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AN EVALUATION OF THE EFFECTIVENESS OF INTEGRATED LEARNING SYSTEMS ON URBAN MIDDLE SCHOOL STUDENT ACHIEVEMENT

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AN EVALUATION OF THE EFFECTIVENESS OF INTEGRATED LEARNING SYSTEMS ON URBAN MIDDLE SCHOOL STUDENT ACHIEVEMENT

A DISSERTATION APPROVED FOR THE

DEPARTMENT OF EDUCATIONAL LEADERSHIP AND POLICY STUDIES

BY

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DEDICATION

I dedicate this to my parents Gary Kirkwood and Selma Joyce Williams who have always been there with love, support and understanding. In addition, to my nieces and nephews that they never place limits on their learning.

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1 Thessalonians 5:18 (NASB): “In everything give thanks; for this is God's will for you in Christ Jesus.”

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ABSTRACT

Many school districts have chosen to invest their federal funds in computer-based integrated learning systems that focus on literacy to increase high-stakes test scores and academic gains (Becker, 1994). Buly and Velencia (2002) supported the belief that a student's reading ability can improve substantially when instruction is integrated with computers and related software. In this quantitative study, the researcher examined the effectiveness of the integrated learning system (ILS) on reading and mathematics achievement of middle school students in an urban school district in NCLB corrective action status. The study employed an ex post facto design, including a treatment group with 188 middle school students who received intervention in mathematics and reading using an ILS and a control group composed of middle school students with similar academic status and demographics. The Oklahoma Core Curriculum Test (OCCT) was used as the dependent variable in this study. Individual total mathematics and total reading scale scores of the subjects were analyzed, along with gender, race and socio-economic data.

The data were analyzed using descriptive statistics, analysis of covariance (ANCOVA), and Pearson Correlation. The analysis concluded that in some cases, students can experience gains in their high-stakes assessment scores despite their gender, ethnicity, or socioeconomic status with the use of an ILS such as CompassLearning Odyssey for reading and math intervention. The information obtained in this study will inform district and school instructional leaders in their decision-making process prior to investing in a technology-based curriculum resource to meet their academic achievement goals.

CHAPTER I

INTRODUCTION AND OVERVIEW

This dissertation addresses the impact of integrated learning systems on academic achievement. This chapter contains a brief review of the literature, a statement of the problem, a description of the purpose, the research questions that guided the study, the assumptions of the study, definition of terms, and an overview of the study.

Across this country, our educational heritage demonstrates the high importance we give to the issues of students becoming adequately prepared to contribute to society. For over 375 years, from the Puritans onward, people have valued education, but the reasons for supporting schools have shifted somewhat over time (Vinovskis, 1999). Among all of the stakeholders and policymakers involved in education, the federal government has played the largest role. This involvement grew significantly after World War II and in the wake of the 1957 launch of *Sputnik 1* (Superfine, 2005). Since then, several presidents have led efforts to provide some degree of equity in education to ensure that all children obtain the same level of services to prepare them to enter society as well informed and able citizens. This commitment has involved the investment of several billion dollars into Head Start programs, Title I, which increased the offering of more math and science classes.

As high-stakes testing has taken center stage in education, districts have sought the use of technology as a means to ensure that their efforts are successful. This has been accomplished largely by investing federal dollars. The potential of technology to have profound influences on instruction is yet to be fully realized (Means, Roschelle, Penuel, Sabelli, & Haertel , 2003). After several decades of implementing computer technology in education, it is agreed that technology in isolation simply provides the necessary infrastructure upon which robust pedagogical solutions to real learning problems should be built (Mioduser, Tur-Kaspa, & Leitner, 2000). Means et al. (2003) studied the contribution of technology to teaching and policy approximately 50 years ago. Early computer-assisted instruction (CAI), derived from Skinnerian learning theory, was developed with the belief that technology could provide better learning experiences than a human teacher (Means et al., 2003). Technology pioneers were sometimes explicit in their view that technology, with all its efficiency and an "optimum learning design" created by "experts," would replace human teachers (Pressler & Scheines, 1988). While this notion can be found in the literature, wholesale replacement of teachers has not occurred, nor has this vision been embraced by many policymakers technologists, or curriculum developers today (Culp, Hawkins, & Honey, 1999; Pea, Wulf, Elliott, & Darling, 2003). However, there is an abundance of evidence in the literature that supports the assertion that high-poverty students need both real teachers and technology to provide quality instruction to obtain real results (Hativa, Shapira, & Navon, 1990; Hernandez-Ramos, 2005; Jervis & Gkolia, 2005; Liu & Huang, 2005).

The driving force behind the interest in technology in education as part of the continued involvement of the federal government is the progress and growth in education and the national commitment of Goals 2000: Educate America Act, Improving America’s Schools Act of 1994, Title I, and the No Child Left Behind Act (NCLB, 2001). Testing mandated by the No Child Left Behind Act identified thousands of students who failed to meet state and national literacy standards. Local and state administrators were left with the task of evaluating and selecting evidence-based literacy programs to meet the needs of students, especially low-achieving students (O'Bryne, Securro, Jones, & Cadle, 2006).

The research on school reform efforts designed to address achievement levels of students and the requirements set forth in Goals 2000: Educate America Act, Title I, and the No Child Left Behind Act of 2001 has placed a major focus on how school districts are meeting the academic needs of all students. Stein (2001) reported that since the inception of Title I in 1964, the achievement levels of students have been cast in terms of deficiencies and weakness. This characterization of student achievement included the belief that students were being held back in their learning efforts by poverty and its attendant deprivations of social, cultural, and physical needs. The Title I program has often been portrayed as a minority program, or one that predominantly or disproportionally serves selected ethnic groups, particularly African Americans. The lack of major progress by schools in making academic gains with these groups of students and the inappropriate use of funds resulted in a reorganization and reauthorization of this program in 1988 and 1994. These changes made schools accountable for performance outcomes of students while stressing higher-order thinking skills and a stronger alignment to school curriculum (Vinovskis, 1999) to ensure compliance. Both Mazyck (2002) and Mevarech (1994) identified the importance that technology as a tool can have on improving student achievement. There is also evidence that supports the premise that access to computers and the academic benefits derived from computer use are not the same for all students. Although monies from federally funded programs such as Title I targeted to assist disadvantaged students are often used to purchase computers, high-income and Caucasian students tend to have greater access than low-income and African American students do, and non-English-speaking students tend to have the least access (Hedges, Konstantopoulos, & Thoreson, 2000).

The introduction of Goals 2000 Educate America Act of 1994 had a large focus on educational technology, which was a particularly important development. Goals 2000 was a major national initiative from 1994 to 2000 designed to promote educational reform by establishing national education goals and standards to be attained through state- and locally planned initiatives using technology. Goals 2000 created a national vision and strategy to infuse technology and technology planning into all educational programs and training functions carried out within school systems. The infusion of technology and telecommunications into teaching and learning had become widely viewed as an effective means of increasing opportunities for learning. By encouraging school planning and use of technology, Goals 2000 set out to facilitate the development of excellent educational standards to enable all students to achieve the National Education Goals and meet the challenges of the 21st-century workplace. While these efforts still churn in the background, students continue to struggle to perform at expected levels of academic achievement (Cradler & Bridgforth, 1996).

The No Child Left Behind Act of 2001 (NCLB) is the result of later policies established by the federal government in an attempt to equalize educational opportunities for all children. This act was designed to identify schools that are consistently failing to serve students effectively and to instigate school-based and systemic remedies so that all students are provided with access to a high-quality, standards-based education (Balfanz, Legters, West, &Weber, 2007).

As a result of these legislative mandates, an increasing number of schools and districts invested in computer-based integrated learning systems (ILSs) to help raise students' norm-referenced test scores similar to efforts Becker (1994) cited in his studies. An ILS is defined as a "computer-based system that manages the delivery of curriculum materials to students in order that they are presented with individual programs of work over a number of weeks or months" (Williams, 2001, p. 174; Kulik, 2002). Integrated learning system programs account for a large portion of computer and software sales in the nation's schools, and many of them use federal and state funding sources, Title I and Title II, which supplement the standard annual operating budgets of school districts (Scott, Cole, & Engel, 1992). An integrated learning system is one of the technology innovations schools utilize to improve student achievement. Integrated learning systems are frequently cited in the literature as a means of improving achievement in reading and mathematics instruction. One such integrated learning system is CompassLearning Odyssey.

CompassLearning Odyssey is an educational software solution that supports differentiated instruction, formative assessment, and targeted intervention. The system reflects current education research that is aligned to state and national standards with curriculum management, reporting, and assessment tools. CompassLearning Odyssey (2010) reported that through personalized instruction, students can experience improved test scores and increase graduation rates. If implemented properly, with the support of professional development and allocated time on the system, CompassLearning Odyssey will effect improvements in student achievement.

CompassLearning Odyssey Reading Language Arts for grades 6 through 8 applies innovative teaching methods within a rich, interactive learning environment. It is created to appeal specifically to middle school students. It engages students deeply in the learning process by simulating a conversation with another person in a fun, casual way and offering hints and tips for mastering new skills. The program also provides detailed lessons that include diverse texts and writing instruction; instruction in phonics, context, and decoding; and that develop reading, comprehension, and study skills while building vocabulary. CompassLearning Odyssey mathematics for grades 6-8 develops students' expertise in the fundamentals of geometry and algebra. In order to achieve academic success in the higher grades, the curriculum activities are spiraled in the lessons for students in kindergarten through fifth grade by having students exposed to topics such as fractions, decimals, algebraic equations, and real-world problem solving to further develop their skills. Real-world examples are embedded in the assessments and lessons to provide individualized instruction.

There have been several effectiveness reports and case studies (CompassLearning, 2011) on the implementation of CompassLearning Odyssey, many of which demonstrate significant evidence of effect. However, there is a lack of presence of effectiveness in peer-reviewed scientific journals. Despite these results and results from other well-known programs, Kulik (2003), in a review of 36 controlled studies of instructional technology, concluded that the "evidence is not yet clear" (p. 60) regarding improvement in instruction and student achievement. The results from the study revealed only modest positive effects and that the literature is too uneven for broad conclusions about the effectiveness of instructional technology for producing significant improvements in reading achievement. There was no negative effect on performance, and they may produce more benefits if implemented properly. Kulik further reported that the literature does not support any broad generalizations regarding the impact of instructional technologies on achievement. However, these results have not prompted school districts from continuing to seek and consider academic assistance using this method.

Rationale for the Present Study

By 2005, an urban school district in the Midwest was identified as a school district in need of improvement as defined by the 2001 No Child Left Behind legislation. This designation was the result of failure to make adequate yearly progress (AYP) district-wide for subgroups of students and having 37 schools on the Needs Improvement List that did not attain the Academic Performance Index (API) scores and the AYP criteria set by the state for two consecutive years. This status ("in need of improvement") required the district to develop a plan of improvement in collaboration with parents, faculty, and other stakeholders. The requirements for the plan included developing strategies that would increase the number of students in the subgroups meeting the annual measurable objectives in reading, writing, and mathematics as well as the number of students that attained appropriate levels of non-academic indicators, such as attendance and graduation. Given the status of the district, the senior administration made critical decisions to bring about significant changes to address the requirements of the No Child Left Behind legislation. These decisions included involvement and participation from the community, teachers, and school district personnel. A series of meetings was held throughout the community and resulted in the decision to implement a new research-based curriculum, professional development activities for all schools, and the establishment of an alternative governance structure for those schools in corrective action status.

Of the 37 schools on the Needs Improvement List, three urban middle schools continued to experience significant academic challenges. These schools served students with a similar socioeconomic status (SES) and demographic characteristics. Of those three schools, two had not met AYP for five or more consecutive years, and the third one was on the Needs Improvement List. Specific strategies were implemented to bring about school-wide improvement in these schools. The following action steps are consistent with the guidelines of school reform as outlined in Cowan and Edwards (2005):

(1) New leadership was placed at all three schools to restructure the internal organization of the school;

(2) Two of the three middle schools underwent a reconstitution in which all teachers had to reapply for their jobs (some remained while others were reassigned);

(3) Additional staffing allocations for reading and math coaches were assigned to the sites;

(4) Title I funds allocated to the district were reallocated to these sites to further support their academic needs;

(5) The master schedules were reconfigured so that classes included 90-minute blocks of reading and math daily; and

(6) A comprehensive integrated learning system was implemented along with significant professional development and support.

This last action step was one of the significant steps that the school chose; the new research-based supplemental curriculum initiative would offer a substantial promise of improving educational achievement for low-achieving students and enable the school to make AYP. The implementation of an ILS is the basis for this research study.

Problem Statement

Student achievement is a primary measure of school success. Attaining academic excellence has become significantly more and more challenging across the nation's public school systems. When NCLB (2001) was enacted by then-president George W. Bush, accountability and expectations levels soared to new heights. The intent was to close the achievement gap for students at risk for failure and to sustain their participation in academics (Balfanz, Legters, West, & Weber, 2007). When schools fail to meet or exceed these new levels of academic expectations set forth by the federal government and state departments of education for reading and math proficiency, they risk receiving sanctions such as loss of state and federal funding. To prevent these measures, schools need to institute the steps required when placed in corrective action status. After four years of not making Adequate Yearly Progress (AYP) (two years in a row of not making AYP and two additional years after that) in the same subject (reading or mathematics), a school is identified for corrective action. This requires that the school or district identify a significant intervention focused on specific actions to improve student achievement and make AYP.

Instructional leaders such as principals and superintendents can consider many solutions to address this instructional dilemma and establish such a plan. One particular solution involves common methods, such as using computers as a change agent regardless of the fact that there had been very little reason for believing that computers will make much difference (Scott, Cole, & Engel, 1992). However, for leadership to build a non-threatening environment that could give students the acuity for their own learning, an integrated learning system that can address the literacy and numeracy challenges that districts across the country face could serve as a motivating factor. Students recognize the value of an integrated learning system over teacher-led instruction: no requirement for written assignments, a variety of tasks presented in a gaming interface, and being informed of their academic progress in apparent privacy (Becker, 1992; National Council for Educational Technology (NCET), 1996).

Purpose of the Study

The purpose of the current study was to determine if any significant differences exist in the academic achievement of urban middle school students in the areas of reading and mathematics based on whether the students were using an integrated learning system. An urban setting was selected because of the growing national concern to lessen the achievement gap between K-12 students living in and attending schools in areas designated as high-poverty and that of their peers who do not live in high-poverty areas. The intent of this research was to examine an integrated learning system program and contribute to the current body of literature. Educational stakeholders such as superintendents, school boards, principals, teachers, students, and parents in similar educational settings can review the findings from this analysis to make informed decisions about their school reform efforts.

Research Questions

Evidence of the instructional effectiveness of CompassLearning Odyssey, an integrated learning system, on student achievement was used as the basis for this study. A generalized achievement effect attributed to various integrated learning systems is documented in the literature and supports the need for this study (Becker, 1994; Brush, 1997a, 1997b; Cassady & Smith, 2005; Gkolia & Jervis, 2004; Hativa, 1994). The researcher sought to determine if this relationship exists in three high-poverty, Title I urban middle schools in corrective action status as defined by No Child Left Behind. The research was guided by the following questions:

1. What were the differences of the CompassLearning Odyssey Program on achievement scores of students in urban middle schools in corrective action status for reading and math by gender, ethnicity, special education, and free and reduced lunch?
2. Are there statistically significant differences in OCCT achievement scores in reading and math between students who participated in the CompassLearning Odyssey Program and students who did not participate?
3. Is there a relationship between students' time on task (minutes devoted to completing tasks aligned to an instructional goal and/or lessons activities completed in CompassLearning Odyssey and academic achievement as measured by reading and mathematics scores?

Significance of the Study

There is limited evidence in the literature from studies conducted in public schools in the United States that support the premise that adopting technology in schools that are in corrective action status as defined by the No Child Left Behind Act made changes in student performance. However, many school districts have chosen to invest their federal funds in computer-based integrated learning systems that focus on literacy to increase high-stakes test scores and academic gains (Becker, 1994). As further discussed in the literature review, researchers for well over 30 years have sought to determine the effects of technology on learning. Since the enactment of NCLB and despite recent advancements in technology, there is still a gap in the research. Currently, there are no studies that cite the use of integrated learning systems as a curricular solution to increase student performance in schools and meet the mandate as defined by No Child Left Behind (2001). The benefit of this study is to inform instructional leaders who seek technology-based interventions to address low academic performance.

Definitions

The following definitions will be used throughout this research to clarify certain terms that are central to its theme.

- Educational Equity: A federally mandated right of all students to have equal access to classes, facilities, and educational programs no matter what their national origin, race, gender, sexual orientation, disabilities, first language, or other distinguishing characteristic. In upholding educational equity, school districts are required to provide certain programs for students to ensure equal education. For example, students with disabilities have access to specialized education programs (Glossary of Education, 2010).

- Educational Technology: The use of technology to enhance the teaching and learning process. For the purpose of this study, this means a focus on the instructional practice rather than hardware and software usage.

- Integrated Learning System (ILS): A computer-based system that manages the delivery of curriculum materials to students to present them with individual programs of work over a number of weeks or months (Kulik, 2002; Williams, 2001, p. 174).

- Student Achievement: Level of attainment or proficiency in relation to a standard measure of performance, or, of success in bringing about a desired end (Glossary of Education, 2010). Example: The increase in student performance in reading, language arts and mathematics in Tulsa Public Schools' OCCT Assessment data for three academic school years.

- Socioeconomic Status (SES): A combination of social and economic factors that are used as an indicator of household income and/or opportunity. Eligibility for the Department of Agriculture's National School Lunch Program (NSLP) is used as a measure of socioeconomic status (National Assessment of Education Programs, 2010).

- Time of Task: Minutes devoted to completing tasks aligned to an instructional goal and/or lessons or activities completed in CompassLearning Odyssey.

- Urban: Defined by the 2000 United States Census (2002) as core census block groups or blocks that have a population density of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile.

Assumptions

The researcher made the following assumptions related to this study:

1. State, district and school-level data were collected and measured without error.
2. All scores used in this research were from students enrolled in the school years 2006-07, 2007-08, 2008-09 as sixth-, seventh-, and eighth-graders.
3. The students in this study are representative of urban middle school students from households of low-middle socioeconomic status.

Summary

The current study investigates how improvement in academic achievement may be enhanced by the use of an integrated learning system. This chapter established the need and purpose for the present study, summarized its research questions, described the design approach, provided assumptions and limitations, and offered a definition of key terms. The second chapter provides a comprehensive review of selected literature representing the existing knowledge of computer use in education.

CHAPTER II

LITERATURE REVIEW

The purpose of this study was to investigate the academic effects of an integrated learning system (ILS) at three middle schools in corrective action as defined by No Child Left Behind. The following literature review begins with an exploration of school reform efforts designed to address the achievement levels of students and the requirements set forth in Goals 2000, Title I, and the No Child Left Behind Act of 2001. Each of these reform efforts highlights the importance of technology as a tool to improve student achievement. The literature review continues with an investigation of conceptual frameworks and empirical evidence to support the premise that the use of an integrated learning system as an instructional tool can improve student achievement in relationship to time on task. Also documented were the results of the various implementation strategies, students' time on task, and its relationship to student achievement.

School Reform

School reform is not a new issue of concern. It has been a topic of much interest and debate to Americans throughout the years. This massive educational effort has been ongoing for well over 20 years and has been revisited and reinvented more than once (Borman, 2003). The discourse has centered on the most effective methods of improving student achievement. One such way is to pursue the accountability of teachers as an indication to determine if student achievement can be improved. The federal government continues to choose legislative acts as the vehicle to carry out this action, with No Child Left Behind (NCLB) from the George W. Bush administration being the most recent and controversial. Signed into law in 2002, the stated purpose of NCLB was "to provide every child with a fair and equal opportunity to obtain a high quality education, and reach proficiency on challenging state academic achievement standards and assessments" (NCLB, 2001). The requirements and effect of No Child Left Behind are of interest to several stakeholders, with principals and teachers having the most to consider. In 1998, the Comprehensive School Reform (CSR) Act was designed to assist schools in raising student achievement with the implementation of effective, comprehensive school reforms that are grounded in scientifically based research and effective practices utilizing a variety of resources that contribute to a focused curriculum (US Department of Education, 2006). The comprehensive school reform model was designed to assist schools in meeting their school improvement efforts. Congress supported this initiative with the appropriation of funds to states to assist high-poverty schools with low student achievement. Educational institutions participating in the program were provided grant funds with the requirement of utilizing proven methods and strategies that permeate all aspects of the school, bringing about school-wide changes that enable all children to meet challenging academic standards. The funds were intended to help schools examine the need for curricular changes and the feasibility of professional development to improve teaching practices. Each school received amounts of $50,000 a year, renewable for up to three years. In order to sustain this funding source, the US Congress established incentives made up of 10 (previously 9) components that schools should use to facilitate their decision making processes: (1) comprehensive design with aligned components, (2) professional development, (3) measurable goals and benchmarks, (4) support within the school, (5) support for staff,

(6) external technical support and assistance, (7) evaluation strategies, (8) coordination of resources, (9) scientifically based research, and (10) parental and community involvement (Hassel, 2002, p. 3). Since no one aspect of the CSR could completely address all of the components, schools were expected to identify gap-fill site-based initiatives.

Reform in general is a continuous improvement process: plan, do, study, and act (Davis, 2010). Researcher Fullan suggested that rather than thinking in terms of reforming schools, there is a need to think in terms of re-culturing schools (MacNeil & Delafield, 1998). The researchers at the Stanford Research Institute and Educational Development Corporation (1992) determined that supporting the reform of education could be done using technology as the tool. An integrated learning system could serve such a purpose.

Educational technologies such as integrated learning systems were used to implement the requirements of CSR and the earlier reform efforts of the Goals 2000 initiative. As much as 10% of the $1 billion of the appropriated funds of Goals 2000 were directed to technology. Two states, Virginia and Alabama, chose to use 100 percent of their allocation to fund technology (Superfine, 2005). This national educational reform, also known as the Goals 2000: Educate America Act, in the Clinton era, allowed decisions to be made at the state and local level rather than the national level. The vision was to plan and strategize an infusion of technology into all educational programs as well as technology training facilitated within school systems. By encouraging the school district to use their sub-grant funds to plan and use technology, this legislation would augment educational standards and would permit students to meet the national educational goals and 21st-century workplace skills (Cradler & Bridgforth, 1996). Fifty percent of the funds were required to be allocated to serve schools of high poverty populations.

Goals 2000, the Comprehensive School Reform, and the No Child Left Behind (NCLB) legislation have provided a national focus on technology and its importance in educating students for the 21st century. Technology is expensive; therefore, one would expect to find educational technology tools, such as an integrated learning system, in schools with high concentrations of high-poverty students where Title I funds could appropriately be used to purchase technology to supplement educational programs .

Stein (2001) provided a historical perspective that posited that the basis of Title I, put in place in 1964, was to address student deficiencies and disadvantages. This included being “held back in their learning efforts by poverty and its attendant deprivations – social, cultural and physical. Title I has often been portrayed as a ‘minority’ program or one that predominately or disproportionally serves particular ethnic groups, particularly blacks” (p. 139). Reauthorization occurred two times, in 1988 and 1994. Due to misuse of funds, accountability measures were instituted that emphasized higher-order thinking skills and curricular alignment for compliance (Vinovskis, 1999). Therefore, many schools used this opportunity to investigate computer-assisted instructional tools, commonly referred to as integrated learning systems, to support the implementation of higher-order thinking skills.

Although money for Title I has been used to purchase technology for impoverished students, Hedges, Konstantopoulos and Thoreson (2000) determined that "high-income and Caucasian students tend to have greater access than low-income and Black students, and non-English speaking students tend to have the least" access (p. 1). The use of these funds allowed the school and school district to implement school improvement reform that could lead to measureable outcomes, attaining adequate yearly progress, in line with the premises of the current study. No Child Left Behind requires each state to define adequate yearly progress for school districts and schools within the parameters set by Title I.

The No Child Left Behind Act of 2001 (NCLB) was passed by Congress to address policy issues in an attempt to equalize educational opportunities for children. This major reform initiative proposed bringing about a widespread shift in student performance while removing bias between ethnicities as well as diminishing the effects of poverty. Schools began to be identified that were not effectively providing high-quality standards-based instruction to students. High-stakes testing methods were used as a measure in the performance of schools that had consistently failed to meet the criteria for adequate yearly progress that the states established.

Literacy and improved reading and language arts skills were of the utmost concern to educators in improving student achievement. Both local and state administrators worked through an evaluation process for research-based literacy programs that would meet the needs of their low-performing children (O'Bryne, Securro, Jones, & Cadle, 2006). One strategy many school districts chose to invest in to increase high-stakes test scores and academic gains was computer-based integrated learning systems that focused on literacy (Becker, 1994). Such actions were supported by the specific language of Section 2402 of NCLB, the Enhancing Education Through Technology Act, also known as Title II, Part D. The stated purpose of Title II, part D is "to improve student academic achievement through the use of technology in elementary and secondary schools." (No Child Left Behind Act, 2001).

Balfanz, Legters, West, and Weber (2007) analyzed whether NCLB's measures, incentives, and improvement strategies were the right ones for low-performing students. They used descriptive and multivariate analyses on various data sources like state report cards, NAEP statistics, and common United States Department of Education census data for grade promotion power along with case studies involving 202 schools representative of urban and rural settings across the country. They found that due to large differences in how states implemented NCLB, the outcomes would be just as diverse. However, the data from the study revealed that a significant number of low-performing schools would not be able to improve through accountability systems and the standards movement alone. While an Oklahoma school was not among the 202 schools represented in the sample, the results offer a reasonable degree of generalizability. Additional information derived from the study was that in order to meet the NCLB criteria significantly, schools would require comprehensive reforms that would need time, hard work, and money. In many instances, that money has been invested in educational technology resources. The hard work came from superintendents, principals, and teachers who were involved in securing, implementing, and supporting these new resources in their schools.

In summary, four government initiatives, No Child Left Behind, Goals 2000, Title I, and Title II, Part D have been instrumental in bringing about school reform. In each instance, each piece of legislation recognized that technology could serve as an effective investment in improving classroom instruction. The evidence from the research supports including school reform as a construct of the conceptual framework of this study.

Conceptual Framework

The literature described above on school reform and characteristics of prior research with evidence on computer-based instruction and learning assisted this researcher in establishing a comprehensive conceptual framework. A national study of the effectiveness of educational technology (Agodini et al., 2003) and a comparative study of the impact of integrated learning systems on students' time on task (Worthen et al., 1994) provide two key frameworks to examine findings that substantiate the need for this study. These studies examined conditions and practices that influenced student achievement, which included the allocation of time and time-on-task, the learning environment's implementation methods and the pedagogical approach, and the effect of the school stakeholders' roles and on student achievement.

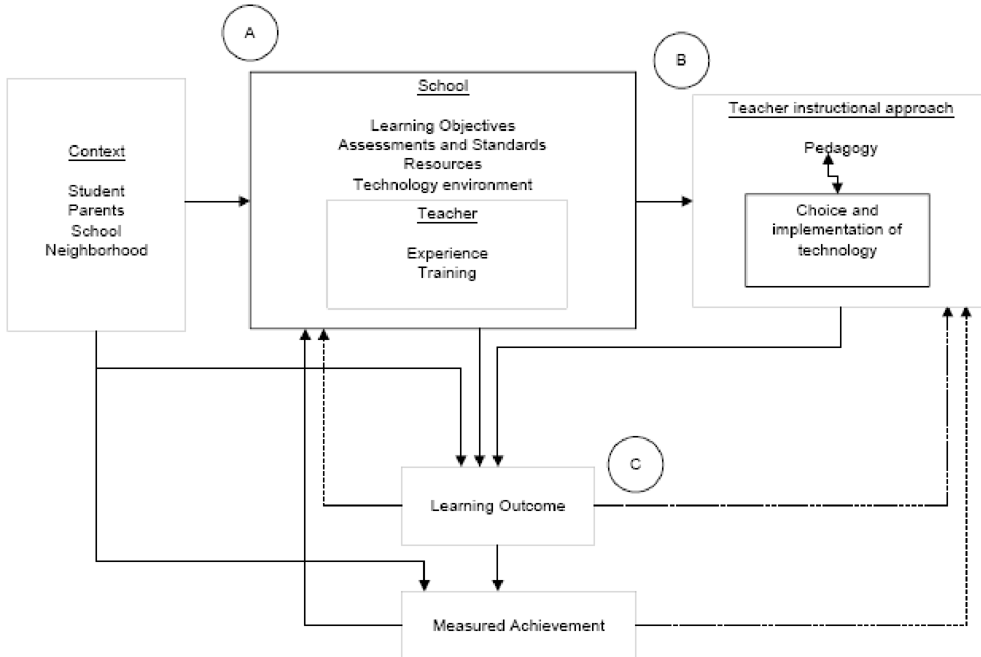

Figure 1. Conceptual framework linking technology application and learning (Agodini et al., 2003).

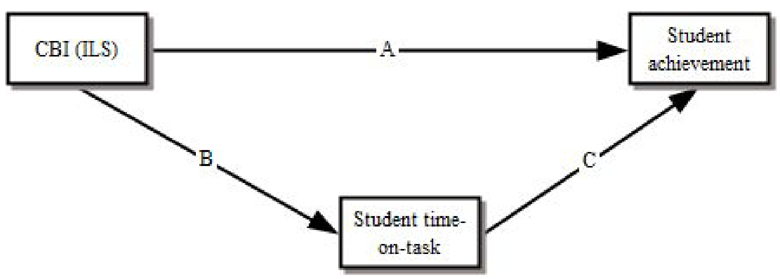

Figure 2. Interrelationship of CBI, time on task, and student achievement (Worthen et al., 1994).

Although there has been a significant span of time between the two studies, there is a strong similarity between the conceptual frameworks depicted in Figure 1, representing the work of Agodini et al. (2003), and Figure 2, representing the work of Worthen et al. (1994). Each recognizes that if a teacher selects and uses an integrated learning system (ILS) with students for a period, the learning outcome can be influenced. In Agodini et al. (2003), the factor of student time-on-task is not cited. However, for the purposes of this study, it will be assumed that part of the flow between the teachers' instructional approach and the learning outcome includes students spending adequate time on an ILS.

An adaptation of the two models has been developed as a basis for this inquiry. The conceptual framework depicted in Figure 3 shows the relationship between the dependent variable (student learning) to the intervening constructs and independent variables (the integrated learning system) to determine the effects on student achievement. The interconnectedness of both variables begins with a student entering a school reform setting that chose an integrated learning system as the intervention, facilitated by involved and influential stakeholders who use technology as a resource for instruction in improving student achievement.

School districts have several choices regarding instructional approaches: direct, independent study, experimental, interactive, and indirect. The most effective approach is to apply a variety of each using a standardized curriculum. However, the academic needs of students often require additional instructional support to meet their needs. In such cases, the pedagogy is modified or supplemented with the implementation of an ILS.

There is evidence in the literature to support the premise that the level of success a student will experience using an integrated learning system is dependent on time-on-task (Worthen et al., 1994). Because of continuous exposure to an integrated learning system, the school and student should be able to improve academic achievement and meet or exceed accountability expectations. Formative and summative assessments can be used to determine the extent to which measurable academic achievement gains are attained and if necessary repeat the instructional delivery. The conceptual framework shown in Figure 3 provides a visual representation of the dependent variable and the independent variable.

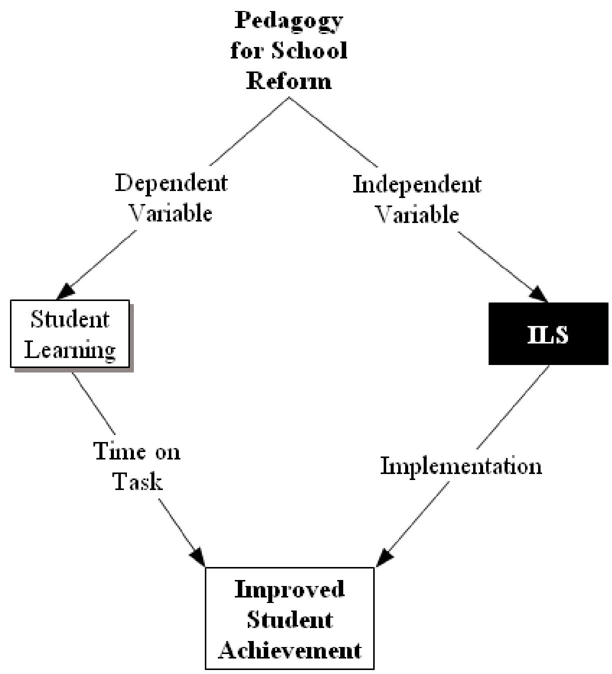

Figure 3. Conceptual framework linking integrated learning systems and academic achievement.

Integrated Learning Systems

The evolving nature of technology suggests that frequent and significant changes are likely to occur in how it is both viewed and used by consumers as reflected in the literature. The same holds true with computers and education and is documented in the literature. Blanton and Menendez (2006) determined that the earliest published study on computers in education was in 1966, where reading was the curricular subject matter. The technology consisted of a mainframe computer. Over the next 30 years, the delivery method in educational technology has evolved from an ancillary computer program residing on a stand-alone computer, known as computer-assisted instruction (CAI), to a networked and centralized system with a comprehensive curriculum that teachers align with their instructional planning processes. This latest form of educational technology is commonly known as integrated learning systems (Blanton & Menendez, 2006; Cassidy & Smith, 2005).

The British Educational Communication and Technology Agency defines an ILS as a "computer-based system that manages the delivery of curriculum materials to students in order that they are presented with individual programs of work over a number of weeks or month" (Williams, 2001, p. 174). While in the classroom, students work on their comprehensive yet individualized activities. The system provides immediate feedback while teachers generate and monitor student performance (Rogers & Newton, 2001; Van Dusen & Worthen, 1994).

Integrated learning systems are based on behaviorist assumptions as identified in B.F. Skinner's operant conditioning learning theory, which became known as programmed instruction (Maddux & Willis, 1992; Mazyck, 2002; Paterson et al., 2003;). Skinner was disappointed with the analysis of group-based traditional instruction; therefore, he developed a mechanical device, "a teaching machine," that could overcome the limitations of lock-step group presentation and provided an individualized method of instruction that offered controlled reinforcement (Molenda, 2008, p. 53).

A few decades later, Rogers and Newton (2001), building on Skinner's work with programmed instruction, provided the transition to integrated learning systems, which developed a trend of their own. They noted that since there are no definitive specifications for an integrated learning system, there are variations in features and complexities. However, there are some common elements:

- Curriculum content: a range of tutorial, practice and assessment modules
- Student record system: recording information on each student's achievement management system for supervising the tasks and monitoring student data

According to Rogers and Newton (2001), the management system's key functionality is to diagnose student ability levels and subsequently provide interpretive reports as well as

- automatically update the students' individual records after each set of responses,
- effect a choice of pathways through modules in response to individual needs,
- enable the learner to find units represented in different remedial guides until individual skills are mastered,
- deliver an appropriate sequence of learning modules for each individual,
- provide essential feedback to learners and to their teachers through a multitude of reports, and
- allow for teacher intervention when necessary.

Bailey (1993) noted that the level of engagement captured with student use of an ILS is much higher than the level of engagement in the regular classroom. In many cases, teachers share these common beliefs of and support for the ILS:

- provides systematic exposure to the curriculum
- tracks errors and re-exposes the pupil to more instruction in order to reach the desired mastery level
- provides motivation through interactivity and a game format
- provides an accurate and comprehensive record of each pupil's progress
- displays the real curriculum to observation, review, and potential revisions so that anyone can know exactly what a child has been taught (Bailey, 1993, p. 115).

Ever since integrated learning systems were introduced into schools throughout the United States and the United Kingdom, debate in the educational world has continued to draw attention to this system. The discourse ranges from integrity of the actual project implementation to the learning theory behind integrated learning system instructional strategies. Research on the effects of integrated learning systems on student performance consists of both qualitative and quantitative methods (Gkolia & Jervis, 2004).

There is power in numbers, and this holds true for the research in instructional technology. With over 40 years' worth of research on the subject of computer-based instruction and integrated learning systems, there are both similarities and differences in the effect of using an ILS as an instructional practice on the improvement in student achievement. While there may not be a single method to address struggling readers, Buly and Velencia's (2002) study supports the belief that a student's reading ability can improve substantially when instruction is integrated with computers and related software. Such results are what caused schools to select computer-based reading instruction as an intervention solution of choice to meet the ongoing needs of struggling readers. Many of these programs are considered to have significant amounts of drill-and-practice components (Anderson & Dexter, 2000). Quite commonly, students in these types of intervention programs participate in pull-out drill-and-practice exercises as they continue in their regular classroom instruction (Wenglinsky, 1998). Because integrated learning systems have become more sophisticated through the years, there is the belief that computer-based instruction has found a niche in schools to improve instruction and to assist schools in meeting the requirements of improving academic achievement. With particular interest in the effectiveness of how an ILS addresses the basic skills curricula that challenges many districts, technological contributions have affected instruction as well as shaped policy (Cohen, 1988; Means et al., 2003; Newman, 1990).

Research has also found that higher-order thinking activities can be facilitated with the use of computers and have a correlation to academic achievement (Cummins & Sayers, 1990; Office of Technology Assessment, 1988; US Department of Education, 1995; Wenglinsky, 1998). There have been numerous studies published on the relationship of integrated learning systems and student achievement (Becker, 1994; Brush, 1997b; Clark, 1985; Estep, McInerney, & Vockell, 2000; Hativa, 1994; Kulik & Kulik, 1991; Lewis, 1999; Mevarech, 1994; Williams, 2001).

Mevarech (1994) investigated differences in academic achievement of third- and sixth-grade students by conducting an analysis using a three-step method regarding the cognitive processes during the learning process when using an ILS in either an individual or cooperative setting. It was determined that at the beginning of the study, both groups' mean achievement scores were the same. At the conclusion of the study using an independent-samples T-test, the annual year gains of cooperative groups of students progressed faster than individual student progress and were considered statistically significant ($t(275) = 2.99$, $p < .001$). This same group of students performed well on cognitive processes that required higher-order thinking, thereby dispelling the aforementioned perception that an ILS is a low cognitive tool and does not improve higher-order thinking skills.

Brush (1997a) used a quasi-experimental design to investigate the effect of an integrated learning system on fifth-grade mathematics achievement. In this study, the integrated learning system was used in an ability group composition setting: heterogeneous, homogeneous-low, and homogeneous-high. The ILS was used as a supplemental curriculum in one school in the Midwest. Students visited the lab once a week for 50 minutes. An analysis of covariance (ANCOVA) suggested the learning gains of high ability students were not significantly different from those of low ability students. Heterogeneously grouped students slightly outperformed homogeneously grouped students on the posttest, but the results were not significant. A one-way analysis of variance determined significant differences in time-on-task among the three treatment groups, $F = 12.56$, $df = 19$, $p < .001$. The analysis of observational data also found that students designated as low ability were engaged for longer periods when they were paired with high-ability students than when they were paired with students of the same ability level.

Hativa (1994) conducted a six-year qualitative investigation of four integrated learning systems using mathematics curriculum for cognitive, social, behavioral, and instructional effects. All of the locations for the study provided computer labs that were centrally networked with a shared management system. Lab visitation schedules varied: 15-30 minute sessions twice a week, 20-minute sessions once a week, 45-minute sessions daily, , and three times a week for 20-30 minutes. Three of the four systems conducted an initial diagnostic testing for mastery levels and determined a starting point. Hativa reported that students made annual gains. These data revealed that based on the levels (which were grade-level equivalent) in the management system, students advanced from one level to the next, thus demonstrating mastery of the curriculum presented. The high-achieving students advanced at a rate of 1.2 and 3.0 more levels than their lower-achieving counterparts, although the reader should keep in mind that these students experienced more difficult and higher cognitive lessons. The study also found that there was a direct relationship between increasing the intensity or frequency of the integrated learning systems sessions and the mean gains for low-SES students. However, the gap between low-SES and high-SES third- and fourth-grade students expanded over a two-year period. The researcher believed such a gap occurred based on research that reports that low-SES populations tend not to get the instructional support at home, where concepts and procedures can be explained (p. 90). In all four ILS implementations, approximately three-fourths of the students liked working in the ILS, as opposed to one-fourth that did not. In particular, the students liked the frequent positive reinforcement and the examples of newly introduced concepts.

Becker (1994) sought to determine if two different types of integrated learning system resources had an effect on academic achievement in reading and math in two similar but separate schools. His study used students in grades 2 through 5 from low-income communities who were eligible for the free and reduced lunch program. The experimental design was devised by having the students divide into two groups. Each of the classes was divided randomly into two groups with half using the ILS for reading and the other half using the ILS for math all year long in a computer lab setting. The study used the California Achievement Tests for pretest and posttest scores. Becker found that school-wide, the only adjusted mean achievement that was statically significant was that the experimental group outscored the control group by .18 of a standard deviation. The outcomes were also true for student performance on the school-developed ILS-generated tests, where only one of the schools saw a significant difference of .25 of a standard deviation.

Williams (2001) conducted a long-term pilot study on the impact of an ILS on reading and mathematics starting with 40 students and expanding to 200 kindergarten through third-grade students with special needs. Students rotated daily in a computer lab setting for 15-minute sessions. Lesson assignments were aligned to their individual education plans (IEP). The study revealed that almost 80% of the participating students demonstrated greater gains in their spelling than a control group that only had paper and pencil instruction. Williams's study supported the work of Lewis (1999) regarding the benefit of special needs students' exposure to an integrated learning system. While the teachers experienced a bit of a learning curve in understanding the overwhelming amount of information the ILS management system had to offer, the students were actively engaged as well as enthusiastic.

Estep, McInerney, and Vockell (2000) used a quasi-experimental design to investigate the impact of an integrated learning system on third-grade academic achievement on a high-stakes test (Indiana State Test for Educational Progress). In this study, the ILS was used to supplement classroom instruction in schools in Indiana with an experimental and control group. Several statistical operations were used, leading to the following analyses: Cohort groups of students who were exposed to an ILS demonstrated significant gains in all four test areas as indicated by the *t*-test using pre- versus post-integrated learning system usage. In addition, there was a significant difference in all tested areas except language arts between those students who used an ILS and those who did not.

Clark (1985, 1994) held a skeptical view of integrated learning systems and challenged the research by exploring the validity of competing claims about the contribution of the computer to measured achievement gains. After selecting a random sample of 128 studies, a research team of two coded the data based on 40 features, leaving only 40 studies that were interpretable. The results suggested that there were overestimations of achievement gains. Fifty percent of the studies failed to manage the amount of exposure students had to an ILS. Teachers in 40 percent of the studies taught both the ILS and the non-ILS groups. Based on these findings, Clark (1985) cautioned those considering an ILS for academic achievement; as he believed, a teacher could just as easily use the methods that the software used.

Kulik and Kulik (1991) reanalyzed their 1986 meta-analysis outcomes from 254 evaluative studies. The results revealed that computer-based instruction usually produces positive effects on students' academic achievement and a positive change in student attitudes. The attitudes and feelings of students during their learning experience have been proven to affect their academic performance. Several researchers (Eom & Reiser, 2000; Lawson-Martin & Normore, 2006; Mevarech, 1988; Presland & Wishart, 2004) conducted studies to determine to what extent attitude and motivation can be transformed when students are exposed to an integrated learning system.

Presland and Wishart (2004) sought to investigate how and why the SuccessMaker Integrated Learning System could motivate students in grade 8 using a qualitative approach. Using a 25-question survey, 77 students received and returned their completed feedback. Motivation was measured by attendance, interviews, questionnaires, and observation. These students visited the computer lab for 20-minute sessions from two to four times a week. The results of the analysis of questionnaire data showed that there was a significant degree of agreement on several motivational conditions asked of students. The top most occurring motivating factors were linked to those factors that raise self-esteem for those students using SuccessMaker:

- Pupils perceive that they are making progress (can see scores and diary records).

- Pupils are able to get high scores for their work because it is pitched at an appropriate level.
- Pupils perceive associated benefits upon their English, spelling, reading, and mathematics work.
- The linked incentives and rewards, e.g., commendation certificates and community-awarded points.

Lawson-Martin and Normore (2006) conducted a similar study with adult high school students (reached age 16 and had not received a high school diploma) attending an urban South Florida high school exposed to an integrated learning system for a mathematics curriculum. Data were examined from individual students as well as cooperative learning groups to determine the effects on attitude and behavior. Two-way analyses of variance (ANOVA) were conducted on achievement scores using pre- and post-Test of Adult Basic Skills (TABE) scores. Both groups experienced gains, but one group did not experience any more gains than the other did. A one-way ANOVA based on the responses to the questionnaire regarding their overall attitude did reveal differences between students in the two groups. The cooperative group was on task less as compared to those students in the individualized group, who were on task considerably more. While the cooperative group did not have a significant gain in their achievement, students did gain the benefit of having a partner help in their understanding and assistance with completing their computerized assignments.

Eom and Reiser (2000) looked at the achievement and motivation levels of 37 middle school students who were split into two groups: learner-controlled, where students could adjust their instruction based on their own needs and preferences, and program-controlled, where the ILS monitors and adjusts the student's lessons based on instructional needs. The achievement was measured using a 15 question multiple-choice test. The motivational component was measured using a 36-question Likert-type survey. Using a two-way ANOVA, the researcher found that the program control group scored significantly higher on the posttest than the learner control group. In reviewing the motivational factors, the two-way ANOVA comparing the total mean scores revealed no significant effect or interaction. Eom and Reiser's hypothesis that low-self regulators would be more motivated under a program-controlled environment was not supported from these findings.

Mevarech (1988) sought to determine if motivational orientations could predict academic achievement using an integrated learning system. Participants in the study consisted of 257 fourth- through sixth-grade students (approximately 50/50 boys and girls) in two Israeli schools. Students visited the computer lab twice a week for 20-minute sessions. All students completed a motivational orientation survey at the beginning of the school year. Both the Arithmetic Achievement Test facilitated by the Israeli Ministry of Education and TOAM Computer Testing Procedure were used to assess students' mathematics achievement at the end of the school year. In looking at the academic and attitudinal data, researchers discovered that intrinsically motivated students performed higher on the computer test but not so well on the paper version of the achievement test, as opposed to those students who were extrinsically motivated. However, students who had high expectations of themselves and relied on the feedback of their teachers performed better on the paper test.

In summary, the research findings on integrated learning systems provide more questions than answers for policymakers and school leaders. The studies highlighted in this literature review also provide mixed results regarding a positive effect on student achievement. Some of the research data suggest that high-poverty students benefit more academically from an instructional learning system than their economically advantaged peers. In addition, some of the research indicates that the use of an ILS can improve a school's ability to meet the requirements of the No Child Left Behind legislation. The current study seeks to examine and synthesize the relevant research in the literature to determine if an integrated learning system, Compass Learning Odyssey, will have a positive effect on student achievement in reading and math with schools in corrective action under the No Child Left Behind Act of 2001 when implemented.

Implementation

There is an increasing interest among instructional leaders in using integrated learning systems for reading and math as supplemental curriculum to assist with increasing academic achievement (Brush, 1999). Many decisions to consider the implementations of an ILS are the result of the pressure to increase high-stakes test scores, based on parent expectations, or because the students have failed to master their basic math and language arts skills (Becker, 1994). Research suggests (Van Dusen & Worthen, 1995) that it takes a minimum of three years for most schools to establish a fully functional integrated learning system. The research (Agodini et al., 2003) also indicates that when adequate time and effort are invested in the use of the system, there is a greater likelihood that teachers will transform their instructional delivery practices, resulting in improved student learning. Time is measured in minutes and completed lesson activities. However, it is important to know that meaningful time on task is not just about time, but that learning is about completing tasks that are directly aligned to the instructional goal (McMurrer, 2007). In order for student learning to improve, schools must commit to adopting and implementing the ILS to the vendor's intended model design (Van Dusen & Worthen, 1995). When implementation models are adhered to, teachers no longer become victims of inappropriate adoption, but rather switch from whole-class to individualized instructional strategies that strengthen and lengthen teacher practice (Hativa, Shapira, & Navon, 1990).

Implementation methods play a critical role in gaining the desired student achievement outcomes. While the system may be the same, the level of success can vary based on the way the integrated learning system is utilized. Research suggests that students spend too little time on the ILS in typical implementations relative to the recommended amount of time required to obtain the results outlined by the program. Integrated learning systems would contribute even more to the school's success with full implementation (Kulik, 2002). Hativa and Becker's (1994) research on integrated learning systems provided four key thematic elements to explain the varying levels of success in school settings: "(1) system implementation methodology, (2) the role the teacher related to the system, (3) student's prior achievement levels and (4) the interface between the teacher and the management system" (p. 113). A study conducted just one year later by Van Dusen and Worthen (1995) supports Hativa and Becker's first level of success. After conducting a five-year study of the effectiveness of integrated learning systems in several studies as well as a two-year national study, it was determined that ILS systems do have an enormous potential, but more often than not, the systems are not implemented to full capacity. The research also identified three aspects of implementation that had a positive link between academic achievement and attitudes towards computer-based instruction: the average weekly amount of students' time on the system, the average number of lessons completed, and the level of integration of the ILS work with classroom instruction (Van Dusen &Worthen, 1995).

Good intentions to implement an integrated learning system do not always lead to a positive outcome. One such implementation experience was investigated by Jervis and Gkolia (2005) in a case study of an elementary school in the United Kingdom that adopted an integrated learning system but after two years decided to abandon it. Both qualitative and quantitative methods were used to investigate this implementation. An interview and questionnaire administered to both teachers and students involving attitudes towards the integrated learning system were conducted and coded. It was determined that based on technical issues, along with no vision from leadership, the school's success with the system was prevented. Overall, students had a positive attitude towards the ILS. There was a strong correlation between the number of years students were exposed to the integrated learning system and their positive attitude towards it (Spearman's coefficient = 0.57, $p < .001$) correlation. The greatest aspect of the program that teachers and students enjoyed was the scoring system, which provided immediate feedback. However, this benefit did not outweigh the ongoing technical difficulties, which caused teacher frustration to increase and led them to lessen their use of the system. Eventually, the ILS was replaced with a similar product during the time the computer lab went under renovation.

Gains in learner achievement cannot be expected if the technology resources are not implemented properly. Schools should consider how students will access the integrated learning system. It is just as important to consider the need for teacher professional development requiring discussion and planning. The available space as well as the budget may dictate the decision regarding where and how an ILS will be implemented. A distributed implementation model consists of one or more computers located in the teacher's classrooms for students to access during the school day. Distributed models are used more often in elementary schools given the nature of an elementary school's instructional day, instructional delivery approach, and assignment of students to classes. Elementary classroom teachers tend to use an ILS as part of a learning center rotation. The laboratory model consists of a large number of networked computers residing in one room. Time is scheduled by the classroom teacher to take students to the lab or library for computer use. Because of the nature of secondary schools, where students change classes throughout the day to attend core courses, a lab setting is used more often and accommodates the intended instruction. There is no statistical evidence that either model is more effective than the other.

Becker's (1998) article on schools and information technology informed leaders of the need to decide priorities in identifying sufficient resources to meet the goals of academic achievement. He asserted that if the desire is to provide students with as much computer contact as possible during a given day no matter what the intended use, placing a lab in the building would enable broad and equitable use. Of the three traditional building level grade spans, middle schools across the country have the largest proportion of labs when compared to the elementary and high schools (Becker, 1998). However, this type of computer setting minimizes the potential for classroom teachers to shift to a constructivist approach, where ideally three to five computers are physically placed in their classrooms like other learning materials and integrated into their curriculum delivery regularly. As the computer inventories in learning environments continue to grow and demand for access by teachers and students increases, effective placement and usage are necessary for academic achievement to improve.

In summary, preparing students for academic success is the intended goal of educational stakeholders. The research has demonstrated that by using legislation and federal funds, instructional leaders can identify and adopt technological resources for school reform (Balfanz, Legters, West, & Weber, 2007; Cradler & Bridgforth, 1996; Hedges, Konstantopoulos, & Thoreson, 2000; Superfine, 2005; Vinovskis, 1999). A conceptual framework derived from two prior studies (Agodini et al., 2003; Worthen, Van Dusen, & Sailor, 1994) brings the necessary constructs together into a coherent model to drive this research study. It presents the idea that connecting school reform, student learning, implementation, and time-on-task contribute to improved student achievement. The research that has contributed to the current body of research on integrated learning systems and their usage and the effect on student learning over the past 20 years is vast and varied. This abundance of literature supports the basis of the study to determine whether the selected method of implementation is effective. What remains lacking in the body of literature is how the use of an integrated learning system in schools in corrective action status can provide the necessary growth and gains that lead to improved student achievement.

Assessment

The No Child Left Behind legislation prompted a new focus on high stakes testing. The response to this legislation and its impact on school districts has created even more furor than the response to the report *A Nation at Risk* (1983), which was published nearly 20 years earlier. Oklahoma was one of many states that developed new standards and statewide assessments in response to the requirements set forth in the No Child Left Behind legislation. In some districts, the outcomes from the test data have been used to deny grade promotion, graduation, and teacher recognition in the form of money and school awards. In many urban school districts, the requirements have fostered high levels of stress for instructional leaders and teachers. In some instances, this has led to accusations of teachers “teaching to the test” and charges of cheating on the test, which have in some cases led to termination of employment and loss of certification. However, there have also been benefits realized, such as a heightened awareness to teacher quality, with a significant focus on professional development along with the implementation of a coherent curricular program (Darling, 2002). Consequently, assessment data has contributed to the new direction of school reform in an effort to promote rigorous student performance measures in order to improve student achievement.

The federal government facilitates the National Assessment of Educational Progress (NAEP) as a means of monitoring student academic achievement across the country. In turn, many school districts choose to use the outcome data to make decisions about instructional programs. However, large urban school districts are not so apt to do so (Railsback, 1987). The NAEP test is administered annually to fourth-, eighth-, and twelfth-grade students in the four core areas of mathematics, reading, science, and writing. The published data reports allow school districts and state officials to examine trends at the state and national levels. Because the NAEP test is not a criterion-referenced, but a norm-referenced test, states have created and administered their own criterion-referenced assessments to meet the needs of the No Child Left Behind legislation.

The Oklahoma Core Curriculum Test (OCCT) is the high-stakes accountability assessment the Oklahoma State Department of Education uses to assess student achievement; target student, classroom, and program improvement; and inform parents of student progress. The administration of the OCCT fulfills NCLB and state mandates for testing. Reading and math test results are used for federal and state accountability requirements (Oklahoma Department of Education Brochure, 2009). Rather than use a national standardized test such as the Stanford 9, ACT, or TerraNova as the measure for determining whether schools and school districts make adequate yearly progress, the states established the criteria for student achievement: that schools have to attain annually and sustain for two years in order to show adequate yearly progress. Subsequently, the cut score that separates test takers into various categories, such as passing and failing, is raised approximately every three years. The intent is that a child who completes all 12 years of education in the school district will achieve at the proficient level over time on state assessments in reading/language arts and math (U.S. Department of Education, 2003). The ranking of neighborhoods and the price of homes have been known to be affected by student test scores in nearby schools, although this may be a small price to pay to ensure that all students can read and are mathematically astute. Oklahoma has also been approved to use elements of the state-mandated Academic Performance Index (API) to measure adequate yearly progress, which primarily focuses on the academic achievement of students in reading/language and math but also considers other educational measures (i.e., attendance and grade promotion). Statewide performance targets are set for each required indicator to determine whether a school or district makes AYP, which can result in rewards or sanctions (Oklahoma State Department of Education, 2009). While NCLB requires that all states participate in administering assessments, there is limited evidence in the research that supports that there is a positive impact specific to students who undergo such an experience.

McLester (2006) contested the claim that there was no positive impact for students in her Technology and Learning article, where three site-based incidences were noted in schools that chose to use various technologies, including integrated learning systems, as the intervention methodology to increase student performance specific to meeting AYP. One of the schools was able to see a 10% gain in both reading and math annually. However, Supovitz (2009) concluded that trend data showed a change in teachers' instructional practices based on motivation concerning high-stakes testing. However, the change was shallow and focused on teaching to the test rather than on teachers improving their practice to facilitate students' understanding. Such behavior was not the intention of NCLB. Jacob and the National Bureau of Economic Research (2007) published a paper on a phenomenon he called *test score inflation*. He conducted a case study in Texas to analyze why student achievement levels on the state's high-stakes tests were not similar to the gains on the NAEP low-stakes test. He was not able to explain why the inflations occurred because there were several differences across the exams. However, he was able to determine that one possible reason for the gap had to do with test format differences.

There is evidence in the literature that technology can affect standardized test scores. Middleton and Murray (1999) conducted a study of fourth- and fifth-grade students' math and reading achievement as measured by the Metropolitan Achievement Test. Teachers were surveyed on their perceived level of use of technology in the classroom. An analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the academic achievement of the students who had teachers that were high users of technology and the academic achievement of students who had teachers of low or no technology usage. The findings revealed high-level technology teachers did have a significant effect on fifth graders in math but not fourth graders. Moreover, there was a significant effect in reading for fifth graders but not on fourth graders. Meanwhile, evidence from Amrein and Berliner's (2002) study on whether the implementation of a high-stakes testing policy resulted in improved student learning revealed no determination of results. In some cases, the level of student learning remained the same or worsened after the implementation of the policy.

CompassLearning Odyssey Program Reviews

CompassLearning Odyssey, Inc., published three middle-school program evaluations similar to this study. While this research may have some bias, the researcher finds value in the contribution of the program to Duval County Public Schools in Jacksonville, Florida. CompassLearning Odyssey was implemented in Jefferson Middle

School during the 2007-2008 school-year for grades 6 through 8 for reading/language arts and math. Computer lab settings were used to access the curriculum in whole-class settings. The measure for academic success within CompassLearning Odyssey is the percent of learning activities where students score 75% or greater. Specific time on task by minutes was not provided. A summary of results on the criterion-referenced Florida Comprehensive Assessment Test (FCAT) for math and reading are shown in the table below.

Table 1

Mean FCAT Math DSS by Grade

Grade	*n*	2007	2008	Gain
6	124	1556	1597	+40
7	255	1586	1755	+170
8	118	1647	1802	+154

Table 2

Mean FCAT Reading DSS by Grade

Grade	*n*	2007	2008	Gain
6	143	1591	1696	+104
7	55	1529	1668	+139
8	82	1679	1787	+107

Seventh-grade students demonstrated the highest gains. The differences between grade levels demonstrate the importance of monitoring students consistently.

Another implementation at the middle school level was in Poway Unified School District in San Diego, California, during the 2006-2009 school years for reading/language arts. The study addressed the question of whether CompassLearning Odyssey (CLO) had a positive effect on overall middle school student literacy scores throughout the district. Using a quasi-experimental method, the effectiveness of CLO was measured by comparing scores pre- and post-implementation as well as comparing student achievement for those who used CLO and those that did not use CLO. From the six middle schools studied, which had a total of 249 CLO students and 386 non-CLO students, a positive effect on achievement on the Measures of Academic Progress Literacy Assessment (MAP Literacy) was shown by students in grades 7 and 8. On average, seventh graders had an additional 27% yearly growth when compared to their non-CLO counterparts, and the eighth graders had an additional 60% yearly growth when compared to their non-CLO counterparts. Both were statistically significant ($p<.001$); however, sixth-grade students had no significant gain or loss in their achievement scores ($p = .35$).

The third study the researcher identified as comparable was conducted in Birdsboro, Pennsylvania, where Daniel Boone Area School District was located. A targeted population of 260 third- to eighth- grade students participated in an academic support program for reading and math. The implementation also involved a computer lab setting where students regularly engaged in the use of the ILS. The district experienced ongoing challenges, but when a recent analysis of dropout data found that the number of at-risk students was growing, an academic intervention was identified and implemented. An after-school program was designed for reading and math tutoring. The student population was 98% Caucasian and 2% African American. Test scores increased on both the district and national assessments. After the first year, reading scores at the advanced and proficient levels increased from 73.9% in 2002-2003 to 82% in 2003-2004 on district benchmark assessments. In addition, after the second year of implementation, the district experienced additional academic growth. The analysis of their Iowa Test for Basic Skills (ITBS) reading scores revealed the advanced and proficient levels increased from 63.6% to 73.1% and a 9.5% decrease in students scoring at the basic and below basic levels.

Summary

Improving the learning experience for students across the country continues to be a national focus. In many cases, school reform can provide a catalyst for change using federal legislation, federal funding programs, and technological instructional resources (Becker, 1994; Stanford Research Institute and Educational Development Corporation, 1992; Superfine, 2005). As illustrated in the conceptual frameworks of Agodini et al. (2003) and Worthen et al. (1994), student achievement can be influenced when technology and instructional practice are interconnected. In particular, when the technology is an integrated learning system, it can have varying levels of impact (Eom & Reiser, 2000; Estep, McInerney & Vockell, 2000).

There is also reason to believe that academic improvements are heavily affected by the manner in which technology is implemented (Van Dusen & Worthen, 1995; Kulik, 2002). Much of the research suggests that students who have classrooms enriched with an integrated learning system post higher academic gains. However, the body of empirical research lacks studies concerning interventions using integrated learning systems in response to legislative policy related to student achievement. Therefore, evidence from the literature supports the need for this study.

CHAPTER III

DESIGN

An interest in technology in education is the result of involvement by the federal government. Legislation such as Goals 2000: Educate America Act, Improving America's Schools Act of 1994, Title I, and No Child Left Behind (NCLB) of 2001 have allowed both progress and growth in the national commitment to the nexus of education and technology. An integrated learning system is one of the technology innovations schools utilize to improve student achievement. Integrated learning systems are frequently cited in the literature as a means of improving achievement in reading and mathematics instruction. Kulik (2002) described an integrated learning system as a software tutorial providing instruction to multiple grade levels that records student progress over time.

The literature review explored the measures school reform has taken in various educational settings; defined integrated learning systems; and recognized the methods of implementation schools have chosen and how assessment plays a role in the way districts, states, and the federal government monitor student achievement. There is evidence in the literature to support the premise that the level of success a student will experience using an integrated learning system is dependent on time on task (Worthen, Van Dusen, & Sailor, 1994). One such integrated system is CompassLearning Odyssey.

There is limited evidence from previous studies reviewed by the researcher that involved examining integrated learning systems as a component of a school reform initiative. No studies were found for multiple middle schools in a similar academic status as identified by NCLB guidelines. The existing body of research centers on studies that do not specify academic status at any particular school level, whether it is elementary, middle or high. The results of this study will portray through quantitative analysis the statistically significant differences in academic performance between students who are and are not exposed to an integrated learning system over two school years while attending schools that are in corrective action status. This research seeks to determine if a specific intervention designed to assist teachers and students in a focused curriculum will improve student learning and lead to the attainment of adequate yearly progress.

This study will investigate the effects of the integrated learning system (ILS) CompassLearning Odyssey on students' reading and mathematics achievement pre- and post-instruction using the Oklahoma Core Curriculum Test (OCCT). This high-stakes test is the accountability measure utilized to determine if schools in Oklahoma are making adequate yearly progress. In order to determine whether the use of an ILS affects student achievement scores in this study, a quantitative analysis will be conducted. The statistically significant differences in the dependent and independent variables as set forth in this research design will be examined. The goal of this study was to garner information from these three research questions:

1. What were the differences of the CompassLearning Odyssey Program on achievement scores of students in urban middle schools in corrective action status for reading and math by gender, ethnicity, special education, and free and reduced lunch?
2. Are there statistically significant differences in OCCT achievement scores in

reading and math between students who participated in the CompassLearning Odyssey Program and students who did not participate?

3. Is there a relationship between students' time on task and academic achievement as measured by reading and mathematics scores?

The study seeks to determine the effects of an integrated learning system (ILS) on student achievement in reading and mathematics in three Midwestern urban middle schools in corrective action status as defined by the No Child Left Behind Act (2001). Urban is defined by the 2000 US Census (2002) as a core census block group or blocks that have a population density of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile

This chapter contains a detailed description of the methodology for the study, including the population, rationale for the study, and the intervention and implementation strategy. The data collection procedures and method of data analysis are also explained. The chapter concludes with the summary.

Population and Sample

All students in the study population are residents of a county in Oklahoma that has a total resident population of approximately 592,000. There are 15 school districts in the county. The public school district involved in this study serves students residing in the city with 9 high schools, 2 alternative schools, 15 middle schools, and 63 elementary schools. The city is in a metropolitan area of about 383,000. The school district serves more than 43,000 students in 89 schools. The public school district's student population is 34.4% Caucasian, 34.9%, African-American, 19.2% Hispanic, 10.0% American Indian and 1.4% Asian. According to the federal lunch program data, 89% of the total student population is classified as economically disadvantaged (District Profile 2010).

This study includes students enrolled in urban middle school grades. The population sample used in this study consists of sixth-, seventh-, and eighth-grade students enrolled in four middle schools out of 15 middle schools in an urban school district. The average number of students enrolled in this district was 40,344 during the time of the study (District Profile 2008).

The four middle schools in the study serve approximately 1,473 students with African-Americans and Hispanics representing the largest student groups. One hundred percent of the students are classified as economically disadvantaged, as described by the National School Lunch Program (Ohio Department of Education, 2011). Full academic year (FAY) students from all of the middle schools are included in this study. All of the schools are accredited by the state of Oklahoma, and the staffs in all schools meet the highly qualified requirements. For the purpose of identification, the schools involved in the study will be known as Treatment School A, Treatment School B, Treatment School C, and Control School.

Student Groups in Treatment Schools

School A had an enrollment of 303 students as of October 1, 2008. The average daily attendance rate for these students is 93.6%. The demographic make-up of the student population is 10.2% Hispanic, 21.1% Caucasian, 59.1% African American, 9.6% Native American, and 0% Asian. The percentage of students that qualify to participate in the Free and Reduced Lunch Program at School A is 102.6% (See Appendix A) The population of special education students with individual education plans (IEPs) is 25.1%. The professional staff at School A consisted of one principal who had over 25 years of teaching and administrative experience, one assistant principal, and 38 teachers.

School B had an enrollment of 406 students as of October 1, 2008. The average daily attendance rate for these students is 93.7%. The demographic make-up of the student population is 4.7% Hispanic, 8.6% Caucasian, 80.5% African American, 5.2% Native American, and 1.0% Asian. The percentage of students that qualify to participate in the Free and Reduced Lunch Program at School B is 103.9% (See Appendix A) . The population of special education students with individual education plans (IEPs) is 23.4%. The professional staff at School B consisted of one principal who had over 25 years of teaching and administrative experience, one assistant principal, and 40 teachers.

School C had an enrollment of 378 students as of October 1, 2008. The average daily attendance rate for these students is 97.2%. The demographic make-up of the student population is 29.1% Hispanic, 25.9% Caucasian, 34.1% African American, 10.6% Native American, and 0.3% Asian. The number of students that qualify to participate in the Free and Reduced Lunch Program at School C is 101.1% (See Appendix A). The population of special education students with individual education plans (IEPs) is 27.8%. The professional staff at School C consisted of one principal who had over 25 years of teaching and administrative experience, one assistant principal, and 35 teachers.

Control School had an enrollment of 386 students as of October 1, 2008. The average daily attendance rate for these students is 90.8%. The demographic make-up of the student population is 20% Hispanic, 16.6% Caucasian, 52.1% African American, 11.1% Native American, and .3% Asian. The number of students that qualify to participate in the Free and Reduced Lunch Program at Control School is 101.1% (See Appendix A). The population of special education students with individual education plan (IEP) is 24.6%. The professional staff at the Control School consisted of one principal who had over 25 years of teaching and administrative experience, one assistant principal, and 40 teachers.

Table 3

Demographic Comparison for All Four Middle Schools in the 2007-2008 School Year

School	No. of Students	Caucasian	African American	Hispanic	Native American	Asian	Free Lunch	SPED IEP
Treatment School A	303	21.1%	59.1%	10.2	9.6%	0%	102.6%	25.1%
Treatment School B	406	8.6%	80.5%	4.7%	5.2%	1.0%	103.9%	23.4%
Treatment School C	378	25.9%	34.1%	29.1%	10.6%	.3%	101.1%	27.8%
Control School	386	16.6%	52.1%	20%	11.1%	.3%	101.1%	24.6%

The criterion sampling technique was selected for this study based on the district's decision to implement a specific integrated learning system and conduct a program evaluation. Given these circumstances, the aforementioned treatment schools utilizing the integrated learning system were selected to participate. Within the same school district, a middle school of similar demographics, socioeconomic status, and AYP status that did not expose their students to the CompassOdyssey Integrated Learning System was selected as the control school.

Because the study is based on middle schools that are in corrective action or on the NCLB Needs to Improve List, the sample came from those schools that meet these conditions and those schools utilizing CompassLearning Odyssey. The sample group consisted of a cadre of students who were enrolled in grade 6 during the 2006-2007 school year (baseline year), grade 7 during the 2007-2008 school year, and grade 8 during the 2008-2009 school year. The sample data were drawn from students who used the ILS and participated in the 2007-2009 administrations of the OCCT.

The Intervention

This study will investigate the differences in student achievement as measured by OCCT scale scores during the 2007-08 and 2008-09 school years after the implementation of the integrated learning system. CompassLearning Odyssey features a prescriptive curriculum that is directly linked to the diagnoses of student strengths and weaknesses in reading and mathematics. The assessment portion of the system allows online or offline test delivery. Students initially took a placement test as part of the CompassLearning Odyssey System. The test assigned students at the beginning of their learning level and prescribed scaffolding lessons, activities, and formative assessments aligned to the district's pacing calendar and the Oklahoma PASS objectives. Students completed their individualized curriculum at their own pace during their assigned time in the computer lab. Based on their responses to the assessment questions, subsequent items were introduced. The management system documented the students' progress in the system and provided reports to teachers, which were used to assist teachers in modifying classroom instruction.

ILS Implementation Strategy

As a part of the comprehensive reform process, schools are exposed to multiple initiatives at once; therefore, it is important for the leadership to be focused. Their plan must be designed for success. Students at the three middle schools received the intervention during the 2007-2008 through 2008-2009 school years for at least 45 minutes twice a week for both reading and mathematics. Teachers attended the lab with their respective classes of students to provide guidance, support, and oversight for the time that students were in the lab. Prior to the school reform being implemented, schools were using the traditional scheduling of 6 to 8 class periods of instruction. These were 40 to 50 minutes in length with a 3-5 minute window for class changes. Carroll (1990) determined that such an environment did not offer teachers an ability to facilitate instructional strategies to maximize student learning nor an opportunity to reflect on their practice.

The district and the new school's leadership recognized that the existing quality of instruction was not to their expectations. Therefore, along with the change in teaching staff, there was a need to change the schedule to support a better learning environment. They used the research from Queen (2003) to identify a model that would support higher levels of engagement for students and more opportunities for teachers to participate in professional learning communities to collaborate and better their practice. The schools implemented 90-minute class periods in which teachers used the district core curriculum as the basis for direct instruction for at least 45 minutes and then took their students on certain days to the CompassLearning Odyssey lab for the remaining 45 minutes to supplement the topics that the students had learned. This also supported the recommended time that students needed to be exposed to the intervention, and teachers could use data from the ILS to monitor students' learning and make adjustments in the classroom.

Adopting the modified block model provided benefits to the learning environment, such as:

- Opportunities to be creative with instructional designs,
- Making effective use of planning time,
- Facilitating cross-curriculum integration,
- Minimizing hallway transitions,
- Increasing teacher-student engagement, and
- Offering a classroom environment focused on students

In the spring of each year, all sixth-, seventh-, and eighth-grade students were tested with the Oklahoma Core Curriculum Test (OCCT) as required by the No Child Left Behind legislation. Students participated in required testing in reading, mathematics, science, and social studies. Achievement test scores for this study will come from the reading and mathematics portion of the assessment for each student in the sample and students in the control group.

Data Collection

Permission from the school district was obtained following the guidelines expressly set forth in the board policy of the district. The Institutional Review Board (IRB) of The University of Oklahoma granted permission to obtain de-identified student data, including Oklahoma Core Curriculum Test scores in reading and mathematics for the 2007, 2008, and 2009 school years. Students' time on task and completed lesson activities in the CompassLearning Odyssey integrated learning system were retrieved from the dedicated network server within the school district's technology department. The data used non-identifiers to provide anonymity for the student subjects and were stored in a secured computer hard drive with limited access. Both the OCCT raw score data and CompassLearning Odyssey usage data retrieved from the school district were imported into SPSS for analysis. The results of the study will be presented to the superintendent, their executive cabinet, and school board members of the school district upon completion.

The validity of the Oklahoma Core Curriculum Test (OCCT) is based on the degree to which accumulated evidence and theory support specific interpretations of test scores, whereas the reliability is based on the degree to which test scores obtained by a group of individuals are consistent over repeated applications. The reliability coefficient indicates the degree to which scores are free of measurement error. The conditions that the coefficient estimates may involve variations in test forms (alternate form reliability), repeated administration of the same form to the same groups after a time interval (test-retest reliability), or the statistical interrelationship of responses on separate parts of the test (internal consistency) (Oklahoma State Department of Education, 2011).

The Oklahoma State Department of Education (2010) acknowledges that there are key components and concepts that ensure the validity and reliability of the OCCT program:

- Item Response Theory (IRT) is a modern approach to test scoring that is based on the idea that a correct answer to a test item is a function of both the item and the ability of the student. One advantage of using IRT is that it can provide information about guessing, the difficulty of the item, and how well the item discriminates among students with different abilities. Since test forms vary in difficulty from one administration to another, raw scores cannot be compared directly.

- Criterion-Referenced Testing is an assessment that allows its users to describe an individual student's performance without referring to the performance of other students. In other words, a student's performance can be described in terms of absolute levels of proficiency. Therefore, the specific learning tasks a student is able to perform can be described, the percentage of tasks a student is able to perform can be indicated, or a student's task performance can be compared to a set of performance standards.
- Performance Level: A specific level of performance is defined by a range of OPI scores. There are four performance levels: Advanced, Proficient/Satisfactory, Limited Knowledge, and Unsatisfactory.
- Performance-Level Descriptors: These are written statements (short or long descriptors) describing performance levels in terms of what students have learned and can do.
- OPI Score: The Oklahoma Performance Index (OPI) is a scaled score resulting from the mathematical transformation of the number-correct scoring. There is a one-to-one relationship between the raw-score and the OPI score; for each raw score, there is a corresponding OPI score. These scaled scores are used to report an objective measure of achievement within a given subject area and to place students in one of the four performance levels. The OPI scores are unique to each subject area and cannot be used to

make comparisons between subject areas, such as comparing a student's OPI score across different subject areas in terms of strengths and weaknesses. Instead, the student's performance-level placement can be used to make these kinds of comparisons.

The OCCT contains criterion-referenced items. A student's test performance is reported according to one of four performance levels: Unsatisfactory, Limited Knowledge, Satisfactory, or Advanced. The Optimized Performance Index Charts below show the raw scores converted into cut scores for the optimized performance index.

Table 4

Optimized Performance Index (OPI) for Reading

Grade Level by Year	Advanced	Satisfactory	Limited Knowledge	Unsatisfactory
2006-2007				
6	**990-831**	**830-700**	**699-656**	**655-400**
7	990-808	807-700	699-641	640-400
8	990-838	837-700	699-638	637-400
2007-2008				
6	990-831	830-700	699-656	655-400
7	**990-808**	**807-700**	**699-641**	**640-400**
8	990-838	837-700	699-638	637-400
2008-2009				
6	990-828	827-700	699-647	646-400
7	990-802	801-700	699-668	667-400
8	**990-933**	**832-700**	**699-655**	**654-400**

Table 5

Optimized Performance Index (OPI) for Mathematics

Grade Level by Year	Advanced	Satisfactory	Limited Knowledge	Unsatisfactory
2006-2007				
6	**990-779**	**778-700**	**699-652**	**651-400**
7	990-783	782-700	699-656	655-400
8	990-801	800-700	699-636	635-400
2007-2008				
6	990-779	778-700	699-652	651-400
7	**990-783**	**782-700**	**699-656**	**655-400**
8	990-801	800-700	699-636	635-400
2008-2009				
6	990-754	753-700	699-660	659-400
7	990-766	765-700	699-667	666-400
8	**990-771**	**770-771**	**699-662**	**661-400**

Plan of Analysis

This study was a quantitative analysis of *ex post facto* data from urban middle schools in corrective action status as defined by NCLB that adopted the use of an integrated learning system for reading and math to increase student achievement. The data were analyzed using several independent variables and one dependent variable. A collection of measures by gender, ethnicity, special education, and free and reduced lunch from the descriptive statistics was used to address research question 1. Using analysis of covariance (ANCOVA) for research question 2, the researcher determined if there were any significant differences in reading and math achievement when students were exposed to an integrated learning system compared to those not exposed to an integrated learning system. Pearson's correlations were used to address research question 3 to determine the correlation between student time on task and their OCCT scale scores.

Procedures for Question 1: Reading and Math Scores

This analysis was computed on the sample of students who participated in a CompassLearning Odyssey school only. Groups such as gender, ethnicity, special education, and free and reduced lunch from the descriptive statistical summary data were computed comparing (a) Pre-Intervention test scores to Posttest Year 1 scores and (b) Pre-Intervention test scores to Posttest Year 2 scores on the reading and math tests.

Procedures for Question 2: Reading and Math Score Comparisons

This analysis was computed on the total sample of students including the students who participated in the CompassLearning Odyssey schools and a non-CompassLearning Odyssey school. An ANCOVA was applied two times to compare the reading and math scores of the students in the intervention group to the reading scores of the students in the control group on (a) Posttest 1, (b) Posttest 2, and (c) Posttest 3 while controlling for Pre-Intervention test scores as a covariate for each analysis. Since three analyses were computed, a Bonferroni correction was applied to correct the alpha level to .05/2 = .025. Thus, ANCOVAs showing higher scores for the intervention group as compared to the control group with *p*-values smaller than or equal to .025 were considered significant.

Procedures for Question 3: Time on Task and Academic Achievement

The time on task at each of the three posttest times was correlated with each type of score for a total of nine correlations. Specifically, time on task for the respective year of assessment was correlated with (a) Reading Posttest 1, (b) Reading Posttest 2, (c) Reading Posttest 3, (d) Language Arts Posttest 1, (e) Language Arts Posttest 2, (f) Language Arts Posttest 3, (g) Mathematics Posttest 1, (h) Mathematics Posttest 2, and

(i) Mathematics Posttest 3. Each of the nine correlations was assessed for significance. In order to avoid changing the alpha level to an ultra-conservative alpha level, the previously used alpha level of $\alpha = .025$ was maintained.

In addition, effect-size statistics as recommended by Becker (2000) and Coe (2002) were determined for each research question. Effect size is a simple way of quantifying the difference between two groups that has many advantages over the use of tests of statistical significance alone. Effect size emphasizes the size of the difference rather than confounding this with sample size. Such an analysis can be particularly valuable for quantifying the effectiveness of a particular intervention. Effect sizes are generally defined as small ($d = .2$), medium ($d = .5$), and large ($d = .8$). For this study, an effect size analysis compares the mean of the treatment group with the mean of the control group. The effect size is used to compare the OCCT score gains for the year before treatment to the OCCT score gains in the year after the treatment.

Role of the Researcher

The researcher was employed by the school district and served in the capacity of the director of instructional technology from 2005 to 2010. A primary responsibility was to design, develop, and deploy educational programs that utilized technology to support instruction. The researcher worked with the school district superintendent and chief academic officer to support the implementation of the academic intervention program. The researcher had no supervisory responsibilities of the instructional leadership at any of the schools. However, the researcher was responsible for working with the district's purchasing department and vendor of the integrated learning system to procure, coordinate installation, and schedule professional development sessions.

Summary

This study allowed the researcher to analyze student data using quantitative methodology to determine the difference in academic achievement for students who used the CompassLearning Odyssey Integrated Learning System. This chapter delineated the demographics for the sample used in this study. The following chapter will include the results of the analyses of covariance and the descriptive statistics for both the treatment schools and the control school in response to the three research questions in this study. The researcher will also discuss the findings and implications.

CHAPTER IV

RESULTS

The efficacy of integrated learning systems is still in question among K-12 instructional leaders. Although in existence for more than 50 years, there is conflicting evidence in the scholarly literature regarding the return on technology investment to increase students' academic achievement (Scott, Cole, & Engel, 1992). However, several sources of information from many studies noted in the literature review suggest that there may be a differences between students who use an ILS and those that do not. This study investigates the potential differences by analyzing student test data. Three research questions guide this study:

1. What were the differences of the CompassLearning Odyssey Program on achievement scores of students in urban middle schools in corrective action status for reading and math by gender, ethnicity, special education, and free and reduced lunch?
2. Are there statistically significant differences in OCCT achievement scores in reading and math between students who participated in the CompassLearning Odyssey Program and students who did not participate?
3. Is there a relationship between students' time on task and academic achievement as measured by reading and mathematics scores?

Description of the Data

The study employed a quantitative, ex post facto design using OCCT scale scores in total reading and total mathematics. Student test scores were used from the 2007 (Pre-Intervention test), 2008 (Posttest 1), and 2009 (Posttest 2) administrations of the OCCT achievement tests. Student scores from the 2006-2007 school year, prior to the implementation of the integrated learning system, will be compared to student scores from the school years 2007-2008 (Year 2) and 2008-2009 (Year 3), which came after implementation of the integrated learning system. Test scores were compared to determine if there was a statistically significant difference in gains after the use of the integrated learning system as well as continued growth in individual student performance for those students who participated for all three consecutive years in the study. Test scores among the three schools were also evaluated to determine if there was continuous improvement in the overall OPI scores.

The Oklahoma Core Curriculum Test (OCCT) was used to conduct pre- and post-implementation assessments with all treatment groups of students in this study. The OCCT is a statewide student-testing program that measures students' progress in mastering Oklahoma's Priority Academic Student Skills (PASS). The scale scores from the OCCT produced and used by the state of Oklahoma Department of Education for achievement and accountability testing were used for this analysis.

Results

Upon process approval from the University of Oklahoma Institutional Review Board (IRB) and the school district, a data file was established to retrieve test scores from students enrolled in three urban middle schools. The subjects in the study were students who held full academic year (FAY) status and used CompassLearning Odyssey as their intervention along with a group of middle school students in the same district that did not use this intervention. The test scores used in this study were results from the 2007, 2008, and 2009 Oklahoma Core Curriculum Tests (OCCT). The test scores were imported into SPSS (17.0), and ANCOVAs and Pearson's correlations were conducted. The independent variable was the intervention, receiving CompassLearning Odyssey versus not receiving it. The dependent variables were OCCT test scores in reading and mathematics for sixth graders, seventh graders and eighth graders for 2007, 2008, and 2009, respectively. The baseline scores from the previous year were used as the covariate.

Both the reading and mathematics sections of the test contain items aligned to the Oklahoma PASS objectives. The OCCT test score data for total reading and total mathematics were obtained from each middle school included in this study and were used to determine effective changes in academic achievement from one year to another based on the use of an ILS. The research began with a candidate group of 260 middle school students. Student data were disaggregated to include only those qualified students who (a) were full academic year (FAY), (b) attended the same school for three consecutive years (grades 6 through 8) and (c) had three years of OCCT scores in reading and math. As a result, 72.3%, or 188, students met the study criteria. In addition to the aforementioned criteria, these students must also have been in the seventh grade, in which case 50 students among the three middle schools did not pass sixth grade promotion requirements. In reading, 138 were considered to have been exposed to CompassLearning Odyssey, and 50 were students in the control school and were not exposed to it. The analysis was conducted to find the mean and the standard deviation for each group based on exposure to CompassLearning Odyssey versus not exposed to it. The 138 students exposed to CompassLearning Odyssey had a mean OCCT reading score of M = 683.45, SD = 59.569, and the 50 students not exposed to

CompassLearning Odyssey had a mean OCCT reading score of *M* = 701.58, *SD* = 54.961. In math, of the 186-student population, 140 were exposed to CompassLearning Odyssey, and 46 were not. The 140 students exposed to CompassLearning Odyssey had a mean OCCT math score of *M* = 696.64, *SD* = 69.471 and the 46 students not exposed to CompassLearning Odyssey had a mean OCCT math score of *M* = 689.87, *SD* = 55.60.

Results for Research Question 1

What were the differences of the CompassLearning Odyssey Program on achievement scores of students in urban middle schools in corrective action status for reading and math by gender, ethnicity, special education, and free and reduced lunch?

Descriptive statistics for students exposed to the intervention by gender.

Table 6

Descriptive Statistics by Gender

Scores	Gender	*n*	*M*	*SD*	*SEM*
Reading Base Year	Female	72	682.50	88.493	10.429
	Male	77	640.57	92.029	10.488
Reading Year 2	Female	70	701.06	53.411	6.384
	Male	68	665.32	60.503	7.337
Reading Year 3	Female	72	655.26	84.080	9.909
	Male	67	631.43	66.578	8.134
Math Base Year	Female	78	659.18	102.907	11.652
	Male	77	646.09	101.221	11.535
Math Year 2	Female	71	699.48	62.217	7.384
	Male	69	693.72	76.574	9.218
Math Year 3	Female	72	622.15	98.185	11.571
	Male	69	631.71	96.394	11.605

Table 6 includes descriptive statistics for students exposed to CompassLearning Odyssey over a two-year period. Results indicate that mean scores of female students who were in seventh grade increased 18.56 points (*M* = 701.06) in reading and increased by 40.30 points (*M* = 699.48) in math after one year of exposure. Concomitantly, these students met the Satisfactory and Limited Knowledge levels of mastery, respectively. The posttest scores after a second year of exposure for female students in reading decreased 45.8 points (*M* = 655.26) and decreased 77.33 points (*M* = 622.15) in math when they were in eighth grade. Students demonstrated the Limited Knowledge and Unsatisfactory levels of mastery, respectively. Their male counterparts started at an Unsatisfactory level in reading and math prior to exposure to the intervention. After one year, male students experienced an increase of 24.75 points (*M* = 665.32), which placed them in the next level of proficiency, Limited Knowledge. However, the same group of male students experienced a decline in their reading score by 33.89 points (*M* = 631.43) in their second year.

Descriptive statistics for students exposed to the intervention by ethnicity.

Table 7

Descriptive Statistics by Ethnicity

Dependent Variable	(I) Ethnicity	(J) Ethnicity	Mean Difference (I-J)	*SE*	Sig.	95% CI *LL*	95% CI *UL*
Read Base Year	American Indian	African American	-3.596	32.453	.912	-67.75	60.55
		Hispanics	-10.022	35.055	.775	-79.31	59.27
		Caucasian	-41.758	36.633	.256	-114.17	30.65
	African American	American Indian	3.596	32.453	.912	-60.55	67.75
		Hispanics	-6.425	19.425	.741	-44.82	31.97
		Caucasian	-38.161	22.146	.087	-81.94	5.61
	Hispanics	American Indian	10.022	35.055	.775	-59.27	79.31
		African American	6.425	19.425	.741	-31.97	44.82
		Caucasian	-31.736	25.809	.221	-82.75	19.28
	Caucasian	American Indian	41.758	36.633	.256	-30.65	114.17
		African American	38.161	22.146	.087	-5.61	81.94
		Hispanics	31.736	25.809	.221	-19.28	82.75
Read Year 2	American Indian	African American	4.075	21.944	.853	-39.33	47.48
		Hispanics	12.073	23.633	.610	-34.67	58.82
		Caucasian	-29.901	24.941	.233	-79.24	19.43
	African American	American Indian	-4.075	21.944	.853	-47.48	39.33
		Hispanics	7.998	12.827	.534	-17.37	33.37
		Caucasian	-33.976*	15.103	.026	-63.85	-4.10
	Hispanics	American Indian	-12.073	23.633	.610	-58.82	34.67
		African American	-7.998	12.827	.534	-33.37	17.37
		Caucasian	-41.975*	17.466	.018	-76.52	-7.42
	Caucasian	American Indian	29.901	24.941	.233	-19.43	79.24
		African American	33.976*	15.103	.026	4.10	63.85
		Hispanics	41.975*	17.466	.018	7.42	76.52

Read Year 3	American Indian	African American	40.727	27.296	.138	-13.26	94.72
		Hispanics	34.806	29.413	.239	-23.37	92.98
		Caucasian	-10.757	31.042	.729	-72.16	50.64
	African American	American Indian	-40.727	27.296	.138	-94.72	13.26
		Hispanics	-5.921	15.938	.711	-37.45	25.60
		Caucasian	-51.483*	18.774	.007	-88.62	-14.35
	Hispanics	American Indian	-34.806	29.413	.239	-92.98	23.37
		African American	5.921	15.938	.711	-25.60	37.45
		Caucasian	-45.563*	21.739	.038	-88.56	-2.56
	Caucasian	American Indian	10.757	31.042	.729	-50.64	72.16
		African American	51.483*	18.774	.007	14.35	88.62
		Hispanics	45.563*	21.739	.038	2.56	88.56
Math Base Year	American Indian	African American	14.097	32.122	.661	-49.38	77.57
		Hispanics	-21.551	35.229	.542	-91.16	48.06
		Caucasian	-10.580	36.549	.773	-82.80	61.64
	African American	American Indian	-14.097	32.122	.661	-77.57	49.38
		Hispanics	-35.648	20.997	.092	-77.14	5.84
		Caucasian	-24.677	23.144	.288	-70.41	21.06
	Hispanics	American Indian	21.551	35.229	.542	-48.06	91.16
		African American	35.648	20.997	.092	-5.84	77.14
		Caucasian	10.972	27.293	.688	-42.96	64.90
	Caucasian	American Indian	10.580	36.549	.773	-61.64	82.80
		African American	24.677	23.144	.288	-21.06	70.41
		Hispanics	-10.972	27.293	.688	-64.90	42.96

Math Year 2	American Indian	African American	1.986	24.448	.935	-46.37	50.34
		Hispanics	-10.993	26.313	.677	-63.04	41.05
		Caucasian	-31.129	28.121	.270	-86.75	24.49
	African American	American Indian	-1.986	24.448	.935	-50.34	46.37
		Hispanics	-12.979	14.728	.380	-42.11	16.15
		Caucasian	-33.115	17.757	.064	-68.23	2.01
	Hispanics	American Indian	10.993	26.313	.677	-41.05	63.04
		African American	12.979	14.728	.380	-16.15	42.11
		Caucasian	-20.136	20.247	.322	-60.18	19.91
	Caucasian	American Indian	31.129	28.121	.270	-24.49	86.75
		African American	33.115	17.757	.064	-2.01	68.23
		Hispanics	20.136	20.247	.322	-19.91	60.18
Math Year 3	American Indian	African American	5.679	34.130	.868	-61.82	73.18
		Hispanics	-21.011	36.917	.570	-94.02	52.00
		Caucasian	-39.690	39.306	.314	-117.42	38.04
	African American	American Indian	-5.679	34.130	.868	-73.18	61.82
		Hispanics	-26.690	20.760	.201	-67.75	14.37
		Caucasian	-45.369	24.760	.069	-94.34	3.60
	Hispanics	American Indian	21.011	36.917	.570	-52.00	94.02
		African American	26.690	20.760	.201	-14.37	67.75
		Caucasian	-18.679	28.480	.513	-75.00	37.65
	Caucasian	American Indian	39.690	39.306	.314	-38.04	117.42
		African American	45.369	24.760	.069	-3.60	94.34
		Hispanics	18.679	28.480	.513	-37.65	75.00

*. The mean difference is significant at the 0.05 level.

Table 7 includes descriptive statistics for students by ethnicity exposed to CompassLearning Odyssey over a two-year period in reading and math. A shift in order ranking of mean scores occurred among ethnicities in the treatment schools once exposed to CompassLearning Odyssey in reading. The baseline year scores of Caucasian students revealed that they outperformed their Hispanic African American, and American Indian counterparts. After one year of exposure to CompassLearning Odyssey, there was a slight shift in ranking among ethnic groups. Caucasian students still performed at the highest level, followed by American Indians, African Americans, and Hispanic students. After a second year of exposure, another shift occurred. Caucasian students performed first again and American Indian students remained in second, whereas their Hispanic counterparts moved to third and African Americans moved to fourth with a decline in mean score by 45.5 points (M = 635.15). Caucasian students increased their reading test scores compared to African American and Hispanic students.

During the baseline year in mathematics, Hispanic students outperformed their peers. These students demonstrated Limited Knowledge proficiency (M = 678.10) followed by their Caucasian counterparts (M = 667.13), American Indian (M = 656.55), and African American students, who performed at the Unsatisfactory level (M = 642.45). After a year of exposure, Caucasian students raised their mean score by 55.55 points (M = 722.68) on their seventh-grade OCCT assessment. Hispanic students also increased their mean score by 24.45 points (M = 702.55), American Indian students increased their score by 35.01 points (M = 691.56), and African-American students experienced the second-highest increase of 47.12 points (M = 689.57) while still placing fourth out of the four ethnicities. In year 3 (the second year of exposure), Caucasian students (M = 660.58) still placed first out of the four ethnicities on their eighth grade OCCT assessment compared to their African American peers (M = 615.21).

Descriptive statistics for special education students exposed to the intervention.

Table 8

Descriptive Statistics by Special Education Status

Scores	Special Education Status	*n*	*M*	*SD*	*SEM*
Reading Base Year	Yes	16	666.44	40.594	10.148
	No	131	661.21	97.156	8.489
Reading Year 2	Yes	5	686.60	31.596	14.130
	No	131	683.73	60.808	5.313
Reading Year 3	Yes	5	588.80	54.279	24.274
	No	132	648.08	75.236	6.548
Math Base Year	Yes	20	640.55	103.467	23.136
	No	133	656.66	100.273	8.695
Math Year 2	Yes	8	738.00	36.414	12.874
	No	130	694.66	70.535	6.186
Math Year 3	Yes	8	673.88	75.901	26.835
	No	131	624.71	98.248	8.584

Table 8 includes descriptive statistics for students classified as being in special education and exposed to CompassLearning Odyssey over a two-year period. Table 8 above indicates that their baseline year (sixth grade) special education (SPED) students had a slightly higher OCCT mean score (M = 666.44) than the non-SPED students (M = 661.21). While the population of SPED students decreased from 16 to 5 during their seventh-grade year, the average mean OCCT score increased by 20 points after the first year of intervention (M = 686.60), whereas the scores of their non-SPED counterparts increased only by 22 points (M = 683.73). However, this increase in scores was not enough to move any student from Limited Knowledge to Satisfactory based on the cut score. The year 2 reading intervention shows a consistent drop in scores overall, with

SPED students having a 97-point decline (*M* =588.8), which placed them at the Unsatisfactory Level along with their non-SPED counterparts (*M* = 648.08).

In math, there was only a 16-point difference between SPED (*M* = 640.55)and non-SPED (*M* = 656.66) students' average mean scores during their sixth-grade baseline year. The non-SPED students barely reached the Limited Proficiency level. After a year of intervention, the SPED group of students experienced a huge increase of two levels on the assessment with a 97-point gain (*M* = 738), compared to only a 38-point gain for the non-SPED group (*M* = 694.66). This gain placed SPED students at the Satisfactory level. Although their non-SPED counterparts experienced growth, these students remained at the Limited Knowledge proficiency level. A setback did occur after the second year of intervention: SPED students' scores dropped, placing them in the Limited Knowledge range, and their non-SPED counterparts dropped to Unsatisfactory. Overall, special education students did experience positive academic achievement by moving from Unsatisfactory to Limited Knowledge. These results may be affected by the fact that students and teachers were held to a different set of curriculum standards each year because the curriculum became more rigorous in concepts and skills.

Descriptive statistics for students exposed to the intervention by free and reduced lunch status.

Table 9

Descriptive Statistics by Free and Reduced Lunch Status

Scores	Lunch Status	*n*	*M*	*SD*	*SEM*
Reading Base Year	Free and Reduced	126	657.91	93.358	8.317
	Not Free	21	684.95	86.484	18.872
Reading Year 2	Free and Reduced	117	682.04	61.793	5.713
	Not Free	19	694.84	46.609	10.693
Reading Year 3	Free and Reduced	118	645.38	74.526	6.861
	Not Free	19	649.26	81.701	18.744
Math Base Year	Free and Reduced	129	651.52	105.490	9.288
	Not Free	24	670.88	66.971	13.670
Math Year 2	Free and Reduced	119	697.06	72.431	6.640
	Not Free	19	697.89	50.647	11.619
Math Year 3	Free and Reduced	121	630.39	98.346	8.941
	Not Free	18	608.39	92.412	21.782

Table 9 reflects students from the sample group that were divided based on qualification for the Free and Reduced Lunch program. The Free and Reduced Lunch (F/R) students (n = 126, M = 657.91) did not outperform their non-F/R counterparts (n = 21, M = 684.95) during the baseline year in reading. Both groups of students scored at the Limited Knowledge level. Sixty-seven percent of the students in the sample qualified for the Free and Reduced Lunch program. After one year of exposure to the CompassLearning Odyssey intervention, seventh-grade F/R students (n = 117) experienced a 24-point increase in their average OCCT score (M = 682.04), which allowed them to maintain the Limited Knowledge level. During their eighth-grade year and the second year of exposure to the intervention, these same students experienced a loss of 36 points, placing this group of students at the Unsatisfactory level. These results show an overall decrease over two years in academic performance by 12 points.

In the area of math, the achievement shifts were more dramatic. Again, Free and Reduced Lunch students underperformed by 19 points (*M* = 651.52) when compared to their non F/R counterparts (*M* = 670.88) during the baseline year of sixth grade. After one year of exposure to the CompassLearning Odyssey intervention, both F/R and non-F/R students advanced to the same mean average of 697, which placed them at the top of the Limited Knowledge range and only three points from the Satisfactory level. Both groups experienced a significant decrease in scores in their eighth-grade year such that both F/R (*M* = 630.39) and non-F/R students (*M* = 608.39) placed at the Unsatisfactory level. It is important to note that F/R students outperformed non-F/R students even though their scores placed them at the Unsatisfactory level. The difference in the decrease of scores between F/R students and their non-F/R students was 23 points.

Results for Research Question 2

Are there statistically significant differences in OCCT achievement scores in reading and math between students who participated in the CompassLearning Odyssey Program and students who did not participate?

Reading scores after 1 year of exposure. To answer this research question, a one-way analysis of covariance (ANCOVA) was conducted (Table 10). This ANCOVA evaluated whether the population means on the dependent variable, OCCT Reading test scores for year 1 of exposure to CompassLearning Odyssey intervention (*n* = 138) and non-exposure (*n* = 50) to the intervention vary significantly.

Table 10

One-Way ANCOVA Results for Reading, Year 1 of Exposure

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	308808.193[a]	2	154404.097	85.861	.000
Intercept	467416.175	1	467416.175	259.922	.000
Read0607	297837.742	1	297837.742	165.622	.000
TechExposure	1567.015	1	1567.015	.871	.352
Error	329088.431	183	1798.297		
Total	8.891E7	186			
Corrected Total	637896.624	185			

Note. R Squared = .484 (Adjusted *R* Squared = .478)

The independent variable, the CompassLearning Odyssey intervention, had two levels: exposed and not exposed. The dependent variable was middle school students with OCCT reading test scores after exposure to CompassLearning Odyssey at the end of 7th grade. The covariate was the same middle school students' OCCT reading test scores before being exposed to the intervention for one year, which occurred during their second year in middle school, from the prior year. There was no statically significant difference between students exposed to the intervention and students not exposed to the intervention.

Table 11:

Number of Eligible Students in Reading after 2 Years of Exposure

	Cases					
	Included		Excluded		Total	
	n	Percent	*n*	Percent	*n*	Percent
Read Year 2 * Tech Exposure	188	72.3%	72	27.7%	260	100.0%

Table 12

Descriptive Statistics for Reading, Year 2 of Exposure

Tech Exposure	*N*	*M*	*SD*
Not Exposed to Tech	49	673.00	66.709
Exposed to Tech	139	643.78	76.811
Total	188	651.39	75.244

The data provided by the school district revealed a population of 260 middle school eighth-grade students; of those, 188, or 72.3%, met the study criteria. In reading, of the 188-student population, 139 were exposed to CompassLearning Odyssey intervention for two years, and 49 students were not. The 139 students exposed to CompassLearning Odyssey had a mean OCCT Reading Score of M = 643.78, SD = 76.811, which was a 38.67 decrease from Year 2. In addition, the 48 students not exposed to CompassLearning Odyssey had a mean OCCT Reading Score of M = 673, SD = 66.709. These students also experienced a decrease of 28.58.

Table 13

One-Way ANCOVA Results for Reading, 2 Years of Exposure

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	489575.938[a]	2	244787.969	81.400	.000
Intercept	4323.201	1	4323.201	1.438	.232
Read0708	460779.714	1	460779.714	153.224	.000
TechExposure	3679.466	1	3679.466	1.224	.270
Error	541303.013	180	3007.239		
Total	7.906E7	183			
Corrected Total	1030878.951	182			

a. R Squared = .475 (Adjusted R Squared = .469)

A one-way analysis of covariance (ANCOVA) was conducted (Table 13). This ANCOVA evaluated whether the population means on the dependent variable, OCCT Reading test scores for year 2 of exposure to CompassLearning Odyssey (*n* = 135) and not exposed (*n* = 48) varied significantly. The independent variable, CompassLearning Odyssey intervention, had two levels: exposed and not exposed. The dependent variable was middle school students with OCCT reading test scores after exposure to CompassLearning Odyssey at the end of 8th grade. The covariate was the same middle school students' OCCT reading test scores before being exposed to CompassLearning Odyssey intervention during their third year in middle school, grade 8. This analysis indicated that the relationship between the covariate and the dependent variable did not differ significantly as a function of the independent variable CompassLearning Odyssey intervention in Year 3 at the $p < .025$ level for the two conditions [F (66.709, 76.811) = 1.224, p = .270] for reading.

Math scores after 1 year of exposure.

Table 14

Number of Eligible Students in Math after 1 Year of Exposure

	Cases					
	Included		Excluded		Total	
	n	Percent	*n*	Percent	*n*	Percent
Math Year 1 * Tech Exposure	186	71.5%	74	28.5%	260	100.0%

Table 15

Descriptive Statistics for Math Scores after 1 Year of Exposure

Tech Exposure	*n*	*M*	*SD*
Not Exposed to Tech	46	689.87	55.600
Exposed to Tech	140	696.64	69.471
Total	186	694.97	66.233

Based on the data (Table 14) provided by the school district, there was a 260 middle school student population, of which 71.5%, or 186, met the study criteria. During this period, these students were attending 7th grade. In math, of the 186 students, 140 were exposed to CompassLearning Odyssey, and 46 were not. Table 15 shows that the 140 students exposed to CompassLearning Odyssey had a mean OCCT math score of *M* = 696.64, *SD* = 69.471, and the 46 students not exposed to CompassLearning Odyssey had a mean OCCT math score of *M* = 689.87, *SD* = 55.60. Both groups performed at the Limited Knowledge level.

Table 16:

One-Way ANCOVA Results for Math, Year 1 of Exposure

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	297489.552[a]	2	148744.776	52.608	.000
Intercept	574165.015	1	574165.015	203.072	.000
Math0607	295659.797	1	295659.797	104.570	.000
TechExposure	15246.626	1	15246.626	5.392	.021
Error	511759.225	181	2827.399		
Total	8.977E7	184			
Corrected Total	809248.777	183			

a. *R* Squared = .368 (Adjusted *R* Squared = .361)

Table 16 presents the results of a one-way ANCOVA. This ANCOVA evaluated whether the population means on the dependent variable, OCCT math test scores after 1 year of exposure to the CompassLearning intervention (*n* = 140) and not exposed to the intervention (*n* = 46), vary significantly. The independent variable, CompassLearning Odyssey intervention, had two levels: exposed and not exposed. The dependent variables were middle school students with OCCT math test scores after exposure to CompassLearning Odyssey. The covariate was the same middle school students' OCCT math test scores before being exposed to CompassLearning Odyssey during their second year in middle school, grade 7, for just one year. This analysis indicated that the relationship between the covariate and the dependent variable was significant as a function of the independent variable at the $p < .025$ level for the two conditions [F (69.471, 55.600) = 5.392, p = .021] for math. The effect size for this significant adjusted mean difference was -0.05.

Math scores after 2 years of exposure.

Table 17:

Number of Eligible Students in Math after 2 Years of Exposure

	Cases					
	Included		Excluded		Total	
	n	Percent	*n*	Percent	*n*	Percent
Math Year 2 * Tech Exposure	190	73.1%	70	26.9%	260	100.0%

Table 18

Descriptive Statistics for Math Scores after 2 Years of Exposure

Tech Exposure	*n*	*M*	*SD*
Not Exposed to Tech	49	640.65	65.072
Exposed to Tech.	141	626.83	97.083
Total	190	630.39	89.965

While in their second year of intervention, this student group was now in the eighth grade. Based on the data provided by the school district, there was a middle school student population of 260, of which 73.1%, or 190, met the study criteria (Table 17). In math, of the 190-student population, 141 students were exposed to CompassLearning Odyssey for two years, and 49 students were not. Table 18 reflects that the 141 students exposed to CompassLearning Odyssey intervention had a mean OCCT math score of *M* = 626.83, *SD* = 97.08, and the 49 students not exposed to CompassLearning Odyssey had a mean OCCT math score of *M* = 640.65, *SD* = 65.07. Both student groups performed at Unsatisfactory levels, a drop from the prior year during which students were performing at the Limited Knowledge level.

Table 19

One-Way ANCOVA Results for Math, Year 2 of Exposure

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	718159.384[a]	2	359079.692	84.217	.000
Intercept	4123.518	1	4123.518	.967	.327
Math0708	708147.271	1	708147.271	166.086	.000
TechExposure	24138.552	1	24138.552	5.661	.018
Error	758947.058	178	4263.748		
Total	7.385E7	181			
Corrected Total	1477106.442	180			

Note. *R* Squared = .486 (Adjusted *R* Squared = .480)

This ANCOVA (Table 19) evaluated whether the population means on the dependent variable, OCCT math test scores for year 3, adjusted for differences between the independent variables, exposure to CompassLearning intervention (n = 136) and not exposed to the intervention (n = 45), varied significantly. The independent variable, CompassLearning Odyssey, had two levels: exposed and not exposed. The dependent variable was middle school students with OCCT math test scores after two years of exposure to CompassLearning Odyssey. The covariate was the same middle school students' OCCT math test scores after two years of exposure to CompassLearning Odyssey during their third year in middle school, grade 8. Despite the drop in academic performance from the prior school year, the analysis indicated that the relationship between the covariate and the dependent variable was statistically significant after two years of exposure at the $p < .025$ level for the two conditions [F (97.083, 65.072) = 5.661, p = .018] for math. The effect size for this significant adjusted mean difference was -0.05.

Results for Research Question 3

Is there a relationship between students' time on task and academic achievement as measured by reading and mathematics scores?

Table 20

Pearson Correlations for Math Scale Score vs. the Number of Math Assignments Completed after 1 Year of Exposure

		Math0708	Math Completed
Math0708	Pearson Correlation	1	**0.122**
	Sig. (2-tailed)		**0.473**
	N	83	**37**
Math Completed	Pearson Correlation	0.122	1
	Sig. (2-tailed)	0.473	
	N	37	52

A Pearson product-moment correlation coefficient was computed (Table 20) to assess the relationship between the CompassLearning Odyssey math activities completed as a part of the intervention and how a student's OCCT math test score changed. There was no correlation between the two variables (r = .122, n =37, p = .473). Overall, there is a weak non-significant relationship between the students' 2008 OCCT math scores and the amount of math activities completed in CompassLearning Odyssey. The number of activities completed is not statistically related to student's OCCT scores.

Table 21

Pearson Correlations for Reading Scale Score vs. Number of Reading Assignments Completed after 1 Year of Exposure

		Read0708	LA Learning Activity Completed
Read0708	Pearson Correlation	1	**0.134**
	Sig. (2-tailed)		**0.436**
	N	86	**36**
LA Learning Activity Complete	Pearson Correlation	0.134	1
	Sig. (2-tailed)	0.436	
	N	36	52

A Pearson product-moment correlation coefficient was computed (Table 21) to assess the relationship between CompassLearning Odyssey Reading activities completed and how a student's OCCT reading test score changed. There was not a statistically significant correlation between the two variables (r = .134, n =36, p = .436). There is a weak, but not statistically significant, relationship between the students' 2008 OCCT reading scores and the amount of reading activities completed in CompassLearning Odyssey. This means that changes in the number of activities completed are not tightly correlated with changes in the increase or decrease of a student's OCCT reading score. Therefore, these variables were not strongly correlated.

Table 22

Pearson Correlation for Reading Scale Score vs. the Number of Reading Assignments Completed after 2 Years of Exposure

		Read0809	LA Learning Activity Complete	LA Learning Activity Score
Read0809	Pearson Correlation	1	0.219	0.483**
	Sig. (2-tailed)		0.199	0.003
	N	85	36	36
LA Learning Activity Complete	Pearson Correlation	0.219	1	0.218
	Sig. (2-tailed)	0.199		0.128
	N	36	50	50
LA Learning Activity Score	Pearson Correlation	0.483**	0.218	1
	Sig. (2-tailed)	0.003	0.128	
	N	36	50	50

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

This Pearson product-moment correlation coefficient (Table 22) was computed to assess the relationship between the Language Arts Learning Activity score a student received as the result of completing CompassLearning Odyssey activities during the second year of the intervention and the rate by which a student's 8th grade OCCT reading test score changed. There was a correlation between the two variables (r = .483, n = 36, p = .003). There was a significant relationship between the students' 2008 OCCT reading score and the score received on a series of reading activities completed in CompassLearning Odyssey. This means that changes in the number of activities completed were correlated with changes in the increase or decrease of a student's OCCT reading score. Therefore, these variables were strongly correlated.

Another Pearson product-moment correlation coefficient was computed to assess the relationship between the number of Language Arts Learning Activities completed by students using CompassLearning Odyssey during the second year of the intervention and the rate by which a student's 8th grade OCCT reading test score changed. There was no correlation between the two variables (r = .219, n = 36, p = .199). There was a weak relationship between the students' 2008 OCCT reading score and the amount of reading activities completed in CompassLearning Odyssey. This means that the number of activities completed was not correlated with changes in the increase or decrease of a student's OCCT reading score. Therefore, these variables were not strongly correlated.

Summary

This chapter presented the statistical results of a quantitative research study conducted in four urban middle schools. The data pertaining to the three research questions were analyzed using descriptive statistics, analyses of covariance, and Pearson correlations. Included in this chapter were the tables and explanations related to the research questions. Based on the results and findings using descriptive statistics, there was no statistical significance that there was an effect of the CompassLearning Odyssey Program on achievement scores. These results include gender comparisons, socioeconomic status, and ethnicities. Results from using one-way ANCOVAs also demonstrated that there were no statistically significant differences in achievement scores between students who participated in the CompassLearning Odyssey Program for Reading and students who did not participate. However, students' exposure to the CompassLearning Odyssey Program for Math did experience significant changes in their achievement scores compared to their non-participating counterparts. There was no statistical significance in the relationship between students' time on task and their academic achievement in math. It is important to mention that students did achieve academic gains. However, after two years of exposure, there was a significant relationship between reading achievement score and time on task. The following chapter will address additional research information found while conducting this study and include recommendations for further studies.

CHAPTER V

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Technology in education has continued to grow and evolve over the past three decades. While the number of computers in the classrooms was once the hallmark of success in schools, the impact on student achievement is now the current measurement. The effect of instructional technology on improving student achievement continues to be widely debated in the literature. The existing body of literature regarding the use of an integrated learning system (ILS) remains sparse.

Many school districts under public scrutiny over test scores pursue the implementation of an ILS and allocate a bulky segment of their federal budgets to acquire and sustain this computer assisted intervention. Kulik (2003) noted in a review of 36 controlled studies on instructional technology that the “evidence is not yet clear” (p. 60) regarding improvement in instruction and student achievement. Kulik further posited that generalizations regarding the impact of instructional technology on achievement could not be made from the literature. Despite this lack of evidence, school districts continue to utilize integrated learning systems as one of the computer-assisted interventions to improve student achievement scores (Cuban, 2001).

While the literature remains uneven and insufficient to draw any definitive conclusions about the effectiveness of instructional technology, there is evidence to show that the use of an ILS improved mathematics and science achievement (Kulik, 2003). The results from early evaluation studies and the more recent studies of the 1990s and beyond highlight the importance of continuing this discourse with the current research study, which considers the effects of an integrated learning system on urban middle school student achievement.

This chapter includes a brief introduction, summary of the study, and discussion and summary of the results from Chapter IV in relation to the current literature. In addition, the implications for practice and study limitations will be addressed. Finally, this chapter concludes with recommendations for future research.

Summary of the Study

This study was designed and conducted to determine the effect of an integrated learning system on student achievement. The current research considered the implementation of one integrated learning system (ILS), CompassLearning Odyssey, in three middle schools in corrective action status as defined by NCLB and compared student achievement scores with the achievement scores of students in one middle school of similar academic status not exposed to the ILS over a two-year period. The results of this study will be placed with the context of the current literature when appropriate.

Chapter 1 established the need and purpose for the present study, summarized the research questions and the design approach, provided assumptions and limitations, and offered a definition of key terms. Also presented in Chapter 1 were the three research questions that guided this study:

1. What were the differences of the CompassLearning Odyssey Program on achievement scores of students in urban middle schools in corrective action status for reading and math by gender, ethnicity, special education, and free and reduced lunch?

2. Are there statistically significant differences in OCCT achievement scores in reading and math between students who participated in the CompassLearning Odyssey Program and students who did not participate?
3. Is there a relationship between students' time on task and academic achievement as measured by reading and mathematics scores?

The literature review in Chapter 2 provided evidence that the current body of empirical research lacks studies concerning interventions using integrated learning systems in response to legislative policy related to student achievement. This dearth of research provided the impetus for this study.

Chapter 3 outlines the research design model that the researcher established. This design was utilized to analyze student data by quantitative methodology to determine the differences in academic achievement for students who used the CompassLearning Odyssey Integrated Learning System and students who did not use it.

The findings from the research are presented in Chapter 4. Analysis of Co-Variance (ANCOVA) and Pearson's correlations were used to analyze and interpret student data, and the descriptive statistics for both the treatment schools and the control school were presented in response to the three research questions.

Discussion and Summary of the Results

The study was prompted by the question of whether there was an effect on middle school students' achievement scores in reading and mathematics using an ILS over a two-year period. This question remains elusive among educational leaders, who continuously seek alternative means to meet the legislative accountability mandates of No Child Left Behind (2001). The current study contributes to the literature with respect to conducting research on the use of ILS to determine the effect on student achievement for more than one year. Estep et al.(2000) noted that such research was virtually nonexistent in the research journals. The investigation by Estep et al. of the relationship between the use of integrated learning systems and academic achievement in elementary schools found similar results to this study. Based on the ILS vendors' proposition that their ILS was an effective instructional strategy that would positively influence students' high-stakes test scores in the state of Indiana, the study sought to determine if this claim was true. The study found similar results to the current study when looking at the interaction between pre- and post-test scores in that there was no significant difference in test scores. Like this study, after one year of intervention, students experienced higher test scores compared to their pre-intervention test scores.

Specifically, the results of this study revealed a significant difference in math achievement scores between students exposed to the ILS and those students not exposed to the ILS. However, there was no significant relationship in students' reading achievement scores, which refutes Buly and Velencia's (2002) study that posited that a student's reading ability can improve substantially when instruction is integrated with computers and related software.

Research question 1. Research question 1 sought to determine if there were differences of the CompassLearning Odyssey Program on achievement scores of students in urban middle schools in corrective action status for reading and math by gender, ethnicity, special education, and free and reduced lunch. The researcher used descriptive statistics to analyze results for students exposed to the intervention. While the results derived from this analysis were not sufficient to answer the research question as presented, some worthwhile data on student subgroups emerged that addressed one of the key issues from which this research was derived, which was how schools and school districts are required to make AYP as defined by No Child Left Behind (2001). This legislative act was passed by Congress to address policy issues in an attempt to equalize educational opportunities for children. High-stakes tests are used annually specifically as a measure of performance; this reform initiative proposed bringing about a widespread shift in student performance while removing bias between ethnicities and diminishing the effect of poverty. The No Child Left Behind Act of 2001 placed a heavy emphasis on meeting the statewide academic goal of making Adequate Yearly Progress (AYP). Each subgroup of students is evaluated separately when determining if a school or district makes AYP. The subgroups include gender, ethnicity, poverty, and special education, and each group is required to meet the standard annually or decrease the numbers of students who are not proficient in any subgroup by 10 percentage points from the previous year, thereby making Safe Harbor. Therefore, every bit of growth matters, and annual growth could allow a school or district to be removed from the corrective action list (Vannest, Temple-Harvey, & Mason, 2009).

The analysis conducted for research question 1 revealed results that could offer contributions to the existing body of literature on the effects of an ILS related to gender and subgroups of students that receive this type of intervention, consistent with Becker’s (1994) study using a similar sample population. The results showed an improvement in academic growth for these groups. Results indicated that mean scores of female students in grade 7 increased by 18.56 points in reading and by 40.30 points in math after one year of exposure to the ILS, meeting the Satisfactory level and

Limited Knowledge level, respectively, on the test. Their male counterparts also experienced an increase of 24.75 points, positioning them from Unsatisfactory level to Limited Knowledge on the OCCT. However, these same students experienced a decline in test scores from the previous year. With respect to ethnicities, a shift in achievement results ranking occurred after exposure to the ILS in reading. Caucasian students outperformed all ethnicities in the baseline year and during the implementation phase of this research; however, after one year of exposure to the ILS, there was a slight shift in rank order, with American Indians outperforming African Americans and Hispanics. In the second year, another shift occurred, with Hispanics outperforming their African American peers. Overall, results also showed that Caucasian students increased their reading scores when compared to African Americans and Hispanics. In math, Hispanic students outperformed all subgroups in math in the baseline year and scored at the Limited Knowledge level. After one year of exposure to the ILS, all students increased their mean math scores on the OCCT assessment. Caucasian students posted the largest increase in mean scores at 55.55, with African Americans students posting the second-largest increase with a mean score of 47.12, followed by American Indians with a mean score of 35.01 and Hispanics with a mean score of 24.45. These results can be compared to the outcomes determined in the Becker study that indicated that when exposed to an integrated learning system after one year, there were increases in average mean scores of students on the high-stakes assessment in math compared to students not exposed, and his results also showed stronger outcomes in math than reading. However, consistent with the reading results in the second year of implementation of the ILS, students' mean scores declined, whereas Caucasians and African-Americans remained first and second in the ranking, respectively. However, unlike Becker's study, this research question did not consider the element of time.

An additional component of determining whether schools or districts make AYP is the area of poverty. For purposes of the analysis based on No Child Left Behind, poverty is typically defined as students who qualify for free and reduced price meals. This study also analyzed data using this category. Sixty-seven percent of the students in the sample met these criteria. The results revealed that F/R students did not outperform their non-F/R peers during the baseline year in reading; however, both groups scored at the Limited Knowledge level on the OCCT assessment. After one year of exposure to the ILS, the F/R students experienced a 24-point increase in their average score on the assessment but experienced a decline in scores in their second year of exposure, placing them at the Unsatisfactory level. In the area of math, while F/R students scored substantially lower than their peers in the baseline year, these same students obtained identical mean scores to their non-F/R peers of 697 after one year of exposure, which placed them at the top of the Limited Knowledge level. Both groups experienced a considerable decrease in scores in year two, placing them in the Unsatisfactory level, although the F/R students outperformed their non-F/R peers.

School districts and schools are also required to analyze the scores of special education students when determining if AYP is met. In the current study, approximately 25 percent of the students in the each middle school participating in the study were students with special needs with an individual education plan (Treatment School A: 25.1%, Treatment School B: 23.4%, Treatment School C: 27.8%., Control School: 24.6%). The results showed that special education students experienced similar academic gains to their non-special education counterparts after the first year of exposure. Similar positive experiences occurred in the study conducted by Williams (2001), in which approximately 80% of the special education students involved in the project made greater gains in spelling than their control group counterparts, whose intervention was conducted by pen and paper methods.

During the baseline year for students in this study, special education (SPED) students had a slightly higher OCCT mean score in reading than their non-SPED peers. When analyzing the results of this subgroup, it is important to note that there was a decrease in the number from 16 to 5 of students identified for special education services. The mean score of the special education students increased by 20 points as compared to their non-SPED peers after the first year of exposure to the ILS. However, this increase was not sufficient to move any student from the Limited Knowledge level to Satisfactory. In math, there was only a 16-point difference in the mean scores of SPED and non-SPED students in the baseline year. After one year of exposure to the ILS, SPED students experienced a huge increase of two levels of performance on the OCCT assessment with a 97-point gain as compared to their non-SPED peers, with a gain of only 38 points. With this increase, the SPED students scored at the Satisfactory level as compared to their non-SPED peers, who remained at the Limited Knowledge level. Consistent with other results in year 2, scores of SPED and non-SPED students declined, placing them in the Limited Knowledge and Unsatisfactory levels, respectively.

Williams's (2001) study that used an ILS with elementary students with special needs suggested that all students could benefit from computer-based instruction.

Students in this small study made greater gains than their control group, who received only paper-and-pencil support. A study conducted by Lewis (1999) suggested that ILSs offered features that are conducive for students with learning difficulties, such as extended wait times, frequent positive reinforcement, and breaking down tasks into manageable bits for students to process. However, Lewis acknowledged and cautioned that there was a shortage in the available reviews on integrated learning systems with use by students with learning difficulties. While these studies offer schools hope in assisting students with special needs, she acknowledged that there were studies in which students with special needs did not use the systems very effectively. These outcomes should be considered when school districts conduct their due diligence in selecting an intervention.

Research question 2. Research question 2 sought to determine if there were statistically significant differences in OCCT achievement scores in reading and math between students who participated in the CompassLearning Odyssey Program and students who did not participate. A one-way analysis of covariance was conducted. The results revealed that no statistically significant differences existed for those students exposed to the ILS compared to those students who were not exposed to the intervention in reading but did exist in math. In addition, descriptive statistics showed that male students outperformed their female counterparts in reading after one year of exposure to the ILS by 6.19 points. Moreover, the same students performed similarly in math with a gain of 47.43 points in one year, a difference of 7.13 points in comparison to their female counterparts. Both male and female students experienced a decline during year 2 in reading of 45 points. In math, female students experienced a much greater decline of 77.33 points as compared to their male counterparts with a 62.01-point drop in OCCT academic scores, a difference of 15.32. Despite the drop in academic performance from the prior school year, the analysis indicated that the relationship between the covariate and the dependent variable was statistically significant.

The results obtained in the analysis of question 2 continue to highlight the gender gap in math that perplexes educators and supports Ganley and Marina's (2011) research on sex differences in relation to math performance, spatial skills, and attitudes in middle school students. The results showed that the significance of particular predictors varied as a function of sex. These results suggest that strategies for closing the gender gap in math warrant further inquiry. Gender-specific research or results that can be gleaned from other research regarding gender differences in math will be important for teachers to facilitate understanding how to modify instruction to reach all students' maximal achievement potential.

Research question 3. The conceptual framework established in the literature review was based on the studies of Agodini et al. (2003) and Worthen et al. (1994) that considered the interrelationship of an ILS and time on task on student achievement. A Pearson product-moment correlation coefficient was computed to assess the relationship between the CompassLearning Odyssey interventions and the degree to which a student's reading or math score changed. Research question 3 sought to determine if there was a relationship between students' time on task and academic achievement as measured by reading and mathematics scores. The notion that time on task in relation to the effect of an integrated learning system on student achievement was originally considered in the literature by Worthen et al. (1994) and Agodini et al. (2003).These researchers contended that student engagement might increase because of time on task with an integrated learning system. In addition, the amount of teacher training in the use of an ILS could affect how activities were assigned to students.

Although it was determined that there was a weak but not significant relationship between the amount of time students spent exposed to the integrated learning system and student achievement for reading or math, the lack of data documenting the teacher or leadership level of support could contribute to the outcome of the study. These results may also be affected by the inconsistencies in the data between year 1 and year 2.

Kulik (2003) raised concern by asking the question of whether there were ways to make the effects of an ILS stronger and more consistent. The collection of studies he examined suggested that if teachers ensured that students spent an adequate amount of time using the programs in the ILS and that the instruction was integrated with regular classroom instruction, then students will have a greater chance of success. Furthermore, details on time on task in the program reviews of CompassLearning Odyssey were not provided to support the performance gains. There were also differences in grade-level performance, to which they caution that it is important to monitor students' consistency of ILS usage.

Kulik's (2003) review of a meta-analysis of controlled studies determined only modest positive effects and indicated that while integrated learning systems do not usually produce significant improvements in reading achievement, there was no negative effect on performance, and ILSs might produce more benefits if implemented properly. These conclusions supported the research by Worthen et al. (1994), which surmised that the level of success a student would experience using an integrated learning system was dependent on time on task.

Implications for Practice

Student achievement and improved test scores were placed squarely on the shoulders of schools and districts with the NCLB (2001) legislation and its concomitant expectations. Accountability and learning expectations heightened the responsibility for closing the achievement gap for students at risk of failure (Balfanz et al., 2007). Educators have considered multiple solutions to address this instructional dilemma. Scott, Cole, and Engel (1992) reported that one common method has been the use of computers regardless of the data that shows that computers have made little difference. Despite the skepticism of Scott et al. and other researchers, integrated learning systems continue to be used to address the academic needs of students.

The current study sought to determine if there were differences in academic gains made in reading and math achievement with those students attending middle schools in corrective action status. The Oklahoma Core Curriculum Test (OCCT) achievement test was used as a measure to assess student growth after implementing an integrated learning system, CompassLearning Odyssey. The findings and conclusions of this study suggest that use of an ILS for a two-year period can make a difference. In addition, when ethnic groups were analyzed, Hispanics exposed to CompassLearning Odyssey experienced significant gains when compared to other ethnic counterparts. These findings suggest that it may be beneficial for instructional leaders seeking an intervention tool specifically for this subgroup of students to consider CompassLearning

Odyssey or some other instructional learning system. Time on task or the implementation of the program can be a significant factor in determining whether an ILS will have a positive effect on academic achievement. Therefore, the results from this study and earlier research suggest that monitoring the implementation of these programs and providing professional development for teachers using an ILS as an instructional tool are essential to obtain positive results and to maximize the use of the funds allocated for this purpose.

Evidence from this study has implications for educational practice that could affect how integrated learning systems are acquired and used to improve academic achievement in low performing schools. A review of the upcoming national initiative of Common Core State Standards that were newly adopted by some states may cause some educators to examine how an ILS should be integrated into the regular classroom instruction to support teacher effectiveness and student learning. As assessments for high-stakes testing are being developed for such more rigorous standards, evidence in this study should be considered.

The research indicated that simply purchasing an integrated learning system would not bring about beneficial change in the teaching and learning process. According to multiple findings cited in the literature review of this study, there continue to be varying degrees of success because of the many variables taken into account when an implementation is deployed. Instructional leaders and teachers should thoroughly evaluate the components and the professional development requirements of the ILS to successfully implement the program and determine the amount of time that students will need to participate in the program to obtain positive results.

The results from this study suggest that schools and districts that need to close the achievement gap between ethnicities and socioeconomic groups should consider an ILS in their pursuit to increase student achievement. However, given the results after the second year of implementation, strategies to ensure that teachers and students do not become bored with the program must be considered. The significant decline in improvements in year 2 suggests that educational leaders and teachers must consider designing the use of an ILS based upon the needs of students rather than simply assigning them to the program in a lab for a designated amount of time.

The change in the digital devices now available for students and teachers could also have implications on the use of an ILS and the potential of these devices to enhance the teaching and learning process. Desktop and laptop computers are becoming obsolete as handheld devices and cloud storage platforms offer high levels of engagement and interaction with technology and expand the information available to students in the acquisition of knowledge. The changes in technology alone will make it even more difficult for students to simply interact with the platforms that currently exist in ILSs and may have implications for how integrated learning systems are designed to deliver curriculum content. The advent of the Common Core State Standards and the constructivist strategies that teachers will be expected to facilitate in their classrooms while addressing the new state standards will have implications on the continued use of an ILS as a tool to improve student achievement.

Study Limitations

Although the research has reached its goal, there were a few limitations. This study did not consider the presence or frequency of use of core curriculum programs in all four schools (treatment and control) in this study. This study was based on middle schools in one district in one state located in the Southwestern United States. This district was located in a community with a major research university. The tests administered to assess the students in this study were designed as criterion-referenced tests, meaning that each grade level test was assessing students on only those standards for reading and math for that grade level during that school year.

The three treatment schools were selected by the district administration due to their NCLB Corrective Action status for not meeting AYP for more than 5 years, unlike the control school, which was in NCLB School Improvement status and was not offered the intervention due to funding limitation. All four schools did have similar student demographics and socioeconomic status. It is also important to note that as a part of the NCLB reform effort mentioned in the literature review, the leadership at all three schools participating in the intervention was replaced.

The student participation data for Treatment School A for Year 2 in math appears to have decreased compared to Year 1. After investigation, the researcher was informed that Treatment School A was forced to use a math intervention program that the State Department of Education prescribed. In order not to burden the students with two different systems, students were exposed to CompassLearning Odyssey only for reading and not math. Therefore, the number of completed assignments declined, thereby causing a difference in the Pearson Correlation. Treatment School C was weaker in reading than math, and more time may have been provisioned to CompassLearning Odyssey reading content. The researcher communicated with the district's ISS department to question the condition of the data provided. They confirmed that it was accurate and that no data were lost.

The study sample was limited to only four middle schools in an urban Oklahoma school district because the school district was interested in providing intervention support only to those schools with the greatest need. All students in this study were sixth, seventh, and eighth graders; therefore, the results can be generalized only to other sixth, seventh, and eighth graders. Students of other grades may respond to the ILS differently. Replicating at other grade levels may be a useful endeavor.

Second, the researcher had no control of the principals' accountability to the oversight of the implementation of CompassLearning Odyssey in their buildings. Last, information regarding the amount of time and types of services the ILS provider CompassLearning Odyssey gave to each of the schools was not available in sufficient detail to conduct a statistical analysis. Based on the literature and the results of this study, the researcher agrees with Williams (2001), who suggested that we must continue to understand how the learning with integrated learning systems occurs in order to make such a resource that is not cheap, effective, or working at its best to effect academic achievement in our schools.

Recommendations for Further Research

After a thorough literature review and as a result of this research, teachers and instructional leader practitioners and academic researchers may want to continue to investigate how to provide support to the learning environment with the use of technology such as integrated learning systems. In addition, based on the findings and conclusion of this study, the following recommendations are offered.

1. A qualitative design study should be conducted to determine the perspectives of instructional leadership, teachers, and students using the CompassLearning Odyssey program. Doing so would offer the researcher an opportunity to survey the various stakeholders regarding their positive and negative views on perception, self-esteem, and the change that technology has made on their role in the teaching and learning process.
2. A study of the integration of the ILS into whole- and small-group instruction should be conducted. An area not well represented in the literature, this teaching strategy may be a key variable in effecting student engagement and academic growth.
3. A follow-up study of the third year of the ILS intervention should be completed using norm-referenced scores.
4. A study on the role of leadership and fidelity to the ILS implementation model should be conducted to determine if levels of involvement affect academic growth.

This research provided a lens to consider the use of an integrated learning system to support academic achievement in reading and math at the middle school level. The evidence in the findings suggests that while not statistically significant, students can experience gains in their high-stakes assessment scores despite their gender, ethnicity or socioeconomic status with the use of an ILS such as CompassLearning Odyssey for reading and math intervention. However, thought should be given to stakeholder accountability at both the school and district level and fidelity to the implementation (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005) to get the greatest return on investment. As teachers, principals, and district administrators continue to strive to provide quality instruction while seeking real results for all students (Hativa, Shapira, & Navon, 1990; Hernandez-Ramos, 2005; Jervis & Gkolia, 2005; Liu & Huang, 2005), this study may provide the information needed prior to making a final decision.

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Appendix:

Free and Reduced Lunch Explanation of Formula
Retrieved from the Ohio State Department of Education

The Office for Child Nutrition compiles data reported by sponsors of the National School Lunch Program via their Claims Reimbursement and Reporting System's annual application and October claim for reimbursement. Schools/reporting sites that use the USDA alternative meal counting method, Provision 2, report the Current Enrollment (CE) and the number of free and reduced price applicants when a base year is established. In succeeding years (until a new base year is established), the current CE is reported and the number of free and reduced price applicants is taken from the base year claim.

Provision Year: If the school/reporting site is participating in the alternative meal counting method (Provision 2), the Provision 2 Base Year will be used. Numbers of free and reduced price applicants for this reporting site are taken from the base year, not the current year. A school/reporting site participating in Provision 2 could have a PctFreeRedCE *greater* than 100% because the CE for a school/reporting site has declined. The number of free and reduced price applicants is taken from the Provision 2 Base Year and the CE is from the current year.

A guidance memorandum jointly signed by Eric M. Bost, Undersecretary of the Food, Nutrition, and Consumer Services for the U.S. Department of Agriculture, and Eugene W. Hickok, Undersecretary for the U.S. Department of Education, was issued on February 20, 2003. The memo provided guidance on the implementation of the new requirements of Title I of the Elementary and Secondary Education Act (ESEA), as reauthorized by the No Child Left Behind Act (NCLB) for schools that participate in the alternative meal counting methods.