CONTINUOUS QUALITY IMPROVEMENT: A TWO-YEAR ANALYSIS OF ONE SCHOOL’S ACHIEVEMENT DURING INITIAL IMPLEMENTATION

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Peggy Garrett Coffey
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Peggy Garrett Coffey

APPROVED:

COMMITTEE CHAIR
Margaret E. Ackerman
Margaret E. Ackerman, Ed.D.

COMMITTEE CO-CHAIR
Rebecca F. Carwile
Rebecca F. Carwile, Ed.D.

COMMITTEE MEMBERS
Michelle B. Goodwin
Michelle B. Goodwin, Ed.D.
John J. Pantana
John J. Pantana, Ed.D.

DEAN, SCHOOL OF EDUCATION
Karen L. Parker
Karen L. Parker, Ed.D.
Continuous Quality Improvement: A Two-Year Analysis of One School’s Achievement during Initial Implementation

(Under the direction of Dr. Rebecca F. Carwile and Dr. Margaret E. Ackerman)

The purpose of this study was to examine two intervention programs to determine if participation in one or both programs affected student achievement. Both programs addressed student achievement in reading, language arts, and mathematics. The programs emphasized score disaggregation, teacher instruction, weekly assessments, tutorial and enrichment classes on the academic concepts. This study compared ninety-six fifth grade student scores who completed both intervention programs.

The hypotheses were tested using paired t-tests. Participation in the first intervention program showed a statistical significant difference at the .05 level for language arts and no statistically difference for reading or mathematics. Participation in both intervention programs showed a statistical significant difference at the .05 level for all areas, reading, language arts, and mathematics.

INDEX WORDS: Achievement, Continuous Quality Improvement, CQI, Criterion-Referenced Competency Test, CRCT, Total Quality Management in Education
“Common sense tells us, and education research confirms, that youngsters rarely learn what they do not study. Since students study what adults teach, it is important for adults to define essential knowledge and resolve to teach it well.”

ACKNOWLEDGEMENTS

To follow a dream is difficult at best, but it is impossible without the help of many people along the way. The first is Jeff Coffey, my husband, best friend, mentor, encourager, and time keeper during the late nights I tried to put words together in a clear, concise way. His unwavering love and support kept me inching closer to my dream.

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A dream is only a dream until someone with the help of friends can make it into a reality. My thanks and deep appreciation goes to each of you for guiding my footsteps.
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CHAPTER I
OVERVIEW OF THE STUDY

Introduction to the Study

This study will examine two intervention programs at Kanoheda Elementary. The first program was implemented during the school year 2002-2003 and the second program, a revised and more in-depth modification of the first program was implemented during the school year of 2003-2004. Both intervention programs address student achievement in reading, language arts, and mathematics, as measured by the Georgia Criterion-Referenced Competency Test (CRCT). This study will compare ninety-six fifth grade student test scores using as a baseline their scores from the end of third grade to their corresponding fourth grade test scores, which was the end of the first intervention program; and also their baseline to their corresponding fifth grade test scores, which was the end of the first and second intervention program. The study participants will be all 2004 fifth graders who attended this school from Spring 2002 to Spring 2004 (end of third grade, all of fourth grade, and fifth grade). The purpose of the study was to determine if participation in CQI (Continuous Quality Improvement) First or participation in CQI First and CQI Second affect student achievement.

Background of the Study

With the national legislation, No Child Left Behind, schools across the United States are accountable for an increase in student achievement (Educational Trust, 2003; Education Trust, 2004, February a; GA Department of Education, n. d. a; No Child Left Behind, n. d. b; Paige, 2002; Sclafani, 2002-03). No Child Left Behind re-approves the
Elementary and Secondary Act of 1965 and makes the Title I answerability stronger by requiring statewide accountability in all public schools (ED.gov, n. d. a; GA Department of Education, 2002, March 21). State Departments of Education are disaggregating information on school achievement into many different student sub-groupings, which reflect the different categories of students in schools. All state departments of education use data on student achievement, reflected through state-mandated test scores, to show publicly which schools have made Adequate Yearly Progress (AYP) (Education Trust 2002-2003, Winter a; Education Trust, 2003; Mathis, 2003; No Child Left Behind, n. d. a; No Child Left Behind, n. d. b; Sclafani, 2002-03). Each state determines its own AYP criteria (Marshak, 2003; No Child Left Behind, n. d. a).

**Defining Student Achievement**

Under the No Child Left Behind legislation of 2002, overall averages of student achievement on standardized tests are not enough. The legislation requires states to examine student achievement disaggregated into sub-groupings by race/ethnicity, gender, grade level, Special Education, and limited English (Education Trust 2002-2003, Winter b). What is student achievement? Romney (2003) defines student achievement as a particular form of learning result and as an “academic success” (p. 31). Darling-Hammond and Snyder (1992) state “a positive relationship between student achievement and ‘a curriculum that offers greater challenges’” (p. 67). Scott and Palmer (1994) define improvement in academic achievement as “taking more challenging courses, spending more time on homework and learning outside school, and devoting more time to reading” (p. 142). For this study, student learning will be defined as the ability to comprehend
information and student achievement will be defined as the ability to complete a task successfully. Student learning and student achievement are two themes that should co-exist.

*State Mandated Test*

According to Sclafani (2002-03), the objective of the state-required test is to measure to what degree students are learning. In her analysis, she explains this is a circular problem in that some people argue that teachers will teach toward the test as if this is a negative act; however, she replies that this is what we want as educators. Educators want students to learn the required information in reading, language arts, and mathematics so that students will be able to perform well on the test as well as perform well in other areas. Simmons (2004) and Weller and Weller (1998) substantiate. The reality of a good fit of a state-required test and state curriculum supports Sclafani’s contention that effective teaching practices of teaching to the state test is, in effect, teaching the curriculum. Mathis (2003) asserts that many states align their required test with the state’s required curriculum, and in this manner, sustains validity. Mathis further states that this alignment of a state-required test to curriculum is often a good match.

*Adequate Yearly Progress*

Under the No Child Left Behind, the National government legislation holds schools accountable for academic progress for all students (Education Trust, 2003; No Child Left Behind, n.d. a; No Child Left Behind, n.d. b; Sclafani, 2002-03). State-required testing for all students, not only indicates one measure of student academic progress, but also indicates an achievement gap between sub-groupings of forty or more
students based on racial-ethnic, disabilities, or limited English (Education Trust, 2003; No Child Left Behind, n.d. a). Adequate Yearly Progress (AYP) means meeting quality standards, monitoring continual academic progress, requiring 95% student test participation, and assessing separate yearly goals aligned to the state’s required curriculum for students on which schools report to the state department of education (ED.gov, 2003; GA Department of Education, n. d. b; Paige, 2002, July 24). States are required to issue their procedure on how that state will determine if adequate student progress has been achieved for that year and in that state. “The goal [of AYP] is for all students to meet the state definition of ‘proficient’ in reading and math by 2014” (Education Trust, 2003, p. 4). In the state of Georgia, 181 school systems and public schools are accountable for AYP (GA Department of Education, n. d. b). In Georgia, AYP measures a percentage of sub groupings of 40 or more students who must score 300 or better on the Criterion-Reference Competency Test, Georgia’s state-mandated test (GA Department of Education, n. d. d). This percentage must meet or exceed the standard score of 300 each year (GA Department of Education, n.d. b; GA Department of Education, n. d. d) so that all students will attain or exceed the standard score in reading and mathematics by 2014. Accountability of schools, or student achievement reported instate-mandated tests, equal adequate yearly progress.

Total Quality Management

To obtain student achievement, schools search for intervention programs that will help them obtain Adequate Yearly Progress. One such intervention program is Total Quality Management. Total Quality Management (TQM) became a popular business
term after World War II when two businessmen, W. Edwards Deming and Joseph M. Juran, separately used their extensive business knowledge to help Japanese companies improve quality control in manufacturing (Kruger, 2001; Landesberg, 1999). Years later, when both returned to the United States, the term TQM remained a term used to identify Deming’s model for improving quality control. According to Landesberg (1999) and Stensaasen (1995) Deming’s theory of Total Quality Management (TQM) evolved into his fourteen points for management and to his plan-do-study-act (PDSA) cycle of quality management. Hackman and Wageman (1995) state the major tenants of TQM are: (a) the finished product is quality; (b) the worker wants to produce a quality end product; (c) the organization must work together as a mutually supporting team; and (d) management holds responsibility for the ultimate product. It is less costly to produce a quality final product than it is to have multiple inspection processes, products that need to be re-done, and/or loss of customer faith. Workers want to provide a quality product if given the proper tools and knowledge to implement this goal. Companies need to encourage, help, and train each individual group of employees in dealing with their obstacles and challenges. These tenants require a long-term commitment from management (Hackman & Wageman, 1995; Landesberg, 1999). To insure that a quality product continues to be produced, long-term interventions need to be in place from management; management need to know that required new knowledge will improve the completed product (Kruger, 2001; Stensaasen, 1995). This is a cyclic process that keeps repeating for a long-term quality product (Landesberg, 1999). From Deming’s Total Quality Management (TQM) plan for industry, this plan evolved or transitioned to Deming’s TQM for education
(Kaufman & Hirumi, 1992; Stensaasen, 1995).

**Total Quality Management in Education**

Several characteristics mentioned in research studies repeatedly that concern effective schools are: (a) assessing teacher knowledge and instruction, (b) training staff, and (c) examining student test data in order to make academic decisions for students (Potter, Reynolds, & Chapman, 2002). Motwani (1995) states that Edward Deming’s model of Total Quality Management (TQM) in Education uses the elements of staff training, data from testing or benchmarks, and procedures or indicators in order to plan and implement a school’s goals. Motwani and Kumar (1997) state that Total Quality Management in Education is not only customer focused, but also recognizes the problem of identifying the customer in an educational setting. After examining several colleges who are implementing Total Quality Management in Education, Motwani and Kumar (1997) found that schools that service the customer, the student, gives those students what they need in the form of an education. Streeter and Brannen (1994) state the need for schools to follow TQM by emphasizing the need of the customer; this is accomplished by insuring the quality of the product through staff training, and by defining the problem of the student. Streeter and Brannen’s (1994) major points, also collaborated with Motwani & Kumar (1997), and Potter, Reynolds, & Chapman (2002), include training the staff, identifying the customer, and collecting data from testing to analyze instruction to implement student achievement.

Lagrosen (1999) researched Total Quality Management in Education in four
schools in Stockholm, Sweden. He observed and interviewed headmasters, teachers, and parents over a three-year period and found the TQM intervention program provided improved communication, offered better-quality participation, enabled effective assessments, and offered greater ability to continue to change with the use of the program. Yoshida (1994) compared the practices of TQM in Japanese and American schools and found that Japanese schools were not individually competitive but were stronger in the quality of group dynamics that are conducive to TQM. These personal characteristics also lead Japanese students to a more uniform academic level due to teachers emphasizing group dynamics at the expense of personal creativity. American schools, Yoshida (1994) continued, were more competitive, grouping students by abilities and encouraging individualism; however, American schools, because of their emphasis on individuality, promote more creativity. Yoshida (1994) also found that after implementing TQM and reducing individual differences through group dynamics, the educational standards rose, and the achievement gap between the American educational system and that of other countries lessened.

Schmidt (1998) states that Total Quality Management promotes the concept that the customer is the judge of product quality, and in education, the customer is the student. Schmidt reports that DePaul University and Mt. Edgecumbe High School have both implemented TQM plans, setting quality learning as a priority, and they are finding that student achievement rises with the TQM model. Bonstingl (1992 b) states that following the TQM program cannot be thought of as a passing strategy for this year but as a change of thought process for an entire faculty over a prolonged period of time. Bonstingl calls
it the four-point plan: (a) the student is the customer; (b) the faculty works together to implement the plan; (c) the staff commits itself to the plan; and (d) the success rests with the administration. Bonstingl continues that administrators are ultimately responsible for motivating, training the faculty and staff in a successful implementation of the TQM program.

Freeston (1992) describes the results of implementing TQM in the Newtown Connecticut Public Schools. An essential ingredient for implementation is a strong staff development that inspires a motivated staff to service the committed customer (student). Each student becomes an independent learner and internalizes the knowledge taught. Freeston states that TQM is not a passing strategy but one that is a long term, “continuous improvement” (p.13) for their school district, and the district realizes satisfying results from their students. Bonstingl (1992 b) and Stensaasen (1995) substantiate this research.

Ligas (2002) examines at-risk students in Broward County, Florida over a five-year program. She focused on thirty-four elementary schools with a major emphasis on students’ reading and mathematical ability. The program implemented staff development along with mastery assessments for students who perform academically on or above grade level. This program, Alliance of Quality, uses many of the components essential to the TQM intervention program. Ligas compared the schools using this program to schools in the district without the program and found that the results were similar, with the exception of the highest gains experienced by the Alliance schools in the years of state-required, grade level, targeted testing.

Davenport and Anderson (2002) examined The Brazosport Independent School
District in Texas using a re-designed intervention program based on Deming’s Total Quality Management in Business. The district superintendent, and his core staff participated in a W. Edwards Deming’s training session to enable the team to use the Deming’s approach to promote student achievement in the Brazosport school system. The superintendent simplified Deming’s plan into an Instruction Cycle (“Plan-Do-Check-Act” p. 32), implemented staff development, designed lesson plans, and sought faculty support for a long-range plan of improvement to help the customer (student) achieve. This district, composed of very academically able students as well as “economically disadvantaged students” (p.18), committed itself to the standard that all students can learn and raised the standards for all students. As a result, all students in the district started showing heightened academic achievement in both mathematics and reading. Davenport and Anderson (2002) supported their research on Plan-Do-Check-Act by student data from state-required tests.

Simmons (2004) explains how a county of ninety schools followed the implementation program discussed in Davenport and Anderson’s book, *Closing the Achievement Gap No Excuses* (2002). Two schools gave a brief summary of the program, explaining how this program has promoted academic growth in its students, made the faculty work more closely together, and closed the achievement gap between different sub-groupings on the state-mandated test.

During the summer of 2002, an intervention program, Continuous Quality Improvement (CQI), was introduced to Gwinnett County principals based on Davenport and Anderson’s study in *Closing the Achievement Gap No Excuses* (2002). The principal
of Kanoheda decided CQI would be a good academic fit for her school so she introduced *Closing the Achievement Gap No Excuses* (2002) to the faculty during the pre-planning session in August 2002. The intent was to implement this program in second, third, fourth, and fifth grades (S. Dressel, personal communication, August 2002).

During initial implementation, the county supplied limited lesson plans to participating schools. After teaching these plans for several weeks, the teachers at Kanoheda felt it would be beneficial to student learning if these plans were re-written for a better academic fit to accommodate the needs of the student population. The principal agreed. Each academic teacher re-wrote several weeks of lesson plans, which included mini-lessons, mini-tests, enrichment and tutorial lessons in reading, language arts, and mathematics. During Year Two of the implementation, the administration decided the lesson plans needed to be student focused as well as hands on. So, the lessons needed to be re-written by the academic teachers, review by administration, then copied, and given to all teachers on a grade level to be delivered at the same time to their individual students.

This study will examine the two intervention programs implemented at Kanoheda Elementary to assess if participation affects student achievement. The first program Year One (CQI First) was implemented during the school year 2002-2003. The second program Year Two (CQI Second), a revised and more in-depth modification of the first program was implemented during the school year 2003-2004. Both intervention programs address student achievement in reading, language arts, and mathematics as measured by the Georgia Criterion-Referenced Competency Test.
Similarities between CQI First and CQI Second were that both programs encompassed two components, which were target time and team time. Target time and team time were teacher made and teacher directed mini-lessons with accompanying mini-tests to establish student comprehension. Each academic teacher was required to write two language arts and two mathematics CQI target and team time lessons each year. Teacher made lessons were read by three educators and approved by an administrator. The CQI target time consisted of two daily 10 to 15 minute mini-lessons, one in language arts and one in mathematics, delivered on Monday through Thursday. The CQI implementors evaluated skill mastery through testing each Friday, using two mini-tests. The language arts test included five questions, and the mathematics test included five problems. Once teachers scored and recorded tests scores, they assigned students to enrichment or tutorial team time classes for a block period of time based on the students test scores.

Table 1 compares the major characteristic differences in target time during the first year of implementation, CQI First, and the second year of implementation, CQI Second.
Table 1

Differences in target time during CQI First and CQI Second

<table>
<thead>
<tr>
<th>CQI First</th>
<th>CQI Second</th>
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<tr>
<td>Lesson plans supplied by Gwinnett County and re-written by Kanoheda grade level teachers, for academic fit, and use of drill worksheets.</td>
<td>Lesson plans revised and re-written by Kanoheda grade level teachers for lessons to be hands-on and student centered. Students given dry erase markers and boards. Students played teacher-made games or worked with a partner.</td>
</tr>
<tr>
<td>Flexible, sometimes cancelled.</td>
<td>A more structured approach, rigidly required implementation, focused application from students.</td>
</tr>
<tr>
<td>Delivered sometime during language arts and mathematics block time.</td>
<td>Rigidly delivered first fifteen minutes of language arts and mathematics block time.</td>
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</table>
Team time used the block period on Mondays and Tuesdays for enrichment or tutorial in language arts. Enrichment was for students who had scored at least 80% mastery on the mini-tests administered the week before. Tutorial was for students who scored below the 80% mastery level. On Wednesdays and Thursdays, teachers used the block period for enrichment or tutorial for mathematics and followed the same format as language arts. During team time, students went to different classrooms Monday through Thursday depending on enrichment or tutorial. Friday was reserved for maintenance in the student’s homeroom class. Maintenance was during the first period of the day for CQI First or Second where two mini-tests, one in language arts and one in mathematics, were given at the beginning of the period. Following student completion, teachers scored the CQI tests while students worked on previously taught academic concepts. During Year One many students read books or used this time for a review of previous academic concepts from language arts and mathematics. During Year Two, this time was exclusively used by students to participate in teacher-made games emphasizing previously taught language arts and mathematics concepts.

Table 2 compares the major characteristic differences in team time during the first year of implementation, CQI First, and the second year of implementation, CQI Second.
Table 2

<table>
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<th>Differences in team time during CQI First and CQI Second</th>
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<tr>
<td>CQI First</td>
</tr>
<tr>
<td>Maintenance sometimes cancelled.</td>
</tr>
<tr>
<td>Worksheets given and/or silent assigned reading</td>
</tr>
<tr>
<td>Last thirty minutes Monday through Thursday, first thirty minute block on Friday</td>
</tr>
<tr>
<td>225 students divided between 9 teachers - 35-40 enrichment students per class, 15-18 students in tutorial.</td>
</tr>
</tbody>
</table>
The major differences between CQI First and CQI Second were the academic type of lessons, the time of delivery, and the flexibility of the program. In CQI First, grades 2nd – 5th were involved whereas in CQI Second, all grades 1st – 5th were actively involved.

Statement of Purpose

The purpose of this study was to determine if there was an affect in student achievement scores in reading, language arts, and mathematics between the students baseline and after student participation in CQI First or Year One (2002-2003). This study also sought to determine if there was an affect in student achievement scores in reading, language arts, and mathematics between the students baseline and after student participation in CQI First and CQI Second or Year One and Year Two (2002-2004). This study was based on the academic performance of the total number of students attending Kanoheda Elementary who took the Georgia Criterion-Referenced Competency Test in 2002 (baseline), 2003 (end of Year One), and 2004 (end of Year One and Two).

Research Question

This study sought to answer the following research question: Does participation in CQI (Continuous Quality Improvement) First or First and Second affect the achievement of fifth grade students in reading, language arts, and mathematics?

Hypotheses

Null hypothesis 1: There is no significant difference in student achievement in reading after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test.
Null hypothesis 2: There is no significant difference in student achievement in language arts after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test.

Null hypothesis 3: There is no significant difference in student achievement in mathematics after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test.

Null hypothesis 4: There is no significant difference in student achievement in reading after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test.

Null hypothesis 5: There is no significant difference in student achievement in language arts after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test.

Null hypothesis 6: There is no significant difference in student achievement in mathematics after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test.

Professional Significance of the Study

The study of one program’s impact, Continuous Quality Improvement (CQI), on achievement of all fifth grade students at one elementary school, Kanoheda, will make a contribution to the knowledge base by identifying programs that might promote learning for all fifth grade students. A preliminary review of the literature indicates that although there have been many reports of schools that have moved from the state “needs to improve” lists to documenting Adequate Yearly Progress, (AYP), the findings are buried
in state reports or originate from the testimony of administrators and school officials. Few research pieces have emerged to describe how one school changed. Therefore, this quantitative research will examine the affect of student achievement in relation to two implementation programs over a two-year period as evidenced by scores on state-mandated tests. This research will provide support for the implementation of focus instruction in small group settings and across all learners.

Overview of Methodology

Participants

The participants of this study are the total population of fifth grade students attending Kanoheda Elementary School from April 2002 to April 2004. The difference in population that tested in grade three and the population of the study in grade five is the result of a highly mobile student population based on a large percentage of students living in the surrounding apartment complexes and housing projects, whereas a smaller number of students were living in non-rental houses, thus the studied population total for this research is ninety-six students. The remaining seventy-two students did not have all three CRCT scores required for comparison. Theses students were either missing their 3rd (baseline) score, 4th grade (end of CQI First) score, or 5th grade (end of CQI First and Second) score.

Instrument

The Georgia mandated test used to report Adequate Yearly Progress for No Child Left Behind in student achievement is the Georgia CRCT (Criterion-Referenced Competency Test); schools across the state of Georgia use the CRCT to determine if a
school accomplishes AYP. The elementary schools give this test to third, fourth, and fifth grade students in April of each school year. Riverside Publishing designed the GA CRCT (F. Linhart, personal communication, November 5, 2004).

**Design**

In an examination of the permanent records of one hundred sixty-eight fifth graders, the researcher determined which students attended this elementary school from April 2002 to May 2004. The researcher conducted a review and an analysis of the GA CRCT reading, language arts, and mathematics scores from these ninety-six fifth grade students attending school from April 2002 until May 2004. The statistics for the students in the third and fourth grade years are important to examine if the CQI First intervention program affected student achievement in reading, language arts, and mathematics. The statistics of the students in the third and fifth grade are important to examine if the CQI First and Second intervention program affected student achievement in reading, language arts, and mathematics.

**Procedure**

Students were tested in April 2002 (at the end of their third grade), April 2003 (at the end of their fourth grade), and April 2004 (at the end of their fifth grade) using the GA CRCT state-mandated test during regular class time as required under No Child Left Behind. Teachers administer the CRCT test in five days, one day each for reading, language arts, mathematics, science and social studies. This study used only the student test results from reading, language arts, and mathematics.
Definition of Key Terms

**Adequate Yearly Progress (AYP)** 1: means meeting quality standards, monitoring continual academic progress, requiring 95% student test participation, and assessing separate yearly goals aligned to state’s required curriculum for students on which schools report to the state department of education (ED.gov, 2003; GA Department of Education, n. d. b; Paige, 2002, July 24). States are to meet the goal by 2014 of all students being capable in reading and mathematics (Education Trust, 2003).

**Continuous Quality Improvement First (CQI First)** 1: an intervention program based on research from Davenport and Anderson’s (2002) book, *Closing the Achievement Gap No Excuses*. This program is based on the authors experience in the Brazosport Independent School District in which students in one part of the district had higher tests scores than the other part of the district. The concepts from their study form the basis for CQI First, which was designed to improve academic achievement in all students and adopted by some schools in Gwinnett County during 2002.

**Continuous Quality Improvement Second (CQI Second)** 1: a re-designed version of CQI First due to the needs of the school administration for a focused emphasis school wide on reading, language arts, and mathematics. This program is taught in a very structured format consisting of two fifteen minute daily mini-lessons, one in language arts and one in mathematics and a forty-five minute block period, four times a week, in enrichment or tutorial in language arts or mathematics.

**Criterion-Referenced Competency Test (CRCT)** 1: the Georgia state-mandated test given in April of each year to assess AYP in elementary schools in Georgia. This test has
five parts. They are reading, language arts, mathematics, social studies, and science.

**student achievement** 1: the ability to complete a task successfully.

2: student learning and achievement are two related concepts; however, student learning does not automatically translate into student achievement.

**student learning** 1: the ability to comprehend information

**Total Quality Management (TQM)** 1: a term used to identify W. Edwards Deming’s business model for improving quality control by encouraging management to empower workers to make quality products using quality materials.

**Total Quality Management in Education (TQM in Education or TQE)** 1: a term used to identify the Total Quality Management business model that has been adapted to an educational purpose. TQM in Education utilizes staff training, data from testing or benchmarks, and procedures or indicators in order to plan and implement school goals (Motwani, 1995).

**Organization of the dissertation**

Chapter 1 contains a general background of the study, statement of the purpose, research question, research hypotheses, professional significance of the study, overview of the methodology, delimitations, and definitions of key terms. Chapter 2 consists of a review of relevant literature. Chapter 3 offers a description of the general methodology, the participants of the study, testing instrument, and data collection procedures. Chapter 4 presents the statistical analysis of the data. Chapter 5 summarizes the results and findings, offers conclusions and recommendations based on these findings.
CHAPTER II
REVIEW OF THE LITERATURE

Introduction

This study examined two intervention programs using the Georgia state-mandated CRCT (Criterion-Referenced Competency Test) in 2002 as baseline data to determine if participation in one program or programs affected student achievement. The first intervention program, CQI (Continuous Quality Improvement) First or Year One, was implemented in the school year 2002-2003. The second program, CQI Second or Year Two, a revised and more in-depth modification of the first program, was implemented during the school year 2003-2004. Both intervention programs address student achievement in reading, language arts, and mathematics as measured by the Georgia Criterion-Referenced Competency Test. These two programs emphasize score disaggregation, teacher instruction, weekly assessments, as well as tutorial and enrichment classes on the academic concepts.

This chapter reviews the relevant literature on an intervention program from its roots, changes, and adaptations to increase student achievement for all learners. This chapter begins with an overview of the need for accountability in schools for student achievement using data from state-mandated testing to meet the criteria for No Child Left Behind. The chapter then continues by examining the nature of a program from its inception, major designers, tenets, to an intervention program in business (Total Quality Management), to a design change to implement a business-driven program into one modified for an educational setting. (Total Quality Management in Education). Total
Quality Management in Education metamorphosed into the Plan-Do-Check-Act (PDCA Instructional Cycle) and then finally adapted again into Continuous Quality Improvement.

Need for Accountability in Schools

In the school year 2002-2003, No Child Left Behind (NCLB) will hold schools accountable for all students’ academic achievement (GA Department of Education, n.d. c). No Child Left Behind, a national mandate, holds schools across the United States accountable for an increase in student achievement as well as closing the gap between different sub-groupings of students, which reflect the different categories of students in schools (Dearman & Alber, 2005; Educational Trust, 2003; GA Department of Education, n. d. a; Marshak, 2003; Mathis, 2003; No Child Left Behind, n. d. a; No Child Left Behind, n. d. b; Paige 2002; Sclafani, 2002-03). These groupings include ethnicity, gender, and grade level, as well as certain academic programs in which students participate, i.e. English Speakers of Other Languages (ESOL) and Special Education (Education Trust 2002-2003, Winter a; Education Trust 2003). Education Trust (2004) states that education needs to implement a successful “closing the gap” in achievement across all students in the country. Education Trust (2004, February b) also states schools need to use testing data to signal the direction for improvement schools should make. One strategy given from Education Trust is to recognize schools’ “opportunity gaps” (slide 33), which are “low expectations and watered down curriculum” (slide 33) and then repair them to raise achievement across ethnic groupings. Slaughter believes the achievement gap between Caucasian and minority students is due to “low expectations”
Haycock (n. d.) maintains that No Child Left Behind is the first evidence of commitment to achievement across all learners and is the strongest reform of the Elementary and Secondary Act (ESEA) since its conception in 1965 (ED.gov, n. d. a). According to Rees (2004, March 6), NCLB closes the achievement gap through standards determined by the federal government as well as options and abilities for adaptations at the state level to implement the standards.

The law, NCLB, is federal, but the individual states select the test that determines Adequate Yearly Progress (AYP) and states have an allowable margin in implementation of the test within tight federal boundaries (Jehlen & Winans, 2005, May). The student scores on state-mandated testing must reflect this commitment to achievement. States must set a level of accountability for all students to achieve or surpass (Education Trust, n. d.; Elmore, 2003; Marshak, 2003; No Child Left Behind, n. d. a; Reutzel & Mitchell, 2005; Robelen, 2003), and this level may be the only official assessment of student achievement (Neill, 2003). Education Trust (n. d.) attests that students’ effectiveness on state-mandated testing is the measure for accountability required by this federal program. Haycock and Wiener (2003) and ED.gov (n. d. b) report that each individual state administers a state-mandated test to evaluate student achievement in reading and mathematics to ensure students will meet proficiency levels in both reading and mathematics by 2013-2014. Harvey, 2003 and Robelen, 2003 substantiate.

Testing can be demanding for some students, but is, in actuality, a routine and predictable form of assessment that students acknowledge in schools (ED.gov, 2003, June
School systems continue to use constant informal assessments to check students' progress and mastery (Bernhardt, 2003). All state departments of education use data on student achievement, reflected through state-mandated test scores to show publicly which schools have made adequate yearly progress (Education Trust, 2003; Mathis, 2003; No Child Left Behind, n. d. a; No Child Left Behind, n. d. b; Sclafani, 2002-03).

Weller (1998) states education needs to bridge the gap between quality teaching and standardized testing. Mathis (2003) documents that many states align their required test with the state’s required curriculum, and in this manner, sustains validity. Sclafani (2002-03) asserts teachers need to teach the required curriculum, and in this way, help students achieve on state-required tests. Educators want students to learn the required information in reading, language arts, and mathematics so that students will be able to perform well on the test as well as perform well in other areas. State-mandated testing show what students have learned, thus quality teaching can improve testing results. Simmons (2004) and Weller and Weller (1998) substantiate.

If quality teaching may improve testing results and if testing results reflect student achievement in the particular academic subject tested, then what is student achievement and what factors lead to student achievement? Romney (2003) defines student achievement as a particular form of learning result and as “academic success” (p. 31); however, Cramer (1996) reports, “learning is the product of education” (p. 366). Darling-Hammond and Snyder (1992) address student achievement factors when they wrote there is “a positive relationship between student achievement and ‘a curriculum that offers greater challenges’” (p. 67). Scott and Palmer (1994) define improvement in
academic achievement as “taking more challenging courses, spending more time on homework and learning outside school, and devoting more time to reading” (p. 142). Thus in this study, student learning is defined as the ability to comprehend information and student achievement is defined as the ability to complete a task successfully. Student learning and student achievement are two themes that should co-exist; however, student learning does not automatically translate into student achievement. Kohn (1999) agrees, he states if students believe that achievement is related to the grading system or a score of some type, students will take the option to pursue easier tasks or courses instead of harder challenging courses to obtain and maintain a higher grade or achievement level. So, student achievement levels or scores override student learning. Connally, a Gwinnett county level gifted coordinator, (L. Connally, personal communication, October 13, 2005) substantiates Kohn’s concept in a gifted endorsement class discussion; she stated that gifted students take less challenging courses in high school to obtain a higher grade point average. Connally continued that some gifted students want to be high school valedictorians or have an opportunity to attend a prestigious college, and they will take less challenging courses to maintain a higher grade point average, thus sacrificing learning for an achievement score.

Senge, Cambron-McCabe, Lucas, Smith, Dutton, and Kleiner (2000) contend “the concept that ‘all children can learn’ [and this] is supported by research on cognitive and social capabilities that suggest that every child…has the potential to achieve something significant—if conditions support learning and if each individual’s capabilities are valued” (p. 104). Wicks, Perego, and Wheeler (2001) state valuable instruments lead to
superior learning. This means when testing aligns with curriculum, and students view this as relevant and worth learning, better-quality learning will take place.

Regardless of the definition of student learning and of the influencing factors, all schools must document Adequate Yearly Progress (AYP). AYP means meeting quality standards, monitoring continual academic progress, and assessing separate yearly goals for all students on which schools report to the state department of education (ED.gov, 2003; ED.gov, 2003, June 01; Georgia Department of Education, n.d. b; Paige, 2002). Haycock and Wiener (2003) view the purpose of AYP for states to “establish clear goals for student learning, measure whether students are reaching them, and hold educators accountable for raising student achievement” (p. 1). “The goal (of AYP) is for all students to meet the state definition of ‘proficient’ in reading and math by 2014” (Education Trust, 2003, p. 4).

The No Child Left Behind Act encourages schools to spend federal money to fund solutions to local problems in student achievement which means school districts have more flexibility in the use of federal money as long as student achievement improves (ED.gov, 2002, July 15 a; ED.gov, 2002, July 15 c). The solution is to demand research-based intervention with results that schools and the federal government can verify (ED.gov, 2002, July 15 b). Davis (2003) substantiates. Programs need to give evidence of “scientifically based research” (ED.gov, 2003, August 1, p. 1).

Darling-Hammond (2000) indicates that there may be a strong connection between state teacher requirements and student achievement. Student achievement in math was higher when teachers took more mathematics’ method classes. Students’
reading achievement was higher if their teacher had higher than a bachelor degree or had taken literature-based classes. Paige (2004) agrees, stating that current studies advise, “teachers are the single most important factor in student achievement” (p. A23). “Good teachers make a difference” (p. 1) according to Educational Research Service in “Effective classrooms: Teacher behaviors that produce high student achievement” (2000). Darling-Hammer in Kaplan and Owings (2003) indicate that teacher requirements “account for 40% to 60% of total achievement variance after taking students’ demographics into account” (p. 689).

Cramer (1996) documents that teachers are re-examining their teaching strategies to help all learners achieve. Teachers, according to Scott and Palmer (1994), need to have their opinions and contributions count in the educational process for students to achieve. Scott and Palmer continue saying that schools do not utilize their senior or more experienced teachers in the most productive manner, that is, to utilize their expertise in promoting student learning. In her analysis, Sclafani (2002-03) explains teaching students the require academic knowledge and achievement on required testing is thought to be a circular problem in that some people argue that teachers will teach toward the test as if this is a negative act; however, she replies that this is what we want as educators. We want students to learn the required curriculum. Sclafani adds the objective of the state-required test is to measure to what degree students are learning. “If teachers cover subject matter required by the standards and teach it well, then students will master the material on which they will be tested—and probably much more” (ED.gov, 2003, June 1, p. 2). Education Trust (2004), in their report shows fourth grade reading scores in 2003
across the country showed 38% of the total students were below the basic cut scores (slide 31). The composite of below basic scores for these same students by ethnic percentages were 61% Black, 57% Latino, 53% Native Americans, 31% Asian, and 26% White (slide 32).

In the state of Georgia, the state-mandated test for elementary students is the Criterion-Reference Competency Test (CRCT) (GA Department of Education, n.d. b). A criterion reference test measures students’ achievement against an recognized criterion instead of aligned with other student achievement (Invernizzi, Landrum, Howell, & Warley, 2005). According to Ghezzi (2003, January 5), in the past, in Georgia, the state labeled a school as failing “when 70% or more students failed math or reading” (p. 1). Since the conception of NCLB in the state of Georgia, AYP measures a percentage of sub groupings of 40 or more students who must score 300 or better on the CRCT. This percentage must meet or exceed the standard score of 300 each year (GA Department of Education, n.d. b; GA Department of Education, n.d. d) so that all students will attain or exceed the standard score in reading and mathematics by 2014. The standard passing score of 300 is written on students test documents that are sent to parents and teacher class rosters.

Total Quality Management

In the forties, two men, Joseph Juran and Edward Deming, watched businesses struggle with quality control issues. Juran and Deming had doctorate degrees, Deming in mathematical physics and Juran in electrical engineering. Each worked at Western Electric in Chicago (Landesberg, 1999). Each decided that the quality of manufactured

Hackman and Wageman (1995) document that the major tenants of TQM are (a) the finished product is quality; (b) the worker wants to produce a quality product; (c) the organization must work together as a mutually supporting team; and (d) management holds responsibility for the ultimate product. To produce a quality final product is less costly than to have multiple inspection processes, products that need to be re-done, and/or loss of customer faith. Workers want to provide a quality product if given the proper tools and knowledge to implement this goal. Companies need to encourage, help, and train each individual section of employees in dealing with their obstacles and challenges. These tenants require a long-term commitment from management (Hackman & Wageman, 1995; Landesberg, 1999). Landesberg (1999) underscores one major tenet for Juran and Deming is “the long term commitment and involvement of top management”
Juran’s plan focused on management: (a) forming a quality control for awareness of potential problems, (b) forming a quality strategy that details guidelines to follow, (c) forming quality goals detailing numbers and a time format for these numbers and (d) forming any resources or training for workers to be able to achieve management’s objectives for quality (Kruger, 2001). Juran’s trilogy evolved from Juran’s plan. Juran believed quality came from “planning, control, and improvement” (Juran, 1992, p. 14; Juran, 1989).

Deming thought increasing quality in products would (a) cut costs to produce, (b) improve sales, and (c) increase the number of quality products made (Kruger, 2001; Stensaasen, 1995). Deming designed his 14-point plan: (a) focus of management is on present and future of the business; (b) quality is the focus; (c) quality does not come from inspection but from constructing quality in a product; (d) bidders’ low prices do not always mean quality; (e) improvement is a cyclic process; (f) workers need to be properly job trained to be able to perform quality work; (g) management’s role is to remove problems for worker’s satisfaction by leading not dictating quotas; (h) workers should be encouraged to ask questions; (i) communication between departments improve quality products; (j) objectives (numerical) need to be removed; (k) requirements (numerical) need to be removed; (l) obstacles to quality work need to be removed; (m) workers’ customer training is provided; and (n) management needs to provide a structure to provide for quality work (Deming, 1982; Kruger, 2001). Starkey, Brewin, and Owen (1996) indicate businesses that follow Deming’s fourteen-point plan expected to have a
better profit margin than companies that do not. Several examples of large corporations that have used or are using TQM are Motorola, Proctor and Gamble, and Xerox (Brigham, 1993). Others include 3M, Milliken, and MBNA (Murgatroyd, 1992); still other giants in industry are IBM and Hewlett-Packard, Co. (Scott & Palmer, 1994).

Toyota’s Lexington plant implements Deming’s TQM. Management requires all decisions made collaboratively; employee input is valued, and workers look forward to going to work to make a quality product, a Toyota (Schmoker & Wilson, 1993 a).

According to Weller in Weller (1998) “Total Quality Management is process thinking; it is system thinking with a holistic mental model based on shared and jointly developed vision, mission, and goals which are future-oriented… commitment to the purpose of meeting customer needs and expectations” (p. 254). Babbar and Aspelin (1994) note that another key point in TQM is allowing and encouraging employees to help change potential problems; these employees are on the front line of production, and they can see potential problems, that may harm the process or quality of the product. This agrees with Smith, Tranfield, Foster, and Whittle (1994) findings that the basic tenet of Deming’s TQM is employees aligning with the concept of a quality product. Deming’s popularity in the United States grew in part due to a 1980 NBC TV documentary, “If Japan Can, Why Can’t We?” which brought national attention to Deming and his work. Total Quality Management (Kruger, 2001; Martinez-Lorente, Dewhurst, & Dale, 1998; Peterson, 1997).

Deming and Juran had similar but different plans for quality products aimed at customer satisfaction and growth within affected companies. Their thought was that
when a company makes a quality product, the customer will buy it (Hackman & Wageman, 1995; Landesberg, 1999; Stensaasen, 1995). If the customer is satisfied and continues to buy the product, the company will prosper, and a cyclic process is maintained. Total Quality Management, according to Martinez-Lorente, Dewhurst, and Dale (1998), “appears to be a well-accepted system of management” (p. 378) with “a solid conceptual foundation” (Hackman & Wageman, 1995, p. 1).

Hackman and Wageman (1995) observe that the total quality management movement has come to stand for dissimilar things to dissimilar people. For example, Delany, Toburen, Hooton, and Dozier (1997) show that parallel block scheduling encompasses many of the components of Total Quality Management. In Washington-Wilkes Primary and Elementary schools, the teachers divide the students to promote higher levels of achievement through teacher teams, staff training, data assessment, and valuing the student, all components of TQM.

In addition, Four Blocks and Learning Focused Schools have many of the tenets of TQM. Both focus on data collection, student achievement, high expectations, student and faculty ownership, and teacher training (Cleland, 1999; Dorekamp & LaPorte, 2002, June; Perkins, 2004, January; Thompson & Thompson, 2003). There is a multiplicity of programs using the name ‘total quality’, but a quality product and customer satisfaction are the major tenets in Deming’s TQM (Kline, 1992; Kruger, 2001; Schenkat, 1993). As Kossoff in Melan (1998) states, “total quality is defined as the unrelenting pursuit of continuous improvement which is realized by accessing and utilizing the concerted knowledge and experience of managers and employees at all levels” (p. 127). This
means that all participants need to contribute to the successful direction of the company (Choppin, 1995; Doherty, 1997; Lehmann & Winer, 1997). Tummala and Tang (1996) explain that all employees from top management down must give of themselves to modify and improve the product. Hackman and Wageman (1995) add that management is responsible for quality, and this is, in fact, a form of top-down management. Schenkat (1993) clarifies Deming’s plans and offers a developmental condition that cultivates and promotes growth in its people.

To ensure that a quality product continues production, long-term interventions need to be in place from management; management needs to know that required new knowledge will improve the completed product (Kruger, 2001; Stensaasen, 1995). This is a cyclic process that keeps repeating for a long-term quality product (Landesberg, 1999). The product according to Oswald (n. d.) will be better when management and workers work together as a team. Weller (1995 b) suggests team problems are generally problems individual have brought in but need to be handled within the group in a supportive manner.

Deming streamlines his 14-point plan into a more simplified four points, Plan-Do-Check-Act (PDCA). In the planning stage, the company examines a product or area for possible changes. In the doing stage, the company, if seeing a need for change, implements the change. In the checking stage, the company evaluates if the change has benefited the product. In the acting stage, the company implements the change consistently across the designated areas (Blades, 1995; Deming, 1994; Kline, 1992; Landesberg, 1999; Latzko & Saunders, 1995; Neave, 1990; Walton, 1986).

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Deming’s Total Quality Management (TQM) plan for industry evolved or transitioned to Deming’s TQM for education (Kaufman & Hirumi, 1992; Stensaasen, 1995).

**Total Quality Management in Education**

Dissatisfaction in business required major changes; dissatisfaction in American schools required similar changes. Again, management turned to Deming’s plan for reforming business, Total Quality Management; only this time school districts were reforming education. Holt (1994) justifies, “to use Deming’s principles, we must adapt them to new contexts” (p. 85). Brandt (1992), Crawford and Shutler (1999), and Lo and Sculli (1996) substantiate. Total Quality Management has progressed from its business roots to educational systems (Hackman & Wageman, 1995; Holt, 1993; Sztajn, 1992; Weller, Jr., 1996).

Berry (1997) documents schools are using TQM in Education because schools “use...curriculum development teams, [and] the relatively high level of responsibility teachers have for educational decisions” (p. 60). Motwani (1995) underscores that Edward Deming’s model of Total Quality Management (TQM) in Education uses the elements of staff training, data from testing or benchmarks, and procedures or indicators in order to plan and implement school’s goals. Gaboury (1999) in an interview with Juran on the problem of who is the customer, states, “In fact, I’d like to change the dictionary. I’d like to say we ought to consider as customers all the people who are impacted with what we do” (p. 32). The customer became the student (Schwartzman, 1995; Weller, 1998); however, Scrabec, Jr. (2000) questions the issue of the student as the customer. Stating that the student receives the benefits of Total Quality in Education, he emphasizes
also that these benefits may not always satisfy this type of customer. Total Quality Management in Education is not only customer focused, but Motwani and Kumar (1997) recognize the problem of identifying the customer in an educational setting. They examined several colleges implementing Total Quality Management in Education and found these colleges serving the students as customers by giving the student a product. The product, in the form of an education, is a successful completion of an academic course. In further research by Streeter and Brannen (1994), researchers realize that when students become customers, and education becomes the product, the schools must constantly monitor the quality of the product through frequent staff development.

Streeter and Brannen’s major points are also collaborated with Motwani (1995), Motwani & Kumar (1997), and Potter, Reynolds, & Chapman (2002), which are to include training the staff, identifying the customer, and collecting data from testing to analyze instruction to implement student achievement.

Schmidt (1998) asserts that Total Quality Management promotes the concept that the customer is the judge of product quality, and in education, the customer is the student. Schmidt reports that DePaul University and Mt. Edgecumbe High School have both implemented TQM plans, setting quality learning as a priority, and they are finding that student achievement rises with the TQM model. Following the TQM program, however is not a passing strategy for a year but is a change of thought process for an entire faculty over a prolonged period of time (Bonstingl, 1992 b). Bonstingl calls it the four-point plan: (a) the student is the customer; (b) the faculty works together to implement the plan; (c) the staff commits itself to the plan; and (d) the success rests with the
administration. Bonstingl continues that administrators are ultimately responsible for motivating, training the faculty and staff in a successful implementation of the TQM program.

Lezotte (1997) in his book, Learning for All establishes that a successfully adopted research-based program in a school environment needs to include important outcomes for student achievement, and Weller (1998) agrees. Bonstingl (1992 a) in his introduction quotes Deming, “The right time for attention to final outcomes in any production process—including the learning process—is at every step along the way—W. Edwards Deming” (p. 66). Choppin (1996) states it a little differently; growth of the staff as it implements change and readjust educational tasks is a learning process. According to Kondo (1993), “Quality control truly begins and ends with education” (p. 124). Dinklocker (1992) an assistant superintendent of Westlake City Schools in Ohio agrees, stating that the TQM process is a learning process shared in their suburban system. Weller, Jr. (1995 a) recognizes educational change and reorganization using Deming’s 14 points because it shows “successful results in schools across America” (p. 20). This is due, according to Hixson and Lovelace (1992) because proponents of Total Quality in Education base their ideas on “research and practice” (p. 25).

Furthermore, Rhodes (1992) defines Total Quality Management in business or education as “a value-based, information-driven management process through which the minds and talents of people at all levels are applied fully and creatively to the organization's continuous improvement” (p. 80). Zairi (1995) obviously agrees with the importance of continuous improvement, when he says, “Total Quality Education is about
creating opportunities for continuous learning through continuous improvement” (p. 35). On the other hand, Prybutok and Kappelman (1995), while not disagreeing with the importance of continuous improvement make the point that employee training leads to group accomplishment since one tenet in TQM is to use quality raw material to make a quality product. However, according to Weller and Hartley (1994), schools do not always have the luxury of obtaining quality raw materials to make their product of a successful student. Public schools must accept all students who come to their door. This problem can produce a less than successful student. When improved student achievement is the ultimate objective, the caliber of students i.e., their quality, becomes extremely important (Lezotte & Bancroft, 1985).

Several characteristics mentioned in research studies repeatedly that concern effective schools are (a) assessing teacher knowledge and instruction, (b) training staff, and (c) examining student test data in order to make academic decisions for students (Back & Monroe, 1985; Jansen, 1995; Potter, Reynolds, & Chapman, 2002). Schools that are effective do survive (D’Amico, 1982).

Examining student test data, which leads to the understanding of the knowledge base of students, aids teachers in determining the direction of their teaching. As Schmoker and Wilson (1993 b) point out, Deming considers data gathering important in the measuring procedures as well as the effects. Kaufman and Hirumi (1992) substantiate. Researchers define benchmarking as the ability to “validate objectives for...vital...performance [and these] measures...guide the organization” (Camp, 1995 in Maleyeff, 2003, p. 10). As Stupak (1999) asserts, “What gets measured, gets done” (p. 37...
432); or, as Schmoker and Wilson (1995) explain, “if you can measure the impact of process, or some aspect of it, you can improve it” (p. 62). Lezotte and McKe (2002) clarify benchmark testing as an instrument to measure student achievement. Chang and Dalziel (1993; 1999) in their books, Continuous Improvement in Education, Volume 1 and Volume 2, give and explain to educators many forms and formats to show visually, progress with classroom students using the TQM format. Andrade and Ryley (1992) used the TQM strategies and benchmark data to improve student writing skills in an elementary school in Colorado. Andrade, the principal, shows with more data from writing samples that the students are achieving at or close to grade-level learning. “Teachers test, regroup, teach, test, and regroup again” (p. 23).

Kaufman and Hirumi (1992) note Total Quality Management in Education collects and uses student data, shares this information with partners in the school to see gaps or breaks between where the student is and where the student should be, and follows the information for possible problems. Weller (1998) writes Total Quality Management in Education can accomplish higher student achievement in testing through the process of change in the school. Weller (1996) sees TQM in Education as a means to obtaining higher levels of excellence in school systems; these include higher student achievement, higher teacher self-confidence, higher efficient outlay of district money and resources.

Beaver (1994) thinks Total Quality Management in Education is helping to transform colleges that depend on students wanting to learn. TQM enables one to think of colleges as businesses as well as learning institutes. Colleges depend on students’ tuition to maintain and increase their business institutions as well as to pay the expenses
of running a college. TQM also sets quality standards for professors to maintain. Colleges using TQM set objectives and guidelines to direct their focus for the future of their students and faculty. They collect data to assess if the college is meeting its objectives as well as faculty training to help all involved understand and reach their goals.

Marchese (1993) indicates TQM in higher education require colleges to be customer focused, to have constant improvement, to manage by data, and to monitor their organization. This means that colleges need to be mindful of the students (customers) they teach. Schools with the student in mind need to keep improving by obtaining data and structuring their institution for quality improvement to help their students succeed in school.

Freeston (1992) describes the results of implementing TQM in the Newtown Connecticut Public Schools. An essential ingredient for implementation is a strong staff development that inspires a motivated staff to service the committed customer (student). Each student becomes an independent learner and internalizes the knowledge taught. Freeston states that TQM is not a passing strategy but one that is a long term, “continuous improvement” (p.13) for their school district, and the district realizes satisfying results from their students. Bonstingl (1992 b) and Stensaasen (1995) substantiate.

Schmoker and Wilson (1993 a) examined schools to ascertain if schools were implementing the principles they found in the Toyota plant, following Deming’s TQM model. Central Park East in East Harlem, New York achieves well on standardized tests. Mrs. Meier, the principal, believes in collaboration, supportive administrators that take an
active, non-threatening approach to leading faculty and students to do their best. Over ninety percent of Mrs. Meier’s students go to college from Central Park East. Another school district Schmoker and Wilson researched was the Comer School Development Program. James Comer includes all staff and parents in school decisions. He follows a more detailed plan, very similar to Deming’s Plan-Do-Check-Act. In one elementary school under Comer’s guidance, the faculty has seen achievement scores go from the 35th to the 98th percentile. Schmoker and Wilson state that using Deming’s TQM for education is not a quick remedy, and other schools should not expect to see major improvement in a shorter period than five years, even though in some schools, faculty morale many times does a drastic improvement, and test scores improve within a few years.

Weller (1998) states that Winder-Barrow High School in Georgia wanted to ensure its students’ achievement on state tests. The principal and faculty decided to start an intervention program that included developing, tracking, and maintaining improvement for students and faculty. Teachers examined students, their likes and dislikes, to design a program that would capture their high schoolers at their best. Testing became a morning activity when students were freshest. Teachers measured their progress. The faculty realized that their plan needed to be long term. Teachers did not want short-term results but long term valid improvement. Teachers decided that teaching the test was teaching the state-required curriculum. They also found that the state tests were following Barrow County objectives. With this discovery, teachers aligned their lesson plans to agree with the objectives and then to their curriculum for their students to
achieve on the state-mandated test. Student test results improved. Their future plans are to continue to work in teams, participate in relevant staff development, use student assessment data as well as student interest to improve student achievement, and to continue to align teacher lesson plans to objectives and thus to state curriculum (Weller, 1998).

Heverly and Fitt (1994) describe an intervention program that promotes classroom achievement, continuous quality improvement (CQI). The components of this program are that the “quality of student learning relates to the quality of classroom teaching” (p. 217); the teacher states goals and objectives, the teacher assesses student learning; and the teacher searches to improve the content knowledge. Heverly and Fitt continue this program is flexible and can be adapted to any classroom.

Simmons (2004) explains how a county of ninety schools followed the implementation program discussed in Davenport and Anderson’s book, Closing the Achievement Gap No Excuses (2002). Two schools in Gwinnett County gave a brief summary of the program, explaining how this program has promoted academic growth in its students, made the faculty work more closely together, and closed the achievement gap between different sub-groupings on the state-mandated test. Olson (2005) documents that twenty-two school systems in the country, including Gwinnett County, have joined a voluntary pilot education group, Educational Benchmarking Network, to exchange information on what is working to close the gap in student achievement. This program did not give a start date and is only accessible to certain data collectors at county offices.
Cramer (1996) advises educators must attentively decide if education needs to change from its long-established design to one of quality. If one prefers change, one must examine these long-established beliefs of education. The solution is to demand a research-based intervention program with results that one can verify (ED.gov 2002, July 15 b). Davis, Jr. (2003) substantiates. Another government document (ED.gov 2003, August 1) emphasizes that programs need to give evidence of “scientifically based research” (p. 1).

Newton (2004) underscores an intervention program based on Davenport and Anderson’s book, Closing the Achievement Gap No Excuses (2002) has brought improved test scores to Penn-Harris-Madison School Corporation, Indiana. The school board told Markavitch, the superintendent, “Find a way to improve the achievement of this district, close the gap between the achievers and non-achievers, and provide enrichment opportunities for those who show proficiency” (p. 105). Markavitch turned to inventive educators, Lezotte, Schmoker, and Reeves, who in turn introduced her to Gerald Anderson. After a year of examining programs, Markavitch decided that, for her district of 10,000 students, she would revise Anderson’s Plan-Do-Check-Act (PDCA) intervention program based on Edward Deming’s Total Quality Management. Markavitch called her program the “focused instruction initiative” (p. 106). This program uses disaggregation of scores, timeline, instruction, assessment, tutorial, enrichment, maintenance, and monitoring. This program, according to one school principal, raised staff dedication and student scores.

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Davenport and Anderson (2002) in their book, *Closing the Achievement Gap No Excuses* examined The Brazosport Independent School District in Texas using a re-designed intervention program based on Deming’s Total Quality Management in Business. The district superintendent and his core staff participated in a W. Edwards Deming’s training session to enable the team to use Deming’s approach to promote student achievement in the Brazosport school system. The superintendent simplified Deming’s plan into an Instruction Cycle (“Plan-Do-Check-Act” p. 32), implemented staff development, designed lesson plans, and sought faculty support for a long range plan of improvement to help the customer (student) achieve. This district, composed of very academically able students as well as “economically disadvantaged students” (p. 18), committed itself to the standard that all students can learn and raised the standards for all students. As a result, all students in the district started showing heightened academic achievement in both mathematics and reading. Davenport and Anderson (2002) supported their research on Plan-Do-Check-Act by student data from state-required tests.

In June of 2002, Gwinnett County held an in-service to examine and use the book, *Continuous Quality Improvement methods in the classroom*. Each participant was given Gerald Anderson’s book, *Quality Tools: The Tools for Collaborative Decision Making* (n. d. a), and a large binder full of information, including a list describing Deming’s 14-point plan of Total Quality Management, a power-point slide presentation discussing the steps in CQI, a chart showing how CQI parallels best practices and the effective school movement, charts showing data from Brazosport Independent School District, and charts showing data from testing for Gwinnett County and Kanocheda Elementary School. Also
included was “Transforming schools through Total Quality Education” (1993 a) where Schmoker and Wilson explained Deming’s strategies, Toyota’s success with TQM, success stories of TQM strategies used at Northview Elementary School, Johnson City Schools, Henry Levin ‘accelerated’ schools, Mt. Edgecumbe High School, and Amphitheater Public Schools. Schmoker and Wilson state, “We believe that Deming’s philosophy and methods best codify what the schools need most if they are to improve substantially” (p. 395). The participants at the in-service were to return to their individual schools to meet as a CQI Team to implement the strategies learned, model their learning to the whole faculty, and be the CQI data collectors for the faculty.

In June of 2003, Gwinnett County invited the authors of Closing the Achievement Gap No Excuses, Patricia Davenport and Gerald Anderson, to speak to select participants from different schools in the county. Their topic was from their paper, Closing the gap in student achievement, AKS continuous improvement model (2003, June). Again, the county gave a large binder to each participant explaining the CQI strategies, principal responsibilities, teacher responsibilities, data collection, and educational focus. This binder had short questions with space to write answers and labeled at the bottom of each page “Effective Schools Activities.” Each participant, sometimes the same ones that attended the year before, were to return to their schools to chair committees on CQI, collect data, and answer questions on the CQI process as well as being the faculty authority.

In June of 2004, Gerald Anderson returned to Gwinnett County to lead an in-service on Quality Tools, The Tools for Collaborative Decision Making; this program
explained the 8-Step Process of CQI. Dr. Anderson’s P-D-C-A Instruction Plan was now being called either the 8-Step Plan or Continuous Quality Improvement. Gwinnett County still called the intervention program CQI. Dr. Anderson brought the book, *8 Steps to Student Success an Educator’s Guide to Implementing Continuous Improvement K-12* by Barksdale (2003) for teachers to use as another reference for participants. It, too, had space for writing short answers to questions posed in Anderson’s workshop. Participants were to return to their schools to lead discussions, raise awareness of the CQI program, and act as the faculty authority.

**Summary**

Chapter 2 contains relevant literature on the basis for the need for accountability in schools for student achievement using data from state-mandated testing to meet the criteria for No Child Left Behind. Then, the chapter examines an intervention program to increase student achievement from its inception, major designers, tenets, changes, and adaptations in business (Total Quality Management). Edward Deming’s Total Quality Management changed from business to education, becoming Total Quality Management in Education into Plan-Do-Check-Act (PDCA Instructional Cycle) to become finally Continuous Quality Improvement (CQI).
CHAPTER III
METHODOLOGY

Introduction

This study examined two intervention programs using the Georgia state-mandated CRCT (Criterion-Referenced Competency Test) in 2002 as baseline data to determine if participation in one program or programs affected student achievement. The first intervention program, CQI (Continuous Quality Improvement) First or Year One, was implemented in the school year 2002-2003. The second program, CQI Second or Year Two, a revised and more in-depth modification of the first program, was implemented during the school year 2003-2004. Both intervention programs address student achievement in reading, language arts, and mathematics as measured by the Georgia Criterion-Referenced Competency Test. These two programs emphasize score disaggregation, teacher instruction, weekly assessments, as well as tutorial and enrichment classes on the academic concepts.

This chapter offers a description of the methodology used in this study. The following sections include a restatement of the purpose, research question, research design, hypotheses, participants of the study, testing instrument, and data collection procedures.

Purpose

The purpose of this study was to determine if there was an affect in student achievement scores in reading, language arts, and mathematics between the baseline and after student participation in CQI First or Year One (2002-2003). This study also sought
to determine if there was an affect in student achievement scores in reading, language arts, and mathematics between the baseline and after student participation in CQI First and CQI Second or Year One and Year Two (2002-2004). This study was based on the academic performance of the total number of students attending Kanoheda Elementary who took the Georgia Criterion-Referenced Test in 2002 (baseline), 2003 (end of Year One), and 2004 (end of Year Two).

Research Question

This study sought to answer the following research question: Does participation in CQI (Continuous Quality Improvement) First or CQI First and Second, affect the achievement of fifth grade students in reading, language arts, and mathematics?

Research Design

The research design of this study was a causal-comparative that explores the relationship between two sets of data. A causal-comparative design allows researchers to investigate cause-and-effect relationships among variables without actually performing an experiment. This type of design establishes two groups based on a single variable. In this research, the independent variable is the intervention program. If the results of the independent variable differ due to another variable, which is the dependent variable then a causal relationship connecting the two variables is hypothesized. The dependent variable in this study is student achievement. A cause and effect statement can be generated in experimental research, where in causal-comparison research, a cause and effect statement can not be firmly established (Borg, Gall, & Gall, 1993). With this in mind, this study examines the possible relationships of student achievement after
participation in the intervention programs, CQI First and CQI First and Second.

The fifth grade participants selected for this study were from the total population of students enrolled in the 2003-2004 school year at Kanoheda Elementary and who had attended this school from April 2002 to May 2004. Data gathered was the reading, language arts, and mathematics CRCT scores for 2002, 2003, and 2004.

The independent variable, or the cause, has already happened, which in this study is the intervention programs CQI First and CQI First and Second. The dependent variable, or the effect, is the achievement scores on the state-mandated test, the CRCT. Causal-comparative, or sometimes labeled as ex post facto research, examines the relationships that do not meet the requirements for a true experiment or have random assignments of participants from the population. This design is helpful when examining data between two or more variables (Gay & Airasian, 2003).

Hypotheses

Null hypothesis 1: There is no significant difference in student achievement in reading after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test.

Null hypothesis 2: There is no significant difference in student achievement in language arts after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test.

Null hypothesis 3: There is no significant difference in student achievement in mathematics after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test.
Null hypothesis 4: There is no significant difference in student achievement in reading after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test.

Null hypothesis 5: There is no significant difference in student achievement in language arts after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test.

Null hypothesis 6: There is no significant difference in student achievement in mathematics after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test.

Participants of the Study

According to the Governor’s Office of Student Achievement (2005), the statistics for the school year 2003-2004 for student enrollment at Kanoheda Elementary was 1,361 in grades K-5. The ethnicity of the students, using CRCT terminology, was 124 Asian, 554 Black, 446 Hispanic, 150 White, and 87 Multi-racial. Of the 1361 students, 707 were male, 654 were female. Additionally 183 students were reported with disabilities and 388 students were reported with limited English language. Of the total population, 863 students were considered “economically disadvantaged” (Governor’s Office of Student Achievement, 2005, p. 20) or 67% of the student population (Watlington, 2004-2005, p. 4). The certified staff consisted of 92 full time teachers, four part time teachers, three support teachers, three assistant principals, and one principal. Years of experience ranged from less than one year (nine teachers) to over thirty years (two teachers). Certificate levels ranged from fifty-three with a four-year Bachelor degree, forty-one with
a five-year Master degree, eight with a six-year Specialist degree, and one with a seven-year Doctoral degree. The staff was composed of one Asian, seventeen Black, three Hispanic, and eighty-two White (Governor’s Office of Student Achievement, 2005; Watlington, 2004-2005).

The participants of this study were the total population of fifth grade students attending Kanoheda Elementary School from April 2002 to May 2004. The difference in the population testing in third grade and the population of the study in fifth grade is the result of a highly mobile student population. A large percentage of these students live in the surrounding apartment complexes and housing projects, whereas a smaller number of students live in non-rental houses, thus the studied population total for this research is ninety-six students. Another reason for the difference in student numbers is this school underwent a redistricting within the county, which included losing approximately 400 students to a new elementary school. The remaining seventy-two students did not have all three CRCT scores required for comparison. These students were either missing their third grade (baseline) score, fourth grade (end of CQI First) score, or fifth grade (end of CQI First and Second) score.

Table 3 establishes the basis for the decline in the total fifth grade (2003-2004) student population as well as the number of students affected.
<table>
<thead>
<tr>
<th>Students attending Kanoheda 2002-2004</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # of students in 5th grade May 2004</td>
<td>168</td>
</tr>
<tr>
<td>Total # of students enrolled 10 months 2003-2004 - 5th grade</td>
<td>140</td>
</tr>
<tr>
<td>Total # of students enrolled 10 months 2002-2003 - 4th grade, and 10 months 2003-2004</td>
<td>119</td>
</tr>
<tr>
<td>Total # of students taking the CRCT in 2001-2002 - 3rd grade, and attending 10 months in 2002-2003 and 2003-2004</td>
<td>101</td>
</tr>
<tr>
<td>Total # of students taking the CRCT all three years in 2002-2004, 3rd-5th grade</td>
<td>96</td>
</tr>
</tbody>
</table>
Of the ninety-six students tested, fifty-six were males, forty were females. The
ethnicity of the ninety-six students, using the CRCT terminology, was thirty-nine Black,
twenty-seven Hispanic, fifteen Asian, eight White, and seven Multi-racial.

Testing Instrument

The Georgia mandated test used to report Adequate Yearly Progress, AYP, for No
Child Left Behind in student achievement is the Georgia CRCT (Criterion-Referenced
Competency Test). Schools across the state of Georgia use the CRCT to determine if a
school accomplishes AYP. Designed by Riverside Publishing, the GA CRCT (F. Linhart,
personal communication, November 5, 2004) is given in April of each year to elementary
school students in third, fourth, and fifth grades. An agent of the testing division of the
Georgia Department of Education states, “the validity of the CRCT is supported by the
alignment to Georgia’s QCC. That is, each item specifically relates to a standard in
Georgia’s Quality Core Curriculum, which bolsters the content validity” (S. Millicans,
personal communication, October 13, 2004). Millicans further states “As an indicator of
reliability, Cronbach’s alpha coefficient is …a measure of internal consistency reliability,
which indicates how well all the items in the test measure one single underlying ability.
The alpha value represents the estimated average correlation between all possible split
combinations of the test” (S. Millicans, personal communication, October 13, 2004). The
2002 third grade Cronbach alpha coefficient for reading is 0.91, for language arts is 0.91,
and for mathematics is 0.94 (S. Millicans, personal communication, October 13, 2004).

Data Collection Procedures

In an examination of the permanent records of one hundred sixty-eight fifth
graders, the researcher determined which students attended this elementary school from April 2002 to May 2004. Once the researcher determined the exact number of the affected population, she conducted a review and an analysis of the GA CRCT reading, language arts, and mathematics scores from the ninety-six fifth grade students attending school from April 2002 until May 2004. The statistics for the students in the third and fourth grade years are important to examine if the Year One intervention program affected student achievement in reading, language arts, and mathematics. The statistics for the students in the third and fifth grade years are important to examine if the Year One and Two intervention program affected student achievement in reading, language arts, and mathematics. The participants represent the different categories for No Child Left Behind. They also correspond to five of the six racial groups, male and female, special education, and English Speakers of Other Languages (ESOL).

Once the researcher examined the students’ permanent records, she made the decision not to test, question, or interview any student so that written permission from the parent and student would not be needed. In using only student data from students’ permanent records, the study will not need an Institutional Review Board (IRB). Liberty University IRB waiver is presented in Appendix A. An IRB waiver is not needed because “research that involves investigation of normal educational practices in educational setting is exempt... (also any) test...that is anonymous is exempt” (Anderson, n.d., b p. 10). Both of these statements are true for this research because only permanent records were examined. The two principals from Kanocheda Elementary school gave permission for the study. In addition, the researcher obtained permission to conduct the
research from the Research Department of the local school system. Supporting
documentation of permission is presented in Appendix A. This study reports data
anonymously from GA CRCT reading, language arts, and mathematics scores from 2002,
2003, and 2004. The individual scores used to statistically obtain the group scores are
identified by a numerical number from one to ninety-six. The data is in Appendix A.

Procedure

Students were tested in April 2002 (at the end of their third grade), April 2003 (at
the end of their fourth grade), and April 2004 (at the end of their fifth grade) using the
GA CRCT state-mandated test during regular class time as required under No Child Left
Behind. Teachers administer the CRCT test over five consecutive days, one day each for
reading, language arts, mathematics, science, and social studies. This study used only the
student test results from reading, language arts, and mathematics. Each subtest took
approximately 150 minutes to administer, which included a ten-minute break.

The study used the SPSS statistical package to analyze the CRCT test data from
reading, language arts, and mathematical skills for the population of ninety-six fifth grade
students. The study divides the data by years (2002, 2003, and 2004) and by academic
areas (reading, language arts, and mathematics). The researcher analyzed the data using
the paired t-test, sometimes identified as the t-test for dependent means, to compare the
CRCT scores for the same group of students, after they participated in CQI First and after
they participated in CQI First and Second. The t-tests will show the mean and statistical
significance of each set of data Year One (2002 and 2003) and Year One and Two (2002
and 2004) for each of the three academic areas of reading, language arts, and
mathematics. The study sets the level of significance (alpha) at .05, or 5 times out of a hundred, that the results could be by chance.

The causal-comparative study will explore the relationship between two sets of data Year One (2002-2003) as well as Year One and Two (2002-2004). This particular design is helpful when examining data between two or more variables (Gay & Airasian, 2003). This study used the SPSS statistical package to analyze the CRCT test data from reading, language arts, and mathematical skills for the population of ninety-six fifth grade students. The study divides the data by years (2002, 2003, and 2004) and by academic areas (reading, language arts, and mathematics). The researcher analyzed the data using the most common descriptive statistics as well as inferential statistics by using t-tests (Gay & Airasian, 2003). In this study, the researcher used the paired t-test, sometimes labeled as t-test for dependent means, to compare the CRCT scores for the ninety-six students who participated in Year One. The study then used the paired t-test to compare the CRCT scores for the ninety-six students who participated in Year One and Year Two. The t-test will show the mean scores of the dependent variable and report statistical significances of each set of groups Year One (2002 and 2003), and Year One and Year Two (2002 and 2004) for each of the three academic areas of reading, language arts, and mathematics. The study sets the level of significance (alpha) at .05, or five times out of a hundred, that the results could be by chance.

Summary

Chapter 3 contains a description of the methodology used in this study. This included a restatement of the purpose, research question, research design, hypotheses,
participants of the study, testing instrument, and data collection procedures.
CHAPTER IV
STATISTICAL ANALYSIS OF THE DATA

Introduction

This study examined two intervention programs using the Georgia state-mandated CRCT (Criterion-Referenced Competency Test) in 2002 as baseline data to determine if participation in one program or programs affected student achievement. The first intervention program, CQI (Continuous Quality Improvement) First or Year One, was implemented in the school year 2002-2003. The second program, CQI Second or Year Two, a revised and more in-depth modification of the first program, was implemented during the school year 2003-2004. Both intervention programs address student achievement in reading, language arts, and mathematics as measured by the Georgia Criterion-Referenced Competency Test. These two programs emphasize score disaggregation, teacher instruction, weekly assessments, as well as tutorial and enrichment classes on the academic concepts.

As stated in Chapter 1, this study examined the research question: Does participation in CQI First or CQI First and Second affect the achievement of fifth grade students in reading, language arts, and mathematics? This chapter presents the results of the paired t-tests, sometimes referred to as t-test for dependent means, which compares student achievement in reading, language arts, and mathematics for the ninety-six students who participated in CQI First (2002-2003) or CQI First and Second (2002-2004).
Source of the data

The permanent records of ninety-six fifth grade students were examined to obtain the Georgia Criterion-Referenced Competency Test (CRCT) data for reading, language arts, and mathematics for 2002 scores from the end of the third grade (baseline) to the corresponding 2003 scores from fourth grade (end of CQI First); and the Georgia Criterion-Referenced Competency Test data for reading, language arts, and mathematics for 2002 scores from the end of third grade (baseline) to the corresponding 2004 scores from the end of fifth grade (end of CQI First and CQI Second).

Descriptive and Inferential Statistics

The statistical data for: Null hypothesis 1: There is no significant difference in student achievement in reading after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test; Null hypothesis 2: There is no significant difference in student achievement in language arts after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test; Null hypothesis 3: There is no significant difference in student achievement in mathematics after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test.

In this study, the range of the scores for 2002 (baseline) was 134, 151, and 163 for reading, language arts, and mathematics respectively. The range of the scores for 2003, after Year One, was 225, 115, and 174 for reading, language arts, and mathematics respectively. Each of three paired t-tests was used to determine if there was a statistically significant difference in student achievement after student participation in CQI First. The descriptive statistics for the paired samples showed the following values for 2002 reading
(M = 332.69) (SD = 33.97), language arts (M = 324.75) (SD = 29.84), and mathematics (M = 322.50) (SD = 28.01). For the corresponding 2003 reading (M = 336.40) (SD = 46.30), language arts (M = 316.91) (SD = 26.52), and mathematics (M = 320.16) (SD = 32.43).

Table 4 shows the mean, standard deviation, and standard error of the mean for ninety-six students taking the Georgia Criterion-Referenced Competency Test in 2002 and 2003 in reading, language arts, and mathematics. These scores represent the baseline data at the end of the third grade year (2002) and after participation in CQI First at the end of the fourth grade year (2003).
Table 4

Paired Samples Statistics

<table>
<thead>
<tr>
<th>Paired Samples for Hypotheses One, Two, and Three</th>
<th>Mean</th>
<th>Number of Students in Study</th>
<th>Standard Deviation</th>
<th>Standard Error of the Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 2002 Reading</td>
<td>332.69</td>
<td>96</td>
<td>33.97</td>
<td>3.47</td>
</tr>
<tr>
<td>2003 Reading</td>
<td>336.40</td>
<td>96</td>
<td>46.30</td>
<td>4.73</td>
</tr>
<tr>
<td>Pair 2 2002 LArts</td>
<td>324.75</td>
<td>96</td>
<td>29.84</td>
<td>3.05</td>
</tr>
<tr>
<td>2003 LArts</td>
<td>316.91</td>
<td>96</td>
<td>26.52</td>
<td>2.71</td>
</tr>
<tr>
<td>Pair 3 2002 Math</td>
<td>322.50</td>
<td>96</td>
<td>28.01</td>
<td>2.86</td>
</tr>
<tr>
<td>2003 Math</td>
<td>320.16</td>
<td>96</td>
<td>32.43</td>
<td>3.31</td>
</tr>
</tbody>
</table>
The Pearson Correlation Coefficient is highest for the paired samples of 2002 language arts and 2003 language arts with $r = .850$, which is a very strong positive correlation. This equates to approximately 72% of the variance. “Variance indicates the amount of spread among test scores. If the variance is small, the scores are close together; if it is large, the scores are more spread out” (Gay & Airasian, 2003, p. 417). The table is in Appendix A.

The next set of data for hypotheses 1, 2, and 3 are in Table 5. The paired samples test is the difference between the pair of variables. The data in the 95% confidence interval of the difference should not contain zero, however if this happens, it supports the null hypothesis (Shannon & Davenport, 2001). For reading and math, the lower to the higher interval contains zero, and so this gives support to the null hypotheses, also the significance in the two tailed is above the alpha of .05. For reading $t(95) = -1.14$, $p > .05$ and for mathematics $t(95) = 1.17$, $p > .05$. The $t$ values are not at or above +1.986 or at or below -1.986 (Table of Cutoff Scores for the $t$ Distribution in Appendix A, Aron and Aron, 1999) for a two tailed test with 95 degrees of freedom at an alpha of .05. Therefore, for the paired 2002-2003 reading (Hypothesis 1) and the 2002-2003 mathematics (Hypothesis 3), the researcher accepts the null hypotheses. This is relevant for data supporting this type of intervention program for reading and mathematics, especially because the same type of intervention program format was used for language arts and it is statically significant.

For language arts the confidence interval does not contain zero, the significance of the 2-tailed test is .000 which is less than 1 in 1,000 ($p < .001$), and the $t(95) = 4.87$, 61
\( p < .05 \) is at or above +1.986 (Aron & Aron, 1999). The researcher rejects the null hypothesis. This paired t-test tells us that CQI First was statistically significant in language arts and not statistically significant in reading and mathematics for the fourth graders in 2002-2003.

Table 5 shows the statistics for the difference between the pairs which include the mean, standard deviation, standard error of the mean, confidence interval, t value, and significance for ninety-six students in this study taking the Georgia Criterion-Referenced Competency Test in 2002 and 2003. The 2003 data represent the student scores after participation in CQI First.
Table 5
Paired Samples Test

<table>
<thead>
<tr>
<th>Paired Samples for Hypotheses One, Two, and Three</th>
<th>Paired Differences</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Pair 1 2002 Reading-2003 Reading</td>
<td>-3.71</td>
<td>31.76</td>
</tr>
<tr>
<td>Pair 2 2002 LArts-2003 LArts</td>
<td>7.84</td>
<td>15.77</td>
</tr>
<tr>
<td>Pair 3 2002 Math-2003 Math</td>
<td>2.34</td>
<td>19.61</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Paired Samples for Hypotheses One, Two, and Three</th>
<th>t</th>
<th>df (t value)</th>
<th>df (degree of freedom)</th>
<th>Significance (2-tailed) p &lt; .001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 2002 Reading-2003 Reading</td>
<td>-1.14</td>
<td>95</td>
<td>.255</td>
<td></td>
</tr>
<tr>
<td>Pair 2 2002 LArts-2003 LArts</td>
<td>4.87</td>
<td>95</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Pair 3 2002 Math-2003 Math</td>
<td>1.17</td>
<td>95</td>
<td>.245</td>
<td></td>
</tr>
</tbody>
</table>
The statistical data for: Null hypothesis 4: There is no significant difference in student achievement in reading after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test; Null hypothesis 5: There is no significant difference in student achievement in language arts after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test; Null hypothesis 6: There is no significant difference in student achievement in mathematics after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test.

In this study, the range of the scores for 2002 (baseline) was 134, 151, and 163 for reading, language arts, and mathematics respectively. The range of the scores for 2004, after Year Two, was 190, 136, and 132 for reading, language arts, and mathematics respectively. Each of three paired t-tests was used to determine if there was a statistically significant difference in student achievement after student participation in CQI First and CQI Second. The descriptive statistics for the paired samples showed the following values for 2002 reading (M = 332.69) (SD = 33.97), language arts (M = 324.75) (SD = 29.84), and mathematics (M =322.50) (SD 28.01). For the corresponding 2004 reading (M = 339.34) (SD = 34.19), language arts (M =329.03) (SD = 26.09), and mathematics (M = 329.38) (SD = 23.80).

Table 6 shows the mean, standard deviation, and standard error of the mean for ninety-six students taking the Georgia Criterion Referenced Competency Test in 2002 and 2004 in reading, language arts, and mathematics. These scores represent the baseline data at the end of the third grade year (2002) and after participation in CQI First and CQI
Second, at the end of the fifth grade year (2004).
Table 6

Paired Samples Statistics

<table>
<thead>
<tr>
<th>Paired Samples for Hypotheses Four, Five, and Six</th>
<th>Mean</th>
<th>Number of Students in the study</th>
<th>Standard Deviation</th>
<th>Standard Error of the Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 2002 Reading</td>
<td>332.69</td>
<td>96</td>
<td>33.97</td>
<td>3.47</td>
</tr>
<tr>
<td>2004 Reading</td>
<td>339.34</td>
<td>96</td>
<td>34.19</td>
<td>3.49</td>
</tr>
<tr>
<td>Pair 1 2002 LArts</td>
<td>324.75</td>
<td>96</td>
<td>29.84</td>
<td>3.05</td>
</tr>
<tr>
<td>2004 LArts</td>
<td>329.03</td>
<td>96</td>
<td>26.09</td>
<td>2.66</td>
</tr>
<tr>
<td>Pair 3 2002 Math</td>
<td>322.50</td>
<td>96</td>
<td>28.01</td>
<td>2.86</td>
</tr>
<tr>
<td>2004 Math</td>
<td>329.38</td>
<td>96</td>
<td>23.80</td>
<td>2.43</td>
</tr>
</tbody>
</table>
The Pearson Correlation Coefficient is highest for the paired samples of 2002 language arts and 2004 language arts with $r = .797$, which is a very strong positive correlation. This equates to approximately 64% of the variance. “Variance indicates the amount of spread among test scores. If the variance is small, the scores are close together; if it is larger, the scores are more spread out” (Gay & Airasian, 2003, p. 417). The table is in Appendix A.

The next set of data for hypotheses 4, 5, and 6 are in Table 7. The paired samples test is the difference between the pair of variables. The data in the 95% confidence interval of the difference should not contain zero. When this happens, this supports the null hypothesis (Shannon & Davenport, 2001). For reading, language arts, and mathematics the confidence interval does not contain zero. The significance of the 2-tailed test for reading is .008, for language arts it is .023, and for mathematics it is .000, which are all less than alpha of .05. For reading $t(95) = -2.69$, $p < .05$, for language arts $t(95) = -2.31$, $p < .05$, and for mathematics $t(95) = -3.89$, all are at or above $+1.986$ or at or below $-1.986$ (Table of Cutoff Scores for t-Distribution in Appendix A, Aron and Aron, 1999) for a two tailed test with 95 degrees of freedom at an alpha of .05. The researcher rejects the null hypothesis. The three paired t tests implied that participation in both CQI First and CQI Second was statistically significant in reading, language arts, and mathematics for the fifth graders in 2002-2004.

Table 7 shows the statistics for the difference between the pairs which include the mean, standard deviation, standard error mean, confidence interval, t value, and significance for ninety-six students in this study taking the Georgia Criterion-Referenced
Competency Test in 2002 and 2004. The 2004 data represent the students score after participation during the school year of 2002-2003 in CQI First and after participation the school year 2003-2004 in CQI Second.
Table 7
Paired Samples Test

<table>
<thead>
<tr>
<th>Paired Samples</th>
<th>Paired Differences</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypotheses Four, Five, and Six</td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Standard Error of the Mean</td>
<td>95% Confidence Interval of the Difference</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Pair 1 2002 Reading-2004 Reading</td>
<td>-6.66</td>
<td>24.26</td>
<td>2.48</td>
<td>-11.57</td>
<td>-1.74</td>
</tr>
<tr>
<td>Pair 2 2002 LArts-2004 LArts</td>
<td>-4.28</td>
<td>18.18</td>
<td>1.86</td>
<td>-7.96</td>
<td>-0.60</td>
</tr>
<tr>
<td>Pair 3 2002 Math-2004 Math</td>
<td>-6.88</td>
<td>17.33</td>
<td>1.77</td>
<td>-10.39</td>
<td>-3.36</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Paired Samples</th>
<th>t (t value)</th>
<th>df (degree of freedom)</th>
<th>Significance (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypotheses Four, Five, and Six</td>
<td></td>
<td></td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>Pair 1 2002 Reading-2004 Reading</td>
<td>-2.69</td>
<td>95</td>
<td>.008</td>
</tr>
<tr>
<td>Pair 2 2002 LArts-2004 LArts</td>
<td>-2.31</td>
<td>95</td>
<td>.023</td>
</tr>
<tr>
<td>Pair 3 2002 Math-2004 Math</td>
<td>-3.89</td>
<td>95</td>
<td>.000</td>
</tr>
</tbody>
</table>

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Summary

Chapter 4 contains the source of the data and the statistical data from the paired t-tests comparing the student achievement in reading, language arts, and mathematics for the ninety-six students who participated in CQI First (2002-2003) or CQI First and CQI Second (2002-2004) at Kanoheda Elementary between the years of April 2002 and April 2004.
CHAPTER V

RESULTS AND FINDINGS,

CONCLUSIONS AND RECOMMENDATIONS

Introduction

This study examined two intervention programs using the Georgia state-mandated CRCT (Criterion-Referenced Competency Test) in 2002 as baseline data to determine if participation in one program or programs affected student achievement. The first intervention program, CQI (Continuous Quality Improvement) First or Year One, was implemented in the school year 2002-2003. The second program, CQI Second or Year Two, a revised and more in-depth modification of the first program, was implemented during the school year 2003-2004. Both intervention programs address student achievement in reading, language arts, and mathematics as measured by the Georgia Criterion-Referenced Competency Test. These two programs emphasize score disaggregation, teacher instruction, weekly assessments, as well as tutorial and enrichment classes on the academic concepts.

The purpose of this study was to determine if there was an affect in student achievement scores in reading, language arts, and mathematics between the baseline and after student participation in CQI First or Year One (2002-2003). This study also sought to determine if there was an affect in student achievement scores in reading, language arts, and mathematics between the baseline and after student participation in CQI First and CQI Second or Year One and Year Two (2002-2004). This study was based on the academic performance of the total number of students attending Kanoheda Elementary
who took the Georgia Criterion-Referenced Test in 2002 (baseline), 2003 (end of Year One), and 2004 (end of Year Two). This chapter will summarize the results and findings, offer conclusions and recommendations based on those findings.

Review of Methodology

As explained in Chapter 3, this study was a causal-comparative that explores the relationship between two sets of data. This study examines the possible relationship of student achievement after participation in the intervention programs CQI First and CQI First and Second. The independent variable, or the cause, has already happened, which in this study is the intervention programs CQI First and CQI First and Second. The dependent variable, or the effect, is the achievement scores on the state-mandated CRCT (Criterion-Referenced Competency Test) in reading, language arts, and mathematics. The ninety-six participants of this study were the total population of fifth grade students attending Kanoheda Elementary School from April 2002 to May 2004. The researcher analyzed the data using the most common descriptive statistics as well as inferential statistics by using t-tests (Gay & Airasian, 2003). The t-test shows the mean scores of the dependent variable and reports statistical significances of each set of groups CQI First baseline (2002) and end of CQI First (2003) and CQI First and Second baseline (2002) and end of CQI First and Second (2004) for each of the three academic areas of reading, language arts, and mathematics.

Summary of results

The results of the paired t-tests comparing the scores of the ninety-six students’ Georgia CRCT for 2002 (baseline) and 2003 (end of CQI First) showed a statistical
significant difference at the .05 level for one area, language arts but not for reading or mathematics. “Statistical tests for the null hypothesis are more conservative than they are for directional hypotheses…hypotheses are critical aspects…[as] they focus the study on the methods and strategies needed to collect data to test the hypotheses” (Gay & Airasian, 2003, p. 65). Gay & Airasian (2003) continue, “Analysis of data in causal-comparative studies involves a variety of descriptive and inferential statistics” (p. 343). Keeping this in mind, this study employed, “the most commonly used descriptive statistics [which] are the mean… and the standard deviation…[whereas] the most commonly used inferential statistics are the t-test, used to determine whether the means of two groups are significantly different from one another” (Gay & Airasian, 2003, p. 343). “The paired-samples t-test or dependent t-test is used…between two scores…[that] belong to the same group” (Shannon & Davenport, 2001, p. 253).

The results of the paired t-tests comparing the scores of ninety-six students’ Georgia CRCT for 2002 (baseline) and 2003 (end of CQI First) showed a statistically significant difference for language arts. Null hypotheses 1, 2, and 3: The paired samples test shows the difference between the pairs had statistical significance for language arts and no statistical significance for reading and mathematics. For language arts the 95% confidence does not include zero (Shannon & Davenport, 2001) and the two-tailed significance is less than .05, which means these results occur less than 1 in 100 times due to chance. For reading and mathematics, the 95% confidence interval includes zero and the two-tailed significance is above .05, which means these results occur more than 1 time in a 100 due to chance. Therefore, the researcher rejects the null hypotheses for
language arts and does not reject the null hypotheses for reading and mathematics.

Null hypothesis 1: There is no significant difference in student achievement in reading after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test. The researcher accepts the null hypotheses.

Null hypothesis 2: There is no significant difference in student achievement in language arts after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test. The researcher rejects the null hypotheses. Student participation in CQI First language arts showed statistical significance at the .001 level of significance, which is greater than the .05 level of significance this study set.

Null hypothesis 3: There is no significant difference in student achievement in mathematics after student participation in CQI First as shown by the GA Criterion-Referenced Competency Test. The researcher does not reject the null hypotheses.

The results of the paired t-tests comparing the scores of ninety-six students’ Georgia CRCT for 2002 (baseline) and 2004 (end of CQI First and CQI Second) showed a statistical significant difference at the .05 level for all areas. Null hypotheses 4, 5, and 6: The paired samples test shows the difference between the pairs had statistical significance for reading, language arts, and mathematics. These results are due to the 95% confidence interval of reading, language arts, and mathematics scores from lowest to highest do not include zero (Shannon & Davenport, 2001) and the two-tailed significance is less than .05, which means these results occur less than 1 in 100 times due to chance (Gay & Airasian, 2003). Therefore, the researcher rejects the null hypotheses for reading, language arts, and mathematics after participation in CQI First and CQI Second.
Null hypothesis 4: There is no significant difference in student achievement in reading after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test. The researcher rejects the null hypotheses for reading after participation in CQI First and CQI Second.

Null hypothesis 5: There is no significant difference in student achievement in language arts after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test. The researcher rejects the null hypotheses for language arts after participation in CQI First and CQI Second.

Null hypothesis 6: There is no significant difference in student achievement in mathematics after student participation in CQI First and CQI Second as shown by the GA Criterion-Referenced Competency Test. The researcher rejects the null hypotheses for mathematics after participation in CQI First and CQI Second.

Research Question

This study sought to answer the following research question: Does participation in CQI (Continuous Quality Improvement) First or CQI First and Second, affect the achievement of fifth grade students in reading, language arts, and mathematics? The results of the paired t-tests showed a strong relationship for students that participated in both CQI First and Second. The researcher rejected all four null hypotheses 2, 4, 5, and 6.

Summary of the findings

The researcher’s findings showed a strong correlation between the three sets of pairs (reading, language arts, and mathematics) for 2002-2003 (participation in CQI First)
and also for (reading, language arts, and mathematics) for 2002-2004 (participation in CQI First and Second). One reason for this strong correlation could be the structured approach of teaching the basics of reading, language arts, and mathematics in a mini-lesson format with a reinforcement lesson presented in a separate block period as well as following a regular academic routine of teaching these subjects during the regular day. Review and practice may have made the academic knowledge easier to remember for a longer period of time for the students. Another factor could be that with the transient quality of the students at this school, the teaching of basic knowledge, followed by constant review of reading, language arts, and mathematics encouraged a deeper retention of the knowledge for all the students that attended this school during CQI First and Second.

Considering CQI First and Second are based on research from the book, *Closing the Achievement Gap No Excuses* by Davenport and Anderson (2002) this gives additional evidence to the solution posed by No Child Left Behind to demand research based interventions with results that schools and the federal government can verify (ED.gov, 2002, July 15 b). The No Child Left Behind Act encourages schools to spend federal money to fund solutions to local problems in student achievement meaning school districts have more flexibility in the use of federal money as long as student achievement improves (ED.gov, 2002, July 15 a; ED.gov, 2002, July 15c). Programs need to give evidence of “scientifically based research” (ED.gov, 2003, August 1, p. 1). The research based program CQI First and Second match these requirements.

During CQI Second, the teachers tried to make the lessons more fun and
interesting by implementing a fast-paced learning experience for the students. This style of lessons could have encouraged a deeper, more meaningful learning experience that promoted a higher level of retention of the knowledge by the students. Since the second intervention program was more structured, routinely taught for a longer period of time, this could have encouraged better participation as well as better retention of the academic knowledge.

Sclafani (2002-03) states the objective of the state-required test is to measure to what degree students are learning. “If teachers cover subject matter required by the standards and teach it well, then student will master on which they will be tested—and probably much more” (ED.gov, 2003, June 1, p. 2). In the state of Georgia, the state-mandated test for elementary students is the Criterion-Reference Competency Test (CRCT) (GA Department of Education, n. d. b). A criterion reference test measures students’ achievement against a recognized criterion instead of aligned with other student achievement (Invernizzi, Landrum, Howell, & Warley, 2005). The literature asserts that when testing aligns with curriculum, and students view this as relevant and worth learning, better-quality learning will take place (Wicks, Peregoy, & Wheeler, 2001).

Limitations

The study will limit its findings in five ways. The first limitation is the researcher will test only one group from one elementary school. However, the one group consists of the total population of fifth graders attending the one elementary school over a two-year period. Gay and Airasian (2003) state that for populations around one hundred, a study should “survey the entire population” (p. 113). The second limitation is the researcher is
a fifth grade teacher at this elementary school. Ten of the ninety-six fifth grade students were in her class during the last year of this study. Another limitation is that the ninety-six students were divided between eight different fourth grade teachers and then re-grouped with eight different fifth grade teachers the following school year. The achievement of these students could be affected by different individual teaching styles among the sixteen teachers over the two-year period being examined. A fourth limitation is that the students are maturing, mentally as well as physically over this two-year period. Some students may mentally mature more rapidly than other students and this may account for an increase in their achievement scores from third grade to fourth and from third grade to fifth grade. A last limitation is that the state-mandated test for Georgia is not listed in the Mental Measurement Yearbook. This is due to the fact that it is designed and only used by the schools in Georgia. Riverside Publishing, one of the more reputable test design companies, designed the CRCT as a standard normed test, which makes it suitable for the purposes of this study.

Recommendations for Future Studies

The researcher recommends that an intervention program of this type should be implemented in the school systems that emphasize structured lessons, repetition, enrichment and tutorial components. Even though CQI First and CQI Second involved many hours of teacher preparation for structured lessons, teaching the content, grading the tests, re-dividing the students into smaller groups for enrichment or remedial activities, the students in the school years 2002-2003 and 2003-2004 showed academic
achievement and growth as reported on the GA CRCT. This program for one set of students showed achievement and according to the statistical significance can be generalized to a larger population of students. It can also be recommended that further research on the intervention program CQI be implemented to check the effectiveness of student achievement in reading, language arts, and mathematics in student populations in other elementary schools. Another recommendation would be to examine an elementary school with a similar high transient student population in terms of the total pass rate for all students on a state-mandated test in the academic areas of reading, language arts, and mathematics. An additional recommendation for further studies would be to examine an intervention program implementing an analysis of variance (ANOVA), whereas paired t-tests compare two related means. An ANOVA could compare data from multiple years without inducing the chance of an increasing error with multiply testing. Another recommendation would be to replicate this two-year study in another elementary school in this county or another county of similar demographics to add to the research base for this intervention program.

Conclusions

According to the results of this study, it can be cautiously concluded that an intervention program consisting of structured lessons with repeated practice (team time) in a more organized format may make the students more intrigued with their learning. In addition, lessons that are regularly taught, along with a regular teaching schedule of prescribed academics of reading, language arts, and mathematics may improve students retention of the academic knowledge. CQI First and Second used a structured ten to
fifteen minute mini-lesson daily in language arts and another in mathematics. During each week, two days were used to teach a structured language arts lesson for enrichment or tutorial for each student depending on assessment tests taken the preceding week. Another two days during the week, students were taught in the same structured format for mathematics. The last day encompassed two mini-tests and a review of the previous week’s academic work.
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APPENDIX A
Liberty University Institutional Review Board Waiver

IRB Waiver
Coffey, Peggy Garrett

You forwarded this message on 7/21/2005 9:05 PM.
Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

To: Milacci, Frederick A.
Cc: Carwile, Rebecca Francis
Attachments: [IRB Waiver - Peggy Coffey.doc (26KB)]

Dear Dr. Milacci: I am attaching a letter to ask for an IRB waiver to use anonymous test scores for 96 fifth grade students. This data is to be used in my dissertation. Thank you for your help, Peggy Coffey

July 21, 2005

Dr. Fred Milacci
Liberty University
1971 University Blvd
Lynchburg, VA 24502

Dear Dr. Milacci:

I would like to apply for an IRB waiver for my dissertation, Continuous Quality Improvement: A Two-Year Analysis of One School’s Achievement During Initial Implementation. The researcher (Peggy Coffey) examined the permanent records of 168 fifth grade students to determine the number of fifth grade students attending Kanoheda Elementary school from April 2002 to May 2004. The population of fifth graders was determined to be 96 students. The researcher then examined the permanent records noting anonymously the scores for the GA CRCT (Criterion-Referenced Competency Test) for Reading, Language Arts, and Mathematics in the year of 2002, 2003, and 2004. These are the years the 96 fifth grade students were in third grade (2002), fourth grade (2003), and fifth grade (2004). The statistics for third, fourth, and fifth grade years for these students are important to examine if one intervention program resulted in higher student achievement or if there is greater growth in student achievement when a student attends both intervention programs. Once the researcher examined the students’ permanent records, she made the decision not to test, question, or interview any student so that no written permission from the parent and student would be needed. Kanoheda’s principal signed a release of these records for the researcher and Gwinnett County Public Schools.

The researcher is requesting an IRB waiver because this “research involves investigation of normal educational practices in an normal education setting is exempt... (also any) test... that is anonymous is exempt” (Anderson, class notes for EDUC 708, Graduate Center for Research and Evaluation, Retrieved July 21, 2005 from http://www.liberty.edu/academics/graduate/index.cfm?PID=7217)

Thank you for your help and reply to this request.

Peggy Coffey
Liberty University Ed D Student
pgcoffey@liberty.edu

cc: Dr. Rebecca Carwile, dissertation chair
Hi Peggy

Good letter. Yes, you do not need IRB approval for your study. Thanks for submitting it, though.

Best wishes on your study!

Cheers!
Dr Milacci
Fred Milacci, D. Ed
Director, Graduate Center for Research & Evaluation
Liberty University
(434) 592-4043
GCRE@liberty.edu
http://www.liberty.edu/Academics/Graduate/index.cfm?PID=7103

From: Coffey, Peggy Garrett
Sent: Thursday, July 21, 2005 9:01 PM
To: Milacci, Frederick A.
Cc: Carwile, Rebecca Francis
Subject: IRB Waiver

Dear Dr. Milacci: I am attaching a letter to ask for an IRB waiver to use anonymous test scores for 5th grade...
Permission from Gwinnett County

---

From: Colin Martin on 04-04-2003 10:18 AM
To: Peggy Coffey/Kanoheda Elementary/GCPS@GCPS
cc: 

Subject: Research approval procedures

Here is the information and forms you need, Peggy. Let me know if you need any help. Good luck with your project.

Colin

--- Forwarded by Colin Martin/Organizational Advancement/GCPS on 04/04/03 10:16 AM ---

Colin Martin

To: Leadership Development I, Leadership Development II
cc: Pat Bridwell
Subject: Research approval procedures

Division of Organizational Advancement
Office of Research and Accountability

This is a reminder that external research studies in the Gwinnett County Public Schools should be approved before any data collection begins (Policy ICC). There are three types of research studies. Please use the following table as a guide to the approval process for each type.

<table>
<thead>
<tr>
<th>Type of Study</th>
<th>Approval Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>(External Research)</td>
<td>• Complete the Local School Research Request form</td>
</tr>
</tbody>
</table>
| • The researcher is a GCPS employee, AND the research participants and data collection will be limited to the researcher/employee's own school only. | Local School Research Request Form.xml
|                                      | • Obtain principal’s signature of approval on the completed form                 |
|                                      | • Send a photocopy of the completed, approved form to Colin Martin, 52 Gwinnett Drive, or fax to 770-513-6668. |
|                                      | Note: The Principal approves Local School Research Requests; the copy delivered to Colin Martin is for documentation and file purposes only. |
| (External Research)                  | • Prepare research proposal according to the following format (the same format is attached) |
| • The researcher is NOT a GCPS employee, |                                                                                  |
The researcher is a GCPS employee who proposes to collect data at other GCPS schools beyond his/her own school. (Internal Research)

- The researcher is a GCPS employee and the research is conducted for the purpose of fulfilling job requirements (not for any outside purpose of meeting degree requirements, publishing, etc.).

Whenever you have a question about a research concern, please contact me via Lotus Notes, or call me at 770-277-4505 or 770-513-6628. Thank you for your help.

Colin Martin, Ph.D., Director of Research and Accountability
Colin_Martin@Gwinnett.K12.GA.US
Phone 770-513-6628; Fax 770-513-6666
Secretary: Pat Bridwell 770-277-4505
Gwinnett County Public Schools
P.O. Box 343
52 Gwinnett Drive
Lawrenceville, GA 30046

<table>
<thead>
<tr>
<th>OR</th>
<th>as both a Lotus WordPro file and as a Rich Text File</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Proposal Format.lwp Proposal Format-RTF.rtf</td>
</tr>
</tbody>
</table>

- Submit proposal as indicated on the proposal format

**Note:** Both the Research Committee and Educational Leadership Team approve these research proposals, but principals and staff members may decline to participate.

- Routine coordination with supervisor regarding job responsibilities and assignments.
- No need for completion of any forms for approval.
Permission for the Study – Mrs. Dressel

GWINNETT COUNTY PUBLIC SCHOOLS
LOCAL SCHOOL RESEARCH REQUEST FORM

Date: 4/4/03

NAME OF SCHOOL: Kanoheda Elementary
NAME OF RESEARCHER: Peggy G. Coffey
POSITION OR GRADE: 5th Grade Teacher at Kanoheda Elementary

A. Research Project
   a. Title: Is the C.Q.I. and/or SuccessMaker programs improving students Language Arts and Mathematics Achievement in fifth grade?
   b. Statement of Problem: Examining fifth grade data from C.Q.I., SuccessMaker, Fifth grade teacher assessment results, along with ethnic, gender, length in a Gwinnett Cty school, and length at Kanoheda for correlation of program to student achievement.
   c. Subjects or population for the study: Fifth grade students at Kanoheda Elementary.
   d. Researcher’s purpose in conducting the study: Researcher’s interest in fifth achievement, graduate school research, and dissertation topic.
   e. Dates research will be conducted: The school year of 2002-2003.

B. All research and researchers must:
   a. Protect the rights and welfare of all human subjects.
   b. Inform students and/or parents that they have the right not to participate in the study.
   c. Adhere to board policies and applicable laws which govern the privacy and confidentiality of students records.

C. This request applies to research conducted within and by local school personnel. All other research requests must be submitted to the Research Department.

D. After approval by the principal, please forward a copy of this completed form to:

   Via GCPS Courier: Colin Martin
   Research Office
   52 Gwinnett Drive

   Via US Mail:
   Dr. Colin Martin, Director
   Research and Accountability
   Gwinnett County Public Schools
   P.O. Box 343
   Lawrenceville, GA 30046

   Via Fax:
   Colin Martin
   770-513-6666

4/4/2003
Date of Approval

Principal’s Signature
GWINNETT COUNTY PUBLIC SCHOOLS
LOCAL SCHOOL RESEARCH REQUEST FORM

Date: 4/4/03 revised 5/23/03

NAME OF SCHOOL: Kanoheda Elementary

NAME OF RESEARCHER: Peggy G. Coffey

POSITION OR GRADE: 5th Grade Teacher at Kanoheda Elementary

A. Research Project

a. Title: Is the C.O.I. and/or SuccessMaker programs improving students Language Arts and Mathematics Achievement in fifth grade?

b. Statement of Problem: Examining fifth grade data from C.O.I., SuccessMaker, teacher assessment results, Otis Lennon scores, Gateway Writing, CRCT, 4th grade Gateway, aggregated data from tests along with ethnic, gender, age, family groupings, length in a Gwinnett Cty school, and length at Kanoheda for correlation of programs to student achievement.

c. Subjects or population for the study: Fifth grade students at Kanoheda Elementary.

d. Researcher's purpose in conducting the study: Researcher's interest in fifth achievement, graduate school research, and dissertation topic.

e. Dates research will be conducted: The school year of 2002-2003.

B. All research and researchers must:

a. Protect the rights and welfare of all human subjects.

b. Inform students and/or parents that they have the right not to participate in the study.

c. Adhere to board policies and applicable laws which govern the privacy and confidentiality of students records.

C. This request applies to research conducted within and by local school personnel. All other research requests must be submitted to the Research Department.

D. After approval by the principal, please forward a copy of this completed form to:

Via GCPS Courier: Colin Martin
Research Office
52 Gwinnett Drive
Via US Mail: Dr. Colin Martin, Director
Research and Accountability
Gwinnett County Public Schools
P.O. Box 343
Lawrenceville, GA 30046
Via Fax: Colin Martin
770-513-6666

5/23/03
Date of Approval

Suzanne Dressel
Principal's Signature

105
GWINNETT COUNTY PUBLIC SCHOOLS
LOCAL SCHOOL RESEARCH REQUEST FORM

Date: 4/21/04

NAME OF SCHOOL: Kanoheda Elementary
NAME OF RESEARCHER: Peggy G. Coffey
POSITION OR GRADE: 5th Grade Teacher at Kanoheda Elementary

A. Research Project
   a. Title: Is the C.Q.I. and/or SuccessMaker programs improving students Language Arts and Mathematics Achievement in fifth grade?
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<td>Colin Martin</td>
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<td>Research and Accountability</td>
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Date of Approval

Principal’s Signature

106
NAME OF SCHOOL: Kanoheda Elementary
NAME OF RESEARCHER: Peggy G. Coffey
POSITION OR GRADE: 5th Grade Teacher at Kanoheda Elementary

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Date of Approval: 5/10/04
Principal's Signature: [Signature]
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Table 9 shows the Pearson Correlation Coefficient and significance for ninety-six students’ paired reading, language arts, and mathematics tests taken in April 2002 and April 2003.

Table 9

Paired Samples Correlations

<table>
<thead>
<tr>
<th>Paired Samples Correlations for Hypotheses One, Two, and Three</th>
<th>Number of Students in Study</th>
<th>Pearson Correlation Coefficient</th>
<th>Significance at p &lt; .001</th>
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</table>
Table 10 shows the Pearson Correlation Coefficient and significance for ninety-six students’ paired reading, language arts, and mathematics tests taken in April 2002 and April 2004.

Table 10

Paired Samples Correlations

<table>
<thead>
<tr>
<th>Paired Samples Correlation for Hypotheses Four, Five, and Six</th>
<th>Number of Students in the Study</th>
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<th>Significance at p &lt; .001</th>
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### TABLE B-2
Cutoff Scores for the t Distribution

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Aron and Aron (1999), p. 566 113
Introduction

CRCT sample items are provided for all mandated grades and content area to introduce examples of multiple-choice item formats that students will encounter on the mandated end-of-year assessments. A minimum of one sample item is provided for each content area (e.g., Reading, English/Language Arts, Mathematics, Science, and Social Studies), each content domain (i.e., groupings of similar content standards), and each grade level. It is important to note, however, that these sample items are not representative of the full range of knowledge and skills assessed on the CRCT. For more information about the content of the CRCT, see the CRCT Content Descriptions or Georgia's Quality Core Curriculum (QCC).
Dear Kirk,

How are you doing? I am fine. We are having a school musical. We are going to sing songs from all different cultures. We are singing an African folk tune and a Mexican fiesta song. My favorite is a Native American song. My classmate, Lainie, taught it to us. She is Native American and her grandmother taught it to her. The music teacher liked it so much that he included the song in the musical. The song has a fun rhythm and we get to clap while we sing it. I hope you can come to the musical. You will like all the different songs. Please write back soon.

Your friend,

Miguel

1. This passage is an example of
   A. a story.
   B. a report.
   C. a letter.
   D. a poem.

2. The author wants to invite someone
   A. to a friend’s house.
   B. to a school musical.
   C. to a school play.
   D. to a Mexican fiesta.

3. What is the main idea of this passage?
   A. Kirk and Miguel live in different towns.
   B. Lainie’s grandmother taught her a very special song.
   C. African folk tunes and Mexican fiesta songs are two different types of songs.
   D. Miguel’s school is having a musical that has songs from different cultures.
4. The music teacher liked the Native American song so much that he
A. taught it to Lainie and Miguel.
B. taught it to Lainie’s grandmother.
C. included grandmother in the musical.
D. included it in the school musical.

5. Based on the passage, Miguel most likely
A. has been to a Mexican fiesta.
B. is Native American.
C. would like to receive a letter from Kirk.
D. dislikes singing in musicals.

6. Which word belongs with these words?

| chair | table | bed |

A. sofa  
B. sink  
C. window  
D. door

You do not need to refer to this passage to answer question 6.
1. What is the purpose of the sentence below?

What a huge slice of cake you gave me!

A. to make a statement  
B. to ask a question  
C. to make a request  
D. to show excitement

2. In the sentence below, which word is the subject of the sentence?

Pete did his homework.

A. his  
B. did  
C. Pete  
D. homework

3. What verb BEST completes the sentence?

The cat ___ fluffy.

A. are  
B. is  
C. were  
D. am

Use the paragraph below to answer question 4.

My cat’s name is Shadow.  
Shadow is a very fussy cat. My friend has a cat named Spunky. Shadow only eats tuna fish and chicken.

4. Which sentence does NOT belong in the paragraph above?

A. sentence I  
B. sentence 2  
C. sentence 3  
D. sentence 4

5. What is the verb in the sentence below?

Goats eat anything and everything.

A. eat  
B. goats  
C. everything  
D. and

6. Gwendolyn is reading her social studies book. She found a word that she does not understand. Where should Gwendolyn look to find the meaning?

A. the title page  
B. the table of contents  
C. the index  
D. the glossary

Question #1 Answer: D; Domain: Sentence Construction & Revision  
Question #2 Answer: C; Domain: Sentence Construction & Revision  
Question #3 Answer: B; Domain: Grammar & Mechanics  
Question #4 Answer: C; Domain: Content & Organization  
Question #5 Answer: A; Domain: Grammar & Mechanics  
Question #6 Answer: D; Domain: Research Process
1. Which digit is in the hundreds place in 7,365?
   A. 3
   B. 5
   C. 6
   D. 7

2. A pencil is about 20 ____ long?
   A. millimeters
   B. centimeters
   C. kilometers
   D. meters

3. What number is missing from the table below?
   \[
   \begin{array}{cc}
   9 & 17 \\
   3 & 11 \\
   7 & \ \\
   4 & 12 \\
   \end{array}
   \]
   A. 7
   B. 8
   C. 15
   D. 28

4. Which toy is in box 1 on shelf B?
   A. 🔴
   B. 🎲
   C. 🎧
   D. 🏀
Mathematics
Grade 3
Sample CRCT Items

5. Nam read 11 books in the first grade, 16 books in the second grade, and 18 books in the third grade. Estimate how many books Nam has read.

A. 10
B. 30
C. 50
D. 70

6. Which is a word problem for the number sentence?

\[ 8 + 6 = \]

A. Jon baked 8 pies and gave 6 of them away. How many pies does he have left?
B. Theresa has 8 fish bowls. She has 6 fish in each bowl. How many fish are there in all?
C. Mai found 8 plants. She counted 6 flowers on each. How many flowers did she count?
D. Leon put 8 pennies and 6 dimes in his empty bank. How many coins does he now have in his bank?

Question #1 Answer: A; Domain: Number Sense & Numeration
Question #2 Answer: B; Domain: Geometry & Measurement
Question #3 Answer: C; Domain: Patterns & Relationships/Algebra
Question #4 Answer: D; Domain: Statistics & Probability
Question #5 Answer: C; Domain: Computation & Estimation
Question #6 Answer: D; Domain: Problem Solving
Papa Freddie's Pita Pizza Dip
(shhhhhhh...it's a secret recipe!)

You will need:
- 1 package of cream cheese
- 3 cups of red tomato sauce (pizza sauce)
- 1 pound of shredded mozzarella cheese
- 1 bag of pita bread (about 10 pieces)
- Two 9 x 13-inch baking pans
- One large spoon
- One large bowl

Preparation:
Preheat the oven to 400 degrees. (As Papa Freddie always says, have a grownup help you with the oven!)

- Using a big spoon, spread the cream cheese on the bottom of the large baking pan. Make a nice, even layer.
- Spread the tomato sauce on top of the cream cheese, making an even layer.
- Sprinkle the mozzarella cheese on top of the tomato sauce. Cover all areas!
- Cook the dip in the oven for about fifteen minutes, or until the mozzarella cheese is melting and the sauce is bubbling. Let the dip cool for about five minutes before serving.
- Place the pieces of pita bread in a large pan. Heat the bread in the oven for about five minutes, or until it is crispy and warm!

To serve:
Place the pita bread in a large bowl. Simply dip the bread in the cream cheese and pizza sauce!

And most importantly, as Papa Freddie says, “Enjoy!”
**Reading**  
**Grade 4**  
**Sample CRCT Items**

1. What is the author’s purpose for writing this passage?  
   A. to give information  
   B. to argue a point  
   C. to entertain readers  
   D. to explain an idea

2. To make the pizza dip, you will need all of these EXCEPT  
   A. a large bowl  
   B. a baking pan  
   C. a big spoon  
   D. a sharp knife

3. What does the recipe say to do AFTER you put on the tomato sauce?  
   A. let the dip cool off  
   B. spread the cream cheese evenly  
   C. put the mozzarella cheese on top  
   D. preheat the oven

4. Which of the following pairs contains synonyms?  
   A. container and environment  
   B. neighborhood and community  
   C. conserve and resources  
   D. reused and operator

---

Question #1 Answer: A; Domain: Critical Analysis  
Question #2 Answer: D; Domain: Locating & Recalling Information  
Question #3 Answer: C; Domain: Reading for Meaning  
Question #4 Answer: B; Domain: Vocabulary Improvement
Directions: The sentence below has a spelling error. Fill in the circle on your answer sheet for the letter of the word that is NOT spelled correctly.

1. The **army**/ followed the train/ home.
   A  B  C  D

2. What is the compound subject in the sentence below?
   Where did Tyler and Samantha go after the movie last Saturday?
   A  Where did
   B  did go
   C  Tyler and Samantha
   D  after the movie

Use the information below to answer question 3.

Carmen began her paragraph with the following topic sentence: *The Midwest region of the United States is made up of many states.*

3. Which supporting detail describes Carmen’s topic sentence?
   A  The United States is a country.
   B  Michigan is one example.
   C  The Southern region is made up of many states also.
   D  There are fifty states.

4. A comma is needed in the sentence below. Where should it be added?
   The new history teacher comes from Montgomery Alabama.
   A  after history
   B  after teacher
   C  after comes
   D  after Montgomery

5. Peter is looking up information about motorcycles. In what part of his book would he most likely find out what *clutch* means?
   A  the index
   B  the glossary
   C  the title page
   D  the table of contents

6. How can the capitalization be corrected in the sentence below?
   Jeff shouted, *"who wants to go for pizza?"*
   A  put a capital *S* in shouted
   B  put a capital *W* in who
   C  put a capital *W* in wants
   D  put a capital *P* in pizza
Fourth Grade Mathematics CRCT Items

www.doe.k12.ga.us/_documents/curriculum/testing/g4-math-sams.pdf

Retrieved 10/07/2005

Mathematics
Grade 4
Sample CRCT Items

1 If the pattern below continues, how many dots will be in the next figure?

A 18
B 16
C 14
D 12

3 Round 6,447 to the nearest thousand.
A 7,000
B 6,450
C 6,400
D 6,000

4 Which number is the median?

\{21, 6, 19, 11, 10\}
A 6
B 10
C 11
D 19

5 If you change the digit 6 to a 9 in the number 56,907, what will be the difference?
A three hundred
B nine hundred
C one thousand
D three thousand

6 Fay picked apples in the orchard. She picked 45 apples on Monday, 57 on Tuesday, and 39 on Wednesday. How many apples did she pick in all?
A 84
B 92
C 102
D 141

Question #1 Answer: B; Domain: Patterns & Relationships/Algebra
Question #2 Answer: C; Domain: Geometry & Measurement
Question #3 Answer: D; Domain: Computation & Estimation
Question #4 Answer: C; Domain: Statistics & Probability
Question #5 Answer: D; Domain: Number Sense & Numeration
Question #6 Answer: D; Domain: Problem Solving
Reading
Grade 5
Sample CRCT Items

The Shopping Trip

Characters:
Dad
Matt, a ten-year-old boy
Chris, Matt's eight-year-old sister

Scene 1
[The snack aisle of a grocery store. Dad, Matt and Chris are looking at soft drinks and snacks.]

Dad: What do you want for snacks this week? Chips? Crackers? Candy?
Chris: We haven't tried these Cheese Treats yet. And look at this new kind of pop—Fizzy Fruit. It says it has five percent juice. Should we try it, Matt?
Matt: To tell you the truth, Chris, I'm really tired of that stuff. Now that I am trying out for the junior track team, I'm starting to pay attention to what athletes eat. Cheese Treats aren't real cheese, just a fatty snack with cheese flavoring sprayed on. And sure, Fizzy Fruit has five percent juice, but the other ninety-five percent is just like regular pop—sugar water, artificial flavoring, and fizz. Sometimes I feel like those people who make snacks are trying to fool us.

Chris: What do you mean, trying to fool us?
Matt: Oh, they put a healthy name like "cheese" or "fruit" on their product, but they don't put healthy things in their product. You have to look very closely to see what is really in what you're eating.

Dad: Matt, you seem to know a lot about food suddenly. Where did all this knowledge come from?
Matt: Well, I got interested when the coach started talking about good nutrition as a way to become a better athlete. So I got some books from the library, and started paying attention to the nutrition articles in the newspaper and magazines. But some really useful information is on the labels right on the packages. You can find out how much fat and salt is in a product just by checking the label.

Chris: Does this mean that you don't like snack food anymore? Are you going to quit eating it always? I thought you loved this stuff.
Matt: Oh, I still like it, and I'll probably have pop at parties and eat chips and other snacks every so often. I just don't think it's smart to eat it all the time.

Dad: Well, I'm glad you're thinking about what you eat. But that still leaves us with a problem—what should we have for you to snack on at the house?

Scene 2
[The produce section of the same grocery store.]
Matt: I think that we can find something good here!
Dad: We certainly have a lot of things to choose from. Should we go for fruits or vegetables?
Matt: I want to have some salads for lunch, so let's get lettuce, tomatoes, cucumbers, celery, and sprouts. And these baby carrots and some cut-up broccoli make good snacks.
Chris: Well, I really like apples, grapes, and peaches. Can we get some of those?
Matt: I can't believe you said that, Mrs. Cheesee Treats and Fizzy Fruit!
Chris: Hey, I want to try out for junior track in a few years, too. I'm just going to start getting ready now!

[All laugh]

1. In the beginning of the passage, what does Dad seem to think the children will want to buy?
A. chips, crackers, or candy
B. Cheesee Treats and Fizzy Fruit
C. apples, grapes, and peaches
D. baby carrots and broccoli

2. This passage can BEST be described as
A. an essay.
B. a drama.
C. nonfiction.
D. a folk tale.

3. Why does Matt call Chris "Mrs. Cheesee Treats and Fizzy Fruit"?
A. because Chris makes those items
B. because Chris is buying those items
C. because Matt wants Chris to buy those items
D. because Matt is surprised Chris wants something else

4. Which food are Matt and Chris most likely to have for snacks from now on?
A. chips
B. fruit
C. crackers
D. candy

5. Matt used three sources to learn about nutrition. Which of the following was NOT used?
A. newspapers
B. magazines
C. books
D. television

6. Which word contains a prefix that means wrongly?
A. immediately
B. approximately
C. malfunctioned
D. unfortunate
1. Which word describes the doctor in the sentence below?
   The knowledgeable doctor quickly gave his professional diagnosis to the sick patient.
   A. quickly  
   B. knowledgeable  
   C. professional  
   D. sick

2. Which BEST combines the sentences below into one sentence?
   The boy ate his dinner. Then he went outside to play ball.
   A. Although the boy wanted to go outside and play, he ate his dinner.
   B. After the boy ate his dinner, he went outside to play ball.
   C. After the boy went outside to play ball, he ate his dinner.
   D. Eating his dinner, the boy went outside to play ball.

3. Which word can take the place of the underlined word in the sentence below?
   Where are the children's toys?
   A. they  
   B. my  
   C. them  
   D. their

4. Use the paragraph below to answer question 4.
   Fruit cobbler is an easy and tasty dessert.  
   First, choose a favorite fruit.  
   Blueberries or peaches work well.  
   Second, mix the fruit with sugar, some flour, and a little lemon juice.  
   Add a little cinnamon for extra spice.  
   Third, make a batch of biscuit dough according to directions on the box of packaged biscuit mix.  
   Drop spoonfuls of the dough onto the fruit.  
   Bake until the fruit is bubbly and the biscuit topping is golden brown.

   Use the paragraph below to answer question 4.

   1. Fruit cobbler is an easy and tasty dessert.  
   2. First, choose a favorite fruit.  
   3. Blueberries or peaches work well.  
   4. Second, mix the fruit with sugar, some flour, and a little lemon juice.  
   5. Add a little cinnamon for extra spice.  
   6. Third, make a batch of biscuit dough according to directions on the box of packaged biscuit mix.  
   7. Drop spoonfuls of the dough onto the fruit.  
   8. Bake until the fruit is bubbly and the biscuit topping is golden brown.

   4. Which sentence could be added to the end of the paragraph?
   A. Blackberries are another good choice of fruit.
   B. A pinch of nutmeg is a nice addition to the fruit.
   C. After the cobbler has cooled, it is ready to serve.
   D. Make sure the fruit is evenly covered with the dough.

5. Which one BEST fills in the blank in the sentence below?
   Adam’s sisters rode their _______ to the store to buy milk.
   A. bicycle  
   B. bicycle’s  
   C. bicycles  
   D. bicycles’
Use the paragraph below to answer question 6.

Mr. Chang's science class decided to plant a garden. The students planted the seeds and watered the garden. Each student brought a packet of seeds. In a few weeks, small sprouts were peeking through the soil.

6. How should the sentences in the paragraph above be organized?

A. 1, 3, 2, 4  
B. 1, 4, 3, 2  
C. 4, 1, 3, 2  
D. 3, 2, 1, 4

Use the dictionary entry below to answer question 3.

record 1. Information that is written down. 2. A description of performance or achievements. 3. The best performance known. 4. A disk to be played on a phonograph.

7. Which definition from the dictionary entry above BEST fits the meaning of the underlined word in the sentence below?

My teacher keeps of a record of the grades in the gradebook.

A. definition 1  
B. definition 2  
C. definition 3  
D. definition 4
1. Which of the following is NOT divisible by 2?
   A. 378
   B. 912
   C. 1,049
   D. 6,510

2. If Kerry went to the store and gave the clerk a $5 bill for a $2.36 total purchase, the change he received back could have been
   A. four pennies, six dimes, and two dollars.
   B. four pennies, seven dimes, and two dollars.
   C. four pennies, six dimes, and three dollars.
   D. a penny, seven dimes, and two dollars.

3. Which symbol belongs in the box?
   \[
   \frac{3}{12} \quad \square \quad \frac{1}{4}
   \]
   A. >
   B. <
   C. +
   D. =

4. Which flavor would a person be LEAST likely to get from the gumball machine?

<table>
<thead>
<tr>
<th>Flavor</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cherry</td>
<td>7</td>
</tr>
<tr>
<td>Grape</td>
<td>3</td>
</tr>
<tr>
<td>Mint</td>
<td>2</td>
</tr>
<tr>
<td>Orange</td>
<td>4</td>
</tr>
</tbody>
</table>

   A. cherry
   B. grape
   C. mint
   D. orange

5. If \(75 - 15 = 5\), then \(5 \times \square = 75\). What number belongs in the \(\square\)?
   A. 75
   B. 15
   C. 5
   D. 3

6. Jerry bought five cases of oil. He wants to know how many cans of oil he bought. What other information is needed?
   A. where the oil was purchased
   B. how many cans of oil were in each case
   C. how many cans of oil were needed
   D. how many trips were made to the store