.2333	70.2033
2nd Set	3	88.8	29.6000	15.4300
3rd Set	3	106.2	35.4000	7.9300
4th Set	3	119.5	39.8333	11.6433

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	174.5533	3	58.1844	2.2121	0.1642	4.0661
Within Groups	210.4133	8	26.3016			
Total	384.9667	11				

Since the test value was less than the critical value, do not reject the null hypothesis of there will be no difference in proportion of students performing proficient and advanced in comparing results for timeline 2006 to 2011.

Table 15

MAP Data Analysis: Null Hypotheses Results

Category/Topic	Hypotheses	Test Value	Critical Value	Rejected
Gender				
Male/Female Schools 1 & 2 Math	H_{01}	11.44	2.77	X
	H_{02}	6.13	1.95	X
Male/Female Schools 1 & 2 CA	H_{01}	0.68	2.77	
Total Student Body				
Schools 1 & 2 CA	H_{01}	1.40	4.38	
Schools 1 & 2 Math	H_{01}	12.52	4.38	X
	H_{02}	5.56	1.95	X
Grade				
School 2 CA Grade to Next Year	H_{01}	0.76	3.68	
School 2 CA Student to Next Grade	H_{03}	5.63	4.06	X
	H_{04}	0.54	1.95	
School 2 Math Grade to Next Year	H_{01}	18.67	3.23	X
	H_{05}	4.70	1.95	X
School 2 Math Student to Next Grade	H_{01}	1.95	4.06	
School 1 CA Grade to Next Year	H_{01}	0.18	3.68	
School 1 CA Student to Next Grade	H_{03}	5.66	4.06	X
	H_{04}	7.13	1.95	X
School 1 Math Grade to Next Year	H_{01}	23.90	3.23	X
	H_{05}	4.36	1.96	
School 1 Math Student to Next Grade	H_{03}	0.16	4.06	

Null Hypotheses

H_{01}. There will be no difference in year-to-year proportion of students performing proficient and advanced in comparing results from the years 2006 - 2011.

H_{02}. There will be no difference in proportion of students performing proficient and advanced for individual comparison of pre-to-post, for the years 2006 and 2011.

H_{03}. There will be no difference in proportion of students performing proficient and advanced in comparing results when following students to the next year.

H_{04}. There will be no difference in proportion of students performing proficient and advanced for samples 1 (students entering sixth grade in 2006) and 4 (students entering sixth grade in 2009).

H_{05}. There will be no difference in proportion of students performing proficient and advanced for grades six and eight.

Summary

Chapter four presents data from the teacher questionnaire, teacher survey, and student MAP test scores. The data presented responds to the hypotheses of there will be a difference in student achievement as measured by the MAP test scores of middle school students since implementation of the Tungsten Learning System; as well as the two research questions of: 1) What are teachers' attitudes regarding the use of the Tungsten Learn System in the areas of reading and mathematics; and 2) how, if at all, do teachers change their behaviors in regards to the monthly reports of the Tungsten Learning System?

Chapter Five: Discussion and Conclusion

Since the implementation of the No Child Left Behind Act of 2002, educators used various strategies to help student achievement increase. Computerized benchmark assessments became popular amongst school districts across the nation because of the claim to predict and possibly improve student success on state-mandated standardized tests. With the implementation of computerized benchmark assessments came more training and planning time for teachers and an increase of expense for districts.

The investigator's purpose for this study was to determine what, if any, relationship there was among middle school teachers' attitudes, monthly computerized benchmark assessments, and student scores on the MAP. The research questions were:

Research Questions

1) What are teachers' attitudes regarding the use of the Tungsten Learning System in the areas of reading and mathematics?
2) How, if at all, do teachers change their behaviors in regards to the monthly reports of the Tungsten Learning System?

Hypotheses

The primary hypothesis of this study was:

There will be a difference in student achievement as measured by the MAP test scores of middle school students, since implementation of the Tungsten Learn System.

The alternative hypotheses to support the primary hypothesis were:

H_{a1}. There will be a difference in year-to-year proportion of students performing proficient and advanced, in comparing results from the years 2006 - 2011.

H_{a2}. There will be a difference in proportion of students performing proficient and advanced, for individual comparison of pre-to-post, for the years 2006 and 2011.

H_{a3}. There will be a difference in proportion of students performing proficient and advanced, in comparing results when following students to the next year.

H_{a4}. There will be a difference in proportion of students performing proficient and above for samples 1 (students entering sixth grade in 2006) and 4 (students entering sixth grade in 2009).

H_{a5}. There will be a difference in proportion of students performing proficient and advanced for grades six and eight.

The researcher organized this chapter by beginning with a review of methodology, addressing research questions one and two in the questionnaire, followed by a survey data analysis section. A discussion of the primary and alternative hypotheses is included. Each section includes discussion and implications of the research. The researcher follows up with a conclusion, recommendations for future studies, and a summary.

Review of Methodology

To test the hypothesis and respond to the research questions, triangulation, or a combination of quantitative and qualitative analysis, was used in this study. To answer the research questions, qualitative data gathered by questionnaire and survey were analyzed, In addition, results of the testing of the null hypotheses, qualitative data, and descriptive MAP scores were analyzed. To determine teachers' attitudes regarding the Tungsten Learning System, a questionnaire and survey were administered to participants

at one of the middle schools in the study district. The questionnaire consisted of five questions and was given to six educators. The survey had 47 questions in the categories of demographics, training or comfort, use of feedback, teachers' perceptions, accountability, and student preparation and motivation. Participants were to respond to 36 of the survey questions by selecting a category from the following choices: disagree, somewhat disagree, somewhat agree, or agree. A Likert scale was assigned to the categories, and the mean and percentage of categorical response to each question was calculated. Each category was cross-tabulated by gender, Tungsten assessed subject taught, and grade level taught. MAP data from 2006 to 2011 for two middle schools in the same district were collected and analyzed. To determine if there will be a difference in student achievement represented by the MAP scores, an ANOVA was performed on both the population and samples from both schools, in the areas of mathematics and communication arts (Bluman, 2008, p. 604). When needed *z*-tests were performed to identify specific differences in proportion.

Questionnaire and Survey Data Analysis

Research question one asked about teachers' attitudes regarding the use of the Tungsten Learning System in the areas of reading and mathematics. Teachers' responses on the questionnaire varied. When asked their thoughts about the computer-based Tungsten Learning System, teachers' responses included liking the instant feedback of students' performance and their own teaching skills. This finding was similar to what Nguyen et al. (2006) found regarding the perception and evaluation of web-based assessment. Immediate feedback and instant scoring were found to be attractive features. However, several teachers in this study mentioned the tool was not aligned with district

standards or the curriculum. Teachers also mentioned student frustration and the buy-in of students. One teacher was pleased with the fact students could monitor their own progress and set goals for themselves to achieve higher scores; however, others indicated Tungsten was given too often to be effective, and students became frustrated quickly, due to being assessed over skills not covered in the classroom. Frustration may be linked to the fact that interim assessments did not occur at the time of instruction, and perhaps did not provide the kind of immediate feedback that was useful to teachers and students, as mentioned by Christman et al. (2009) in the literature review of this study. A majority, three out of five of the educators who completed and submitted the questionnaire, favored discontinuation of use of the Tungsten Learning System and welcomed implementation of Discovery, a computerized benchmark assessment administered three times a year. Reasons listed for favoring Discovery were the reduced number of administrations, the breakdown of the result, and inclusion of tools for re-teaching and assessing. One educator indicated preference for Tungsten, because learning a new program takes time. This same concern about training and professional development, and reluctance to replace assessments was discussed in the Czubai (2004) study.

According to the survey, a little over half of the teachers believed Tungsten was an effective predictor of MAP achievement. Even with belief in the effectiveness of prediction, nearly 85% believed Tungsten had limitations in predicting student achievement. The likeability of Tungsten was inconclusive. Just over half of the participants liked Tungsten. Seventy-five percent believed Tungsten assisted with classroom instruction, and 58.3% would be satisfied if the district removed the use of Tungsten from the curriculum. Some teachers believed students understood the relevance

of Tungsten, in comparison to parents understanding the relevance. Nearly 62% of educators believed their attitudes regarding Tungsten affected students' attitudes and achievement. All but one communication arts teacher agreed teacher attitudes affected students, while only one mathematics teacher agreed. The mean of the responses showed teachers somewhat disagreed with the thought that their attitudes affected student achievement and somewhat agreed that their attitudes affected students' attitudes. Nguyen et al. (2006) found that students' attitudes affected their achievement. The teachers in this study believed they had an effect on students' attitudes, but not their achievement, so therefore there was an indirect effect on students' achievement through students' attitudes. Jones and Egley's (2004) study showed teachers were in favor of accountability or believed that accountability was necessary. This study found that teachers believed their principal held them accountable, instead of their students, for progress on the monthly reading and mathematics Tungsten assessments. Half of the communication arts teachers thought students were held accountable, whereas all of the mathematics teachers disagreed that students were held accountable. The researcher would agree with Christman et al. (2009) that teachers' satisfaction with benchmark data was not a statistically significant predictor of student achievement gains

Research question two asked, how, if at all, teachers changed their behaviors in regards to the monthly reports of the Tungsten Learning System. All educators who completed and submitted the questionnaire indicated they used the Tungsten data in one form or another. Some used the data to make decisions about how to re-teach lessons, differentiate lessons and create small groups, track students' performance, and work on test-taking strategies. One educator also indicated the data was shared with students and

parents during conferences. Teachers used various methods to prepare students for the monthly computer-based benchmarks. An educator indicated reviewing the previous month's assessment with students, while another focused on transitioning from paper tests to computerized tests. Similar to Gretes and Green's (2000) study, it was found beneficial to student achievement to practice using a computer-assisted assessment prior to taking a pencil-paper-based assessment. There was a perceived difference in whether or not the benchmark was aligned to the curriculum and/or standards. One participant stated there was no way to prepare because of the lack of correlation, while another felt the benchmark was in line with standards.

According to the survey, although, 91.7% of educators stated they used Tungsten data to adjust or re-teach lessons, only 38.4% used the re-teaching strategies available through Tungsten materials. The mean rating indicated participants somewhat disagreed with conducting monthly strand analysis of students' progress and reviewing missed benchmark items with the students each month. This was similar to Rieg's (2007), in which teachers felt giving students feedback and understanding why their answers were incorrect was not effective, although research had already support such practices as being beneficial. Seventy-seven percent of teachers somewhat agreed or agreed that they prepared students for taking the Tungsten assessments. Eight-four point six percent reported they communicated the relevance of Tungsten to their students, however only 46.1% believed students understood the relevance. The majority of teachers surveyed stated they recognized and celebrated students' growth indicated by Tungsten assessments each month with their students and somewhat rewarded them for making gains. While a majority of educators reported they were comfortable administering

Tungsten and using the re-teaching strategies available, 61.6% did not feel comfortable setting up custom groups to monitor advanced, proficient, basic and below students. However, only 23.1% of the teachers, all from the content area of communication arts, wanted more training.

MAP Scores: Data Analysis

The hypothesis of this study stated there will be a difference in student achievement, as measured by the MAP test scores of middle school students, since implementation of the Tungsten Learning System. Table 67 displays the results of the alternative hypotheses used to provide a conclusion for the primary hypothesis.

After analyzing scores for both mathematics and communication arts, the hypothesis appears to be supported by data for only one of the subjects, mathematics. When analyzing MAP scores for total performance of both middle schools, gender and grade, there was an increase in proportion of students performing proficient and advanced in mathematics. However, there was no difference in performance in the area of communication arts. Total student body performance of both schools showed there was a difference in mathematics scores in 2011 compared to 2006. Also, for middle schools one and two, students scored better in mathematics in the sixth grade compared to the eighth grade. Observation of the same set of students from sixth grade through eighth grade revealed there was no difference in mathematics for either middle school; however, there was a difference in communication arts for both middle schools. An increase in proportion of the student sample beginning middle school in 2009 was detected in middle school one, when compared to the sample that began in 2006. There was no observable difference in proportion for middle school two.

Table 16

MAP Data Analysis: Alternative Hypotheses Results

Category/Topic	Hypotheses	Test Value	Critical Value	Not Supported
Gender				
Male/Female Schools 1 & 2 Math	H_{a1}	11.44	2.77	
	H_{a2}	6.13	1.95	
Male/Female Schools 1 & 2 CA	H_{a1}	0.68	2.77	X
Total Student Body				
Schools 1 & 2 CA	H_{a1}	1.40	4.38	X
Schools 1 & 2 Math	H_{a1}	12.52	4.38	
	H_{a2}	5.56	1.95	
Grade				
School 2 CA Grade to Next Year	H_{a1}	0.76	3.68	X
School 2 CA Student to Next Grade	H_{a3}	5.63	4.06	
	H_{a4}	0.54	1.95	X
School 2 Math Grade to Next Year	H_{a1}	18.67	3.23	
	H_{a5}	4.70	1.95	
School 2 Math Student to Next Grade	H_{a1}	1.95	4.06	X
School 1 CA Grade to Next Year	H_{a1}	0.18	3.68	X
School 1 CA Student to Next Grade	H_{a3}	5.66	4.06	
	H_{a4}	7.13	1.95	
School 1 Math Grade to Next Year	H_{a1}	23.90	3.23	
	H_{a5}	4.36	1.96	X
School 1 Math Student to Next Grade	H_{a3}	0.16	4.06	X

Alternative Hypotheses

H_{a1}. There will be a difference in year-to-year proportion of students performing proficient and advanced in comparing results from the years 2006 - 2011.
H_{a2}. There will be a difference in proportion of students performing proficient and advanced for individual comparison of pre-to-post, for the years 2006 and 2011.
H_{a3}. There will be a difference in proportion of students performing proficient and advanced in comparing results when following students to the next year.
H_{a4}. There will be a difference in proportion of students performing proficient and above for samples 1 (students entering sixth grade in 2006) and 4 (students entering sixth grade in 2009).
H_{a5}. There will be a difference in proportion of students performing proficient and advanced for grades six and eight.

At a glance at the averages of gender MAP scores from 2006 to 2011, it appeared as though females in both schools had a greater proportion of scoring proficient and

above in mathematics and communication arts than males; however, further statistical analysis would be required to verify.

Conclusion

As the literature review revealed, there was limited evidence of the effectiveness of data-based decision making, because there was often a lag before rigorous research could identify the impact of technologies (as cited in Christman et al., 2009). The Tungsten Learning System was implemented as a means to predict and make decisions regarding student achievement and instructional planning. This study found that from 2006 to 2011, there was a difference in student achievement represented by mathematics MAP scores. Based on the results of the questionnaire and survey, the conclusion reached regarding teachers' attitudes about the Tungsten Learning System was that teachers did not believe it was a good predictor of student achievement and favored the discontinuation of use; however teachers did appreciate the feedback and some of the tools provided. The appreciation of the feedback coincides with Christman et al.'s (2009) findings regarding the belief that assessments were a source of useful information about students' learning. Regarding computerized benchmark assessments overall, it appeared teachers favored them if not administered monthly, they were aligned with the curriculum, provided student feedback and effective re-teaching tools, and teachers were trained. Teachers believed their attitudes had more of an effect on their students' attitudes than on student achievement, whereas, MacIver and Epstein (1993) found the curriculum and the nature of instruction fostered or limited students' feelings of achievement. Similar to Faulkner and Cook (2006), the study questionnaire and survey revealed that practically all teachers changed their instructional behaviors as a result of the outcome of

students' performance on the monthly Tungsten Learning System and utilized some of the same instructional strategies.

When trying to rationalize why there was an increase in mathematics MAP scores and not communication arts scores; the researcher closely observed and considered participants' demographics and responses to the tools administered in this study. The data revealed all mathematics teachers who participated in this study had six or more years of teaching experience. Also, practically all of the mathematics teachers believed Tungsten had limitations and favored its discontinuation. More communication arts teachers thought Tungsten prepared students for MAP and favored its use. Christman et al. (2009) sited that teachers could become distracted by the predictive uses of benchmark assessments instead of the instructional and evaluative purposes. It is possible communication arts teachers were more distracted by prediction of student achievement than mathematics teachers, therefore mathematics achievement increased. Teachers of both subjects rewarded their students, yet all of communication arts shared the relevance of Tungsten with their students. Analysis of the MAP data also revealed that sixth grade of both middles schools had a significant increase in proportion of students performing proficient and higher, in comparison to eighth grade. This could also be explained by sixth grade teachers providing more years of experience in teaching their Tungsten-assessed subject. Although all eighth grade teachers believed Tungsten had many limitations, sixth grade teachers disliked tungsten more frequently than eighth grade teachers. When comparing participants' responses to student achievement, as measured by MAP scores, the researcher believes teachers' attitudes regarding Tungsten Learning System had no effect on student achievement.

The study of students' communication arts MAP scores, with consideration of when they began middle school, indicated there was a difference. The class that began in 2009 had a significant increase, in comparison to the class that began in 2006. This could be supported by the fact that many of the communication arts teachers felt more comfortable with Tungsten each year following its initial implementation; however, as previously discussed, when analyzing total performance or the whole population from 2006 to 2011, there was no significant increase in students' performance in communication arts. Therefore, the researcher cannot determine if there was a correlation of teachers' attitudes and student achievement, as measured by MAP for individual samples. As a result of this study, the researcher concluded educators' years of experience may have a greater effect on student achievement, as measured by MAP, than teachers' attitudes. As Pereira and Tienken's (2012) evaluation of the influence of interim assessments on eighth grade students' achievement in mathematics and language arts revealed, differences may be due to contextual factors, and one size does not fit all.

Since the research began, there were been several uncontrollable changes that may have caused limitations to this study. MAP scores were used to measure students' achievement from 2006 to 2011. During that time, the format of MAP changed to where eighth grade algebra students began taking the End of Course (EOC) exam, and MAP-A was developed for students with special needs. Additionally, the category of questions changed to multiple choice, constructive response, and performance events. Levels not determined (LND), or students who did not take MAP, should be considered in interpreting results of this study, also. There were also limitations to the qualitative data. The survey and questionnaire was administered to the mathematics and communication

arts teachers of only one of the two middles schools in the study district. Therefore, there was a small sample size. Also, during the time of this study, there were changes in assigned subjects taught and retention of teachers. This change could have had an effect on responses to the questionnaire and survey. The length of time it took the researcher to complete the study may also have an effect. Due to the researcher's health, the study took longer than anticipated. Over the course of this study, the computerized benchmark assessment used in the middle schools changed. Edison Schools changed the name of Tungsten to Evaluate, then later the district selected a completely new assessment called Discovery, which was given three times a year instead of monthly.

Recommendations for Further Study

Although the researcher found teachers' attitudes to not be as influential to students' achievement as educators' years of teaching, further study should be completed. Future study should include a larger sample size and more diverse sample, and should include qualitative study of mathematics and communication arts teachers from both schools to give a greater number of participants. Also, additional qualitative observation could include how teachers specifically used the tools and results of computerized benchmark testing. MAP data analysis could include a comparison of female and male performance, as well as comparison of the entire population of middle school one to the entire population of middle school two. Interviews could also be used in future studies, so that the researcher could obtain more information not included on a questionnaire.

Since the start of this study, the assessment system across the U.S. evolved to one that focused on Common Core State Standards (CCSS) in English language arts/literacy and mathematics. The Smarter Balanced assessment system was developed, which

included summative, interim, and formative assessment resources for teachers. The Smarter Balanced assessment system was designed to measure progress towards college and career readiness by providing accurate information about what students know before entering college. In 2011, higher education leaders were established and in 2013, assessment items and performance tasks were piloted. In spring 2014, field testing of summative and interim assessments were performed, and in the 2014-2015 school year, the assessment system was implement (Smarter Balanced Assessment Consortium, 2012). Since many states were a part of the Smarter Balanced Assessment Consortium, the study could be conducted again to include some or all states of the Consortium.

Summary

This study observed teachers' attitudes regarding the Tungsten Learning System, a computer-based benchmark assessment, and student achievement. The researcher concluded teachers' attitudes regarding Tungsten were not as influential to student achievement as years of experience teaching. Recent to the time of this writing, the Department of Elementary and Secondary Education in the State of Missouri launched Top 10 by 20, an initiative that aims to rank Missouri in the top 10 of the United States by 2020 (MODESE, "Top 10 by 20", 2015b). One of the goals of the initiative was to increase the proportion of students scoring at or above the proficient level on state assessments each year, to exceed 75% of students in all subgroups by 2020. Districts continued to be faced with making decisions regarding the best strategies to use to evaluate student progress.

References

Abrams, L., Pedulla, J., & Madaus, G. (2003). Views from the classroom: Teachers' opinions of statewide testing programs. *Theory Into Practice, 42*(1), 18-29.

Atkinson, P. (2003). *Assessment 5-14: What do pupils and parents think?* Glasgow, Scotland: Glasgow University.

Babo, G., Tienken, C. H., & Gencarelli, M. A. (2014). Interim testing, socio-economic status, and the odds of passing grade 8 state tests in New Jersey. *Research in Middle Level Education Online, 38*(3), 1-9.

Bambrick-Santoyo, P. (2007). Data in the driver's seat. *Educational Leadership, 65*(4), 43-46.

Bennett, R. E. (2002). Using electronic assessment to measure student performance: Online testing. *State Education Standard, 3*(3), 23-29.

Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappa International, 80*(2), 139-44.

Bluman, A. (2008). *Elementary statistics: A step-by-step approach.* New York, NY: McGraw-Hill.

Brookhart, S. M. (1997). A theoretical framework for the role of classroom assessment in motivating students' effort and achievement. *Applied Measurements in Education, 10*(2), 161-180.

Bugbee, A. (1996). The equivalence of paper-and-pencil and comptuer-based testing. *Journal of Research on Computing Education, 28*(3), 282.

Bunderson, C. (1988). *The four generations of computerized educational measurement.* Princeton, NJ: Educational Testing Service.

Butler, D. (2003). *The impact of computer-based testing on student attitudes and behavior.* Retrieved from http://technologysource.org/article/impact_of_computerbased_testing_on_student_attitudes_and_behavior/

Christman, J., Neild, R., Bulkley, K., Blanc, S., Liu, R., & Mitchelle, C. (2009). *Making the most of interim assessment data. Lessons from Philadelphia.* Philadelphia, PA: Research for Action.

Clune, W. H., & White, P. A. (2008). *Policy effectiveness of interim assessments in Providence Public Schools. WCER Working Paper No. 2008-10.* Madison, WI: Wisconsin Center for Education Research.

Cole, R., MacIsaac, D., & Cole, D. (2001). *A comparison of paper-based and web-based testing*. Flagstaff, AZ: Northern Arizona University

Cooley, V. E. (1997). Technology: Building success through teacher empowerment. *Educational Horizons, 75*(2), 73-77.

Creswell, J. W. (2008). *Educational reserch: Planning, conducting, and evaluating quantitative and qualitative research.* New Jersey, NJ: Pearson Educational, Inc.

CTB/McGraw Hill. (2008). Promoting student achievement using research-based assessment with formative benefits. Monterey, CA: CTB/McGraw Hill.

Curda, L. K., Martindale, T., & Pearson, C. (2005). Effects of an online insturctiona application on reading and mathematics standardized test scores. *Journal of Research on Technology in Education, 37*(4), 349-60.

Czubai, C. A. (2004). Literature review: Reported educator concerns regardng cyberspace curricula. *Education, 124*(4), 676-681.

Dugger, W. E. (1997). Technology for all Americans: Providing a vision for technological literacy. *Educational Horizons, 75*(2), 97-100.

Edison Schools. (2009, December). *A message for our clients*. Retrieved from http://www.edison schools.com/tungsten-learning

Faulkner, S. A., & Cook, C. M. (2006). Testing vs. teaching: The perceived impact of assessment on middle grades instructional practices. *RMLE Online: Research in Middle Level Education, 29*(7), 1-13.

Gardner, D. P., Larsen, Y. W., Baker, W. O., Campbell, A., Crosby, E. A., Foster, C. A., . . . Wallace, R. (1983). *A nation at risk: The imperative for educational reform.* Washington, DC: National Commission on Excellence in Education.

Goertz, M., Nabors Olah, L., & Riggan, M. (2009). Can interim asessments be used for instructional changes. *Policy Brief. RB-51*. Philadelphia, PA: Consortium for Policy Research in Education.

Gretes, J., & Green, M. (2000). Improving undergraduate learning with computer-assisted assessment. *Journal of Research on Computing in Education, 33*(1), 46.

Hamilton, L., Halverson, R., Jackson, S., Mandinach, E., Supovitz, J., Wayman, J., & Clearinghouse, W. W. (2009). *Using student achievement data to support instructional decision making. IES Practice Guide. NCEE 2009-4067.* Washington, DC: National Center for Education Evaluation and Regional Assistance.

Jackson, A. W., & Davis, G. A. (2000). *Turning points 2000: Educating Adolescents in the 21st Century.* New York, NY: Teachers College Press.

Jones, B. D., & Egley, R. J. (2004). Voices from the fronterlines: Teachers' perceptions of high-stakes testing. *Educational Policy Archives, 12*(39), 34.

Jones, M. G., Jones, B. D., Hardin, B., Chapman, L., Yarbrough, T., & Davis, M. (1999). The impact of high-stakes testing on teachers and students in North Carolina. *Phi Delta Kappan, 81*(3), 199-203.

Kim, J. (2015). A study of perceptional typologies on computer based assessment (CBA): Instructor and student perspectives. *Educational Technology & Society, 18*(2), 80-96.

Konstantopoulos, S., Miller, S. R., & van der Ploeg, A. (2013). The impact of Indiana's system of interim assessments on mathematics and reading achievement. *Educational Evaluation and Policy Analysis, 35*(4), 481-499.

Kurt, H. (2013). The analyze of teachers' responsibility beliefs for students academic successes and failures. *International Online Journal of Educational Sciences, 5*(2), 314-32.

MacIver, D. J., & Epstein, J. L. (1993). Middle grades research: Not yet mature, but no longer a child. *The Elementary School Journal, 93*(5), 519-531.

Marshall, K. (2008). Interim assessment: A user's guide. *Phi Delta Kappan, 90*(1), 64-68.

McIntire, T. (2005). *DATA: Maximize your mining, part one.* Retrieved from http://www.tech learning.com/assessment-&-testing/0034/data-maximize-your-mining-part-one/45194

Missouri Department of Elementary and Secondary Education. (2011). Achievement Level 4 - Public - Historical. Retrieved from http:// mcds.dese.mo.gov/guided

inquiry/Achievement%20Level%20%204%20Levels/Achievement%20Level%204%20Report%20-%20Public%20-%20Historical.aspx

Missouri Department of Elementary and Secondary Education. (2012). District report card. Retrieved from http://mcds.dese.mo.gov/guidedinquiry/School%20Report%20Card/District%20Report%20Card.aspx

Missouri Department of Elementary and Secondary Education. (2014). Assessment technical support materials. Retrieved from http://dese.mo.gov/college-career-readiness/assessment/assessment-technical-support-materials

Missouri Department of Elementary and Secondary Education. (2015). LEA guide to the Missouri Assessment Program 2015-2016. Retrieved from http://dese.mo.gov/college-career-readiness/assessment/lea-guide-missouri-assessment-program-2015-2016

Missouri Department of Elementary and Secondary Education. (2015). Top 10 by 20. Retrieved from http://dese.mo.gov/top-10-by-20

Nabrs Olah, L., Lawrence, N., & Riggan, M. (2010). Learning to learn from benchmark assessment data: How teachers analyze results. *Peabody Journal of Education, 85*(2), 226-245.

Nguyen, D., Hsieh, Y., & Allen, G. (2006). The impact of web-based assessment and practice on students' mathematics learning attitudes. *The Journal of Computers in Mathematics and Science Teaching*, *25*(3), 251-79.

Nichols, S. L., Glass, G. V., & Berliner, D. C. (2012). High-stakes testing and student achievement: updated analyses with NAEP data. *Educational Policy Analysis Archives, 20*(20), 1-30.

Owens, C. H., Magoun, A. D., & Anyan, J. (2000). *The effects of technology on the attitudes of classroom teachers (E-TACT).* Society for Information Technology & Teacher Education International Conference, San Diego, CA.

Pereira, M., & Tienken, C. (2012). An evaluation of the influence of grade 8 student achievement in mathematics and language arts. *International Joural of Educational Leadership Preparation, 7*(3), 13.

Perie, M., Marion, S., & Gong, B. (2007a). *A framework for considering interim assessments.* Dover, NH: National Center for the Improvement of Educational Assessments.

Perie, M., Marion, S., Gong, B., & Wurtzel, J. (2007b). *The role of interim assessment in a comprehensive assessment system.* Washington, DC: The Aspen Institute.

Poggio, J., Glasnapp, D., Yang, X., & Poggio, A. (2005). A comparative evaluation of score results from computerized and paper & pencil mathematics testing in a large scale state assessment program. *Journal of Technology, Learning, and Assessment, 3*(6), 31.

Reckase, M. D. (1986). *Position paper on the potential use of compterized testing procedures for the National Assessment of Educational Progress.* Retrieved from http://files.eric.ed.gov/fulltext/ED279693.pdf

Reed, D. K. (2015). Middle level teachers' perception of interim reading assessments: an exploratory study of data-based decision making. *RMLE Online: Research in Middle Level Education, 38*(6), 1-13.

Rieg, S. A. (2007). Classroom assessment strategies: What do students at-risk and teachers perceive as effective and useful? *Journal of Instructional Psychology, 34*(4), 214-225.

Russell, G., & Russell, N. (1997). Imperatives and dissonances in cyberspace curriculum: An Australian perspective. *Education, 117*(4), 584-591.

Schmoker, M. (1999). *Results: The key to continuous school improvment.* Alexandra, VA: The Association for Supervision and Curriculum Development.

Sloane, F., & Kelly, A. (2003). Issues in high-stakes testing programs. *Theory into Practice, 42*(1), 12-18.

Smarter Balanced Assessment Consortium. (2012). *Smarter Balanced Assessment Consortium: Building a plan for higher education to implement the Smarter Balanced Assessment System.* Los Angeles, CA: Smarter Balanced Assessment Consortium.

Springer, R., Pugalee, D., & Algozzine, B. (2007). Improving mathematics skills of high school students. *The Clearing House, 81*(1), 37-44.

Stiggins, R., & Chappius, J. (2005). Using student-involved classroom assessment to close the achievement gaps. *Theory into Practice, 44*(1), 11-18.

Stone, C., & Lane, S. (2000). *The relationship between changes in MSPAP school performance over time and teacher, student, and school factors.* Washington, DC: U.S. Department of Education.

Study School District. (2013). Study School District Fact Sheet. Retrieved from http://www.study.k12.mo.us/files/_pGDoP_/c506bb63725044233745a49013852ec4/Study_School_District_Fact_Sheet_-_UPDATED_-_June_2013.pdf

Sullivan, M. (1999). The making of a distinguished school. *Thrust for Educational Leadership, 28*(3), 33-35.

Sunderman, G. E., Kim, J., & Orfield, G. (2005). *NCLB meets schools realities: Lessons from the field.* Thousand Oaks, CA: Corwin Press.

U.S. Department of Education. (2002). *No Child Left Behind: A desk-top reference.* Washington, DC: U.S. Department of Education.

U.S. Department of Education. (2006, November). Secretary Spellings delivered remarks at education trust dispelling the myth award ceremony: Greatest myth of all is that our 2014 goal is impossible [Press Release]. Washington, DC: Retrieved from http://www.ed.gov/news/ pressreleases/2006/11/11062006.html

Vispoel, W. (2000). Computerized versus paper-and-pencil assessment of self-concept: Score comparability and respondent preferences. *Measurement & Evaluation in Counseling & Development, 33*(3), 130-143.

Wang, K. H., Wang, T. H., Wang, W. L., & Huang, S. C. (2006). Learning styles and formative assessment strategy: Enhancing student achievement in web-based learning. *Journal of Computer Assisted Learning, 22*(3), 207-17.

Zandvliet, D., & Farragher, P. (1997). A comparision of computer-administered and written tests. *Journal of Research on Computing in Education, 29*(4), 423-438.

Appendix A

Consent Form

Dear Educator:

I am a doctoral student at Lindenwood University. As part of my coursework I have chosen to study the effect of computer-based assessment on student achievement in the areas of mathematics and communication arts. I am asking you to participate in this study. Surveys will be completed online. If necessary a questionnaire may occur at a later date. You will not have to answer any question you do not wish to answer. You may hand write your responses or type and submit responses electronically via email. Only I will have access to your survey and/or questionnaire. Your identity will be kept confidential to the extent provided by law and your identity will not be revealed in the final manuscript. There are no anticipated risks, compensation or other direct benefits to you as a participant in this study.

If you have any questions about this research protocol you may contact me at the phone number or email address below. Questions or concerns about your rights as a research participant may be directed to the Institutional Review Board, Lindenwood University, 209 South Kingshighway, St. Charles, MO 63301, or at 636-949-4987.

By completing and submitting the survey and or questionnaire, you give me permission to report your responses anonymously in the final manuscript to be submitted as part of my dissertation.

Thank you,

Felica Griffin, Principal Investigator

If you have any questions, you may contact us as follows:

Felica Griffin
felicajackson@sbcglobal.net
314-795-8938

Appendix B

Teacher Questionnaire

Place X at the appropriate response:

- Gender: Male___ Female___
- Highest Level of Education: BA/BS___ MA___ MA+30___ PhD___
- Tungsten Assessed Subject: Math_____ Communication Arts _____
- Grade Level Taught: 6_____ 7_____ 8_____
- Years teaching Tungsten Assessed Subject: 0-5___ 6-10___ 11-15___ 16-20____ 20+___
- Years of service as a teacher: 0-5___ 6-10___ 11-15___ 16-20____ 20+___
- Years using Tungsten: _____

Answer each question as detailed as possible. If additional space is needed, please a attach sheet of paper or use the reverse side of this sheet.

1. What are your thoughts about the computer-based Tungsten Learning System?

2. How did you prepare the students to take the computer-based [Tungsten] assessment?

3. After students took the computer-based [Tungsten] assessment, how did you use the data?

4. Do you have any additional comments about your experience with the Tungsten Learning System and/or how you believe it relates to student achievement?

5. What are your thoughts regarding the discontinuation of Tungsten Learning System and the implementation of Discovery?

Appendix C

Survey Questions by Category

Demographics:
Gender: Male___ Female___
Highest Level of Education: BA/BS___ MA___ MA+30___ PhD___
Tungsten Assessed Subject: Math_____ Communication Arts _____
Grade Level Taught: 6_____ 7_____ 8_____
Years teaching Tungsten Assessed Subject: 0-5___ 6-10___ 11-15___ 16-20____ 20+___
Years of service as a teacher: 0-5___ 6-10___ 11-15___ 16-20____ 20+___
Years using Tungsten: _____

Training/Level of comfort

I am comfortable using the re-teaching strategies available on Tungsten.
I am comfortable setting up custom groups to monitor advanced, proficient, basic, and below basic students.
I feel comfortable administering Tungsten.
I have been well trained on Tungsten.
I would like more training on Tungsten.
I feel more comfortable using Tungsten with each year it's implemented.

Use of Tungsten Feedback
I conduct monthly strand analysis of my students' progress.
My students can communicate their performance on Tungsten with their teachers, parents, peers, or the principal.
I communicate with students about their progress on the monthly reading and math Tungsten assessments.
I regularly review missed benchmark items with my student each month.
I use Tungsten data to adjust or re-teach lessons.
I use the re-teaching strategies available on Tungsten.
My students are made aware of their Tungsten scores.
I wait until the following year to address low scoring Tungsten strands.
I address low Tungsten scores by immediately addressing the low scoring strand.

Teachers' perceptions of Tungsten
I believe Tungsten is an effective predictor of MAP achievement.
I believe Tungsten does not predict students' achievement.
I believe Tungsten assists me with my class instruction.
I would be satisfied if the district removed Tungsten assessment from the curriculum.
I believe Tungsten hinders me in delivering effective instruction.
I believe Tungsten is a valid tool for assessing student achievement.
I believe Tungsten has many limitations in predicting student achievement.

Tungsten prepares students for MAP testing.
I dislike Tungsten.
I believe my attitude regarding Tungsten affects student achievement.
I believe my attitude regarding Tungsten affects students' attitudes.
I think favorably of Tungsten.
I believe my students believe Tungsten helps predict achievement.
I believe students understand the relevance of Tungsten.
I believe the parents understand the relevance of Tungsten.

Accountability

My principal holds my students accountable for their progress on the monthly reading and math Tungsten assessments.
My principal holds me accountable for student progress on Tungsten.

Student prep/Motivation/Rewards

I prepare my students for taking Tungsten assessment.
I communicate the relevance of Tungsten to my students.
I recognize and celebrate students' growth each month on Tungsten with my students.
Students are rewarded for making gains each month on Tungsten.

Appendix D

Exit this survey

Doctoral Research Survey

1. Demographics

Please select the best response for each question. Questions with an * need a response.

*** 1. Gender**

Male

Female

*** 2. Highest Level of Education**

BA/BS

MA

MA+30

PhD

*** 3. Tungsten Assessed Subject**

Math

Communication Arts

*** 4. Grade Level Taught**

6

7

8

*** 5. Years teaching Tungsten assessed subject**

0-5

6-10

11-15

16-20

20+

*** 6. Years of service as a teacher**

0-5

6-10

11-15

16-20

20+

*** 7. Years using Tungsten**

Powered by Survey Monkey

Exit this survey

Doctoral Research Survey

2. Teachers' Perception

Please select the best response for each question.

1. Students are rewarded for making gains each month on Tungsten.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

2. I am comfortable using the re-teaching strategies available on Tungsten.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

3. I conduct monthly strand analysis of my students' progress.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

4. I am comfortable setting up custom groups to monitor advanced, proficient, basic, and below basic students.

Agree
Somewhat Agree
Somewhat Disagree

Disagree

5. I recognize and celebrate students' growth each month on Tungsten with my students.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

6. My students can communicate their performance on Tungsten with their teachers, parents, peers, or the principal.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

7. My principal holds my students accountable for their progress on the monthly reading and math Tungsten assessments.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

8. My principal holds me accountable for student progress on Tungsten.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

9. I communicate with students about their progress on the monthly reading and math Tungsten assessments.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

10. I regularly review missed benchmark items with my student each month.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

11. I use Tungsten data to adjust or re-teach lessons.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

12. I prepare my students for taking Tungsten assessment.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

13. I address low Tungsten scores by immediately addressing the low scoring strand.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

14. I wait until the following year to address low scoring Tungsten strands.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

15. I believe Tungsten is an effective predictor of MAP achievement.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

16. I believe Tungsten does not predict students' achievement.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

17. I believe Tungsten assists me with my class instruction.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

18. I feel comfortable administering Tungsten.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

19. I have been well trained on Tungsten.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

20. I would like more training on Tungsten.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

21. I would be satisfied if the district removed Tungsten assessment from the curriculum.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

22. I believe Tungsten hinders me in giving effective instruction.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

23. I believe Tungsten is a valid tool for assessing student achievement.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

24. I believe Tungsten has many limitations in predicting student achievement.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

25. I believe students understand the relevance of Tungsten.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

26. I believe the parents understand the relevance of Tungsten.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

27. I communicate the relevance of Tungsten to my students.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

28. I believe my students believe Tungsten helps predict achievement.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

29. My students are made aware of their Tungsten scores.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

30. I think favorably of Tungsten.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

31. I believe my attitude regarding Tungsten affects students' attitudes.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

32. I believe my attitude regarding Tungsten affects student achievement.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

33. I feel more comfortable using Tungsten with each year it's implemented.

Agree
Somewhat Agree
Somewhat Disagree
Disagree

34. I use the re-teaching strategies available on Tungsten.

Agree

Somewhat Agree

Somewhat Disagree

Disagree

35. I dislike Tungsten.

Agree

Somewhat Agree

Somewhat Disagree

Disagree

36. Tungsten prepares students for MAP testing.

Agree

Somewhat Agree

Somewhat Disagree

Disagree

Powered by Survey Monkey

Vitae

The author of this study, Felica Griffin, was born, raised, and still resides in Saint Louis, Missouri. She graduated with honors from Riverview Gardens Senior High School in 1996. That same year, she began her undergraduate studies at Truman State University, located in Kirksville, Missouri. In December 2000, the author received her Bachelor of Science in Exercise Science from Truman. After reflection of her future, Felica decided to pursue a career in education.

In 2002, the author began years of study in education at Lindenwood University and obtained her Master of Arts in Teaching in 2004. That same year, she began teaching Health and Physical Education at a middle school in northwest St. Louis County. She continued her education by obtaining a Master of Arts in Educational Administration in 2007, from Lindenwood University. Immediately after achieving a second master's degree, Felica was accepted and began working towards a Doctor of Education Degree in Educational Leadership at Lindenwood University and anticipates graduating in 2015.

During her career as an educator, she has served in leadership roles on the Positive Behavior Support and School Safety Committees, as well as served on the Professional Development Committee, Parent Teacher Organization, and District Calendar Committee. She has also served as a Math Interventionist. She volunteered for community organizations, including Big Brother, Big Sister of Eastern Missouri, as a Big Sister, and Saint Louis Crisis Nursery, as a committee member for a major fundraiser.