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Evaluating the Achievement Outcomes of 5th-Grade Students Following Their Enrollment in Federally-Funded, Inquiry- Based Classrooms to Determine Program Sustainability

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by

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ABSTRACT

EVALUATING THE ACHIEVEMENT OUTCOMES OF 5TH-GRADE STUDENTS FOLLOWING THEIR ENROLLMENT IN FEDERALLY-FUNDED, INQUIRY-BASED CLASSROOMS TO DETERMINE PROGRAM SUSTAINABILITY

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The purpose of this study was to evaluate the achievement outcomes of 5th-grade students following their enrollment in federally funded inquiry-based classrooms compared to same school traditional education program students to determine the feasibility of inquiry-based program sustainability. The study analyzed achievement data of students in the inquiry-based Charter Education Program compared to achievement data of students in the Traditional Education Program to determine pretest-posttest achievement gain for students in both research arms and posttest-posttest intervention effectiveness. The inquiry-based Charter Education Program required students to utilize laptop computers rather than textbooks to research, analyze, write, and complete reports. The Traditional Education Program required students to utilize textbooks and other printed source material to research, analyze, write, and complete reports. Pretest-Posttest results

indicate that students who participated in the Charter Education Program (n = 11) significantly improved their Iowa Tests of Basic Skills, Spelling and Language Total Normal Curve Equivalent subtest scores while students who participated in the Traditional Education Program (n = 9) significantly improved their Iowa Tests of Basic Skills, Capitalization, Language Total, and Composite Normal Curve Equivalent subtest scores. The null hypothesis was not rejected for any of the Posttest-Posttest achievement inferential comparisons revealing statistical equipoise between the research arms. While the data and results of the study do not support the continuation of a separate charter program, inquiry-based learning activities could be considered worthwhile and beneficial to all students in the rural research school district. Moreover, the now routine use of computer-based, Internet, inquiry-based instruction may be sustained for all students without placing any additional financial stress on the school district.

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CHAPTER ONE

Introduction

Public schools in the United States have fallen subject to such a level of criticism during the last two decades that their condition has become a punch line in our popular culture as parodied in the long-running television show *The Simpsons*. In one episode when responding to the deplorable condition of Springfield Elementary School, Superintendent Chalmers said to Bart Simpson, “The way America's public schools are sliding, they'll all be this way in a few months. I say, lay back and enjoy it! It's a hell of a toboggan ride” (Oakley, Weinstein, & Anderson, 1994).

The American public is no longer satisfied with its public schools on the whole. They want improvement, and they want options for their children. Phi Delta Kappa, in conjunction with the Gallup Organization, has been polling the public opinion of the United States since 1974 on what it thinks of our nation’s public schools. In the most recent study released in October of 2007, 80 percent of the general public respondents when asked, “What grade would you give the public schools nationally?” expressed that U.S. schools deserve a grade from “C” to “failing.” At the same time, when asked “As you may know, charter schools

operate under a charter or contract that frees them from many of the state regulations imposed on public schools and permits them to operate independently. Do you favor or oppose the idea of charter schools?" sixty percent of those surveyed answered that they supported the concept of charter schools. This is up from 42 percent back in the year 2000. Meanwhile the same question indicated that during the same seven-year period, opposition to charter schools has fallen from 47 percent to only 35 percent (Rose & Gallup, 2007; Phi Delta Kappa, 2007).

Budde (1988) first introduced the concept of charter schools. Public awareness for the idea increased as it was promoted by former president of the American Federation of Teachers, Albert Shanker, in his weekly news column in the *New York Times* (Green & Mead, 2004). In 1991, Minnesota became the first state in the nation to enact legislation to create charter schools. During the next thirteen years, 40 states, the District of Columbia, and Puerto Rico also passed charter school legislation (Green & Mead, 2004).

Charter schools are gaining in popularity because they offer choice to families (Arsen, Plank, & Sykes, 1999). They stand in direct competition to public schools which some believe improves the quality of both charter schools as well as public schools (Bifulco & Ladd, 2006). One of

the original bases for charter schools is that they spark innovation. Freed from the laws and regulations that bind traditional schools, they are allowed to experiment with new instructional concepts and ways of serving students (Bifulco & Ladd, 2006; Nelson, Muir, & Drown, 2000). Finally, they are highly accountable by virtue of their charters. If charter schools fail to meet the standards set for them or fulfill their academic promises, they face closure with the revocation of their charters (Bifulco & Ladd, 2006; Green & Mead, 2004; U.S. Department of Education, 2002).

Responding to the public's outcry for more choice in education, Congress included funding in federal legislation to spur the start-up of charters. The No Child Left Behind Act of 2001 granted money to the states to establish new charter schools. It stated, "Funding will be provided to assist charter schools with start-up costs, facilities, and other needs associated with creating high quality schools" (NCLB, 2002, p. 10). In 2002 the Iowa Legislature passed state code that allowed public schools to create charter schools subject to the approval of the local school board. Then Governor Tom Vilsack signed Iowa's charter school law, Senate File 348, in April 2002. The law provided for pilot programs for up to ten charters, but provisions in the bill

stipulated that the law would be effective only after the state received funding under a federal grant for charter schools. In 2003, the state received a charter school grant from the federal government of $1.1 million (U.S. Department of Education, 2003). Sioux Central Community School District of Sioux Rapids, Iowa, was the first Iowa school district to be granted a charter and $400,000.00 start-up funding under this law.

Sioux Central Community School District, the research school district, is a small, rural public school system in Northwest Iowa, an area hit hard by declining enrollment. From its most recent peak of 696 students in 1993, the district had fallen to only 431 resident students by the fall of 2006--a loss of over a third of its student population. Declining enrollment is a pervasive problem to schools of rural America. Rural communities are experiencing the *graying*, or increase in percentage of the population of senior citizens, the exodus of young families with children to the cities in search of better opportunities, and the decline in rural birth rates (Schwartzbeck, 2003). School districts are typically funded on a per-pupil basis; however, as the number of pupils declines, the cost of maintaining buildings and hiring staff does not decrease with the number of students

(Schwartzbeck, 2003). Chronic declining enrollment results in severe financial distress to rural schools. These on-going financial losses result in deep cuts in programs, staff, and resources. Rural schools are more vulnerable to these cuts since they have proportionally less latitude toward finding other cost-saving alternatives (Jimerson, 2006).

When faced with difficult financial dilemmas, smaller schools find it difficult to sustain alternative programs such as charter schools when the money associated with a grant supporting these initiatives expires (Lockwood, 2003). When making decisions about program cuts such as those forced by shrinking revenues due to declining enrollment, school leaders must make their decisions based upon maintaining classroom standards and student achievement (Mariano, 2003; Marzano, 2003). For this study, the research school district needed to determine whether or not their charter school program is making a significant difference for children in order to decide if the program should be sustained long-term.

Purpose of the Study

The purpose of this study was to evaluate the achievement outcomes of 5th-grade students following their enrollment in federally funded inquiry-based classrooms

compared to same school traditional education program students to determine the feasibility of inquiry-based program sustainability. This exploratory study focused on 5th-grade students who attended the same elementary system and classrooms in kindergarten through 3rd-grade. The Sioux Central Community School District, the research school, then received a grant to form a separate and innovative charter school program, the Buffalo Ridge Charter School, within the same elementary school building that emphasized inquiry-based learning. Students and their parents had the option to choose either the traditional education program (TEP) or the charter education program (CEP) that emphasized inquiry-based learning for the students' 4th-grade and 5th-grade school years.

Importance of the Study

This study contributes to research, practice, and policy. The study is of significant interest to students and parents in light of the options available for enrollment, to educators as they consider the research of best classroom practices, and to legislators and policy makers as they consider how best to allocate tax dollars in order to create the most significant affects on student achievement.

This study is particularly significant because this charter school program was the result of federal funding to establish innovative charter schools in states across the nation. The Buffalo Ridge Charter School examined in this study was the first such charter school established in the state of Iowa under state and federal legislation.

Research Questions

The following overarching research questions were used to analyze the independent variable, students enrolled in a charter education program verses students enrolled in a traditional education program: (1) do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for reading vocabulary, reading comprehension, and reading total measures; (2) do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for reading vocabulary, reading comprehension, and reading total measures; (3) do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for reading

vocabulary, reading comprehension, and reading total measures; (4) do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for language spelling, language capitalization, language punctuation, language usage and expression, and language total measures; (5) do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for language spelling, language capitalization, a language punctuation, language usage and expression, and language total measures; (6) do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for language spelling, language capitalization, language punctuation, language usage and expression, and language total measures; (7) do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for mathematics concepts/estimation, mathematics problems/data, mathematics computation, and

mathematics total measures; (8) do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for mathematics concepts/estimation, mathematics problems/data, mathematics computation, and mathematics total measures; (9) do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for mathematics concepts/estimation, mathematics problems/data, mathematics computation, and mathematics total measures; (10) do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for core total measures; (11) do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for core total measures; (12) do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for core total measures; (13)

do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for social studies, science, and sources of information measures; (14) do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for social studies, science, and sources of information measures; (15) do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for social studies, science, and sources of information measures; (16) do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for composite measures; (17) do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for composite measures; (18) do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to

traditional education students' ending 5th-grade norm-referenced achievement scores for composite measures?

Assumptions

The design of this study had several strong features including (a) strong teacher and administrator commitment to the educational options and student progress in both research arms, (b) good intervention stability in the charter and traditional classrooms, (c) long-term intervention use, and (d) similarity of student time on task and positive learning environments for both the charter and traditional groups. The study focused only on one dependent variable area, achievement because no office referrals or unexcused absences were reported for these students throughout the 3rd-grade through 5th-grade reporting periods.

Delimitations

This study was delimited to fifth grade elementary public school students in one school in a small, rural school district in Iowa. The research results were delimited to those students who attended school in the same third grade during the 2003—2004 school year, continued through fourth grade, and completed fifth grade in the same school during the 2005—2006 school year.

Limitations

This exploratory study was confined to one grade of an elementary school building over a three-year period of time. The students who participated in the two classroom programs chose these alternatives based on the strength of the educational offering with parental support. The total number of subjects (N = 20) represents a real-world rural school sample; however, this small number of participants could skew the statistical results.

Definition of Terms

Authentic assessment. In this study, authentic assessment refers to measuring student learning and performance in manners other than the traditional paper test. Students give oral reports, portray historical figures, present to students and parents in a living-history demonstration, or compile their knowledge and present it using computer technology.

Block scheduling. In this study, block scheduling refers to large blocks of time within an elementary classroom where several subjects are integrated into a large time period. This stands in contrast to traditional periods where teachers move systematically from one subject to another by sequential periods of 30 to 45 minutes each.

Charter education. Charter education is an educational program operating in a state-sanctioned charter school.

Charter Education Program (CEP). In this study, the CEP is an innovative educational program that is part of a public school. CEP utilizes inquiry learning where students collaboratively work together to solve problems and use computers exclusively in place of textbooks to complete reading and writing assignments. Integrated learning takes place in large blocks of time (up to 90 minutes) where subject matter is fully integrated rather than taught as separate subject material. Using authentic assessments, student learning is regularly measured by teachers.

Charter school. A charter school is a public school that operates under a charter or contract with a public body. The expectation is that a charter school must meet the terms of its charter or face closure by its authorizing body. Charter schools are supported by public education funds. As such, charter schools must also meet the accountability requirements of the federal Elementary and Secondary Education Act of 1965 (ESEA), as amended by the No Child Left Behind Act of 2001 (Finnigan et al., 2004).

Inquiry learning. The book *Instructional Approaches: A Framework for Professional Practice* (Saskatchewan, 1991) defines inquiry learning as an instructional methodology

based on providing opportunities for students to experience and acquire processes through which they can gather information about the world. Inquiry learning requires a high level of interaction between the learner and the teacher depending upon the area of study, available resources, and the learning environment. Students must ask relevant questions and develop ways to search for answers and generate explanations. Emphasis is placed upon the process of thinking as students interact with issues, data, topics, concepts, materials, and problems.

Inquiry learning classrooms. In this study, inquiry learning classrooms use the students' own interests to guide their learning. Teachers identify themes and allow students to select individual topics for their own research efforts. Teachers serve as facilitators of learning as student direct themselves in researching their projects.

Integrated learning. In this study, integrated learning refers to learning and instruction whereby multiple subjects are addressed in a single lesson. Several core subject areas simultaneously address a common theme and the lesson of the core subject all relate to that theme.

Iowa Tests of Basic Skills (ITBS). Developed by the University of Iowa, the ITBS are a series of 13 achievement

tests that serve as a comprehensive assessment for schools in kindergarten through grade 12 for the purpose of providing information that can improve instruction. It is designed to help obtain information for instructional decisions, reporting individual progress to students and their parents, and "evaluating the progress of groups of students" (Hoover, et al., 2003, p. 11).

National Assessment of Educational Progress (NAEP). According to Nelson, Rosenberg, & Van Meter (2004), the National Assessment of Educational Progress, called the nation's report card by administrators, teachers, and parents,

> . . . has been testing the academic achievement of a nationally representative sample of students and publicly reporting the results since 1969. NAEP is a project of the National Center for Education Statistics (NCES), which is within the Institute of Education Sciences (IES) of the U.S. Department of Education. Overall policy direction for NAEP is the responsibility of the National Assessment Governing Board (NAGB), an independent entity whose members are appointed by the U.S. Secretary of Education according to categories set by Congress. (p. 1)

No Child Left Behind Act of 2001 (NCLB, 2002). This act is federal legislation passed in 2002 that relies heavily on testing of students and has severe consequences for schools that fail to make Adequate Yearly Progress.

Norm-referenced test (NRT). Norm-referenced tests measure student performance compared to the performance of similar groups of students who have also taken the tests.

Normal curve equivalent (NCE). NCE are normalized standard scores that have a mean of 50, a standard deviation of 21.06, and a range from 1 to 99 (Hoover, et al., 2003).

Traditional education. Traditional education programs are teacher-led classrooms with a heavy reliance on lectures, textbooks, and seatwork, predominantly relying on worksheets. Traditional education has been the preference of parents for years. In self-contained classrooms, children engage in education that is individualized and based on facts often presented as correct answers on tests. Traditional education is skills-based. Teachers use textbooks to support instruction and prepare students for tests.

Traditional Education Program (TEP). In this study, the TEP consists of elementary classrooms that utilize the instructional methodology characterized by traditional

education. The teacher determines the curriculum for the class. Instruction is teacher-centered and takes place during periods of time where core subjects are taught as separate lessons. Textbooks and worksheets are used extensively. Assessment of student learning often takes the form of a written, paper-pencil test.

Significance of the Study

This study contributed to further research regarding innovative school models--instructional pedagogy and the effective use of these practices in elementary schools--and whether or not programs receiving federal funds should be sustained at the conclusion of the funding period.

Contribution to research. A review of professional literature suggested that more research is needed on the subject of resistance to change and the role that competing values and cultural resistance have on the expanding options of school choice. Furthermore, the expanding influence and the increasing public acceptance of charter schools suggested that research is also needed on the difference between how students perform in our traditional classrooms and how they perform in innovative charter classrooms.

Contribution to practice. Since the charter school in this study made use of several innovative instructional

methodologies, this study suggested alternative and effective pedagogical practices.

Contribution to policy. The results of this study offer insight into the effectiveness of charter schools as an alternative to traditional public schools in a rural school system. Since the charter school emanated from federal legislation, this study has the potential to influence policy decisions based on program outcomes even in the face of financial shortfalls.

Organization of the Study

The literature review relevant to this research study is presented in Chapter 2. This chapter reviews the professional literature related to traditional education and contrasts it to the popular issue of school choice programs throughout the United States and other parts of the world with a special emphasis on the many emerging charter school concepts. Chapter 3 describes the research design, methodology, independent and dependent variables and procedures that will be used to gather and analyze the data of this study. This includes a detailed synthesis of the participants, a comprehensive list of the dependent variables, the dependent measures, and the data analysis used to statistically determine if the null hypothesis is rejected for each research question. Chapter 4 reports the

research findings, including data analysis, tables, and inferential statistics. Chapter 5 draws conclusions on the findings and provides a discussion of the study findings.

CHAPTER TWO

Review of the Literature

A Review of Selected Literature and Research

In April 1983, the National Commission of Excellence released its report, *A Nation at Risk: The Imperative for Educational Reform*. In the report, Gardner, et al., called for significant change in public education as they alarmed America with warnings about the rise of mediocrity in public schools that threatens the future of our nation. One response to the cry for reform came from Budde in his book *Education by Charter: Restructuring School Districts* (1988). Budde introduced the concept of charter schools as a means of stimulating instructional innovation. The concept grew in popularity. By 2003, 40 states plus Puerto Rico and the District of Columbia had authorized charter schools to operate and receive tax dollars in financial support (Green & Mead, 2004).

Traditional Education

Traditional education, as the term is used in this paper, refers to the type of school, classroom, and instruction that has been predominant in the public schools of the United States for the last half century. Citizens reside within a school district and support it with property taxes. Historically, parents with school-age

offspring send their children to the local school district where they are assigned. School choice traditionally consists of families choosing where to purchase a home or where to live in order for students to attend a particular school (Hoxby, 1998).

Instruction in traditional schools is often characterized by teacher-centered activities. Many teachers believe in a didactic approach where teachers bestow knowledge to students (Quinsland, n.d.). This type of instruction is known as direct instruction with lecture being the primary methodology where the teacher does most of the information and fact giving and the students respond (Harman, Egelson, Hood, & O'Connell, 2002; Patterson & Luft, 2002).

The American Association for the Advancement of Science published their *Benchmarks for Science Literacy* in 1993. Prior to the publication of the benchmarks, their research into current science practices showed a didactic, teacher-centered approach as dominant in the modern science classroom. Textbooks were the most common classroom resource, and lecture was the most common instructional method. The majority of high school science teachers believed that students should learn vocabulary and formulas before learning and developing an understanding for

concepts and principles (American Association for the Advancement of Science, 1993).

Student activities in the traditional classroom involve seatwork the majority of the time. With independent seatwork, students are independently using worksheets, completing other assignments, or taking tests that provide review exercises, questions, and/or other activities to apply and practice the content they have studied (Harman, Egelson, Hood, & O'Connell, 2002). William Poston, Professor Emeritus for the Department of Educational Leadership and Policy Studies at Iowa State University, is now a partner in a private firm that provides curriculum management audits for schools in addition to consulting on student achievement issues. His firm Curriculum Management Systems, Incorporated, has performed over 400 curriculum audits over the past two years. He states that seat work persists as one of the most common classroom activities observed by auditors, the most common form of seat work being the classroom use of the worksheet (personal communication, August 27, 2007). Actual differences between student outcomes in traditional education programs and charter school options may or may not exist, but nevertheless an increasing number of parents seem to be choosing charter schools (May, 2006). This difference has

been called a *perception gap,* as charter parents perceive--often incorrectly--that traditional public schools have large classes, less individualized attention, and more isolated and unresponsive teachers (May, 2006).

Charter Education

Charter schools run by public school systems. Across the United States, charter schools are largely administered by public school systems. Currently 40 states allow for the formation of charter schools. Of these, 31 give authority to public schools to establish charter schools. In 11 states: Alaska, Colorado, Georgia, Iowa, Kansas, New Mexico, Nevada, Pennsylvania, South Carolina, Tennessee, and Wyoming, public schools have sole authority to create charter schools (Green & Mead, 2004).

In recent years under the influence of the No Child Left Behind Act of 2001, many failing public schools have been converted into charter schools. Public schools who fail to make Adequate Yearly Progress (AYP) for five years are forced to make significant changes in their structures. One option available to schools who fail to meet AYP mandates is converting failing traditional programs over to innovative charter concept programs. Some public schools that have made the change have experienced quick and dramatic improvements in student achievement. As an

example, Sacramento High School in California faced state sanctions due to low student performance. In 2002 the school board shut down the school and reopened it as six autonomous charter academies in the same facility. Eighty percent of the original student body returned to Sacramento High School the next fall. Over the next three years, the school's test score index rose 20 points (Arkin & Kowal, 2005). For another example, McKeel Middle School of Polk County, Florida, realized in 1996 that the school would not meet the evaluation criteria under Florida's new accountability system. The school voluntarily converted to charter status in 1998 and changed its name to McKeel Academy of Technology. After its conversion, McKeel consistently earned top marks on the state's grading system and was recognized as the top-performing middle/high school in the county for 2004-2005 (Arkin & Kowal, 2005). These improvements in public schools converting to charter structures are often driven by a major change in the school's culture and a new mission that gives the school community a sense of shared purpose (Arkin & Kowal, 2005).

Charter schools run by private schools. Most commonly, states do not allow private schools to simply convert to become charter schools. Nine states including Arizona, Michigan, Missouri, Oregon, Pennsylvania, South Carolina,

Texas, Utah, and Wisconsin, plus the District of Columbia, allow this possibility while 27 states prohibit it by law. However, some states who do not allow the conversion leave open the possibility that a private school could close and reopen as a charter school (Green & Mead, 2004).

Charter schools operated by for-profit entities. The majority of states only allow charter schools to operate as non-profit organizations. However, five states, Arizona, Colorado, New York, Virginia, and Wisconsin, do allow the possibility that for-profit entities could receive government charters. Also, in those states where charters must be non-profit, the possibility exists that the school could hire a for-profit management firm to operate the school. It should be noted that all but three states, Alaska, Connecticut, and Georgia, strictly prohibit charter schools from charging tuition (Green & Mead, 2004). In a number of cases, businesses have established charter schools, often in conjunction with their business operations. Minnesota's second largest charter school, Duluth Public School Academy, is managed by Edison Schools, a private corporation based in New York City (Schroeder, 2004).

Charter schools run by religious organizations. Due to their support by public funds, charter schools are public

schools and must therefore comply with the Establishment Clause of the Constitution. A charter school being operated by a non-secular organization raises separation of church and state issues. As a result, 18 states restrict religious organizations from being involved in the operation of charter schools (Green & Mead, 2004).

Home schooling as charter schools. The majority of states expressly prohibit home schooling from being called charter schools. Some states such as California initially allowed home schooling situations to qualify for public funds as charter schools. However, because unscrupulous providers used the low overhead of home schooling to support large numbers of students and pocketed the profit the California legislature, responding to public outrage over the misuse of public funds, reversed their approval (Huerta & Gonzalez, 2004). As a result, many states have passed laws so that home schooling situations cannot qualify for public funding (Green & Mead, 2004).

Charter schools delivering instruction via the Internet. Charter schools utilizing the Internet are often compared and contrasted to home school situations since parents can use the Internet as a means of home schooling. The Internet therefore allows home schooling to take place in a state-sanctioned setting (Huerta & Gonzalez, 2004).

Even among the 25 states that prohibit home schooling through charters, charter schools are allowed to operate as distance-learning opportunities primarily supported by the Internet (Green & Mead, 2004). These on-line schools may take several forms. Chisago Lakes in Minnesota is a charter school sponsored by a public school so that it can offer all of its learning opportunities on-line. In another variation, Cyber Village Academy in St. Paul, Minnesota, requires students to be on campus two days a week and allows students to do their on-line course work the other three days. Former U.S. Secretary of Education William Bennett has opened a private enterprise, an on-line school that can operate as a charter school in states across the nation (Schroeder, 2004).

Charter Schools and Special Needs Students

Charter schools working with students with disabilities. Students with the most significant disabilities usually are enrolled in public schools or traditional institutions. Their enrollment in charter schools is rare except for the schools that specifically target the special needs population. Some schools actually counsel parents against enrolling their special needs child in the charter school citing an ill fit with the student population and the purpose of the institution (Fiore,

Harwell, Blackorby, & Finnegan, 2000). Charter schools tend to be smaller which dictates that they have fewer financial resources. These schools have difficulty providing adequate education to special needs students without weakening their services to their other students. To promote and protect charter schools, the state of Massachusetts excludes charter schools from paying for expensive private and residential placements (Green & Mead, 2004).

Charter schools that take special needs students tend to only accept students with mild disabilities. These students often do not receive special interventions. The charters believe in their version of inclusion where all students are served in a similar manner according to their educational philosophy and service model. Moreover, many charters do not attempt to identify students with special needs for the same reason (Fiore et al., 2000).

Some states allow special education funding to follow special needs students into their charter schools according to the same formula based upon student need as used by public schools. A few states, such as Alaska, Arizona, Louisiana, Massachusetts, Pennsylvania, North Carolina, and Rhode Island, match special education funding to special charter students in accordance with a state formula but without regard to the needs of the individual. California,

Colorado, Connecticut, and Illinois fund special needs charter programs through negotiations with individual public school districts (Nelson et al., 2000).

In some states, serving special needs students in charter schools is more common. A study in Minnesota suggested charters may be serving:

> a comparable share of students with disabilities relative to the 12.2 percent of district school enrollment. More than one-half of the currently operating charters serve a higher percentage of special education students than do district schools as a whole. About 20 percent serve more than double the statewide average. (Schroeder, 2004; p. 10)

Some schools are actually designed to target special needs students such as the Metro Deaf School in St. Paul, Minnesota (Schroeder, 2004).

Other special needs may be accommodated in charters specifically designed to meet those needs. The Einstein Montessori School in Gainsville, Florida, specializes in serving students with dyslexia. In some cases, charter schools contract with public school districts to provide for special needs students (U.S. Department of Education, 2002).

Charter schools working with at-risk students. Some charter schools actually focus their design and service specifically for special needs and at-risk students. In some cases, whether it is due to parent dissatisfaction with the local public school or the school's curriculum and/or instructional approach, charter schools may end up serving more special needs and at-risk students than they had intended or were originally designed to serve (Fiore et al., 2000). A study by the U.S. Department of Education (2002) suggested that nearly half of all charter schools serve a student population where more than 40 percent of students are considered at-risk or are former dropouts. As some critics argue that charter schools may skim the cream of the students, some states have taken precautions against such practices. Louisiana mandates that charters serve a student population that is at least 85 percent aligned with the population of the local public school district. Colorado, Illinois, and Texas give preference in granting charters to schools that serve at-risk populations (Nelson et al., 2000).

In most states, charter schools receive more money by virtue of serving at-risk students; however, this varies a great deal across the United States. In some states, the extra dollars that support at-risk youth follow these

students to their charter schools (Green & Mead, 2004). California, Colorado, Illinois, Minnesota, and Wisconsin have an additional at-risk allocation that follows the per-pupil funding to the charters. Kansas, Michigan, New Mexico, South Carolina, and Texas grant additional weighting to at-risk students (Nelson et al., 2000). In a few states such as Colorado, Georgia, Hawaii, Illinois, Kansas, New Mexico, South Carolina, and Wisconsin, the additional funding may or may not follow but is dependent upon negotiations between the charter school and their resident public school district (Nelson et al., 2000).

In keeping with the premise for charter schools that they are more accountable to the chartering bodies, these special schools can likewise be very responsive even when the students are not local residents. In one particular example, Gulf Coast Trades Center/Raven School serves adjudicated high school youth from across the state of Texas. Yet they successfully built a number of business partnership through responsiveness to their cooperating partners and the local community (Czaja & Belcher, 1999).

Charter Schools as College Preparatory Schools

Some charter schools have developed to create more challenging learning environments for high achieving students. Some charters are emphasizing back-to-basics and

a rigorous college-preparatory curriculum (Schroeder, 2004). This tends to occur most frequently in suburbs where parents are insistent on basic instruction in the fundamentals with higher expectations for their children (Schroeder, 2004).

Charter Schools Operating in Rural Communities

Rural areas have opened successful charter schools that incorporate innovation and technology into their programs. One of the first in the nation was the Minnesota New Country School in Henderson, Minnesota, opening in 1994. Serving only 150 students in grades 7 through 12, the students arrive at school from 10 different counties around the school. The curriculum is project-based and heavily infuses technology into the curriculum. The school operates year-round with strong ties to the community. For example, the school provides web design and support services for the local businesses in the community. In return, the community supports the school by contributing their talent and knowledge to help students (Thomas, 2000).

Among the first charter schools under Colorado's law was a reopened community school in the town of Marble. A small town high in the Rocky Mountains, Marble is more than 100 miles from their home district headquartered in Gunnison. The charter school opened in 1995 to 18 students

in kindergarten through 8th-grade. The curriculum includes an emphasis on local history as students serve as docents in the local museum housed within their school. They also emphasize instruction regarding the local environment as students regularly test the waters of the Crystal River and report the results to the Colorado Division of Wildlife (Jaramillo, 2000).

The small, rural community of Nerstrand, Minnesota, used chartering as a means of keeping their small elementary school open rather than consolidating with other larger schools nearby. The school serves 160 students in multi-age classrooms where the primary focus is on service learning and respect for community elders. Each year the school honors local community members for their contributions to their school and town (Thomas, 2000).

Unlike Nerstrand, the Minnesota community of Hanska was already part of the much larger school district of New Ulm, but they feared the closing of their small elementary and the busing of their local students to another elementary in another community. In response Hanska, Minnesota converted their local elementary to a charter as a means of keeping a school within their community. The curriculum emphasizes music and technology along with the area's heritage. Hanska is largely a community whose

residents are of Norwegian ancestry, and Norwegian folk dancing is a special emphasis within their school (Thomas, 2000).

Similar to Hanska, Minnesota the town of Guffey, Colorado, used their state's charter law to avoid the closure of their local school. Originally opening with 19 students, in five years Hanska had 45 students in their school in the preschool through 8th-grade. In the mountains southwest of Pike's Peak, Guffey school is studying high altitude winter gardening using a solar pod built with the assistance of local community mentors. Most notably, the school publishes the only local news source, the *Eye on Guffey*, an all-color, 24-page news magazine containing information on local news and events (Jaramillo, 2000).

Comparing the Academic Performance of Charter Schools to Public Schools

The National Assessment of Educational Progress (NAEP) annually tests the academic achievement of a nationally representative sample of students and has been publicly reporting the results since 1969. NAEP is produced by the National Center for Education Statistics (NCES), which is within the Institute of Education Sciences (IES) of the U.S. Department of Education. In 2003 NAEP conducted its first nationally representative sampling of charter schools

(grade 4) in reading and mathematics on national and state assessments (Nelson et al., 2004).

The American Federation of Teachers (AFT) union analyzed NAEP results from charter schools in 2004 and released their study independent of the NCES. Results from the assessment were broken out by eligibility for the national school-lunch program, school location (central cities, urban fringe/large towns, and rural/small towns), and race and ethnicity. Comparing both public and charter schools overall, the AFT found charters were below the public schools in grade 4 mathematics and reading scores. These mathematics and reading scores were found to be statistically significantly different (Nelson et al., 2004). Rural charter and public schools however were found to have comparable mathematics and reading scores. Furthermore, differences in race between the two types of schools revealed no statistical difference (Nelson et al., 2004).

This report by the AFT stirred supporters of the charter movement who criticized the results as inaccurate. Critics cited that charters have more disadvantaged students so differences in student populations were not accommodated in the analysis. A later analysis of this criticism suggested otherwise, however. The number of

disadvantaged students could not be verified as a significant difference from the public schools. Other criticisms were leveled as well, such as charters are supposed to be experimental, so they should be expected to have lower results initially. But these theories could not be supported by data (Carnoy, Jacobsen, Mishel, & Rothstein, 2006).

Although NAEP results suggest that charter schools do not perform as well as public schools, this was only one measurement, although prominent and well publicized by the American Federation of Teachers. Almost in response to the AFT conclusions, Hoxby (2004) of Harvard University conducted another study of charter achievement near the end of the same year. Hoxby's conclusions stated that charter students are more likely to be proficient in their state's reading and mathematics assessments. Hoxby's results remained consistent when accounting for at-risk students and the effects of race. Hoxby also pointed out that the charter schools in her study were able to accomplish these impressive results while receiving less money in state support than their public school counterparts.

Hoxby did identify one state that was an exception to her research, and that was North Carolina. Bifulco and Ladd (2006) also reached even greater negative conclusions

regarding the affect of charter schools on student achievement within the state of North Carolina. However their study suggested that students lag behind the most in their first year in a charter school. This implies that more long-term study is necessary. With North Carolina standing out as unique among states, the difference may be the result of the way charter laws are written or implemented in the state (Hill, Angel, & Christensen, 2006).

Since the release of the two studies in 2004, other studies have been conducted with different groups examining some of the same data but drawing different conclusions. Many other studies now exist regarding charter school performance and how students compare with their public school peers. Lake and Hill (2005) examined 35 studies. Of these, 15 produced generally positive findings while the other 20 provided neutral, mixed, or negative results. Moreover, trends cannot be drawn based upon the extent of the sophistication of the research approaches. Regardless of the methods employed, there are both positive and negative results (Lake & Hill, 2005). One thing that can be affirmatively stated is that students in charter schools, in the vast majority of cases, are making significant learning gains (Hassel & Terrell, 2006).

Charter Schools and Innovation

One of the initial promises of charter schools was that, freed from governmental regulations, charter schools would generate innovation in educational practices and methodology. However, the concept of charter schools is institutionally innovative in itself. Charter schools employ a new concept where the charters are publicly funded but with greater autonomy and under the control of a variety of parties (Bulkley & Fisler, 2002). By design charter schools were intended to be innovative in terms of governance and management, school organization, and teaching and learning (Arsen et al., 1999).

Schools tend to emulate what has already been shown to be successful and proven in other schools (Marzano, 2007). What is more, parents tend to favor traditional modes of instruction over the new and different (Arsen et al., 1999). Probably for these reasons, charter schools have not shown a great deal of innovation. Most frequently their new programs tend to be add-ons to what a public school already offers such as all-day kindergarten (Arsen et al., 1999).

Some charters have demonstrated innovation in terms of structure. They often show differences from traditional schools in terms of class sizes, grade configurations, staffing patterns, and use of staff time. There are also

some schools that have broken with tradition and are offering new and distinctive programs such as African-centered education or specialized vocational study (Arsen et al., 1999). Many charters require extensive hands-on and community-based learning. In Minnesota, a dozen new charters have adopted the project-based learning model mentioned previously that was first used in Henderson's New Country School (Schroeder, 2004).

The innovation of charter schools has sparked change and innovation in public school as well as they compete in an open educational marketplace. Two notable changes have occurred in public schools in response to charters. The number of public schools offering all-day kindergarten has increased. Also, public schools have adopted active marketing strategies to influence parental choice of schools (Arsen et al., 1999).

Inquiry Learning

Inquiry learning--and its related terms: open-inquiry learning (Roth, 1996), discovery learning (Veermans, van Joolingen, & de Jong, 2006), active learning (Halsall & Cockett, 1998; Murdoch & Guy, 2002), and active-investigative learning (Broadhead, 2001)--is not a recent concept. Education pioneer John Dewey as early as the Nineteenth Century advocated for essentially this same

concept. Dewey preached on the transaction of organism and environment and advocated for a hands-on approach to instruction (Vanderstraeten, 2002). The concept was later referred to as *constructivism* because using it students are to construct their own frames of thought based upon their prior knowledge and experience (Johnson, Dupuis, Murial, Hall, & Golnick, 1996). According to Kuhn, Black, Keselman, & Kaplan (2000), inquiry learning allows students to come to understand that they are able to acquire knowledge they desire, in virtually any content domain, in ways that they can initiate, manage, and execute on their own. Furthermore they understand that such knowledge is empowering. Using inquiry learning, students explore a new subject within a particular theme and then independently explore and extend their learning into new areas. In this way, students feel personally connected with their lessons and are better able to contextualize a subject such as history (Bevevino, Dengel, and Adams, 1999). Inquiry learning can be a beneficial instructional practice depending on the curricular area and the age and ability of the student.

Effectiveness as an instructional practice. As students mature, they become capable of deeper levels of reasoning using inquiry methodology. Inquiry abilities are unique to the individual and not highly connected to the

subject matter; therefore in theory, inquiry abilities can improve significantly with time and experience (Hofstein, Shore, & Kipnis, 2004). Consequently, inquiry learning may be at its most effective at the high school and collegiate levels. A study of two university classes, one political science and the other history, showed marked differences in learning and achievement for those engaged in inquiry or active learning. Both classes showed statistically significant differences between the mean performance of the experimental group as compared to the control group. The study found little prior evidence of the effects of active learning compared with traditional methods (McCarthy & Anderson, 2000).

Middle school students are capable of utilizing inquiry science learning through classroom experiments and experiences (Krajcik, et al. 1998). Indeed, even elementary students are capable of using these same skills at their respective and appropriate levels as stated by Kuhn et al. (2000):

> An implication that should not be drawn from this research is that inquiry activity is inappropriate in the elementary or middle school science curriculum because students do not have the requisite skills to engage in it productively. The message we hope our

> work will convey is a different one, which is that supporting the design of inquiry curriculum for these critical years in science education should be identification of a sequence of well-delineated cognitive competencies that become the objective of this curriculum. In the absence of an explicit sequence of this nature, inquiry learning risks becoming a vacuous practice--one embraced without clear evidence of the cognitive processes or outcomes that it is likely to foster. (p. 520)

Creating deep understanding. Inquiry learning has become more prevalent in recent years as students and teachers search for more student-centered activities and can easily access Internet web-based resources (Veermans et al., 2006). Practitioners, such as department heads, report seeing more independent and active learning methodology employed in classrooms. The practice varies from instructor to instructor, although traditional methods still remain dominant in classrooms (Kyriacou, 1992).

At present there does not appear to be data to support the idea that this is making a difference in student learning. Sometimes students do feel they are getting more out of their work using inquiry and on-line resources even though achievement on exit examinations does not support

their opinions (Turchin, et al., 2000). However, if students feel positive about their learning experience, they are more likely to succeed. A student's attitude toward a particular class can affect his or her academic achievement (Butler, Phillmann, & Smart, 2001). In a different case, a study of in-class writing as an active learning methodology at the University of Northern Iowa reflected positive feelings from the student participants over two semesters and three different courses. Moreover this was paralleled by a marked increase in student achievement as measured by student performance on the course examinations (Butler et al., 2001). One particular study suggested that students showed more deep understanding of material related to science experiments although the tests did not reveal a significant difference between the inquiry learning students and the control group on a standard assessment over the content (Veermans, de Jong, & van Joolingen, 2000).

Because of the idea that the learning experience in the inquiry style is more related to the real world, it is most commonly associated with science instruction. "When properly developed, inquiry-centered laboratories have the potential to enhance students' meaningful learning, conceptual understanding, and their understanding of the

nature of science. Inquiry-type experiences in the science laboratory are especially effective if conducted in the context of, and integrated with, the concept being taught" (Hofstein et al., 2004, p. 47). Science experiments taught with inquiry-type methods result in students asking better scientific questions. What's more, a student's experience with science can deepen his or her use of inquiry-type experiments (Hofstein et al., 2004).

The nation of Norway sees inquiry learning (or active learning) as a major pathway to curriculum reform in its educational system where thematic approaches couple with *active-investigative learning*, and peer cooperation. The country's Minister of Education describes Norway as having a culture that values themes, so the thematic instruction of inquiry learning fits well with Norwegian national learning values (Broadhead, 2001).

Instructional limitations. Although there are apparent instructional advantages to inquiry learning, this finding does not transfer by extension to all ages and learners in other developmental stages. Inquiry skills are not necessarily in place by early adolescence. Multivariable problems can be too complex for the early adolescent (Kuhn et al., 2000). An instructor cannot assume that the skills required to engage effectively in typical forms of inquiry

learning will be in place by early adolescence. As stated by Kuhn et al. (2000):

> Many young adolescents find a model of multivariable causality challenging. Correspondingly, the strategies they exhibit for accessing, examining, and interpreting evidence pertinent to such a model are far from optimal. We turn later to curriculum implications that we believe follow from these findings and consider first what the results suggest regarding the nature of these cognitive competencies and how they develop. (p. 515)

These issues are even more pronounced when inquiry learning is utilized with learning disabled and mildly mentally retarded students. A study in 1997 reported 75 percent of non-disabled students were able to identify a simple principle regarding the speeds of pendulums of different lengths, and after some simple coaching virtually all non-disabled students could identify the principle. Unfortunately, learning disabled students found the principle difficult to grasp without coaching, and no mildly mentally-retarded students were able to identify the principle without at least some coaching (Mastropieri, Scruggs, & Butcher, 1997).

Inquiry learning has further limitations based upon its affects on the instructor. It is extremely time consuming and can create heavy demands on the teacher. Teachers sometimes resort to teacher-centered activities when they perceive that students need to be taught certain content or skills before they can engage in inquiry learning. Inquiry learning can be constrained by the limits necessarily set by the course content. Finally, inquiry learning often requires additional resources--time and financial--that may be prohibitive in a school setting (Halsall & Cockett, 1998).

Successful instruction is highly dependent upon the skills of the teacher. “The provision of intensive professional development for teachers is vital for the successful implementation” of inquiry learning (Hofstein et al., 2004, p. 60). This reliance on professional development has its own issues as teachers report feeling overwhelmed by the amount of change they are experiencing and the amount of professional development they need to keep current with instructional practices (Kyriacou, 1992).

The suggestions and questions of teachers are vital to the inquiry process. Teachers need to guide and encourage students through their inquiry activities (Krajicek et al., 1998). Parallel to this idea, inquiry learning becomes less

effective as class size grows and is most effective when the student to teacher ratio is low (Murdoch & Guy, 2002). This rule applies even when students are able to personally and individually interact with the subject matter using technological resources. Coaching has a significant effect on student performance using inquiry learning (Pedaste & Sarapuu, 2006).

Conclusion

Evidence exists that there are advantages to inquiry learning. It can increase the learning of students by helping them to function at higher cognitive levels. Students enjoy inquiry-based learning activities making them more receptive to learning. This may allow them to perform better in class in a given subject area. It also teaches students skills that transfer to the real world. However, it appears that age and ability are both factors in how successful inquiry learning may be. Although advantages and disadvantages accompany the concept of inquiry learning, many educators are committed to the idea that inquiry learning may be the future of education.

CHAPTER THREE

Methodology

The purpose of this study was to compare 5th-grade students' achievement using norm referenced tests following the completion of 18 months of same school traditional and charter education programs to determine if the charter education program should be continued or terminated. This chapter describes the participants, procedures, independent variable descriptions, dependent measures and instrumentation, research questions, and data analysis.

Participants

Number of participants. Twenty (N = 20) students attending same school 3rd-grade through 5th-grade classes were chosen for this study. Study participants consisted of two naturally formed groups students who completed two years in the CEP (n = 11) and students who completed two years in the TEP (n = 9).

Gender of participants. Students who were participants in CEP were male (n = 7) and female (n = 4). Students who were participants in TEP were male (n = 4) and female (n = 5). These numbers are representative of the overall student population of the school.

Age range of participants. Students who participated in the CEP ranged from 8 years, 9 months to 9 years, 9

months of age at pretest data collection and ranged from 10 years, 9 months to 11 years, 9 months of age at the time of posttest data collection. Students who participated in the TEP ranged from 8 years, 8 months to 9 years, 11 months of age at the time of pretest data collection and ranged from 10 years, 8 months to 11 years, 11 months of age at the time of posttest data collection.

Racial and ethnic origin of participants. Of the total number of subjects (N = 20), 19 were white, of northern European decent and one was Hispanic. These numbers are representative of the overall student population of the school.

Inclusion criteria of participants. The grant application as written allowed students to self-select either the CEP or TEP based on the strength of the educational offering with parental support.

Method of participant identification. Of the total number of subjects (N = 20), all were enrolled in the same third grade public school program and remained in either the CEP or TEP throughout the length of this study.

Description of Procedures

Research design. The pretest-posttest two-group comparative survey study design is displayed in the following notation:

Group 1 X_1 O_1 X_2 O_2

Group 2 X_1 O_1 X_3 O_2

Group 1 = naturally formed TEP group (*n* = 9)

Group 2 = naturally formed CEP group (*n* = 11)

X_1 = students participating in the same school 3rd-grade through 5th-grade setting

X_2 = students participating in the 3rd-grade through 5th-grade TEP

X_3 = students participating in the 3rd-grade through 5th-grade CEP

O_1 = pretest 3rd-grade achievement: Iowa Tests of Basic Skills for (a) reading vocabulary, (b) reading comprehension, (c) reading total, (d) language spelling, (e) language capitalization, (f) language punctuation, (g) language usage and expression, (h) language total, (i) mathematics concepts/estimation, (j) mathematics problems/data, (k) mathematics computation, (l) mathematics total, (m) core total, (n) social studies, (o) science, (p) sources of information total, and (q) composite.

O_2 = posttest 5th-grade achievement: Iowa Tests of Basic Skills for (a) reading vocabulary, (b) reading comprehension, (c) reading total, (d) language spelling, (e) language capitalization, (f) language punctuation, (g) language usage and expression, (h) language total, (i)

mathematics concepts/estimation, (j) mathematics problems/data, (k) mathematics computation, (l) mathematics total, (m) core total, (n) social studies, (o) science, (p) sources of information total, and (q) composite.

Implementation of the Independent Variables

The independent variables for this study were the two parallel elementary education programs, the Traditional Education Program and the Charter Education Program. They comprised the two research arms of the study. Both programs operated simultaneously in the same elementary school building. Therefore, both programs operated on similar schedules, had similar student-to-teacher ratios, and enjoyed similar classroom support programs such as Title I reading, special education, and talented and gifted education. Students in both programs also participated in weekly 30 minute art, computers, general music, large-group guidance, and library classes. Physical education was provided twice each week. Parental contact was similar in both programs with teachers available through e-mail, telephone, and personal appointments. Parent-teacher conferences were scheduled once each semester for both programs.

Traditional Education Program. The TEP consisted of a seven hour, ten minute day with 30 minutes for lunch and

two 15 minute recesses daily. The TEP had adequate time for regular classroom instruction at five hours, forty minutes (approximately) each day for sufficient time on task. Students were provided with multiple periods for lessons. The instructional day was divided into subject periods. Core subjects were instructed as separate courses, each during a period of 30 to 45 minutes for each. Teachers were departmentalized with one teacher assuming responsibility for teaching English language and spelling. One taught mathematics. Another taught science, and still another taught social studies. All TEP teachers taught reading to ability-leveled groups during a common reading period.

Students in the TEP were issued textbooks in each of their core subject areas. The classroom curriculum was developed by individual teachers and based upon locally adopted standards and benchmarks. Instruction tended to be teacher-centered and take place while students were seated in desks placed in rows. Seatwork was the most common instructional device with students tested regularly with paper and pencil tests. TEP students were graded on a standard 4.0 grading scale identified by the letter grades A-F.

Charter Education Program. CEP students also had a five hour, forty minute instructional day with adequate

time on task. Instruction was based primarily on the inquiry learning method. Block scheduling was used during the CEP classes so that large blocks of time (up to 90 minutes) were provided for integrated lessons. Time for subject lessons varied from day to day according to the instructional needs of the teacher. On certain days, a lesson focused on science experimentation might last up to 90 minutes to provide time for both classroom research and for laboratory experience. Other subjects such as reading and mathematics were integrated into the major instructional theme for each day's lesson. Spelling lists, for example, came from each student's research and writing rather than a standardized list from a separate spelling program. Therefore, each student in class might have had a unique spelling list each week.

CEP classrooms did not utilize textbooks as classroom instructional tools. Library books and books from the inter-library loan were the only books available to students as additional resources to help them with their research. CEP classrooms had at a minimum one laptop computer per student. Wireless networking allowed students to log onto the school network for reading, writing, printing, communication, and Internet access purposes. Students became adept at taking their laptops from their

overnight charging stations, booting their computers, logging onto the network, and returning each computer to its charging cradle at the end of each day. Rather than using a set curriculum, CEP teachers arranged instruction around pre-determined themes. Such themes might include famous inventors, ancient civilizations, geographic locations, or historic battles. Teachers guided and facilitated students as they chose their own specific topics to research under the identified themes. Core instruction such as reading, writing, mathematics, and science was then integrated into the independent projects of the students. Assessment of CEP students was often done through the presentation of projects. For example, U.S. history was presented to parents and other visitors during a history day where all students performed in character as they portrayed significant historical figures from our nation's past. Students also demonstrated learning by completing a graphic project or presenting before the class. Technology played an important part in both instruction and assessment as the students performed their research on-line and often presented their findings with a computerized slide show (such as PowerPoint). As part of the experiential nature of the CEP, teachers made greater and more frequent use of field trips as learning

activities. CEP students were graded against benchmark work with the rubric identifiers *introduced*, *practiced*, *application*, *mastery*, and *extended*. The CEP was guided by a steering committee of staff and parents; the committee met monthly during the school year.

Research Questions and Data Analysis

The following research questions were used to analyze student achievement in CEP and TEP 3rd-grade and 5th-grade years. Norm-referenced achievement NCE scores for (a) reading vocabulary, (b) reading comprehension, (c) reading total, (d) language spelling, (e) language capitalization, (f) language punctuation, (g) language usage and expression, (h) language total, (i) mathematics concepts/estimation, (j) mathematics problems/data, (k) mathematics computation, (l) mathematics total, (m) core total, (n) social studies, (o) science, (p) sources of information total, and (q) composite will be utilized. The following research questions will be used to analyze the achievement of students who participated in CEP and TEP programs.

Overarching Pretest-Posttest Achievement Research Question #1: Do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-

referenced achievement scores for (a) reading vocabulary, (b) reading comprehension, and (c) reading total measures?

Sub-Question 1a. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced reading vocabulary achievement scores?

Sub-Question 1b. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade year norm-referenced reading comprehension achievement scores?

Sub-Question 1c. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced reading total achievement scores?

Research Sub-Questions #1a, 1b, and 1c were analyzed using dependent *t* tests to examine the significance of the difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #2: Do traditional education students lose,

maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) reading vocabulary, (b) reading comprehension, and (c) reading total measures?

Sub-Question 2a. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced reading vocabulary achievement scores?

Sub-Question 2b. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced reading comprehension achievement scores?

Sub-Question 2c. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced reading total achievement scores?

Research Sub-Questions #2a, 2b, and 2c were analyzed using dependent *t* tests to examine the significance of the difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Posttest-Posttest Achievement Research Question #3: Do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for (a) reading vocabulary, (b) reading comprehension, and (c) reading total measures?

Sub-Question 3a. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced reading vocabulary achievement scores?

Sub-Question 3b. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced reading comprehension achievement scores?

Sub-Question 3c. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced reading total achievement scores?

Research Sub-Questions #3a, 3b, and 3c were analyzed using independent *t* tests to examine the significance of the difference between charter education students' ending 5th-grade compared to traditional education students' ending 5th-grade norm-referenced achievement scores.

Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #4: Do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) language spelling, (b) language capitalization, (c) language punctuation, (d) language usage and expression, and (e) language total measures?

Sub-Question 4a. Is there a significant difference between charter education students' ending 3rd-grade year compared to ending 5th-grade norm-referenced language spelling achievement scores?

Sub-Question 4b. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced language capitalization achievement scores?

Sub-Question 4c. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced language punctuation achievement scores?

Sub-Question 4d. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced language usage and expression achievement scores?

Sub-Question 4e. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced language total achievement scores?

Research Sub-Questions #4a, 4b, 4c, 4d, and 4e were analyzed using dependent *t* tests to examine the significance of the difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #5: Do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) language spelling, (b) language capitalization, (c) language punctuation, (d) language usage and expression, and (e) language total measures?

Sub-Question 5a. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced language spelling achievement scores?

Sub-Question 5b. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced language capitalization achievement scores?

Sub-Question 5c. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced language punctuation achievement scores?

Sub-Question 5d. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced language usage and expression achievement scores?

Sub-Question 5e. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced language total achievement scores?

Research Sub-Questions #5a, 5b, 5c, 5d, and 5e were analyzed using dependent *t* tests to examine the significance of the difference between traditional education students' ending 3rd-grade compared to ending

5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Posttest-Posttest Achievement Research Question #6: Do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for (a) language spelling, (b) language capitalization, (c) language punctuation, (d) language usage and expression, and (e) language total measures?

Sub-Question 6a. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced language spelling achievement scores?

Sub-Question 6b. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced language capitalization achievement scores?

Sub-Question 6c. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced language punctuation achievement scores?

Sub-Question 6d. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced language usage and expression achievement scores?

Sub-Question 6e. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced language total achievement scores?

Research Sub-Questions #6a, 6b, 6c, 6d, and 6e were analyzed using independent *t* tests to examine the significance of the difference between charter education students' ending 5th-grade compared to traditional education students' ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #7: Do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) mathematics concepts/estimation, (b) mathematics problems/data, (c)

mathematics computation, and (d) mathematics total measures?

Sub-Question 7a. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced mathematics concepts/estimation achievement scores?

Sub-Question 7b. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced mathematics problems/data achievement scores?

Sub-Question 7c. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced mathematics computation achievement scores?

Sub-Question 7d. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced mathematics total achievement scores?

Research Sub-Questions #7a, 7b, 7c, and 7d were analyzed using dependent *t* tests to examine the significance of the difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha

level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #8: Do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) mathematics concepts/estimation, (b) mathematics problems/data, (c) mathematics computation, and (d) mathematics total measures?

Sub-Question 8a. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced mathematics concepts/estimation achievement scores?

Sub-Question 8b. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced mathematics problems/data achievement scores?

Sub-Question 8c. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced mathematics computation achievement scores?

Sub-Question 8d. Is there a significant difference between traditional education students' ending

3rd-grade compared to ending 5th-grade norm-referenced mathematics total achievement scores?

Research Sub-Questions #8a, 8b, 8c, and 8d were analyzed using dependent *t* tests to examine the significance of the difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Posttest-Posttest Achievement Research Question #9: Do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for (a) mathematics concepts/estimation, (b) mathematics problems/data, (c) mathematics computation, and (d) mathematics total measures?

Sub-Question 9a. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced mathematics concepts/estimation achievement scores?

Sub-Question 9b. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced mathematics problems/data achievement scores?

Sub-Question 9c. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced mathematics computation achievement scores?

Sub-Question 9d. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced mathematics total achievement scores?

Research Sub-Questions #9a, 9b, 9c, and 9d were analyzed using independent *t* tests to examine the significance of the difference between charter education students' ending 5th-grade compared to traditional education students' ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #10: Do charter education students lose, maintain,

or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) core total measures?

Sub-Question 10a. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced core total achievement scores?

Research Sub-Questions #10a were analyzed using dependent *t* tests to examine the significance of the difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #11: Do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) core total measures?

Sub-Question 11a. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced core total achievement scores?

Research Sub-Questions #11a were analyzed using dependent *t* tests to examine the significance of the difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Posttest-Posttest Achievement Research Question #12: Do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for (a) core total measures?

Sub-Question 12a. Is there a significant difference between charter education students' ending 5th-grade year compared to traditional students' ending 5th-grade norm-referenced core total achievement scores?

Research Sub-Questions #12a were analyzed using independent *t* tests to examine the significance of the difference between charter education students' ending 5th-grade compared to traditional education students' ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01

alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #13: Do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) social studies, (b) science, and (c) sources of information measures?

Sub-Question 13a. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced social studies achievement scores?

Sub-Question 13b. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced science achievement scores?

Sub-Question 13c. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced sources of information achievement scores?

Research Sub-Questions #13a, 13b, and 13c were analyzed using dependent *t* tests to examine the significance of the difference between charter education students' ending 3rd-grade compared to ending 5th-grade

norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #14: Do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) social studies, (b) science, and (c) sources of information measures?

Sub-Question 14a. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced social studies achievement scores?

Sub-Question 14b. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced science achievement scores?

Sub-Question 14c. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced sources of information achievement scores?

Research Sub-Questions #14a, 14b, and 14c were analyzed using dependent *t* tests to examine the

significance of the difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Posttest-Posttest Achievement Research Question #15: Do charter education students have different or congruent ending 5th-grade norm-referenced achievement scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for (a) social studies, (b) science, and (c) sources of information measures?

Sub-Question 15a. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced social studies achievement scores?

Sub-Question 15b. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced science achievement scores?

Sub-Question 15c. Is there a significant difference between charter education students' ending 5th-

grade compared to traditional students' ending 5th-grade norm-referenced sources of information achievement scores?

Research Sub-Questions #15a, 15b, and 15c were analyzed using independent *t* tests to examine the significance of the difference between charter education students' ending 5th-grade compared to traditional education students' ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #16: Do charter education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) composite measures?

Sub-Question 16a. Is there a significant difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced composite achievement scores?

Research Sub-Questions #16a were analyzed using dependent *t* tests to examine the significance of the difference between charter education students' ending 3rd-grade compared to ending 5th-grade norm-referenced

achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #17: Do traditional education students lose, maintain, or improve their ending 3rd-grade norm-referenced achievement scores compared to their ending 5th-grade norm-referenced achievement scores for (a) composite measures?

Sub-Question 17a. Is there a significant difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced composite achievement scores?

Research Sub-Questions #17a were analyzed using dependent *t* tests to examine the significance of the difference between traditional education students' ending 3rd-grade compared to ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Overarching Posttest-Posttest Achievement Research Question #18: Do charter education students have different or congruent ending 5th-grade norm-referenced achievement

scores compared to traditional education students' ending 5th-grade norm-referenced achievement scores for (a) composite measures?

Sub-Question 18a. Is there a significant difference between charter education students' ending 5th-grade compared to traditional students' ending 5th-grade norm-referenced composite achievement scores?

Research Sub-Questions #18a were analyzed using independent *t* tests to examine the significance of the difference between charter education students' ending 5th-grade compared to traditional education students' ending 5th-grade norm-referenced achievement scores. Because multiple statistical tests were conducted, a one-tailed .01 alpha level was employed to help control for Type 1 errors. Means and standard deviations are displayed in tables.

Data Collection Procedures

All student achievement data was retrospectively, archival, and routinely collected school information. Permission from the appropriate school research personnel was obtained. Non-coded numbers were used to display individual de-identified achievement data. Aggregated group data, descriptive statistics, and inferential statistical analysis were utilized and reported with means and standard deviations on tables.

Performance site. The research was conducted in the public school setting through normal educational practices. The study procedure did not interfere in any way with the normal educational practices of the public school and did not involve coercion or discomfort of any kind. All data were analyzed in the office of the Primary Investigator at the Sioux Central Community School District located at 4440 U.S. Highway 71, Sioux Rapids, Iowa, 50585. Data were stored on spreadsheets and computer disks for statistical analysis. Data and computer disks were kept in a locked records vault. No individual identifiers were attached to the data.

Institutional Review Board (IRB) for the Protection of Human Subjects Approval Category

The exemption categories for this study were provided under 45CFR46.101(b) categories 1 and 4. The research was conducted using routinely collected archival data. A letter of support from the school district is located in the Appendix.

CHAPTER FOUR

Results

The purpose of this study was to evaluate the achievement outcomes of 5th-grade students following their enrollment in federally funded inquiry-based classrooms compared to same school traditional education program students to determine the feasibility of inquiry-based program sustainability.

The study analyzed achievement data of Charter Education Program compared to Traditional Education Program students to determine if students in the two programs have different or congruent achievement gains. All student achievement data related to each of these dependent variables was retrospective, archival, and routinely collected school information. Permission from the appropriate school research personnel was obtained before data were collected and analyzed.

Research Question #1

Table 1 displays gender information of individual 5th-grade students in the Traditional Education Program including their school-wide eligibility percentage for free or reduced-price meals and if a student has a minority status designation. Table 2 displays gender information of individual 5th-grade students in the Charter Education

Program including their school-wide eligibility percentage for free or reduced-price meals and if a student has a minority status designation. Individual students in the Traditional Education Program Iowa Tests of Basic Skills normal curve equivalent scores for reading subtests are displayed in Table 3. Individual students in the Charter Education Program Iowa Tests of Basic Skills normal curve equivalent scores for reading subtests are displayed in Table 4.

The first hypothesis was tested using the dependent *t* test. Tests analyzed TEP students' pretest compared to posttest Iowa Tests of Basic Skills reading subtest NCE scores. Results were displayed in Table 5. As seen in Table 5, the null hypothesis was not rejected for the three reading achievement subtests, reading vocabulary, reading comprehension, and reading total. The pretest reading vocabulary score (M = 51.00, SD = 17.16) compared to the posttest reading vocabulary score (M = 48.56, SD = 13.86) was not statically significantly different, $t(8) = -.73$, $p = .24$ (one-tailed), $d = .16$. The pretest reading comprehension score (M = 44.89, SD = 25.84) compared to the posttest reading comprehension score (M = 53.89, SD = 16.33), was not statically significantly different, $t(8) = 2.05$, $p = .04$ (one-tailed), $d = .43$. The pretest reading

total score (M = 48.22, SD = 20.90) compared to the posttest reading total score (M = 52.22, SD = 14.63), was not statically significantly different, $t(8) = 1.24$, p = .13 (one-tailed), d = .23.

Overall, pretest-posttest results indicated that TEP students did not significantly improve their reading subtest scores. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest reading vocabulary mean score of 48.56 is congruent with a standard score of 99, a percentile rank of 47, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. An NRT NCE posttest reading comprehension mean score of 53.89 is congruent with a standard score of 102, a percentile rank of 55, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. An NRT NCE posttest reading total mean score of 48.56 is congruent with a standard score of 99, a percentile rank of 47, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. While TEP students' pretest-posttest reading scores were not statistically significantly different positive gain over time was observed for reading comprehension and reading total.

Research Question #2

The second hypothesis was tested using the dependent *t* test. Tests analyzed CEP students' pretest-posttest Iowa Tests of Basic Skills reading subtest NCE scores. Results were displayed in Table 6. As seen in Table 6, the null hypothesis was not rejected for the three reading achievement subtests, reading vocabulary, reading comprehension, and reading total. The pretest reading vocabulary score (M = 57.09, SD = 21.64) compared to the posttest reading vocabulary score (M = 60.00, SD = 23.11) was not statically significantly different, $t(10) = .77$, $p = .23$ (one-tailed), $d = .07$. The pretest reading comprehension score (M = 58.18, SD = 20.95) compared to the posttest reading comprehension score (M = 65.09, SD = 23.11), was not statically significantly different, $t(10) = 1.47$, $p = .09$ (one-tailed), $d = .31$. The pretest reading total score (M = 57.82, SD = 21.50) compared to the posttest reading total score (M = 63.91, SD = 20.70), was not statically significantly different, $t(10) = 1.63$, $p = .07$ (one-tailed), $d = .29$.

Overall, pretest-posttest results indicated that CEP students did not significantly improve their reading subtest scores. Comparing CEP students' norm-referenced test NCE scores with derived achievement scores puts their

performance in perspective. An NRT NCE posttest reading vocabulary mean score of 60.00 is congruent with a standard score of 107, a percentile rank of 68, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest reading comprehension mean score of 65.09 is congruent with a standard score of 110, a percentile rank of 75, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest reading total mean score of 63.91 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average.

Research Question #3

The third hypothesis was tested using the independent *t* test. Tests compared TEP students' posttest reading scores with CEP students' posttest reading scores on the Iowa Tests of Basic Skills reading subtests, reading vocabulary, reading comprehension, and reading total. Results were displayed in Table 7. As seen in Table 7, the null hypothesis was not rejected for the three reading achievement subtests. The TEP reading vocabulary posttest score (M = 48.56, SD = 13.86) compared to the CEP reading vocabulary posttest score (M = 60.00, SD = 17.04) was not

statically significantly different, $t(18) = 1.62$, $p = .06$ (one-tailed), $d = .74$. The TEP reading comprehension posttest score ($M = 53.89$, $SD = 16.33$) compared to the CEP reading comprehension posttest score ($M = 65.09$, $SD = 23.11$) was not statically significantly different, $t(18) = 1.22$, $p = .12$ (one-tailed), $d = .57$. The TEP reading total posttest score ($M = 52.22$, $SD = 14.63$) compared to the CEP reading total posttest score ($M = 63.91$, $SD = 20.70$) was not statically significantly different, $t(18) = 1.42$, $p = .09$ (one-tailed), $d = .66$. Overall, posttest-posttest results indicated that while CEP students posttest reading vocabulary, reading comprehension, and reading total mean scores were numerically greater CEP and TEP students did not perform statistically significantly differently on these norm-referenced measures.

Research Question #4

Individual students in the Traditional Education Program Iowa Tests of Basic Skills normal curve equivalent scores for language subtests are displayed in Table 8 and Table 9. Individual students in the Charter Education Program Iowa Tests of Basic Skills normal curve equivalent scores for language subtests are displayed in Table 10 and Table 11.

The fourth hypothesis was tested using the dependent *t* test. Tests analyzed TEP students' pretest compared to posttest Iowa Tests of Basic Skills language subtest NCE scores. Results were displayed in Table 12. As seen in Table 12, the null hypothesis was rejected for two language achievement subtests, capitalization and language total, and not rejected for three language achievement subtests spelling, punctuation, and usage and expression. The pretest spelling score (M = 52.56, SD = 10.10) compared to the posttest spelling score (M = 55.33, SD = 20.26) was not statically significantly different, $t(8) = .59$, $p = .28$ (one-tailed), $d = .18$. The pretest capitalization score (M = 36.00, SD = 18.06) compared to the posttest capitalization score (M = 54.33, SD = 20.13), was statically significantly different, $t(8) = 2.76$, $p = .01$ (one-tailed), $d = .96$. The pretest punctuation score (M = 51.56, SD = 18.82) compared to the posttest punctuation score (M = 55.89, SD = 14.44), was not statically significantly different, $t(8) = 1.04$, $p = .16$ (one-tailed), $d = .26$. The pretest usage and expression score (M = 45.89, SD = 20.44) compared to the posttest usage and expression score (M = 54.33, SD = 20.83), was not statically significantly different, $t(8) = 2.02$, $p = .04$ (one-tailed), $d = .41$. The pretest language total score (M = 45.44, SD =

17.21) compared to the posttest language total score (M = 55.56, SD = 16.52), was statically significantly different, $t(8) = 2.99$, $p = .01$ (one-tailed), $d = .60$.

Overall, pretest-posttest results indicated that TEP students did significantly improve their capitalization and language total subtest scores over time but did not significantly improve their spelling, punctuation, and usage and expression subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest spelling mean score of 55.33 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest capitalization mean score of 54.33 is congruent with a standard score of 103, a percentile rank of 58, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest punctuation mean score of 55.89 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest usage and expression mean score of 54.33 is congruent with a standard score of 103, a percentile

rank of 58, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest language total mean score of 55.56 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While TEP students' pretest-posttest language scores were found to be statistically significantly different in only two areas, capitalization and language total, positive gain over time was observed for all language scores, spelling, capitalization, punctuation, usage and expression, and language total.

Research Question #5

The fifth hypothesis was tested using the dependent *t* test. Tests analyzed CEP students' pretest compared to posttest Iowa Tests of Basic Skills language subtest NCE scores. Results were displayed in Table 13. As seen in Table 13, the null hypothesis was rejected for two language achievement subtests, spelling and language total. The null hypothesis was not rejected for three language achievement subtests, capitalization, punctuation, and usage and expression, The pretest spelling score (M = 51.73, SD = 18.47) compared to the posttest spelling score (M = 60.36, SD = 20.42) was statically significantly different, $t(10)$ =

2.62, p = .01 (one-tailed), d = .44. The pretest capitalization score (M = 48.82, SD = 15.45) compared to the posttest capitalization score (M = 55.82, SD = 21.27), was not statically significantly different, $t(10) = 1.40$, p = .10 (one-tailed), d = .38. The pretest punctuation score (M = 59.00, SD = 19.86) compared to the posttest punctuation score (M = 55.82, SD = 14.97), was not statically significantly different, $t(10) = -.76$, p = .23 (one-tailed), d = .18. The pretest usage and expression score (M = 53.18, SD = 23.45) compared to the posttest usage and expression score (M = 68.64, SD = 16.53), was not statically significantly different, $t(10) = 2.35$, p = .02 (one-tailed), d = .77. The pretest language total score (M = 53.09, SD = 17.21) compared to the posttest language total score (M = 61.45, SD = 17.91), was statically significantly different, $t(10) = 2.56$, p = .01 (one-tailed), d = .43.

Overall, pretest-posttest results indicated that CEP students did significantly improve their spelling and language total subtest scores over time but did not significantly improve their capitalization, punctuation, and usage and expression subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in

perspective. An NRT NCE posttest spelling mean score of 60.36 is congruent with a standard score of 107, a percentile rank of 68, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest capitalization mean score of 55.82 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest punctuation mean score of 55.82 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest usage and expression mean score of 68.64 is congruent with a standard score of 113, a percentile rank of 81, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest language total mean score of 61.45 is congruent with a standard score of 108, a percentile rank of 70, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While CEP students' pretest-posttest language scores were found to be statistically significantly different in only two areas, spelling and language total, positive gain over time was observed for four language

scores, spelling, capitalization, usage and expression, and language total. Punctuation scores were found to not be in the direction of improvement over time.

Research Question #6

The sixth hypothesis was tested using the independent *t* test. Tests compared TEP students' posttest language scores with CEP students' posttest language scores on the Iowa Tests of Basic Skills language subtests, spelling, capitalization, punctuation, usage and expression, and language total. Results were displayed in Table 14. As seen in Table 14, the null hypothesis was not rejected for the five language achievement subtests. The TEP spelling posttest score (M = 55.33, SD = 20.26) compared to the CEP spelling posttest score (M = 60.36, SD = 20.42) was not statically significantly different, $t(18) = .55$, $p = .29$ (one-tailed), $d = .25$. The TEP capitalization posttest score (M = 54.33, SD = 20.13) compared to the CEP capitalization posttest score (M = 55.82, SD = 21.27) was not statically significantly different, $t(18) = .16$, $p = .44$ (one-tailed), $d = .07$. The TEP punctuation posttest score (M = 55.89, SD = 14.44) compared to the CEP punctuation posttest score (M = 55.82, SD = 14.97) was not statically significantly different, $t(18) = -.01$, $p = .50$ (one-tailed), $d = .01$. The TEP usage and expression

posttest score (*M* = 54.33, *SD* = 20.83) compared to the CEP usage and expression posttest score (*M* = 68.64, *SD* = 16.53) was not statically significantly different, *t*(18) = 1.71, *p* = .05 (one-tailed), *d* = .77. The TEP language total posttest score (*M* = 55.56, *SD* = 16.52) compared to the CEP language total posttest score (*M* = 61.45, *SD* = 17.91) was not statically significantly different, *t*(18) = .76, *p* = .23 (one-tailed), *d* = .34.

Overall, posttest-posttest results indicated that while CEP students posttest spelling, capitalization, usage and expression, and language total mean scores were numerically greater and CEP students posttest punctuation mean score was numerically less than TEP students, CEP and TEP students did not perform statistically significantly differently on these five norm-referenced language measures.

Research Question #7

Individual students in the Traditional Education Program Iowa Tests of Basic Skills normal curve equivalent scores for mathematics subtests are displayed in Table 15. Individual students in the Charter Education Program Iowa Tests of Basic Skills normal curve equivalent scores for mathematics subtests are displayed in Table 16.

The seventh hypothesis was tested using the dependent *t* test. Tests analyzed TEP students' pretest compared to posttest Iowa Tests of Basic Skills mathematics subtest NCE scores. Results were displayed in Table 17. As seen in Table 17, the null hypothesis was not rejected for concepts/estimation, problems/data, computation, and mathematics total. The pretest concepts/estimation score (M = 48.78, SD = 24.13) compared to the posttest concepts/estimation score (M = 48.33, SD = 19.47) was not statically significantly different, $t(8) = -.13$, $p = .45$ (one-tailed), $d = .02$. The pretest problems/data score (M = 43.33, SD = 19.46) compared to the posttest problems/data score (M = 51.67, SD = 15.64), was not statically significantly different, $t(8) = 2.14$, $p = .03$ (one-tailed), $d = .48$. The pretest computation score (M = 54.67, SD = 19.15) compared to the posttest computation score (M = 43.78, SD = 18.92), was not statically significantly different, $t(8) = -2.48$, $p = .02$ (one-tailed), $d = .57$. The pretest mathematics total score (M = 45.56, SD = 21.46) compared to the posttest mathematics total score (M = 50.00, SD = 17.82), was not statically significantly different, $t(8) = 1.38$, $p = .10$ (one-tailed), $d = .23$.

Overall, pretest-posttest results indicated that TEP students did not significantly improve their

concepts/estimation, problems/data, computation, and mathematics total subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest concepts/estimation mean score of 48.33 is congruent with a standard score of 99, a percentile rank of 47, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. An NRT NCE posttest problems/data mean score of 51.67 is congruent with a standard score of 101, a percentile rank of 53, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. An NRT NCE posttest computation mean score of 43.78 is congruent with a standard score of 95, a percentile rank of 37, a stanine score of 4, the lowest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest mathematics total mean score of 50.00 is congruent with a standard score of 100, a percentile rank of 50, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. While TEP students' pretest-posttest mathematics scores were not found to be statistically significantly different, positive gain over time was observed for problems/data and

mathematics total and negative skill change was observed for concepts/estimation and computation.

Research Question #8

The eighth hypothesis was tested using the dependent *t* test. Tests analyzed CEP students' pretest compared to posttest Iowa Tests of Basic Skills mathematics subtest NCE scores. Results were displayed in Table 18. As seen in Table 18, the null hypothesis was not rejected for concepts/estimation, problems/data, computation, and mathematics total. The pretest concepts/estimation score (M = 57.45, SD = 15.69) compared to the posttest concepts/estimation score (M = 62.18, SD = 17.34) was not statically significantly different, $t(10) = 1.60$, $p = .07$ (one-tailed), $d = .29$. The pretest problems/data score (M = 60.64, SD = 24.27) compared to the posttest problems/data score (M = 64.18, SD = 19.10), was not statically significantly different, $t(10) = .51$, $p = .31$ (one-tailed), $d = .16$. The pretest computation score (M = 54.36, SD = 16.93) compared to the posttest computation score (M = 55.64, SD = 11.58), was not statically significantly different, $t(10) = .34$, $p = .37$ (one-tailed), $d = .09$. The pretest mathematics total score (M = 59.82, SD = 20.97) compared to the posttest mathematics total score (M =

63.09, *SD* = 17.92), was not statically significantly different, *t*(10) = .69, *p* = .25 (one-tailed), *d* = .17.

Overall, pretest-posttest results indicated that CEP students did not significantly improve their concepts/estimation, problems/data, computation, and mathematics total subtest scores over time. Comparing CEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest concepts/estimation mean score of 62.18 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest problems/data mean score of 64.18 is congruent with a standard score of 110, a percentile rank of 75, a stanine score of 6, the higest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest computation mean score of 55.64 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest mathematics total mean score of 63.09 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation

of average. While CEP students' pretest-posttest mathematics scores were not found to be statistically significantly different, positive gain over time was observed for all four mathematics subtests concepts/estimation, problems/data, computation, and mathematics total.

Research Question #9

The ninth hypothesis was tested using the independent *t* test. Tests compared TEP students' posttest mathematics scores with CEP students' posttest mathematic scores on the Iowa Tests of Basic Skills mathematics subtests, concepts/estimation, problems/data, computation, and mathematics total. Results were displayed in Table 19. As seen in Table 19, the null hypothesis was not rejected for the four mathematics achievement subtests. The TEP concepts/estimation posttest score (M = 48.33, SD = 19.47) compared to the CEP concepts/estimation posttest score (M = 62.18, SD = 17.34) was not statically significantly different, $t(18) = 1.68$, $p = .05$ (one-tailed), $d = .75$. The TEP problems/data posttest score (M = 51.67, SD = 15.64) compared to the CEP problems/data posttest score (M = 64.18, SD = 19.10) was not statically significantly different, $t(18) = 1.58$, $p = .07$ (one-tailed), $d = .72$. The TEP computation posttest score (M = 43.78, SD = 18.92)

compared to the CEP computation posttest score (*M* = 55.64, *SD* = 11.58) was not statically significantly different, *t*(18) = 1.73, *p* = .05 (one-tailed), *d* = .78. The TEP mathematics total posttest score (*M* = 50.00, *SD* = 17.82) compared to the CEP mathematics total posttest score (*M* = 63.09, *SD* = 17.92) was not statically significantly different, *t*(18) = 1.63, *p* = .06 (one-tailed), *d* = .73.

Overall, posttest-posttest results indicated that while CEP students posttest concepts/estimation, problems/data, computation, and mathematics total mean scores were numerically greater than TEP students posttest concepts/estimation, problems/data, computation, and mathematics total mean scores, CEP and TEP students did not perform statistically significantly differently on these five norm-referenced mathematics measures.

Research Question #10

Individual students in the Traditional Education Program Iowa Tests of Basic Skills normal curve equivalent scores for the core total subtest are displayed in Table 20. Individual students in the Charter Education Program Iowa Tests of Basic Skills normal curve equivalent scores for core total subtest are displayed in Table 21.

The tenth hypothesis was tested using the dependent *t* test. Tests analyzed TEP students' pretest compared to

posttest Iowa Tests of Basic Skills core total subtest NCE scores. Results were displayed in Table 22. As seen in Table 22, the null hypothesis was not rejected for the core total subtest. The pretest core total score (M = 46.00, SD = 20.67) compared to the posttest core total score (M = 53.11, SD = 16.37), was not statically significantly different, $t(8) = 2.39$, $p = .02$ (one-tailed), $d = .38$.

Overall, pretest-posttest results indicated that TEP students did not significantly improve their core total subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest core total mean score of 53.11 is congruent with a standard score of 102, a percentile rank of 55, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. While TEP students' pretest-posttest core total scores were not found to be statistically significantly different, positive gain over time was observed for the core total measure.

Research Question #11

The eleventh hypothesis was tested using the dependent t test. Tests analyzed CEP students' pretest compared to posttest Iowa Tests of Basic Skills core total subtest NCE scores. Results were displayed in Table 23. As seen in

Table 23, the null hypothesis was not rejected for the core total subtest. The pretest core total score (M = 57.73, SD = 21.42) compared to the posttest core total score (M = 63.45, SD = 18.76), was not statically significantly different, $t(10) = 1.89$, $p = .04$ (one-tailed), $d = .29$.

Overall, pretest-posttest results indicated that CEP students did not significantly improve their core total subtest scores over time. Comparing CEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest core total mean score of 63.45 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While CEP students' pretest-posttest core total scores were not found to be statistically significantly different, positive gain over time was observed for the core total measure.

Research Question #12

The twelfth hypothesis was tested using the independent t test. Tests compared TEP students' posttest core total scores with CEP students' posttest core total scores on the Iowa Tests of Basic Skills core total subtest. Results were displayed in Table 24. As seen in Table 24, the null hypothesis was not rejected for the core

total subtest. The TEP core total posttest score (M = 53.11, SD = 16.37) compared to the CEP core total posttest score (M = 63.45, SD = 18.76) was not statically significantly different, $t(18) = 1.30$, $p = .11$ (one-tailed), $d = .59$.

Overall, posttest-posttest results indicated that while CEP students posttest core total mean scores were numerically greater than TEP students posttest core total mean scores, CEP and TEP students did not perform statistically significantly differently on the core total measure.

Research Question #13

Individual students in the Traditional Education Program Iowa Tests of Basic Skills normal curve equivalent scores for social studies, science, and sources of information subtests are displayed in Table 25. Individual students in the Charter Education Program Iowa Tests of Basic Skills normal curve equivalent scores for social studies, science, and sources of information subtests are displayed in Table 26.

The thirteenth hypothesis was tested using the dependent t test. Tests analyzed TEP students' pretest compared to posttest Iowa Tests of Basic Skills social studies, science, and sources of information subtest NCE

scores. Results were displayed in Table 27. As seen in Table 27, the null hypothesis was not rejected for the social studies, science, and sources of information subtests. The pretest social studies score (M = 55.11, SD = 18.43) compared to the posttest social studies score (M = 55.78, SD = 20.21) was not statically significantly different, $t(8) = .12$, $p = .45$ (one-tailed), $d = .03$. The pretest science score (M = 50.22, SD = 22.48) compared to the posttest science score (M = 53.33, SD = 24.17), was not statically significantly different, $t(8) = .57$, $p = .29$ (one-tailed), $d = .13$. The pretest sources of information score (M = 52.11, SD = 21.62) compared to the posttest computation score (M = 55.56, SD = 16.52), was not statically significantly different, $t(8) = .77$, $p = .23$ (one-tailed), $d = .18$.

Overall, pretest-posttest results indicated that TEP students did not significantly improve their social studies, science, and sources of information subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest social studies mean score of 55.78 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a

descriptive designation of average. An NRT NCE posttest science mean score of 53.33 is congruent with a standard score of 102, a percentile rank of 55, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. An NRT NCE posttest sources of information mean score of 55.56 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While TEP students' pretest-posttest social studies, science, and sources of information scores were not found to be statistically significantly different, positive gain over time was observed for all three subtest measures: social studies, science, and sources of information.

Research Question #14

The fourteenth hypothesis was tested using the dependent *t* test. Tests analyzed CEP students' pretest compared to posttest Iowa Tests of Basic Skills social studies, science, and sources of information subtest NCE scores. Results were displayed in Table 28. As seen in Table 28, the null hypothesis was not rejected for the social studies, science, and sources of information subtests. The pretest social studies score (M = 67.00, SD = 14.99) compared to the posttest social studies score (M =

62.36, *SD* = 15.11) was not statically significantly different, *t*(10) = -1.42, *p* = .09 (one-tailed), *d* = .31. The pretest science score (*M* = 68.45, *SD* = 21.93) compared to the posttest science score (*M* = 62.82, *SD* = 18.54), was not statically significantly different, *t*(10) = -1.83, *p* = .05 (one-tailed), *d* = .28. The pretest sources of information score (*M* = 67.45, *SD* = 21.21) compared to the posttest computation score (*M* = 64.45, *SD* = 19.35), was not statically significantly different, *t*(10) = -1.06, *p* = .16 (one-tailed), *d* = .18.

Overall, pretest-posttest results indicated that CEP students did not statistically significantly improve their social studies, science, and sources of information subtest scores over time. Comparing CEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest social studies mean score of 62.36 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest science mean score of 62.82 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest

sources of information mean score of 64.45 is congruent with a standard score of 110, a percentile rank of 75, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While CEP students' pretest-posttest social studies, science, and sources of information scores were not found to be statistically significantly different, negative change over time was observed for all three subtest measures: social studies, science, and sources of information.

Research Question #15

The fifteenth hypothesis was tested using the independent *t* test. Tests compared TEP students' posttest social studies, science, and sources of information scores with CEP students' posttest social studies, science, and sources of information scores on the Iowa Tests of Basic Skills social studies, science, and sources of information subtests. Results were displayed in Table 29. As seen in Table 29, the null hypothesis was not rejected for the social studies, science, and sources of information achievement subtests. The TEP social studies posttest score (M = 55.78, SD = 20.21) compared to the CEP social studies posttest score (M = 62.36, SD = 15.11) was not statically significantly different, $t(18) = .83$, $p = .21$ (one-tailed), $d = .37$. The TEP science posttest score (M = 53.33, SD =

24.17) compared to the CEP science posttest score (M = 62.82, SD = 18.54) was not statically significantly different, $t(18) = .99$, $p = .17$ (one-tailed), $d = .44$. The TEP sources of information posttest score (M = 55.56, SD = 16.52) compared to the CEP sources of information posttest score (M = 64.45, SD = 19.35) was not statically significantly different, $t(18) = 1.09$, $p = .14$ (one-tailed), $d = .18$.

Overall, posttest-posttest results indicated that while CEP students posttest social studies, science, and sources of information mean scores were numerically greater than CEP students posttest social studies, science, and sources of information mean scores, CEP and TEP students did not perform statistically significantly differently for all three subtest measures: social studies, science, and sources of information.

Research Question #16

Individual students in the Traditional Education Program Iowa Tests of Basic Skills normal curve equivalent scores for the composite subtest are displayed in Table 30. Individual students in the Charter Education Program Iowa Tests of Basic Skills normal curve equivalent scores for composite subtest are displayed in Table 31.

The sixteenth hypothesis was tested using the dependent *t* test. Tests analyzed TEP students' pretest compared to posttest Iowa Tests of Basic Skills composite subtest NCE scores. Results were displayed in Table 32. As seen in Table 32, the null hypothesis was rejected for the composite subtest. The pretest composite score (M = 49.56, SD = 18.72) compared to the posttest core total score (M = 54.33, SD = 17.85), was statically significantly different, $t(8) = 3.25$, $p < .01$ (one-tailed), $d = .26$.

Overall, pretest-posttest results indicated that TEP students did significantly improve their composite subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest composite mean score of 54.33 is congruent with a standard score of 107, a percentile rank of 68, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. TEP students' pretest-posttest core total scores were found to be statistically significantly different, and positive gain over time was observed for the composite measure.

Research Question #17

The seventeenth hypothesis was tested using the dependent *t* test. Tests analyzed CEP students' pretest

compared to posttest Iowa Tests of Basic Skills composite subtest NCE scores. Results were displayed in Table 33. As seen in Table 33, the null hypothesis was not rejected for the composite subtest. The pretest composite score (M = 64.64, SD = 21.39) compared to the posttest composite score (M = 64.36, SD = 18.82), was not statically significantly different, $t(10) = -.14$, $p = .45$ (one-tailed), $d = .01$.

Overall, pretest-posttest results indicated that CEP students did not significantly improve their composite subtest scores over time. Comparing CEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest composite mean score of 64.36 is congruent with a standard score of 110, a percentile rank of 75, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While CEP students' pretest-posttest composite scores were not found to be statistically significantly different, negative gain over time was observed for the composite measure.

Research Question #18

The eighteenth hypothesis was tested using the independent t test. Tests compared TEP students' posttest composite scores with CEP students' posttest composite scores on the Iowa Tests of Basic Skills composite subtest.

Results were displayed in Table 34. As seen in Table 34, the null hypothesis was not rejected for the composite subtest. The TEP composite posttest score (M = 54.33, SD = 17.85) compared to the CEP composite posttest score (M = 64.36, SD = 18.82) was not statically significantly different, $t(18) = 1.21$, $p = .12$ (one-tailed), $d = .55$.

Overall, posttest-posttest results indicated that while CEP students posttest composite mean scores were numerically greater than TEP students posttest composite mean scores, CEP and TEP students did not perform statistically significantly differently on the composite measure.

Table 1

Gender Information of Individual 5th-Grade Students in the Traditional Education Program

Student number (a)	Gender
1. (a)	Female
2.	Female
3. (a)	Male
4.	Female
5. (a)	Male
6.	Male
7.	Female
8.	Male
9.	Female

(a) Note: 32% of students in the research school received free or reduced-price meals and are therefore categorized as low income.

Table 2

Gender Information of Individual 5th-Grade Students in the Charter Education Program

Student number (a)	Gender
1.	Male
2.	Male
3.	Male
4.	Male
5.	Male
6.	Female
7.	Female
8.	Male
9. (a)	Female
10. (a)	Female
11. (a)	Male

(a) Note: 32% of students in the research school received free or reduced-price meals and are therefore categorized as low income.

Table 3

Individual Students in the Traditional Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Reading Subtests

Student	Vocabulary		Comprehension		Total	
number	Pre	Post	Pre	Post	Pre	Post
1.	27	27	15	37	20	33
2.	37	35	10	34	25	35
3.	74	58	46	68	59	65
4.	27	45	15	34	20	40
5.	58	45	58	53	58	50
6.	70	75	67	73	68	75
7.	58	56	83	73	74	66
8.	53	45	58	64	56	56
9.	55	51	52	49	54	50

Note. Student numbers correspond with Table 1.

Table 4

Individual Students in the Charter Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Reading Subtests

Student	Vocabulary		Comprehension		Total	
number	Pre	Post	Pre	Post	Pre	Post
1.	27	43	22	46	23	44
2.	70	90	83	99	78	99
3.	93	75	90	73	93	75
4.	74	81	69	85	72	87
5.	70	63	78	81	75	74
6.	22	38	32	19	26	27
7.	49	58	58	48	54	52
8.	58	54	53	85	56	73
9.	37	45	53	68	45	59
10.	58	45	44	48	51	47
11.	70	68	58	64	63	66

Note. Student numbers correspond with Table 2.

Table 5

Traditional Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Reading Vocabulary, Reading Comprehension, and Reading Total Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Vocab-ulary	51.00	(17.16)	48.56	(13.86)	.16	-.73	.24*
Compre-hension	44.89	(25.84)	53.89	(16.33)	.43	2.05	.04*
Total	48.22	(20.90)	52.22	(14.63)	.23	1.24	.13*

* Note: *not significant*.

Table 6

Charter Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Reading Vocabulary, Reading Comprehension, and Reading Total Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Vocab-ulary	57.09	(21.64)	60.00	(17.04)	.07	.77	.23*
Compre-hension	58.19	(20.95)	65.09	(23.11)	.31	1.47	.09*
Total	57.82	(21.50)	63.91	(20.70)	.29	1.63	.07*

* Note: *not significant*.

Table 7

Comparison of Traditional Education Program Students to Charter Education Program Students Posttest Iowa Tests of Basic Skills Reading Vocabulary, Reading Comprehension, and Reading Total Normal Curve Equivalent Scores

	TEP Posttest Scores		CEP Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Vocab-ulary	48.56	(13.86)	60.00	(17.04)	.74	1.62	.06*
Compre-hension	53.89	(16.33)	65.09	(23.11)	.57	1.22	.12*
Total	52.22	(14.63)	63.91	(20.70)	.66	1.42	.09*

* Note: *not significant*.

Table 8

Individual Students in the Traditional Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Language Subtests

Student	Spelling		Capital-ization		Punc-tuation	
number	Pre	Post	Pre	Post	Pre	Post
1.	46	32	13	26	25	27
2.	38	45	7	46	41	55
3.	63	52	49	62	60	66
4.	46	52	32	69	34	62
5.	56	74	60	55	73	59
6.	46	45	46	93	51	62
7.	71	99	44	62	85	78
8.	51	40	24	40	51	47
9.	56	59	49	36	44	47

Note. Student numbers correspond with Table 1.

Table 9

Individual Students in the Traditional Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Language Subtests

Student number	Usage and expression		Total	
	Pre	Post	Pre	Post
1.	22	35	22	28
2.	35	39	29	46
3.	51	72	54	65
4.	25	31	31	55
5.	42	43	59	56
6.	55	85	49	75
7.	90	77	77	81
8.	38	39	38	41
9.	55	68	50	53

Note. Student numbers correspond with Table 1.

Table 10

Individual Students in the Charter Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Language Subtests

Student	Spelling		Capital-ization		Punc-tuation	
number	Pre	Post	Pre	Post	Pre	Post
1.	46	39	52	46	57	52
2.	87	90	76	87	85	74
3.	71	74	44	74	64	66
4.	48	81	46	69	64	66
5.	71	77	64	66	93	57
6.	19	24	24	13	30	32
7.	41	59	60	58	64	55
8.	46	52	24	48	30	35
9.	43	49	52	33	41	42
10.	54	74	49	74	57	78
11.	43	45	46	46	64	57

Note. Student numbers correspond with Table 2.

Table 11

Individual Students in the Charter Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Language Subtests

Student number	Usage and expression		Total	
	Pre	Post	Pre	Post
1.	38	48	47	46
2.	99	85	93	90
3.	77	85	64	78
4.	58	72	54	75
5.	67	64	77	66
6.	29	48	22	27
7.	40	99	51	67
8.	17	58	24	48
9.	51	77	46	52
10.	67	55	57	73
11.	42	64	49	54

Note. Student numbers correspond with Table 2.

Table 12

Traditional Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Language Spelling, Language Capitalization, Language Punctuation, Language Usage and Expression, and Language Total Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Spelling	52.56	(10.10)	55.33	(20.26)	.18	.59	.28*
Capital-ization	36.00	(18.06)	54.33	(20.13)	.96	2.76	.01**
Punc-tuation	51.56	(18.82)	55.89	(14.44)	.26	1.04	.16*
Usage and Expression	45.89	(20.44)	54.33	(20.83)	.41	2.02	.04*
Total	45.44	(17.21)	55.56	(16.52)	.60	2.99	.01**

* Note: *not significant*.

** Note: $p < .01$.

Table 13

Charter Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Language Spelling, Language Capitalization, Language Punctuation, Language Usage and Expression, and Language Total Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Spelling	51.73	(18.47)	60.36	(20.42)	.44	2.62	.01**
Capital-ization	48.82	(15.45)	55.82	(21.27)	.38	1.40	.10*
Punc-tuation	59.00	(19.86)	55.82	(14.97)	.18	-.76	.23*
Usage and Expression	53.18	(23.45)	68.64	(16.53)	.77	2.35	.02*
Total	53.09	(20.54)	61.45	(17.91)	.43	2.56	.01**

* Note: *not significant*.

** Note: $p < .01$.

Table 14

Comparison of Traditional Education Program Students to Charter Education Program Students Posttest Iowa Tests of Basic Skills Language Spelling, Language Capitalization, Language Punctuation, Language Usage and Expression, and Language Total Normal Curve Equivalent Scores

	TEP Posttest Scores		CEP Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Spelling	55.33	(20.26)	60.36	(20.42)	.25	.55	.29*
Capital-ization	54.33	(20.13)	55.82	(21.27)	.07	.16	.44*
Punc-tuation	55.89	(14.44)	55.82	(14.97)	.01	-.01	.50*
Usage and Expression	54.33	(20.83)	68.64	(16.53)	.77	1.71	.05*
Total	55.56	(16.52)	61.45	(17.91)	.34	.76	.23*

* Note: *not significant*.

Table 15

Individual Students in the Traditional Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Mathematics Subtests

Student	Concepts/ estimation		Problems/ data		Computation		Total	
number	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1.	23	29	29	38	25	41	25	33
2.	39	50	32	46	51	41	35	48
3.	70	59	58	61	81	72	62	60
4.	29	40	7	38	38	35	15	38
5.	42	50	48	58	58	38	46	55
6.	78	77	69	68	75	52	75	72
7.	85	74	65	77	75	72	75	77
8.	53	37	41	50	41	15	46	44
9.	20	19	41	29	48	28	31	23

Note. Student numbers correspond with Table 1.

Table 16

Individual Students in the Charter Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Mathematics Subtests

Student	Concepts/ estimation		Problems/ data		Computation		Total	
number	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1.	53	64	48	55	48	62	50	59
2.	93	93	99	93	75	68	99	93
3.	63	77	99	68	58	53	87	72
4.	66	69	65	73	51	59	66	72
5.	75	69	83	73	81	65	80	72
6.	39	29	29	29	34	44	33	28
7.	53	66	51	65	64	77	52	66
8.	46	69	29	93	25	46	36	80
9.	46	42	48	46	46	44	47	44
10.	49	54	58	58	68	53	54	56
11.	49	52	58	53	48	41	54	52

Note. Student numbers correspond with Table 2.

Table 17

Traditional Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Mathematics Concepts/estimation, Mathematics Problems/data, Mathematics Computation, and Mathematics Total Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Concepts/ estimation	48.78	(24.13)	48.33	(19.47)	.02	-.13	.45*
Problems/ data	43.33	(19.46)	51.67	(15.64)	.48	2.14	.03*
Compu- tation	54.67	(19.15)	43.78	(18.92)	.57	-2.48	.02*
Total	45.56	(21.46)	50.00	(17.82)	.23	1.38	.10*

* Note: *not significant*.

Table 18

Charter Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Mathematics Concepts/estimation, Mathematics Problems/data, Mathematics Computation, and Mathematics Total Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Concepts/ estimation	57.45	(15.69)	62.18	(17.34)	.29	1.60	.07*
Problems/ data	60.64	(24.27)	64.18	(19.10)	.16	.51	.31*
Compu- tation	54.36	(16.93)	55.64	(11.58)	.09	.34	.37*
Total	59.82	(20.97)	63.09	(17.92)	.17	.69	.25*

* Note: *not significant*.

Table 19

Comparison of Traditional Education Program Students to Charter Education Program Students Posttest Iowa Tests of Basic Skills Mathematics Concepts/estimation, Mathematics Problems/data, Mathematics Computation, and Mathematics Total Normal Curve Equivalent Scores

	TEP Posttest Scores		CEP Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Concepts/ estimation	48.33	(19.47)	62.18	(17.34)	.75	1.68	.05*
Problems/ data	51.67	(15.64)	64.18	(19.10)	.72	1.58	.07*
Compu- tation	43.78	(18.92)	55.64	(11.58)	.78	1.73	.05*
Total	50.00	(17.82)	63.09	(17.92)	.73	1.63	.06*

* Note: *not significant.*

Table 20

Individual Students in the Traditional Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Core Total Tests

Student number	Core total	
	Pre	Post
1.	19	30
2.	28	42
3.	59	64
4.	19	44
5.	55	54
6.	65	76
7.	78	78
8.	46	47
9.	45	43

Note. Student numbers correspond with Table 1.

Table 21

Individual Students in the Charter Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Core Total Tests

Student number	Core total	
	Pre	Post
1.	40	49
2.	93	99
3.	85	77
4.	65	78
5.	81	71
6.	24	26
7.	53	63
8.	39	66
9.	45	52
10.	54	60
11.	56	57

Note. Student numbers correspond with Table 2.

Table 22

Traditional Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Core Total Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Core Total	46.00	(20.67)	53.11	(16.37)	.38	2.39	.02*

* Note: *not significant*.

Table 23

Charter Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Core Total Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Core Total	57.73	(21.42)	63.45	(18.76)	.29	1.89	.04*

* Note: *not significant*.

Table 24

Comparison of Traditional Education Program Students to Charter Education Program Students Posttest Iowa Tests of Basic Skills Core Total Normal Curve Equivalent Scores

	TEP Posttest Scores		CEP Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Core Total	53.11	(16.37)	63.45	(18.76)	.59	1.30	.11*

* Note: *not significant*.

Table 25

Individual Students in the Traditional Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Social Studies, Science, and Sources of Information Subtests

Student	Social studies		Science		Sources of information	
number	Pre	Post	Pre	Post	Pre	Post
1.	36	38	50	33	36	35
2.	42	35	45	52	13	37
3.	85	68	60	56	64	69
4.	42	44	35	15	47	56
5.	36	59	19	46	57	55
6.	71	93	93	85	90	68
7.	77	62	74	93	66	85
8.	56	71	41	58	55	54
9.	51	32	35	42	41	41

Note. Student numbers correspond with Table 1.

Table 26

Individual Students in the Charter Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for Social Studies, Science, and Sources of Information Subtests

Student	Social studies		Science		Sources of information	
number	Pre	Post	Pre	Post	Pre	Post
1.	60	51	78	58	46	53
2.	77	93	99	93	99	93
3.	93	78	85	85	90	90
4.	71	71	85	85	90	69
5.	85	74	93	75	90	90
6.	42	48	24	38	39	35
7.	60	57	55	52	55	50
8.	71	57	55	54	49	64
9.	51	59	55	45	54	52
10.	56	41	66	48	62	49
11.	71	57	58	58	68	64

Note. Student numbers correspond with Table 2.

Table 27

Traditional Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Social Studies, Science, and Sources of Information Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Social Studies	55.11	(18.43)	55.78	(20.21)	.03	.12	.45*
Science	50.22	(22.48)	53.33	(24.17)	.13	.57	.29*
Sources of Information	52.11	(21.62)	55.56	(16.52)	.18	.77	.23*

* Note: *not significant*.

Table 28

Charter Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Social Studies, Science, and Sources of Information Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Social Studies	67.00	(14.99)	62.36	(15.11)	.31	-1.42	.09*
Science	68.45	(21.93)	62.82	(18.54)	.28	-1.83	.05*
Sources of Information	67.45	(21.21)	64.45	(19.35)	.18	-1.06	.16*

* Note: *not significant*.

Table 29

Comparison of Traditional Education Program Students to Charter Education Program Students Posttest Iowa Tests of Basic Skills Social Studies, Science, and Sources of Information Normal Curve Equivalent Scores

	TEP Posttest Scores		CEP Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Social Studies	55.78	(20.21)	62.36	(15.11)	.37	.83	.21*
Science	53.33	(24.17)	62.82	(18.54)	.44	.99	.17*
Sources of Information	55.56	(16.52)	64.45	(19.35)	.18	1.09	.14*

* Note: *not significant*.

Table 30

Individual Students in the Traditional Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for the Composite of Tests

Student number	Composite	
	Pre	Post
1.	31	32
2.	31	41
3.	65	64
4.	31	41
5.	45	54
6.	77	81
7.	76	81
8.	48	54
9.	42	41

Note. Student numbers correspond with Table 1.

Table 31

Individual Students in the Charter Education Program Iowa Tests of Basic Skills Normal Curve Equivalent Scores for the Composite of Tests

Student number	Composite	
	Pre	Post
1.	52	52
2.	99	99
3.	90	85
4.	76	80
5.	90	77
6.	30	33
7.	55	58
8.	49	61
9.	49	52
10.	59	53
11.	62	58

Note. Student numbers correspond with Table 2.

Table 32

Traditional Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Composite Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Composite	49.56	(18.72)	54.33	(17.85)	.26	3.25	.01**

** Note: $p < .01$.

Table 33

Charter Education Program Students Pretest Compared to Posttest Iowa Tests of Basic Skills Composite Normal Curve Equivalent Scores

	Pretest Scores		Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Composite	64.64	(21.39)	64.36	(18.82)	.01	-.14	.45*

* Note: *not significant*.

Table 34

Comparison of Traditional Education Program Students to Charter Education Program Students Posttest Iowa Tests of Basic Skills Composite Normal Curve Equivalent Scores

	TEP Pretest Scores		CEP Posttest Scores				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Composite	54.33	(17.85)	64.36	(18.82)	.55	1.21	.12*

* Note: *not significant*.

CHAPTER FIVE

Conclusions and Discussion

The purpose of this study was to evaluate the achievement outcomes of 5th-grade students following their enrollment in federally funded inquiry-based classrooms compared to same school traditional education program students to determine the feasibility of inquiry-based program sustainability.

The study analyzed achievement data of Charter Education Program compared to Traditional Education Program students to determine if students in the two programs had different or congruent achievement gains. All student achievement data related to each of these dependent variables was retrospective, archival, and routinely collected school information. Permission from the appropriate school research personnel and from the Combined University of Nebraska Medical Center/University of Nebraska at Omaha Institutional Review Board for the Protection of Human Subjects was obtained before data were collected and analyzed.

This chapter contains the conclusions and discussion of the findings from this research effort. The chapter begins with the conclusions reached from calculating the data. The next section contains a discussion of those

conclusions. The discussion includes an assessment of the significance of those findings. The discussion also includes recommendations for future research.

Conclusions

Research question #1. Pretest-posttest results indicated that TEP students did not significantly improve their reading subtest scores. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest reading vocabulary mean score of 48.56 is congruent with a standard score of 99, a percentile rank of 47, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. An NRT NCE posttest reading comprehension mean score of 53.89 is congruent with a standard score of 102, a percentile rank of 55, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. An NRT NCE posttest reading total mean score of 48.56 is congruent with a standard score of 99, a percentile rank of 47, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. While TEP students' pretest-posttest reading scores were not statistically significantly different positive gain over time was observed for reading comprehension and reading total.

Research question #2. Pretest-posttest results indicated that CEP students did not significantly improve their reading subtest scores. Comparing CEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest reading vocabulary mean score of 60.00 is congruent with a standard score of 107, a percentile rank of 68, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest reading comprehension mean score of 65.09 is congruent with a standard score of 110, a percentile rank of 75, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest reading total mean score of 63.91 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average.

Research question #3. Posttest-posttest results indicated that while CEP students posttest reading vocabulary, reading comprehension, and reading total mean scores were numerically greater CEP and TEP students did not perform statistically significantly differently on these norm-referenced measures.

Research question #4. Pretest-posttest results indicated that TEP students did significantly improve their capitalization and language total subtest scores over time but did not significantly improve their spelling, punctuation, and usage and expression subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest spelling mean score of 55.33 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest capitalization mean score of 54.33 is congruent with a standard score of 103, a percentile rank of 58, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest punctuation mean score of 55.89 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest usage and expression mean score of 54.33 is congruent with a standard score of 103, a percentile rank of 58, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest

language total mean score of 55.56 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While TEP students' pretest-posttest language scores were found to be statistically significantly different in only two areas, capitalization and language total, positive gain over time was observed for all language scores, spelling, capitalization, punctuation, usage and expression, and language total.

Research question #5. Pretest-posttest results indicated that CEP students did significantly improve their spelling and language total subtest scores over time but did not significantly improve their capitalization, punctuation, and usage and expression subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest spelling mean score of 60.36 is congruent with a standard score of 107, a percentile rank of 68, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest capitalization mean score of 55.82 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the

highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest punctuation mean score of 55.82 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest usage and expression mean score of 68.64 is congruent with a standard score of 113, a percentile rank of 81, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest language total mean score of 61.45 is congruent with a standard score of 108, a percentile rank of 70, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While CEP students' pretest-posttest language scores were found to be statistically significantly different in only two areas, spelling and language total, positive gain over time was observed for four language scores, spelling, capitalization, usage and expression, and language total. Punctuation scores were found to not be in the direction of improvement over time.

Research question #6. Posttest-posttest results indicated that while CEP students posttest spelling, capitalization, usage and expression, and language total

mean scores were numerically greater and CEP students posttest punctuation mean score was numerically less than TEP students, CEP and TEP students did not perform statistically significantly differently on these five norm-referenced language measures.

Research question #7. Pretest-posttest results indicated that TEP students did not significantly improve their concepts/estimation, problems/data, computation, and mathematics total subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest concepts/estimation mean score of 48.33 is congruent with a standard score of 99, a percentile rank of 47, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. An NRT NCE posttest problems/data mean score of 51.67 is congruent with a standard score of 101, a percentile rank of 53, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. An NRT NCE posttest computation mean score of 43.78 is congruent with a standard score of 95, a percentile rank of 37, a stanine score of 4, the lowest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest mathematics total mean score of 50.00 is congruent

with a standard score of 100, a percentile rank of 50, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. While TEP students' pretest-posttest mathematics scores were not found to be statistically significantly different, positive gain over time was observed for problems/data and mathematics total and negative skill change was observed for concepts/estimation and computation.

Research question #8. Pretest-posttest results indicated that CEP students did not significantly improve their concepts/estimation, problems/data, computation, and mathematics total subtest scores over time. Comparing CEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest concepts/estimation mean score of 62.18 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest problems/data mean score of 64.18 is congruent with a standard score of 110, a percentile rank of 75, a stanine score of 6, the higest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest computation mean score of 55.64 is congruent with a standard score of 104, a

percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest mathematics total mean score of 63.09 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While CEP students' pretest-posttest mathematics scores were not found to be statistically significantly different, positive gain over time was observed for all four mathematics subtests concepts/estimation, problems/data, computation, and mathematics total.

Research question #9. Posttest-posttest results indicated that while CEP students posttest concepts/estimation, problems/data, computation, and mathematics total mean scores were numerically greater than TEP students posttest concepts/estimation, problems/data, computation, and mathematics total mean scores, CEP and TEP students did not perform statistically significantly differently on these five norm-referenced mathematics measures.

Research question #10. Pretest-posttest results indicated that TEP students did not significantly improve their core total subtest scores over time. Comparing TEP

students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest core total mean score of 53.11 is congruent with a standard score of 102, a percentile rank of 55, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. While TEP students' pretest-posttest core total scores were not found to be statistically significantly different, positive gain over time was observed for the core total measure.

Research question #11. Pretest-posttest results indicated that CEP students did not significantly improve their core total subtest scores over time. Comparing CEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest core total mean score of 63.45 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While CEP students' pretest-posttest core total scores were not found to be statistically significantly different, positive gain over time was observed for the core total measure.

Research question #12. Posttest-posttest results indicated that while CEP students posttest core total mean scores were numerically greater than TEP students posttest core total mean scores, CEP and TEP students did not perform statistically significantly differently on the core total measure.

Research question #13. Pretest-posttest results indicated that TEP students did not significantly improve their social studies, science, and sources of information subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest social studies mean score of 55.78 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest science mean score of 53.33 is congruent with a standard score of 102, a percentile rank of 55, a stanine score of 5, the middle stanine in the average range, and a descriptive designation of average. An NRT NCE posttest sources of information mean score of 55.56 is congruent with a standard score of 104, a percentile rank of 61, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While TEP

students' pretest-posttest social studies, science, and sources of information scores were not found to be statistically significantly different, positive gain over time was observed for all three subtest measures: social studies, science, and sources of information.

Research question #14. Pretest-posttest results indicated that CEP students did not significantly improve their social studies, science, and sources of information subtest scores over time. Comparing CEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest social studies mean score of 62.36 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest science mean score of 62.82 is congruent with a standard score of 109, a percentile rank of 73, a stanine score of 6, the higest stanine in the average range, and a descriptive designation of average. An NRT NCE posttest sources of information mean score of 64.45 is congruent with a standard score of 110, a percentile rank of 75, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While CEP students' pretest-posttest social studies, science, and

sources of information scores were not found to be statistically significantly different, negative gain over time was observed for all three subtest measures: social studies, science, and sources of information.

Research question #15. Posttest-posttest results indicated that while CEP students posttest social studies, science, and sources of information mean scores were numerically greater than CEP students posttest social studies, science, and sources of information mean scores, CEP and TEP students did not perform statistically significantly differently for all three subtest measures: social studies, science, and sources of information.

Research question #16. Pretest-posttest results indicated that TEP students did significantly improve their composite subtest scores over time. Comparing TEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest composite mean score of 54.33 is congruent with a standard score of 107, a percentile rank of 68, a stanine score of 6, the middle stanine in the average range, and a descriptive designation of average. TEP students' pretest-posttest core total scores were found to be statistically significantly different, and positive gain over time was observed for the composite measure.

Research question #17. Pretest-posttest results indicated that CEP students did not significantly improve their composite subtest scores over time. Comparing CEP students' norm-referenced test NCE scores with derived achievement scores puts their performance in perspective. An NRT NCE posttest composite mean score of 64.36 is congruent with a standard score of 110, a percentile rank of 75, a stanine score of 6, the highest stanine in the average range, and a descriptive designation of average. While CEP students' pretest-posttest composite scores were not found to be statistically significantly different, negative gain over time was observed for the composite measure.

Research question #18. Posttest-posttest results indicated that while CEP students posttest composite mean scores were numerically greater than TEP students posttest composite mean scores, CEP and TEP students did not perform statistically significantly differently on the composite measure.

Discussion

Parents in the United States continue to push for school choice as they grow more and more concerned about the quality of our nation's public schools. Charter schools are one means of meeting the demand for parental choice,

and the movement is growing. For the 2007-2008 school year, 347 new charter schools opened across the country. This is an increase of eight percent over the previous year. Now over 4,100 charter schools serve more than 1.2 million children in the U.S. (Center for Education Reform, 2006). The concept of charter schools was introduced as a means of stimulating instructional innovation (Budde, 1988). By design, charter schools are intended to be innovative in terms of governance and management, school organization, and teaching and learning (Arsen et al., 1999).

Sioux Central Community School District of Sioux Rapids, Iowa, the research school district, was the first Iowa school to be granted a charter under Iowa's first charter school law. Sioux Central created the Buffalo Ridge Charter School, the new charter school, with the innovative design that students would learn utilizing Internet-based resources rather than textbooks per se. Inquiry learning has become more prevalent in American schools in recent years as students and teachers search for more student-centered activities and can easily access Internet web-based resources (Veermans et al., 2006). At this time, there does not appear to be data to support the idea that inquiry learning is making a greater difference in increasing student achievement than when compared to

student achievement in traditional classrooms. Sometimes students do feel they are getting more out of their work using inquiry and on-line resources even though achievement on exit examinations does not support their opinions (Turchin, et al., 2000).

Reading. Data from the study showed mixed results after the first two years of operation. Of the three reading dependent measures: reading vocabulary, reading comprehension, and reading total, none reached the .01 threshold for rejecting any of the pretest-posttest reading research questions. The study employed a one-tailed .01 alpha level to help control for Type 1 errors. The reading comprehension subtest did show TEP pretest-posttest gain at the .05 level of confidence but did not reach the established .01 alpha level. Overall, given the data, it must be concluded that no significant difference existed between any of the three pretest-posttest comparisons.

Language. The language subtests showed the greatest fluctuation between areas of growth for the TEP students and areas of growth for the CEP students. The CEP students showed statistically significant growth over time at the .01 level in the area of spelling, but the spelling growth of the TEP students was not significant. It may be interesting to note that the TEP used a textbook spelling

program whereas the CEP students individualized their spelling, creating their own list of words each week unique to each student and usually derived directly from their lessons in the other subject areas.

On the capitalization subtest, growth for the TEP students was statistically significant at the .01 level, but growth for the CEP students was not. This result may have occurred because the TEP students were instructed using a traditional textbook which contained units on capitalization. Students in the CEP learned writing as compositions integrated with lessons in the other subject areas. No statistically significant differences were recorded for either program for the punctuation and usage and expression subtests. The usage and expression subtests for students in both programs was significant at the .05 level as was the difference between the TEP and CEP posttest-posttest means with the CEP mean being higher than the TEP mean. Despite the variations between the two programs, both the TEP students and the CEP students experienced statistically significant growth over time at the .01 level for the language total which includes all language subtests.

Mathematics. Parents of the CEP students were perhaps most worried about how their children would perform in

mathematics given that students were not using a regular mathematics textbook. In fact, rumors began to circulate through the public that CEP students were missing out on some vital mathematics skills. The researcher, who is the research school superintendent, engaged in numerous conversations with parents about the rigor of the mathematics curriculum in both the TEP and CEP classrooms. Nonetheless, CEP students showed growth in all four mathematics subtests, although none of the growth was statistically significant at the .01 level. The TEP students actually declined on two mathematics subtests during this same time period. Again, neither of the declines were statistically significant at the .01 level. However, the decline for the TEP students on the mathematics computation subtest was nearing significant at the .05 level. Comparing posttests for the two programs, none of the four subtests were statistically significantly different at the .01 level; even though at a .05 level, the CEP students would have had significantly higher scores in the areas of mathematics concepts/estimation and mathematics computation. Neither the TEP nor the CEP students experienced statistically significant growth on the mathematics total score. It should be noted that the mathematics computation scores were not included in the

math total score, the core total score, or the composite score.

Core total. For the core total of reading, language, and mathematics subtests combined, TEP and CEP student gains over time were not found to be statistically significant at the .01 level, even though gains neared significance at the .05 level of confidence. For this study there was no statistically significant difference between the posttests comparisons for TEP and CEP students.

Social studies, science, and sources of information. A particular area of focus for this study was how the CEP students performed in the areas of science and sources of information. Inquiry instruction is most closely associated with science instruction (Hofstein et al., 2004, p. 47). Therefore, teachers in the research school anticipated that CEP students would out-perform their TEP counterparts in science. Likewise, teachers expected CEP students to score highly in research skills examined on the subtest called sources of information. With inquiry learning, students carry on their own independent research using Internet web-based resources (Veermans et al., 2006). However, results did not meet expectations. The TEP students showed growth over time on all three subtests, but none of the results of the three subtests were statistically significant at the

.01 level. The results for the CEP students likewise showed no statistically significant difference at the .01 level. The CEP students posted negative change in two years on all three subtests: social studies, science, and sources of information.

Composite. Perhaps the most significant finding of the research came on the composite measure calculated for all battery subtests. The TEP students showed statistically significant growth at the .01 level over the two years of the study. In contrast, the CEP students showed no statistically significant growth during this same time period. In fact the overall mean for the CEP students showed a slight NCE mean score drop from 64.64 to 64.36 by the end of this study.

Summary. The data suggest that students in the Buffalo Ridge Charter School made no greater gains than students in the traditional program running parallel within the same school. At the drafting of the charter school grant application, CEP teachers expressed confidence in their inquiry learning concept. They believed that the inquiry method of instruction would result in deeper understanding for their CEP students. This is consistent with an earlier study that found it is possible for students who learn using the inquiry method to demonstrate greater

understanding of material although the tests do not reveal a significant difference between the inquiry learning students and the control group on a standard assessment over the content (Veermans, de Jong, & van Joolingen, 2000). Given this result, it must be concluded that the charter program was no more successful in improving student achievement than the traditional program. As teachers, parents, administration, and the board of education consider school programs that can be sustained in times of financial stress, the charter concept and the traditional program would appear, based on this study, to have equivalent outcomes for student learning. While the data and results of the study would not support the continuation of a separate charter program, the inquiry-based learning activities could be considered worthwhile and beneficial to students in the school district's traditional classrooms. Therefore, while the charter program as a separate entity would not be sustained, clearly the computer-based Internet, inquiry-based instruction should be sustained without placing any financial stress on the school district.

Recommendations for future research. Because traditional teachers in the research school district will require training to implement inquiry-based instruction, it

is recommended that an inquiry-based learning community (Marzano, 2003) be established to insure that teachers are highly qualified and have the appropriate attitudes congruent with the type of openness associated with the use of Internet-based learning resources. Pretest-posttest inquiry-based learning community teacher attitudes should be assessed. Moreover, student outcome data, both criterion-referenced and norm-referenced, should be consistently and persistently utilized to ensure data-driven decision-making rather than basing future changes in the inquiry-based curriculum on emotion and isolated opinion.

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APPENDIX A: School District Letter Authorizing Research

APPENDIX B: University of Nebraska Medical Center/University of Nebraska at Omaha Combined Institutional Review Board for the Protection of Human Subjects Study Approval Letter