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Acknowledgments

I would like to acknowledge my friends who supported and encouraged me with their wisdom and steadfast support throughout this journey. Thank you for being there for me throughout this process.

I would like to give special thanks to my dissertation chair and committee members: Dr. Carole Mottaz, Dr. John Francis and Dr. David Freitas for continued guidance and helping me make this dream a reality.

Heartfelt thanks are also expressed to the Capella University Scholars of Practice cohort members. Without you, the journey would not have been as enjoyable. The years we spent together throughout each cohort at Capella University will always be special.

Finally, special gratitude is extended to Dr. Carole Mottaz for believing in me, my talents and gifts, pushing me to go the extra mile, and for being such an awesome mentor. Thank you for your patience, words of wisdom and making this possible.
EVALUATING THE EFFECTIVENESS OF THE CAMELOT LEARNING
MATH INTERVENTION CURRICULUM FOR PROGRAM
IMPLEMENTATION

by

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A Dissertation Presented in Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

Capella University
September 2012
CHAPTER 1. INTRODUCTION

Introduction to the Problem

This study evaluates the effectiveness of a cost effective, innovative math program with kindergarten and first grade students who have been identified as at-risk of not making appropriate yearly progress in math. Current intervention methods have not been successful in moving struggling students from tier II instruction (focused supplemental instruction in small groups targeting specific strengths and needs) to tier I instruction (high-quality classroom instruction using research-based programs and instructional methods). The majority of students are not meeting standards on formative assessments and district math benchmarks. Providing a research-based intervention program in the early years is critically important in preventing low math scores and contributing to student success.

Some progress has been made in identifying various characteristics of at-risk students in which specific programs have been developed to meet their needs. Yet the magnitude of this issue continues to afflict the American school system. Many studies and extensive research have been completed by experts, yet there are still many students that are unsuccessful. Most of the early research focused on identifying the characteristics of at-risk students, while other researchers focused on educational reform and developed programs to assist at-risk students (Creswell, 1994). Providing a specific intervention along with differentiated instruction is necessary for students who are in need of extra support to help them understand abstract concepts. Test results from previous state data and prior research have indicated that an effective, research-based math instructional
delivery is necessary for student achievement (National Council of Teachers of Mathematics, 2005).

Given the fact that the overall achievement gap is complex and has been very difficult to close, an early intervention program that targets a specific skill, is the most obvious solution to assist in the efforts of raising student scores. Thomas and Dykes (2011) suggest that finding practical and relevant suggestions for promoting successful transitions and enhancing post-school outcomes for all students emerge from the tiered intervention paradigm, Response to Intervention. The district in which the research site is located has made the effort to address issues of student achievement and develop a system that will affect the methodology of teaching and learning. Throughout this process, a positive transition can definitely be accomplished if all stakeholders are willing to share the commitment in improving academics and embracing programs that enhance education.

As stated by McGuire and Ritter (2006), “Educational interventions provide teachers with tools to deliver meaningful learning activities that improve academic performance and modify behavior for students who have already failed and need credit recovery, and for borderline students who require immediate support to avoid failure; all of these students can benefit from the intensive, individualized attention” (p. 1). At the targeted research site, promoting academic success is most effective through some form of individualized or content specific intervention method. In most cases, small group or individualized learning experiences are critical for addressing explicit instruction when meeting the needs of all students.
According to Grouws and Cebulla (2000), research findings indicate that certain teaching strategies and methods are worth careful consideration as teachers strive to improve their mathematics teaching practices. There is a lack of appropriate resources used for implementation of interventions at the targeted research site. Careful consideration of a content-specific intervention program is appropriate for raising student scores in the area of math, especially for the lower grades. This study has the potential to remediate low math scores by evaluating the effectiveness of a math intervention program. A specifically designed math intervention curriculum will enhance teaching methodologies to increase student achievement.

**Background, Context, and Theoretical Framework**

The continuous movement towards math achievement focuses on measuring student performance. The state requirement is that students must demonstrate that they have learned the required skills and content in order to meet Adequate Yearly Progress (AYP). Adequate Yearly Progress is the measure in which Title I schools, districts and states are held accountable for student performance under the current version of the Elementary and Secondary Act, No Child Left Behind Act of 2001 (Education Week, 2012). Most students at-risk of failing and performing below grade level expectations are in need of immediate intervention to indicate the problems afflicting their academics. Response to Intervention incorporates a tiered approach to instruction which includes ongoing assessments to screen for learning difficulties. Intensive, short-term, and tertiary interventions are designed to meet the needs of all students, even those placed in special education services (Tollefson, Johnson, & Byrd, 2004).
Teachers must provide motivation and enthusiasm in their math lessons for students to know how the concepts apply to real-life situations. When students learn in the context of their own environment, it enables recognition and understanding of practical values related to math in the world around them. Lieberman and Hoody (1998) suggests that as their concept of math changes, students become more committed and engaged in their studies. All students have the desire to learn, but for some there is a lack of self-confidence and anxieties which contributes to unsuccessful scores regarding math achievement. According to Steele and Aronson (1995), the feeling and anxieties that students harbor are a result of negative messages which can and do affect their performance on tests.

Looking at the big picture, who is to blame for educational failure? The failure to improve educational achievement is an inevitable result of inadequacy in students not learning to comprehend or problem-solve at an adequate level. Richard Rothstein, a former educational columnist for the New York Times, states that “blaming the achievement gap mostly on failing schools is a mistake because it diverts attention from the need to improve the economic and social gaps between children and prevent academic potential long before school starts” (as cited in Hirsch, 2006). Because this has proven to be an ongoing issue, there should be a burning desire to gain greater educational equality for all children.

Problem-solving supports the development of students’ thinking skills across the continuum of Bloom’s Taxonomy. Given the focus on higher-order thinking, students should be prompted with thought-provoking questions that promote creative ideas and new ways of thinking and problem-solving (SCORE! Educational Center, 1992). In most
cases, students develop a greater proficiency in solving math problems if they are able to think strategically. Giving students the freedom to explore, engage and develop a high level of thinking skills in their learning environment serves as a rich context in which students can gather, analyze and understand the factors that affect their decision-making (Lieberman & Hoody, 1998).

According to Riccomini and Witzel (2010), teaching mathematics requires skillful planning of concepts and effective instructional pedagogy, especially when students are low achievers, struggling, and have been identified as having a learning disability. They reported from the National Mathematics Advisory Panel’s Final Report (2008) that research over many years clearly indicate that students who are low achievers and struggling to learn math require regular access to explicit methods of instruction on a daily basis. Math intervention is needed to provide teachers with an understanding of the components of effective instructional delivery for students with math deficiencies. Collaborative planning involves explicit differentiated instruction as an effective approach to rigorous and engaging activities, assessment, and evaluation.

According to Tomlinson (2001), best practices in teaching are when the teacher realizes that instruction must work for the individual learner as well as the group. The differentiated classroom includes diagnosing the students’ needs and crafting learning experiences in response to the diagnosis. In referencing best practices (Brandt, 1998), students learn best when the content is personally meaningful, challenging, appropriate to their developmental level, they have choices in their own learning, and they have opportunities to use what they know to construct new knowledge. Because students learn
at different rates and have different backgrounds, the need for varied scaffolding is necessary for student to achieve both personal and educational goals.

Being aware of the educational system and its realities allow us to recognize that much of the responsibility of teaching struggling students within any intervention model falls in the laps of the special education teachers, reading coaches, interventionists, and even the paraprofessionals. Without support for student learning, the achievement gap is destined to widen even more if educators and parents do not take proactive measures to address the issues. Meanwhile, parents of these struggling students are continuously experiencing the imperfections of elementary math programs.

Math intervention is the main theoretical base or framework of this study. Research-based interventions are now required prior to determining specific areas of learning disabilities, or lack of appropriate math instruction. Research-based interventions are strategies from valid research studies that have been proven to help students improve specific skills in the area of academics and/or behavior. The instructional strategies of research-based interventions are designed to address certain skill deficiencies for the individual student in their weakest area of need. The Response to Intervention model fits these requirements, and provides ongoing support for those students who struggle with school curriculum.

Statement of the Problem

According to the Texas Education Agency (2011) Title I Requirements for school districts, the district of the targeted research site did not meet AYP (Adequate Yearly Progress) in two areas, one area listed is math. The problem to be addressed is that all
students are not passing the district benchmarks and math common formative
assessments. A determination must be made regarding resources or supplemental
programs needed to provide math intervention, along with the number of students that
can be suitably served.

**Purpose of the Study**

The purpose of this study is to use an experimental research design to evaluate the
effectiveness of the Camelot Learning Math Intervention Curriculum for program
implementation at the targeted research site.

**Research Questions**

Booth, Colomb, and Williams (2008) explain that “going beyond fact-grubbing, is
important to find or develop questions that will narrow your research to collect the data
you need” (p. 45). The research question will relate to the background of the study by
determining if the research evaluation aims to measure or verify whether the application
of the Camelot Math Intervention Curriculum has the intended effect on the study’s
participants, which is to increase student scores in math. Furthermore, the evaluation
process of the experimental study will require the collection of data on the “study” and
“control” participants level of performance before and after the intervention takes place.
This research design is the most effect way to get true effects of the math intervention
program.

*Research Question:* To what extent can the Camelot Learning Math Intervention
Curriculum improve the test scores for kindergarten and first grade students who are
demonstrating difficulty in learning basic math concepts?
Null Hypothesis: There is no significant difference between at-risk kindergarten and first grade students who receive (Camelot) math intervention and those who do not.

Alternative Hypothesis: There is a significant difference between at-risk kindergarten and first grade students who receive math intervention and those who do not.

Rationale, Relevance, and Significance

Rationale

There is a need for the study to improve student math scores through a specifically designed math intervention program. Current intervention methods have not been successful in moving struggling students from tier II instruction to tier I instruction at the targeted research site. Most students, especially in the lower grades, are not meeting standards on formative assessments and district benchmarks. Therefore, the rationale is to comply with the district initiative of improving math scores. Providing a research-based intervention program is critically important in preventing low math scores and contributing to student success.

Relevance

The relevance of the study is an attempt to implement a math intervention program specifically designed to target deficiencies of students who are struggling in math. The targeted research site has consistently struggled with student growth in the content area of math, especially in the primary grades. Devising a plan to implement the intervention program will address the areas of weakness for those students who need additional assistance in order to be successful, as well as provide teachers with a supplemental resource to implement the proper intervention according to student needs.
CHAPTER 3. METHODOLOGY

Introduction

Chapter 3 of this study will include a description of the processes and procedures that will be used throughout the action research. A detailed account of the tools and instruments used will be indicated in this chapter, the data collection procedures, as well as the test used to analyze the data. A great deal of emphasis will be placed on the indicators of how the data from the Camelot Learning Math Intervention Curriculum can be used to improve student scores.

Purpose of the Proposed Study

The purpose of this study is to evaluate the effectiveness of the Camelot Learning Math Intervention Curriculum to remediate low math scores of kindergarten and first grade students identified as low performing in mathematics. The program targets the reluctant math learners from pre-k through ninth grade. The intervention program has been approved for SES (Supplemental Educational Services) and Title I schools. Due to the increased focus on accountability and assessments of the No Child left Behind Act (2001), researchers Ernst, Miller, Robinson and Tilly (2005) feel that it is critical for evaluative measures, along with appropriate intervention are designed and implemented for the success of at-risk students.

The intervention curriculum will provide superior instruction and practice through effective strategies, progress monitoring and assessments. Combinations of the components are designed to support student mastery of key concepts and problem solving skills in efforts to raise student test scores. The research will involve implementation of the math intervention program with kindergarten and first grade students.
This study is representative of a quasi-experimental research design using the quantitative methodology. According to Creswell (2009), the quasi-experimental research design will ensure high-quality validity in comparing the study group to the control group on the “outcome” variable, treatment conditions, and pretest-posttest instruments.

Quantitative research methods provide options for objective measurements and statistical validity. Creswell (1994) describes quantitative research as an essential instrument used to collect data which enables a researcher to generalize the findings from a sample of responses to a population. The research data derives from the true experimental design referred to as pretest-posttest control group design, which proves accurate and reliable treatment through validity and reliability. This type of research is a traditional, classic design which involves the quasi-experimental research of an assignment of subjects in two groups. Both groups are administered a pre-and post test in which the treatment is only applied to the experimental group (p. 133).

According to Creswell (1994), there are five quantitative paradigm assumptions. These assumptions are as follows:

1. Ontological Assumption- reality is objective and singular, apart from the researcher.
2. Epistemological Assumption- the researcher is independent from that being researched.
3. Axiological Assumption- value-free and unbiased.
4. Rhetorical Assumption- formal; impersonal voice.
5. Methodological Assumption- deductive process; accurate and reliable through validity and reliability. (p. 5)
"The quantitative paradigms, consistent with the quantitative study, is an inquiry into a human problem, based on testing a theory, measured with numbers and analyzed with statistical procedures, in order to determine generalizations of a theory holding true" (Creswell, 1994, p. 2).

Research Questions and Hypotheses

*Research Question:* To what extent can the Camelot Learning Math Intervention Curriculum improve the test scores for kindergarten and first grade students who are demonstrating difficulty in learning basic math concepts?

*Null Hypothesis:* There is no significant difference between at-risk kindergarten and first grade students who receive math intervention and those who do not.

*Alternative Hypothesis:* An early intervention program specifically designed for mathematics will significantly increase the scores of a kindergarten and first grade student’s knowledge in number sense.

Research Design

Quasi-Experimental Research Design

The quasi-experimental research design study will focus on four groups of students which will include kindergarten and first grade. This study is a type of evaluation that will seek to determine whether the Camelot Learning Math Intervention Curriculum has an intended causal effect on the potential study participants. The three key components of this study are the: (1) math placement indicator, (2) pretest-posttest design, (3) the study group and the control group. The Renaissance Learning STAR Math Universal Screener will serve as the placement indicator for the potential participants.
The pretest will require that data be collected on the study participants to determine their level of math proficiency prior to intervention taking place. The same data will be collected on the study participants after the math intervention is completed in the form of a posttest. This method of research design is considered the best way to determine if the math intervention curriculum will have a causal effect on student scores.

According to the National Center for Technology Innovation (2012), it is also equally important that all groups, study groups and control groups, are of adequate size in order to determine whether an effect took place or not. Since the quasi-experimental research design aims to determine whether the intervention program used will have an intended effect on the participants, this action research study will simulate the following study design:

![Study Design Diagram](image)

*Figure 1. Study Design. National Center for Technology Innovation (NCTI).*

Another benefit to conducting this type of study will affect the internal validity. The greater the internal validity, there is also a greater chance of making a determination on the causal effect on the study as well. For this type of study, it is necessary that the math
intervention be measured quantitatively through assessments, progress monitoring and observations.

According to Creswell (2009), there are three methods of research; quantitative, qualitative and mixed method. The design selected is determined by the type of data to be gathered. This quantitative study will specifically capture the changes in test scores of the approved participants by using the experimental research design. Creswell (2009) also states that, “the basic intent of this type of experimental design is to test the impact of a treatment (or an intervention) on an outcome, controlling for all other factors that might influence that outcome” (p. 146). The components of this method include subjects, procedures, materials, and specific measures. The procedures will include compiling raw data from Renaissance Learning STAR Math Universal Screener, district math benchmarks, and math common formative assessments which will be provided by the district.

Because the research study will be carried out in the form of a quasi-experimental research design, the purpose is to investigate the effects of a specifically designed math intervention program as the treatment. By manipulating the independent variable, the study will determine the significance of the math intervention program by measuring the outcome of student scores. The selection procedures for participants will be taken from the Renaissance Learning STAR Math Universal Screener data, which are specifically designed to determine which students will receive tier II math intervention. The students who score is 65% or less on the universal screener will be placed in tier II intervention.

Instructional materials used with the study groups will come from the Camelot Math Intervention curriculum. Instructional materials used with the control groups will
come from the intervention strategies resource booklet included in the district math curriculum adoption, Texas Mathematics. A baseline skills test will be provided by the Glencoe/McGraw-Hill for both, kindergarten and first grade research participants. Sub-tests will be administered throughout the intervention process as scheduled by the district. The sub-tests are considered as math common formative assessments, which are administered every three weeks; and district benchmarks, which are administered every six weeks.

During the study, the participants will receive a total of 40 lessons from the Camelot Curriculum and the control group will receive 40 lessons from the Texas Mathematics intervention strategies resource booklet. The lessons are designed to provide appropriate skill builders and reinforcements for "Number Sense" strands. Progress monitoring will be administered frequently throughout the math intervention process in the form of math common formative assessments administered by the district. The purpose of frequent progress monitoring is to assess the rates of student improvement, identify those students who are not progressing adequately, and to monitor the effectiveness of the intervention curriculum (Stecker, 2012). Progress monitoring is also an efficient tool for determining whether instructional modifications are necessary for students who may need specific or targeted content areas addressed as a result of a learning disability.
Target Population, Sampling Method and Related Procedures

Target Population

The targeted research site is in a Title I district with a total population of approximately 6,300 students and an academic rating of Academically Acceptable. According to the Texas Education Agency (2011), the district is at a “Stage 1” on the Requirement Improvement List for math and reading; with the middle school listed at a “Stage 5” for required improvement. The research site is one of seven elementary schools in the district with approximately 360 students. It is considered one of the two smallest schools in the district, housing only two grade levels of pre-k through third grade, with a total of 22 students as the cap for kindergarten and first grade classes. Five of the other elementary schools house a total of three more classes at each grade level.

The school selected for involvement in this research study is also identified based upon the needs of student population and targeted interventions. The school’s academic performance rating for the 2010-11 school year is “Recognized” as reported by Texas Education Agency based on the testing grade levels third through fifth grade. Although the school is considered a “Recognized” campus, it did not meet AYP (Adequate Yearly Progress), nor did the district in two academic areas, one area being math. This past school year, common assessments were created for math and science in grades first through fifth. During that time, common assessments were not created for kindergarten. For the school year 2011-12, it was confirmed that all kindergarten students would take common assessments for math and science as well. The math common assessments will be used as a tool for progress monitoring, yet there are currently no programs developed specifically for math intervention.
According to the most recent AEIS (Academic Excellence Indicator System) report listed from the Texas Education Agency (2010-2011), the student population of the district in which the research site is located is 77.4% African American, 18.2% Hispanic, 2.9% White, 0.7% Native American, 0.2% Asian, and 81.2% are Economically Disadvantaged. The Public Education Information Management System (PEIMS) data for the targeted research site reports that 50.3% are at-risk students. The school district’s mobility rate is currently reported at 9.3% with 6.6% as the drop-out rate. The targeted research site experienced an average student mobility rating of 25.4% in the 2010-2011 academic school year (Texas Education Agency, 2011).

Student mobility is significant to the action research study as it is commonly expressed as an indicator of disruptions in curriculum, home environment upheaval, and social network changes on student learning (Strand & Demie, 2006). It has been argued that an indicator of academic success versus the drop-out rate is closely related to student mobility. Mobility itself cannot be targeted as a major factor of poor achievement, but it is a complicating factor for those students who are identified as at-risk of failing or performing below grade level proficiency. The lack of immediate transfer of student records often results in inappropriate placement in which students are held back and often suffer academic consequences (ERIC, 1991). It may also have an impact on the study as the target research site traditionally experiences high rates of student mobility.

**Sampling Method**

According to Russell Lenth (2001), when conducting a quasi-experimental research, the study must be of adequate size and relative to the goal of the study. It must be large enough that the scientific significance is statistically significant. It is just as
important that the study is not too large where an effect of scientific importance is statistically detectable. An undersized study exposes the participants to potentially harmful treatments without producing growth or advancing knowledge. An over-sized number of participants are also exposed to potentially harmful treatments by not reaping any benefits. Once all groups are measured and receive treatment, the change or growth of the experimental groups will be measured at the end of the treatment with the control groups.

The method of sampling that was used was considered *purposive sampling*, a non-probability sampling technique which enables the researcher to answer his/her research questions (Lund Research, 2010). In this method, the selections of subjects are unidentified prior to analyzing the data from the Renaissance Learning STAR Math Universal Screener. Once identified as receiving a scale score of 271 or less from the data, lists of subjects are submitted to the campus interventionist for implementation of tier II math intervention. Each year, students ranging from kindergarten through fourth grade that are in need of additional assistance in math, receive small group instruction from the campus interventionist, who is also the researcher of this study. Therefore, the potential participants of this study would inevitably be enrolled or placed in the researcher’s class for targeted math instruction.

**Sample Size**

A total of 32 participants will be drawn from the two kindergarten classes and the two first grade classes at the targeted research site. The subjects will include 16 kindergartners (eight students from two different classes) and 16 first graders (eight students from two different classes). Each grade level will consist of a *control group* and
a study group. All ages ranging from 5 to 7, genders and ethnicities (Hispanic, White and African American) will be represented. Groups from both grade levels (study participants and control group) will reflect a total of 32 students participating in the action research study. There will be 16 kindergarten students and 16 first grade students. According to Riccomini and Witzel (2010), small group instruction is defined as fewer than 10 students but most often involves three to five students.

Setting

The setting of the quasi-experimental includes two classes of kindergarten and two classes of first grade. The research site is also considered a “Title I” school, which is determined by the number of students qualifying for free or reduced lunch. The official enrollment statistics for the elementary school is approximately 360 students. The enrollment of the kindergarten classes total 44 students. The enrollment for first grade also totals 44 students as well. All classes up to fourth grade have a cap or maximum capacity of 22 students. The fifth grade classes have a student cap or maximum capacity of 32 students.

Recruitment

The potential participants at the research site will be assigned by their homeroom teachers according to the district diagnostic results or Renaissance Learning STAR Math Universal Screener. Approximately 32 students will be selected to participate in the math intervention study. Consent in the form of parental permission will be granted for all kindergarten and first grade students who participate. This type of selection of participants is less likely to be biased, especially if there is a high participation rate in the sample selection. Anecdotal records of observations will be kept for demonstration of
progress throughout the implementation of each intervention group. Recognizing the mobility rate that exists at the school, participants who move or change schools during the time the research study is taking place will not be included in the final analysis.

All kindergarten and first grade students identified for tier II math intervention with granted permission to participate in the study will be given a pre-assessment to identify targeted. The control groups will be given a diagnostic/pre-assessment provided by the Texas Mathematics curriculum consisting of fifteen problems based on the “Number Sense” Standards and Objectives to identify targeted performance levels related to math deficiencies. All groups will be given approximately 45 minutes to complete the assessment. This data will also be used in conjunction with district math benchmark results and math common formative assessment results. The pre-assessment and post-assessment for the study group will be scored based on the learning framework for “Number Sense” Standards and Objectives according to the Camelot Learning program.

Instrumentation

The instrument used to determine the tier II math intervention students will be the Renaissance Learning STAR Math Universal Screener. Universal screening is an assessment of age-appropriate skills used to determine the students’ level of proficiency in essential academic areas. The screening data is organized in a format that allows for the analysis of both group performance and individual student performance on specific skills (State Educational Resource Center, 2010-2011). The universal screener administered to all students for math is a computer-based test in which students must
login to Renaissance Learning STAR MATH website to take the test (a copy of the assessment is unavailable for attachment).

The instrument was developed by Renaissance Learning, Inc. It is a computer-based assessment for both screening and progress monitoring by the National Center on Response to Intervention. The assessment can be completed in approximately 15 to 30 minutes, depending on the grade level, and the teachers and administrators receive the results immediately. Though this computer-based assessment is designed for primary grades through secondary, it can be used with kindergarten. The content is organized in eight mathematical strands: computation, word problems, estimation, numeration concepts, data analysis and statistics, algebra, measurement and geometry. These strands were also identified after consulting with the National Council of Teachers of Mathematics (Renaissance Learning, 2010, pp. 3-5).

The kindergarten universal screener for math consist of 30 questions that include: basic math skills and computation for addition, subtraction, sequencing, patterns, skip counting by two’s, number sentences, and time with analog clocks. The first grade universal screener for math consist of 30 questions that include: (numeration objectives) ones, tens, hundreds, thousands, decimals, advanced concepts I & II; and (computational objectives) addition & subtraction basic facts to 10 and 18 without regrouping, addition and subtraction with regrouping, multiplication and division basic facts, advanced computation with whole numbers, fractions, decimals, percents, ratios & proportions, multiplication and division of mixed numbers (Renaissance Learning, 2010).
Data Collection

The Glencoe/McGraw-Hill diagnostic/pre-assessment will be administered to each potential participant by the researcher/interventionist prior to math intervention implementation. This pre-assessment is designed to provide targeted information about the students’ current knowledge of the Number Sense skills. The reports for this study will be collected by the researcher. Other reports will include: screening data, progress monitoring, math benchmark assessment results, math common formative assessments, and other miscellaneous reports pertinent to the study; such as, anecdotal journal notes taken by the researcher and attendance records. Below is a list of measures that will be included in the study.

- The progress monitoring will provide a scale score for each student.
- Math common formative assessment data will be collected every three weeks from the DMAC Solutions data source under the TEKScore Report section on the district website link.
- Anecdotal journal notes will include written observations about the participant’s development over a period of time and to identify any additional instructional needs.
- Attendance reports to reflect excessive absences or tardiness.
- The snapshots of student test results will reflect grade performance (GP), scale score (SS), grade equivalent (GE), percentile rank (PR), and percentile rank range (PR Range) which will indicate if the student is below average, average or above average.
The terms that follow provide an explanation of other levels of measurements included in this study:

*Nominal* - The targeted research site kindergarten and first grade students (male & female).

*Ordinal* - The discrete data presented in the form of a bar graph illustrating the percentile rank range.

*Interval* - Each problem will be measures on a 3.34 scale (30 questions).

*Ratio* - Will include a boy-girl ratio by math performance scores.

For the purpose of comparison, the differences between the mathematical gains in number sense achievement made by the low-performing kindergarten and first grade students who will participate in the Camelot Learning Intervention program (*the study group*) will be measured against the mathematical gains of the kindergarten and first grade student achievement scores of the low-performing students who will receive the alternative intervention (*the control group*).

**Field Test/Pilot Test**

Field or pilot testing is not needed in this research study to complete the intervention process. The experimental design feature for this study includes a pre-test and post-test for both, kindergarten and first grade groups involved (study groups and control groups). Survey questions are normally piloted for the researcher to revise and retest the questions until the pilot group agrees that the questionnaire is of quality. In a
pilot study, the researcher is also able to seek information from the participants (to include interviewers) to identify and determine the degree of questions and problem areas that need attention (Borg & Gall, 1979; Neuman, 1997, p. 232). A questionnaire will not be administered in the research study to either, kindergarten or first grade, prior to the math intervention implementation.

Operationalization of Variables

Independent Variable (Intervention)

The Camelot Learning curriculum is a pre-k through ninth grade tier II math intervention program that focuses specifically on helping reluctant learners improve their math skills in number sense. Seven math strands comprise the “Number Sense” program: 1) number recognition, 2) ordinal numbers to identify location and sequence, 3) skip counting, 4) place value in estimating totals, 5) place value to identify number through the thousands, 6) compare and order whole numbers, 7) and rounding. Each strand reflects the critical content of primary and intermediate grade level skills and aligns with the core academic standards (NCTM, 2005).

Camelot’s scripted lessons utilize an explicit instructional format. The lessons include teacher modeling, scaffold instructional examples, and multiple opportunities for academic feedback. The lessons offer various opportunities for student practice and review. The researcher/interventionist will complete two lessons per day, twice a week for a total of 10 weeks. The lessons will last approximately 45 minutes per session. The lessons will be delivered in small-group instructional formats, with approximately eight students per group. Camelot Learning math intervention will occur outside of the
participant’s core math instruction. The Camelot intervention curriculum will provide the participants with an additional 90 minutes of math instruction per week.

**Dependent Variable (Data Collection and Analysis)**

The primary outcome will measure variables of skill acquisition, which will be used to make decisions about participants at the instructional and frustration level. The data analysis will indicate preliminary findings of the Camelot Learning program for positive influences on student math outcomes. The analysis will include results of student outcomes which will be interpreted through a systemic visual observation. Student scores will be collected to indicate the quality of instruction.

A curriculum-based assessment will be administered to each participant to further determine their instructional level. Each participant will have the allotted time to complete the lesson worksheets. The researcher/interventionist will calculate the percentage correct for accuracy and proficiency. Participants who answer problems correctly with 60%-80% accuracy will be considered at the instructional level. The procedures will include implementing intervention instruction during the allotted time in a pull-out session, establishing the participant’s instructional level, conducting curriculum-based assessments, and assessing baseline or alternating treatment design.

**Data Analysis Procedures**

Data will be obtained from Renaissance Learning STAR Math universal screener, DMAC Solutions software system for results from district benchmarks, common assessments, progress monitoring and anecdotal records. Anecdotal journal notes will be utilized to record observations of student development over a period of time and any
additional instructional needs of participants, reflections, student modifications, considerati o ns, and evaluations. A copy of the attendance report for each participant will be collected from the PEIMS clerk or the classroom teacher to determine the number of absences and tardiness, which may affect student growth. According to Ziegler (1972), poor attendance has been linked to poor student achievement. The snapshot data for each student will also reveal if each study participant is performing Below average, Average and Above average. Data will also be collected from post-assessments provided by the Camelot Learning Math Intervention program to measure overall growth for student achievement.

One of the most common inferential statistics is the $t$ test, also known as the analysis of variance. The $t$ test is most commonly used when there are two groups of participants in the research study. According to the Education Commission of States (2012), the test is statistical technique used to make inferences about a population of study participants based on a sample of these participants or to test for statistically significant differences between two different groups of observations. The groups will be compared on differences of gain scores or sometime called change scores. A pretest-posttest analysis will be applied in this quasi-experimental research study to determine if there are significant gains of the Camelot Learning Math Intervention Curriculum.

Limitations of the Research Design

As a result of permission only being granted at the targeted research site, the research study is limited to one elementary school. Also, limitations of this type of quasi-experimental research design may be able to implicate that the selected math intervention
curriculum produces better results than the state adopted intervention strategies, but it may not be able to indicate specific components that create the improved results. The research study will take place in a classroom environment which will be conducted in a small group instructional setting. Two study groups will receive treatment with the Camelot Learning program and two control groups will receive intervention strategies from the state math adoption in the same classroom location at the targeted research site, conducted by the researcher.

**Internal Validity**

To strengthen the internal validity, the participants from both grade levels will be placed in a group ("control group" or "study group") by the classroom teacher of that particular grade level. All groups will receive a pretest and a posttest after tier II placement from the Renaissance Learning STAR Math Universal Screener indicator. The Glencoe/McGraw-Hill assessment will serve as the pretest and posttest baseline skills test for kindergarten and first grade. The control groups will be considered a part of the measuring instrument. In regards to the study groups, the results of the treatment implemented with the Camelot Learning Intervention curriculum are predicted to be supported by the evidence of data illustrating student growth in math Number Sense Standards and Objectives. The Texas Essential Knowledge and Skills for Mathematics regarding *Number Sense* include student expectations regarding: Number, Operation, and Quantitative Reasoning skills for both, kindergarten and first grade. The *cause (independent variable)* and *effect/outcome (dependent variable)* of this study is anticipated to reflect that kindergarten and first grade students who will receive treatment
with the Camelot Learning Math Intervention program will demonstrate more significant
gains in math Number Sense than the group of students who will not.

External Validity

According to Campbell & Stanley (1966), the results of external validity must
justify predictions about the population, setting, treatment variables, and measurement
variables generalized through observations. The research study will include a total of four
groups; two “study groups” receiving math intervention treatment from Camelot
Learning, and two “control groups” receiving math intervention from the district math
adoption, which will allow for a more meaningful statistical analysis. Both groups of
kindergarten and first grade participants will be selected by the classroom teacher after
analyzing the math universal screener data. The “setting” in which the research study will
take place is a Title I elementary school. Data from both grade levels will include:
observations, common assessment results, pretest, and posttest results. The data will also
be collected and analyzed to justify predictions made about the sampling groups of the
targeted population receiving math intervention from the state adoption curriculum.

Expected Findings

It is expected that struggling math learners in the kindergarten and first grade
study groups will improve their math skills beyond math fluency and problem solving.
The Camelot Learning Math Intervention Curriculum is specifically designed to address
math deficiencies mainly because it contributes to the students’ level of understanding
throughout the learning process through differentiated instruction. As stated by
Tomlinson (2001), “the differentiating process as related to student readiness means matching the complexity of the task to a student’s current level of understanding and skill” (p. 80). Once the students’ knowledge and math skills are assessed with the baseline skills test from Glencoe/McGraw-Hill, students will be matched with the appropriate instructional activities according to their readiness level. Differentiation will also be organized according to specific group, curriculum objectives and individual student learning needs.

Comparison data between the control group and the experimental or study group will be illustrated from the results of the pre-assessment and the post-assessment. This information will be used to answer the research question(s):

(1) To what extent can the Camelot Learning Math Intervention Curriculum improve the test scores of kindergarten students who are demonstrating difficulty in learning basic math concepts? *Test-retest and internal validity methods will be used in the process of making the final determinations and recommendations.*

(2) Why differentiated instruction is important for struggling students? *Once students’ skills and knowledge have been pre-assessed, learners can be matched with the appropriate activities according to their readiness skills and levels of understanding in math number sense. This process will also include how intervention is implemented according to the participants’ individual learning style* (Heacox, 2002).
CHAPTER 4. DATA ANALYSIS AND RESULTS

Introduction

This chapter contains the findings of this research study. The purpose of this quantitative study is to use a quasi-experimental research design to evaluate the effectiveness of the Camelot Learning Math Intervention Curriculum for program implementation at the targeted research site. There is a need for the study to improve student math scores through a specifically designed math intervention program. Current intervention methods have not been successful in moving struggling students from tier II instruction to tier I instruction. Most students, especially in the lower grades, are not meeting standards on formative assessments and district benchmarks. The rationale is to comply with the district initiative of improving math scores. Providing a research-based intervention program is critically important in preventing low math scores and contributing to student success. A total of 32 students were invited and agreed to participate in the study. The age range of the participants in the study was from 5 to 7 years.

Description of the Sample

The targeted research site is located in Title I district with a total population of approximately 6,300 students and an academic rating of Academically Acceptable. According to the Texas Education Agency (2011), the district is at a “Stage 1” on the Requirement Improvement List for math and reading; with the middle school listed at a “Stage 5” for improvement. The research site is one of seven elementary schools in the district with approximately 360 students. It is considered one of the two smallest schools in the district, housing only two kindergarten classrooms and two first grade classrooms
diagnostic for kindergarten and first grade. The assessments administered to the study
groups will be scored based on the learning framework for Number Sense according to
the Camelot Learning program.

This chapter also included a discussion of data results which will be collected and
analyzed from the Renaissance Learning STAR Math universal screener, district
benchmarks, regularly scheduled common assessments, progress monitoring, and
anecdotal notes collected by the researcher. Comparison data between both control
groups and study groups will be illustrated to justify predictions made about the targeted
population. It is expected that struggling math learners in the kindergarten and first grade
study groups will improve their math skills at or beyond their grade level proficiency.
The overall results of the action research study will reflect true data and will not appear
misleading or misused in any manner.
with a total of 22 students as the cap for kindergarten and first grade classes. Five of the other elementary schools have a total of three or more classes per grade level.

The 32 participants of this study were selected from two kindergarten classes and two first grade classes at the targeted research site. The subjects included a total of 16 kindergartners (eight students from two different classes) and a total of 16 first graders (eight students from two different classes). A control group and study group was assigned to each grade level. Student participants consisted of male and female students, ages 5 to 7 years, from the following ethnicities; Hispanic, Caucasian, and African American. There were 8 participants in each grade level's study group and control group. According to Riccomini and Witzel (2010), small group instruction is defined as fewer than 10 students but most often involves three to five students.

According to Russell Lenth (2001), determining sample size is important in planning a statistical study. An undersized study can be a waste of resources for not having the capability of producing useful results. It is important to select from the appropriate population and reliable instruments to obtain measurements. Adequate size is relatively important to the goals of the study. According to Creswell (2009), when determining group size the researcher should consider three things: 1) the level of statistical significance for the experimental study; 2) the amount of power desired in the study; and 3) the expected differences in the means between the control and study groups.

Instrumentation and Materials

The participants at the research site were assigned by their homeroom teachers based on the results of the Renaissance Learning STAR Math Universal Screener. Students who failed to meet the criteria of performing at grade level were required to
participate in math intervention. The Response to Intervention instructional model was implemented twice a week beginning in March and ending in May, totaling 10 weeks with each intervention session lasting up to 45 minutes. Each group received two instructional lessons of similar math concepts during each math intervention session, totaling 40 lessons. The Camelot Learning Math Intervention Curriculum was used with fidelity, following the prescribed lessons as designed by the author.

As the curriculum is designed to build student math skills at levels pre-k through ninth grade, the kindergarten and first grade study groups were provided the same intervention lessons. As each skill was mastered, the group moved on to the next lesson. The Camelot lessons are designed to address the student’s learning style through games and the math skills are targeted through experiential learning Camelot (1997-2007). Therefore, the majority of the learning experiences were hands-on using some type of math manipulative. Since the kindergarten and first grade study participants started at the same lesson, the first grade study group moved through the first few lessons much faster.

The kindergarten and first grade students in the control groups received intervention lessons designed to enhance math concepts and skills of early numeracy from the Texas Mathematics curriculum adopted by the district. The students in the control groups received comprehensive instructional strategies based on fundamental mathematics according to their grade level to include; number operation and reasoning, patterns, measurement (compare and order, sequence of events, time, and calendar), probability, geometry and spatial reasoning, and underlying processes (problem-solving). These students received 40 lessons in 10 weeks just as the students who participated in the kindergarten and first grade study groups.
Prior to intervention implementation, participants were given a pretest. The assessment demonstrated that the students performed unsatisfactory in addition, subtraction, fact family, place value, patterns, time/measurement, shapes, fractional parts, graphs, and number lines. All students had previous experience with using math manipulative counters and the ten-frame; therefore the researcher began with the double ten-frame strategy with addition and subtraction skills. Anecdotal notes were taken during each intervention session to track student’s progress and to note needed modifications to enhance the likelihood that struggling students would master the mathematical concept or targeted skill. Students performed at different learning rates throughout the various mathematical components taught during the intervention sessions. Therefore, differentiated instruction was provided for those students, when necessary, for mastery of the targeted skill. At the conclusion of the math intervention, all participants were given a posttest.

During the initial study group’s intervention session using the Camelot curriculum, students were instructed in the area of mental math using addition and subtraction. The introductory lessons focused on problem-solving and developing addition and subtraction sentences using the double ten-frame strategy. These problem-solving skills provided students with the background knowledge to begin instruction in addition and subtraction. A “word box” was included on each worksheet which illustrated key vocabulary terms and definitions as a visual reference for the students. At the beginning of each lesson, a “warm-up” activity of fifteen computation problems was provided. The students were given eight minutes to complete the activity before the new “learning quest” was introduced. Various lessons were presented in the form of a game
designed to reinforce that particular math skill. Some examples of the games from the Camelot intervention curriculum included, "Concentration/Memory, Simon Says, Buzz, How Close Can You Get, and Skip It!"

Once the addition and subtraction instruction was completed, students progressed on to the "counting back" and "fact family" strategy. During the initial phase of instruction, the students were grouped in teams of four to complete the learning activity. There were four "castle" graphic organizers illustrated on the page. At the top of each castle were three numbers which the students used to name all of the facts that belonged in that particular "fact family" group. The first "fact family" was illustrated by the researcher on the board for both kindergarten groups. Each team was also allowed to use the function symbol cards in order to be successful in completing the "fact family" for all four castles. The students were engaged in the activity and eager to share information they previously learned in the classroom regarding "fact family" groups.

The introductory lessons for the kindergarten and first grade control groups were based on their grade level performance according to the Renaissance Learning STAR Math Universal Screener results. The first week of math intervention implementation focused on problem-solving using the ten-frame and the double ten-frame strategy. This instructional strategy was also being used in the classrooms as well. The students were given a warm-up activity and review of math vocabulary words during each session to develop an understanding of the essential mathematic concepts. Both kindergarten and first grade groups were also given an eight minute time limit to complete the warm-up activity. Various lessons were presented in the form of games to reinforce certain math skills for reluctant learners. Not all lessons were implemented in this manner.
Both first grade study group and control group participants recalled information they learned during whole group instruction in the classroom. There was rich discussion among the first grade groups as they shared their strategies and solutions. They were able to work collaboratively as a team and complete the task as directed. This activity allowed the students to practice these skills over the course of the intervention lessons. The students were also able to use the same materials when transitioning to the second lesson which illustrated “fact family” groups as well. The conclusion of both lessons with each group included a review of inverse operations, math vocabulary, and flash cards which included function symbols.

Summary of the Results

The results of the study showed significant gains in student scores for Number Sense skills. The kindergarten study group (Camelot Learning) demonstrated a +45.75% increase in Number Sense skills. The Camelot Learning posttest was used to measure the overall growth of this group. The kindergarten control group made an increase of +24.75% in Number Sense skills. The Texas Mathematics posttest was used to measure overall student growth for this particular group. The increase in growth was significantly higher for the study group in comparison to the control group. The results of the study for the first grade study group demonstrated a +47.88% increase in Number Sense skills. The Camelot Learning posttest was used to measure the overall growth of this group. The first grade control group made an increase of +20.63% in Number Sense skills. The Texas Mathematics posttest was also used to measure overall student growth for this group of
participants. Students in the study groups made twice the progress of those students in the control groups.

**Detailed Analysis**

According to Jenkins, Hudson and Johnson (2007), the purpose of a math screener is to determine the first step in identifying the students who are at risk for learning difficulties. The analysis of the assessment targets students who struggle with comprehension and perform below grade level proficiency, or at-risk of failing. The goal of early identification is for the at-risk student to develop adequate academic competence. Therefore, the Renaissance Learning STAR Math Universal Screener was used as a tool for identifying deficits, and preparing for effective instruction through intervention.

Results from the Beginning of the Year (BOY) Renaissance Learning STAR Math Universal Screener for the kindergarten study group and control group in Figure 2 illustrate all participants received a scale score less than 237 which resulted in the need for urgent math intervention. According to Riccomini and Witzel (2010), students at this level have more than one skill deficit that appear across content areas. As a result, they received more intense and personalized instruction for their specific needs. The diagnostic was a computerized program assessment from the Renaissance Learning website which also tabulated the results of the data that were gathered. The electronic diagnostic is a skills-based math assessment which expanded on student mastery of the Texas Essential Knowledge and Skills (TEKS) according to their current grade level. As a result of the data from the math universal screener, these particular students were selected by their classroom teachers to receive math intervention.
The data in Figure 3 illustrate results from the universal screener for the first grade study group. These results indicate 50% of the participants needed intervention and 37.50% of the participants needed urgent intervention in math. There were no students performing at or above proficiency level at the time the universal screener was administered. Equally important, there were 12.50% of the participants who received a scale score between 271 and 296 which indicated they were on watch for performing slightly below proficiency level, and could easily fall well below. The diagnostic for first grade was also a computerized program assessment from the Renaissance Learning website which tabulated the results of the data that were gathered as well. The electronic diagnostic is one in the same skills-based math assessment which expanded on student mastery of the Texas Essential Knowledge and Skills (TEKS) according to their current grade level.
Figure 3. Renaissance Learning STAR Math Universal Screener Diagnostic Results

The data in Figure 4 illustrate results from the universal screener for the first grade control group. These results indicate 62.50% of the participants needed intervention and 25% of the participants needed urgent intervention in math. There were no students performing at or above proficiency level at the time the universal screener was administered. Equally important, there were also 12.50% of the participants who were on watch for performing slightly below proficiency level. Of all group participants, the first grade control group had the most students that required the same level of tier II math instruction according to their diagnostic scores. These students were administered the same electronic diagnostic skills-based math assessment which expanded on student mastery of the Texas Essential Knowledge and Skills (TEKS) according to their current grade level.
Renaissance Learning STAR Math Universal Screener Diagnostic Results

(First Grade Control Group)

*SS=Scale Score

![Pie Chart]

Figure 4. Renaissance Learning STAR Math Universal Screener Diagnostic Results

The analysis process for this study was based on pretest-posttest data which provided comparison data between control groups and the experimental groups. This information was used to answer the research question: To what extent can the Camelot Learning Math Intervention Curriculum improve the test scores for kindergarten and first grade students who are demonstrating difficulty in learning basic math concepts? The researcher used the t test (type I) method as the hypothesis test to compare the pretest-posttest results of the groups. The goal of the t test is to determine variance that indicates how likely it is to get certain results by chance (Creech, 2003-2012).

The information in the following tables illustrates the data analysis from the t test samples. As the t test was used to evaluate the differences in the means between each participant’s pretest and posttest scores, the p value was also reported with the t test to represent the probability of error needed to reject the null hypothesis. Paired differences in scores were analyzed to determine the overall growth from pretest to posttest scores.
The information shown in Table 1 illustrates the data collected from the kindergarten study group. A one-tailed test was conducted in which the \textit{p-value} is 1.76%. The \textit{mean} for the kindergarten study group is 26.87\% for the pretests, and 72.62\% for the posttests. A \textit{type I variance} was used in the \textit{t} test due to the repeated measures condition. The standard deviation for the pretests average is 12.22\%, and 4.92\% for the posttests average. The pretest revealed a level of difficulty in which the study group participants were not able to complete independently. The researcher was asked by various students to read the questions several times for clarity and understanding. The students also relied heavily on the use of manipulative materials to assist them in their thought process.

The students were previously exposed to the method of problem solving that was introduced and used throughout the Camelot intervention curriculum. As the intervention sessions progressed, the level of difficulty decreased. It was anticipated that the kindergarten study group to increase their scores throughout the implementation of the math intervention curriculum. With a mean score of 72.62\% for the posttests, the overall growth rate indicated a 45.75\% increase in achievement. It was evident in the data that the intervention program proved successful in increasing student scores.
Table 1. Kindergarten Study Group Pretest-Posttest Data

<table>
<thead>
<tr>
<th></th>
<th>Kinder Study Group Pretest</th>
<th>Kinder Study Group Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>26.87</td>
<td>72.62</td>
</tr>
<tr>
<td>Variance</td>
<td>149.55</td>
<td>24.26</td>
</tr>
<tr>
<td>Observations</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Hypothesis Mean Difference</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>df (degrees of freedom)</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>( P ) value (one-tail) pre-posttest</td>
<td>1.76</td>
<td>1.76</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>12.22</td>
<td>4.92</td>
</tr>
<tr>
<td>( T ) critical one-tail</td>
<td>1.76</td>
<td>1.76</td>
</tr>
</tbody>
</table>

The information shown in Table 2 illustrates the data collected from the kindergarten control group. The Texas Mathematics pretest administered to the kindergarten control group did not appear to be as difficult in comparison to the Camelot pretest. The majority of the problems were quite simple and self-explanatory. The students did not express any concerns or levels of frustration during the entire assessment, and was not asked by the students to read the questions several times for clarity and understanding. The mean for this set of data was 66% for the pretests with a standard deviation of 6.63%, and 90.75% for the posttests with a standard deviation of 7.85%. The \( p \) value was 2.17% with an increase from pretest to posttest of 24.75%. The format of problem solving strategies used in the Texas Mathematics intervention lessons were identical to the lesson format used in the classrooms during tier I instruction.
Table 2. Kindergarten Control Group Pretest-Posttest Data

<table>
<thead>
<tr>
<th></th>
<th>Kinder Control Group Pretest</th>
<th>Kinder Control Group Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>66</td>
<td>90.75</td>
</tr>
<tr>
<td>Variance</td>
<td>44</td>
<td>61.64</td>
</tr>
<tr>
<td>Observations</td>
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<td>8</td>
</tr>
<tr>
<td>Hypothesis Mean Difference</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>df (degrees of freedom)</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>P value (one-tail) pre-posttest</td>
<td>2.17</td>
<td>2.17</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>6.63</td>
<td>7.85</td>
</tr>
<tr>
<td>T critical one-tail</td>
<td>1.76</td>
<td>1.76</td>
</tr>
</tbody>
</table>

The information shown in Table 3 illustrates the data collected from the first grade study group. The standard deviation for the pretest scores is 7.85% and 1.06% for the posttest scores. The pretest administered to the first grade study group appeared to be more difficult in comparison to the Texas Mathematics pretest. The participants of this group were expected to estimate the difference of three digit numbers rounded to the nearest hundred. At certain points during the assessment the students expressed some levels of concerns, as well as frustration. The p value was 1.86% for the pretest and posttest data. The mean score for this set of data was 51.75% for the pretest averages, and 99.63% for the posttest averages. The overall growth rate indicated in this set of data is 47.88%. The Camelot intervention program proved successful in increasing student scores.
Table 3. First Grade Study Group Pretest-Posttest Data

<table>
<thead>
<tr>
<th></th>
<th>First Grade Study Group Pretest</th>
<th>First Grade Study Group Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>51.75</td>
<td>99.63</td>
</tr>
<tr>
<td>Variance</td>
<td>61.64</td>
<td>1.12</td>
</tr>
<tr>
<td>Observations</td>
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<td>8</td>
</tr>
<tr>
<td>Hypothesis Mean Difference</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>df (degrees of freedom)</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>P value (one-tail) pre-posttest</td>
<td>1.86</td>
<td>1.86</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>7.85</td>
<td>1.06</td>
</tr>
<tr>
<td>T critical one-tail</td>
<td>1.76</td>
<td>1.76</td>
</tr>
</tbody>
</table>

The information shown in Table 4 illustrates the data collected from the first grade control group. There was an overall average increase of 20.63% from pretest to posttest scores. The pretest administered to the first grade control group appeared to be less difficult in comparison to the Camelot Learning pretest. The participant in this group was expected to estimate the difference of three digit numbers rounded to the nearest hundred. The students in the control group did not express any levels of frustration throughout the assessment. The mean score for this set of data was 70% for the pretest scores and 90.63% for the posttest. The Texas Mathematics intervention lessons were extended lessons very similar in format to the math lessons provided by the classroom teacher. A type 1 variance was used with this group as well due to the repeated measures condition for each participant.
The next illustration in Figure 5 demonstrates actual results of the pretest-posttest assessment data from all four research groups. As illustrated in Figure 5, the kindergarten study group made significant gains according to the Camelot Learning pretest-posttest data. The results indicate an average increase of 46% from pretest to posttest for the kindergarten study group, and 25% from pretest to posttest for the kindergarten control group. The data in Figure 5 also illustrates a 48% increase from pretest to posttest for the first grade study group, and a 21% increase in scores from pretest to posttest for the first grade control group. Overall, participants in both kindergarten and first grade study groups made great gains in academic growth using the Camelot Learning Math Intervention curriculum.
Chapter 4 Summary

In reviewing the data that was collected in this research study, the kindergarten and first grade study groups made significant gains as a result of the Camelot Learning Math Intervention Curriculum. All participants were given the opportunity to use manipulative items to enhance their learning abilities. The most notable difference among students of various academic abilities was evident in the manner of which the student solved the problem. Some students chose to write out each step needed to solve the problem while others chose to write only the answers without showing the steps needed to solve the problem. Another significant difference included whether or not manipulative items were needed, depending on the complexity of the problem. Some students were able to use mental math skills to complete a problem without writing every step, where others needed to illustrate the entire process to solve the problem as they used the manipulative items.

The most common pattern revealed among the kindergarten and first grade study groups is the expression of frustration and difficulty of a math concept or skill if they had no previous exposure to the manner in which the curriculum was illustrated. In the beginning, the most common response among both study groups indicated certain problems or concepts were too hard. After various implementations of vocabulary review and skill-builders, the students became more comfortable with the implementation of the intervention curriculum. Although particular students sometimes needed more in-depth differentiated instruction, the results also illustrated significant gains in their scores from Camelot Learning Math Curriculum’s pretest to posttest.
Figure 5. Pretest-Posttest Growth Data Analysis. Data illustrated in the table represents the "mean" score from the t-Test analysis with equal variances.

Attendance Data

According to the National Center for Education Statistics (2009), the rationale for high-quality attendance is the relationship between student attendance and student achievement. A recent study found that absenteeism in kindergarten was associated with negative outcomes for those students once they entered first grade. The rates from this study also indicated that students who eventually dropped out in high school missed significantly more days of school in the first grade than their peers who graduated high school (NCES, 2009). The attendance rates for the kindergarten and first grade study and control groups are illustrated in Appendix B and C. The charts illustrate the number of absences for each participant. The rates of absenteeism did not affect the data results of this research study. The students were allowed to make up any days of intervention instruction he or she may have missed during that week.
CHAPTER 5. CONCLUSIONS AND DISCUSSION

Introduction

This chapter includes a discussion of the overview of the major findings of the study focused on the effectiveness of the Camelot Learning Math Intervention Program. The goal of this study was to describe the effects the intervention curriculum had on the achievement of kindergarten and first grade students who were identified as at-risk learners in the area of mathematics. In order to investigate the nature of the effects of the intervention program on the students, the following research question was addressed: “To what extent can the Camelot Learning Math Intervention curriculum improve test scores for kindergarten and first grade students who are demonstrating difficulty in learning basic math concepts?”

Linking this study to prior research, Dr. Maggie Meyers, a mathematics education consultant and content expert reviewer, reported that the Camelot Learning Math Intervention program provided opportunities for students in math intervention to work together on a series of specific sequential lessons (Southwest Educational Development Laboratory, 2011). Even though the curriculum is not designed to be grade-specific and does not explicitly address students’ diverse backgrounds, the content targets the needs of students struggling in math through a variety of activities that appeal to different students through multiculturalism. The lessons are clearly structured, feasible for teacher use, pre-written lesson plans, and all materials are provided which decrease preparation time.

In this study, the deductive approach was used as the framework for verifying the need and relevance for a math intervention program. Agrawal (2004) believes that the subject matter of school curriculum should be based on real-life experiences. Such
experiences are known to increase the desire to learn and challenge the students in ways that ultimately generate curiosity and organize their thinking in learning outcomes. In the effort of meet the needs of every student, the intervention process must be structured around real life experiences in order for students to focus and engage on the learning task.

Summary of the Results

Based on this quasi-experimental study, the research supported the hypothesis and rejected the null hypothesis. Of the four research groups, the data revealed there was a significant correlation between the pretest and posttest scores of the kindergarten and first grade study groups. According to the data analysis, there was no significant difference between the posttest scores of the study groups and control groups. Therefore, the posttest scores were not significantly high enough between the study groups and the control groups to support the null hypothesis.

The purpose of this study was to determine whether the Camelot Learning Math Intervention Curriculum was an effective model to assist kindergarten and first grade students who were considered at-risk and performing below grade level proficiency in math. All kindergarten and first grade students were given an online diagnostic assessment by the Renaissance Learning STAR Math Universal Screener. The kindergarten students who participated in the research study received a scale score from 49 to 197 (needing “urgent intervention”), their grade equivalent score ranging from 0.0 to 0.4, making their math skills comparable to those of an average kindergartner entering at the first month to the fourth month of the school year.
The first grade students who participated in the research study received a scale score from 49 to 271 (needing “urgent intervention” to “intervention”). Their grade equivalent score ranged from 0.0 to 1.0, making their math skills comparable to those of an average kindergartener entering at the first month of kindergarten to first month of first grade. The results of the universal screener indicated that students receiving a scale score below 296 (40 %-Percentile Rank) were identified as “On Watch” and below benchmark. Students who received a scale score below 271 (25 %-Percentile Rank) were identified as needing “Intervention” and below benchmark. The students who received a scale below 237 (10%-Percentile Rank) were identified as needing “Urgent Intervention” and below benchmark.

Of all four groups, there were students that were retained the previous school year. One student from the kindergarten control group was retained and one student was retained in the first grade control group. There were four students that were in school for the first time, two students in the kindergarten control group and two students in the kindergarten study group. There were 15 of the 32 students that were new to the research site. Participants in all four groups had taken the Renaissance Learning STAR Math Universal Screener for the first time at the research site. A different type of universal screener was used the previous school year for determining academic growth as a Beginning-of-the-year (BOY) and End-of-the-year (EOY) math diagnostic.

As illustrated below in Table 5, the data from the End-of-the-year Renaissance Learning STAR Math Universal Screener revealed that all kindergarten study participants needing “urgent intervention” increased their academic growth rate in comparison to their beginning of the year scale score.
Table 5. *Kindergarten Study Group and Control Group Diagnostic Data*

<table>
<thead>
<tr>
<th>Kindergarten Data</th>
<th>Beginning of Year Math Diagnostic Scores</th>
<th>End of Year Math Diagnostic Score</th>
<th>Kindergarten Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Group (A-H)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Group (I-P)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>108</td>
<td>304</td>
<td>+196</td>
</tr>
<tr>
<td>B</td>
<td>142</td>
<td>253</td>
<td>+111</td>
</tr>
<tr>
<td>C</td>
<td>180</td>
<td>399</td>
<td>+219</td>
</tr>
<tr>
<td>D</td>
<td>80</td>
<td>308</td>
<td>+228</td>
</tr>
<tr>
<td>E</td>
<td>49</td>
<td>191</td>
<td>+142</td>
</tr>
<tr>
<td>F</td>
<td>79</td>
<td>216</td>
<td>+137</td>
</tr>
<tr>
<td>G</td>
<td>120</td>
<td>265</td>
<td>+145</td>
</tr>
<tr>
<td>H</td>
<td>197</td>
<td>257</td>
<td>+60</td>
</tr>
<tr>
<td>I</td>
<td>120</td>
<td>313</td>
<td>+193</td>
</tr>
<tr>
<td>J</td>
<td>79</td>
<td>308</td>
<td>+229</td>
</tr>
<tr>
<td>K</td>
<td>100</td>
<td>421</td>
<td>+321</td>
</tr>
<tr>
<td>L</td>
<td>133</td>
<td>394</td>
<td>+261</td>
</tr>
<tr>
<td>M</td>
<td>142</td>
<td>317</td>
<td>+175</td>
</tr>
<tr>
<td>N</td>
<td>177</td>
<td>327</td>
<td>+150</td>
</tr>
<tr>
<td>O</td>
<td>120</td>
<td>345</td>
<td>+225</td>
</tr>
<tr>
<td>P</td>
<td>108</td>
<td>412</td>
<td>+304</td>
</tr>
</tbody>
</table>

Illustrated in Table 6 below, the data from the End of the Year (EOY) Renaissance Learning STAR Math Universal Screener revealed that the first grade study participants increased their overall growth rate by 92.50% as a group according to their beginning of the year scale score. A majority of the participants in the first grade control group made minimal gains, while two participants experienced a reduction in their growth.

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growth rate average. Although the participants in the first grade control group had slightly higher diagnostic scale scores at the beginning of the year, their end of the year scores were not significantly higher than the participants in the first grade study group.

Table 6. First Grade Study Group and Control Group Diagnostic Data

<table>
<thead>
<tr>
<th>First grade Data Study Group (A-H)</th>
<th>Beginning of Year Math Diagnostic Scores</th>
<th>End of Year Math Diagnostic Score</th>
<th>First Grade Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>241</td>
<td>255</td>
<td>+14</td>
</tr>
<tr>
<td>B</td>
<td>257</td>
<td>353</td>
<td>+96</td>
</tr>
<tr>
<td>C</td>
<td>269</td>
<td>266</td>
<td>-13</td>
</tr>
<tr>
<td>D</td>
<td>186</td>
<td>276</td>
<td>+90</td>
</tr>
<tr>
<td>E</td>
<td>49</td>
<td>188</td>
<td>+139</td>
</tr>
<tr>
<td>F</td>
<td>279</td>
<td>274</td>
<td>-5</td>
</tr>
<tr>
<td>G</td>
<td>275</td>
<td>376</td>
<td>+101</td>
</tr>
<tr>
<td>H</td>
<td>303</td>
<td>335</td>
<td>+32</td>
</tr>
<tr>
<td>I</td>
<td>223</td>
<td>371</td>
<td>+148</td>
</tr>
<tr>
<td>J</td>
<td>246</td>
<td>352</td>
<td>+106</td>
</tr>
<tr>
<td>K</td>
<td>264</td>
<td>358</td>
<td>+94</td>
</tr>
<tr>
<td>L</td>
<td>188</td>
<td>341</td>
<td>+153</td>
</tr>
<tr>
<td>M</td>
<td>295</td>
<td>334</td>
<td>+39</td>
</tr>
<tr>
<td>N</td>
<td>233</td>
<td>326</td>
<td>+93</td>
</tr>
<tr>
<td>O</td>
<td>254</td>
<td>353</td>
<td>+89</td>
</tr>
<tr>
<td>P</td>
<td>339</td>
<td>357</td>
<td>+18</td>
</tr>
</tbody>
</table>
Discussion of the Results

The purpose of this action research study was to determine the effectiveness of the Camelot Learning Math Intervention Curriculum on students’ proficiency in number sense. The results of this study suggest that the Camelot Learning Math Intervention Curriculum benefited the students who participated in the intervention. The data for this research study was collected over 10 consecutive weeks. The pretest, which provided information about the students’ current knowledge of number sense skills, was given the first Monday of the week the intervention program was implemented. During the subsequent weeks, the study groups received two math intervention lessons twice a week, totaling four lessons each week. The control groups received the same amount of intervention lessons from the Texas Mathematics curriculum. At the conclusion of the study, all intervention groups were administered a posttest to measure growth in number sense skills.

After collecting the data for 10 consecutive weeks, the researcher was able to evaluate the students’ actual growth set at the beginning of intervention implementation. At the end of the study, low-achieving students were able to verbally restate problems in a simplified form as they solved them on paper. Most of the students became less dependent on manipulative items when utilizing critical thinking skills. Students were also motivated to provide immediate feedback to peers in their group. Results for both study groups illustrated significant gains in overall number sense skills. In addition, the incidence of students with math deficiencies was substantially reduced at the end of kindergarten and first grade.
At the beginning of the school year, math deficits were clearly established by the universal math screener. These deficits provided challenges for the students with number combinations of fact family strategies and problem solving. As the intervention progressed with the flash cards and warm-up practices each session, the students were able to identify math fact strategies and write a set of fact family number sentences that were related. The systematic reinforcement of modeling the instructional strategies enabled the students to complete the warm-up activities in the eight minute time-frame for mastery of specific skills prior to the next lesson objective.

Each research group consisted of targeted students performing below the 10% Percentile Rank and in need of urgent intervention. A visual analysis of the data illustrated a growth model of steady progress from the lowest-level performing students exceeding above the expected growth level. Although some students showed regression in scores on certain math CFA’s, the intervention growth rate of the study groups far exceeded the growth rate of the control groups. In fact, the achievement of the kindergarten study groups began to approach the math achievement level of the first grade study groups as the lessons were the same. The Renaissance Learning STAR Math Universal Screener was used as the district benchmark tool to measure mathematical achievement for the beginning and end of the year assessment. Kindergarten and first grade students who participated in the intervention groups receiving Camelot math intervention as their treatment made significant gains in Number Sense mathematics according to the district benchmark data analysis.
Discussion of the Results in Relation to the Literature

According to Gersten, Chard (1999) and Griffin (2004), the importance of early development of the number sense skills is the foundation of basic mathematics understanding and is a vital component for future study of complex numbers. Researchers have studied various interventions to reduce math deficiencies. Research has shown that efforts to improve math proficiency outcomes have focused on identifying procedures that appear to contribute to positive results. The framework for this study was based on a research-based math intervention, Camelot Learning Math Intervention Curriculum, which was used to increase student scores in math. Such intervention methods are now required prior to determining learning disabilities, or lack of effective math instruction.

Proactive measures must be taken to address the issues of closing the achievement gap. The National Council of Teachers of Mathematics (NCTM) standards clearly indicate that math achievement is the main topic of school reform. The position of the National Council of Teachers of Mathematics (NCTM) advocates identifying early and appropriate levels of student achievement. Without implementing specific interventions and effective instruction, students will continue to struggle in mathematics. Data from various assessments should also be obtained to identify specific areas of need. This will also assist in choosing appropriate interventions in which students can excel in the targeted areas.

The curriculum model used in this study provided a foundation for the instructional strategies offered during the intervention implementation. The students started with concrete objects to represent number sentences on a double 10-frame. They progressed from writing number formations on the double ten-frame to writing addition
and subtraction sentences. The models from the intervention curriculum offered explicit instructions which allowed the students to construct and develop meaningful knowledge of number sense skills. This approach to math intervention leads to an emphasis on greater ideas in math applications so that important skills don't become insignificant (NCTM, 2012).

Newman-Gonchar, Clarke, and Gersten (2009) and Fletcher, Lyon, Fuchs and Barnes (2007) provided an analysis of small group math intervention which focused on the use of concrete and pictorial representations, explicit methods of instruction, screening and progress monitoring for focusing on instruction and deficit areas. Their research also indicated students who received explicit math intervention took a personal interest in setting goals for their own learning which illustrated great gains in their achievement. Their analysis, along with that of the National Mathematics Advisory Panel (2008) recommends that at-risk students with math difficulties have the opportunity to receive explicit methods of instruction to impact student achievement. Using the Response to Intervention model, the Camelot Learning curriculum used in this study delivered successful outcomes for students with learning deficiencies in math. Results from this intervention study reinforce these research findings, as well as demonstrate the importance of implementing explicit instruction for struggling learners.

Bryant, Bryant, Gersten, Scammacca, and Chavez, M. (2008) provided an analysis of tier II intervention with first and second grade struggling students. The study confirmed that early identification of academic difficulties in math provided evidence of needing math intervention. The findings in this study indicated that the implementation of tier II math intervention was successful using the Camelot Learning curriculum. The
materials used for instructional delivery was specific to the deficits in early numeracy math skills associated with each student.

As indicated by Riccomini and Witzel (2010), the main purpose of progress monitoring is to evaluate student growth and program effectiveness. This process involved collecting and analyzing data from Math CFA’s (Common Formative Assessments) every three weeks to determine student outcomes on specific math objectives. Based on the analysis of the data, decisions were made by the researcher to adjust some levels of intervention instruction, or differentiate the lesson depending on the need of the child. Instructional adjustments included working one-on-one with particular students in the small groups, or modifying the lesson so the student could experience success of measureable intervention goals.

Progress monitoring is also used to determine instructional intervention strategies for students in need of math assistance. As indicated by Petty (2004), ongoing warm-up activities are beneficial to enhancing mastery of math concepts in small group intervention. The Camelot curriculum included an eight minute warm-up activity at the beginning of each lesson. Because of the high-stakes testing environment, a systematic approach is needed to encourage struggling students. The integration of warm-up activities in each lesson of the Camelot curriculum helped the students in several ways. The warm-up activities were used as a review of the prerequisites for each lesson, it allowed the researcher to gauge student mastery prior to introducing the next lesson, and it provided an opportunity for a quick informal assessment.

The instructional model which utilized direct and explicit instruction to develop early numeracy was determined to be more effective for teaching math computation and
problem-solving. Clements and McMillen (1996) encourage the development of number sense through the use of manipulative objects, believing it to be crucial for the development of fluency in math computation. These findings also support the research methodologies described by the Math Intervention Programs and Practices (2008), which address the need for effective math intervention strategies using manipulative resources to enhance all learning styles. The instructional strategies are conducive to those from the Camelot Learning Math Intervention Curriculum which is the focus of this study.

Limitations

There were limitations due to the nature of the study. The students were not randomly selected for this intervention. The method of sampling that was used was considered *purposive sampling*. There were a total of 32 students that participated in the study, 16 kindergartners and 16 first graders. All study participants attend school where the researcher is employed. Students were selected according to their diagnostic assessment scores from the Renaissance Learning STAR Math Universal Screener. Those students receiving a scale score of 271 or less were recommended for tier II math intervention. However, there were some students who were identified by the universal screener as “on watch” and were also selected for tier II intervention. These particular students were also retained in that grade level.

As a final limitation, it was evident that the Camelot intervention curriculum was more rigorous than the materials used in the Texas Mathematics intervention. The Camelot Learning intervention curriculum required more thinking, problem solving, and student engagement using manipulative game items which was demonstrated throughout various lessons. Due to the level of rigor in the program, the pretest scores of both study
groups, kindergarten and first grade, were significantly lower than both control groups. It was evident that the students in the study groups had not been exposed to the level of questioning, nor the amount of questions provided. The pretest also required more written calculations and problem solving skills to achieve correct answers. During the researchers observations, it was also evident the students had not been previously exposed to a test of such rigor. Therefore, they were unable to complete the pretest in the 45 minute time allotment.

**Implication of the Results for Practice**

The implication of the results for this study indicate a tier II intervention model using the Camelot Learning Math Intervention Curriculum is effective in improving student achievement in Number Sense. The students were actively involved in the ongoing practice of math skills in the form of competitive games. The implementation of the weekly practice indicated significant improvement in the posttest scores. The results provide an intervention model that can prove successful with the math intervention curriculum in an elementary school. It is crucial that policy makers at the district level provide a math intervention curriculum that allows teachers to use specific instructional strategies and activities for at-risk students. In this particular study, the students who received math intervention in both, kindergarten and first grade, continued to attend their regular math instruction in the classroom.

A second implication of the study emphasizes the need for early intervention for kindergarten and first grade students performing below proficiency in math. Identifying student achievement levels at the beginning of core instruction is crucial when conducting observations and evaluations. According to the NTCM (2012), all students
should have the opportunity to receive high-quality math instruction and learn challenging, grade-level content. However, struggling students must be provided with the opportunity to receive targeted instruction from an effective research-based curriculum that enhances their knowledge to develop the skills for potential growth. Research-based math intervention programs, such as the Camelot Learning Math Intervention Curriculum, specify clear learning goals for students, as well as assess the outcomes related to math achievement. Reluctant learners have the opportunity to improve their math skills on standardized assessments (Camelot Learning, 1999-2007).

The final implication of the Response to Intervention model used in kindergarten and first grade classrooms also stipulate the necessity to use manipulative items as a tool for learning new concepts. Other studies have illustrated the power of manipulative components in the classroom (Ball, 1992). This study has provided evidence of the effectiveness of the Response to Intervention model using the combination of a targeted math intervention curriculum and manipulative components. However, few programs offer models that are based on the Multiple Intelligence model, provide ready-to-use lesson plans, and designed to build student math skills and their confidence levels. This study also supports previous research conducted by Dr. Ronald Thomas (1993). The study he conducted using the pretest and posttest showed an overall average of 16.21% improvement in the scores of the students using the Camelot math intervention program.

Recommendations for Further Research

This study has provided valuable insights into the use of the Response to Intervention model with kindergarten and first grade mathematics students. The Camelot
Learning Math Intervention Program proved to be valuable to students with needs in the area of mathematics. The following recommendations are offered to further the study of Response to Intervention using the Camelot Learning Math Intervention Program:

1. Future studies should further investigate the long-term effects of the intervention program regarding student achievement. This study was observed for approximately 10 weeks. Following students throughout their early elementary years could reveal the learning patterns of students who could later be identified as having a mathematical learning disability or dyscalculia.

2. A series of longitudinal studies of the long-term effects of students receiving math intervention using this program with at-risk students would be both desirable and beneficial. Most schools do not choose to use a temporary fix for a situation that requires deep intervention. Rather, the ultimate goal is to find long-term solutions that promote student progress. Therefore, the value of the intervention program can truly be measured over the long-term, determining if the effects of receiving math intervention is sustainable.

3. It would be beneficial to implement this study in a larger setting that involves students from different socio-economic cultures. This study was conducted at one Title I school with 32 students on free or reduced lunch.

4. While this intervention model is designed to implement research-based strategies to close the achievement gap that frequently characterizes the performance of African-American students, the Camelot Learning Math Intervention Program has not been assessed long-term with more diverse populations. Future studies should
exclusively investigate the effects of the math intervention program with a larger population among multiple grade levels; in multiple schools in the same district, this research study was conducted.

5. A future study should be conducted in other curriculum domains such as Computations, Fractions & Decimals, and Geometry & Measurement with upper grade levels. This study only focused on kindergarten and first grade students who needed additional skills in early numeracy.

Conclusion

This study was designed to evaluate the effectiveness of the Camelot Learning Math Intervention Curriculum on tier II kindergarten and first grade students using the Response to Intervention model. State regulations, No Child Left Behind (NCLB) and the Individuals with Disabilities Act (IDEA) have indicated the need for school districts to support the use of interventions to address students with difficulties in mathematic concepts and reasoning skills. The Response to Intervention model was therefore developed in response to this legislation (IDEA, 2004). This intervention model is divided into three tiers, each with a screening indicator to determine specific learning challenges.

All students begin in tier I in a general education setting with the general education curriculum. If the students are not making significant progress in tier I, alternative assessments should be discussed and considered for tier II implementation of targeted intervention in which the student will receive intense, research-based instruction in a small group. Progress monitoring was used in the form of a common formative
assessment every three weeks to evaluate student growth throughout the intervention. Those students who continue to struggle in tier II intervention will be recommended to receive small group instruction in tier III where they receive even more intense interventions, which may possibly indicate special education placement.

At the end of each three week cycle, students received a math Common Formative Assessment (CFA). This assessment was used as a progress monitoring tool to determine student growth in math. The assessment provides the assessor with a standard score of overall results of the students’ mathematical achievement during that three week period. Student results varied from one CFA to the next regarding the mastery of each objective. Some students made significant gains on one CFA, and did not meet expectations on another CFA. Therefore, results varied from one assessment to the next, depending on the content covered and the format of the assessment. Students tended to perform on or above average if the CFA math assessments included a variety of pictorials along with computation, multi-step problem solving and open-ended answer responses.

Overall results from this study indicate dramatic student growth from both kindergarten and first grade study groups. If a student reached the grade equivalent benchmark score prior to the end of the study, he/she continued with the math intervention implementation and CFA assessments. These student’s scores were not excluded from this study. All intervention students included in this study demonstrated significant growth in number sense throughout the study, meeting or exceeding the recommended expectations of growth. Analysis of the pretest-posttest experimental research design data indicates the strength of the math intervention study.
Further comparisons between the kindergarten and first grade groups using the data showed a significant difference between the assessment skill levels for the two study groups used and the two control groups. Compared to the 15 question pretest administered to the control groups, the skill level of the pretest administered to the study groups was challenging and included 15 additional problems. The students in both kindergarten and first grade study groups had not been previously exposed to an assessment of such magnitude. The first grade study group participants who took the Camelot Learning pretest did not express any level of frustration while taking the assessment, yet completed what they could in the amount of time allotted.

The participants in the kindergarten and first grade control groups received math intervention in small group pull-out using the Texas Mathematics intervention strategies curriculum. The intervention implementation was administered the same days of the week as the study groups, as referenced in Appendix A. It was evident that the Texas Mathematics pretest administered to the kindergarten and first grade control groups was less difficult and allowed the students to complete more problems on the assessment in the amount of time allotted. Because there were 15 additional questions on the pretest administered to the study groups, the scale score was different for both study groups.

In order to identify which intervention curriculum supported the greatest gains in mathematical competence by all participants, each group’s data was analyzed for making comparisons. The $t$ test was used to compare the difference between the average scores assessed from the pretest and posttest. Based on the $p$ value of the $t$ test analysis (type 1 variance), the research analysis clearly indicated that the participants in the kindergarten and first grade study groups using the Camelot Learning Math Intervention Curriculum as
their intervention program made statistically greater gains. Based on the researcher's observations, their academic experience in early numeracy compared to the performance of the participants in both control groups using the Texas Mathematics curriculum, was more rigorous and engaging. It is the hope of the researcher that this intervention will continue within the school to help students develop a strong foundation for a lifetime of mathematical comprehension, retention and appreciation for the subject.