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Class Size and Academic Achievement

Kristy Chandler Vandenberg

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CLASS SIZE AND ACADEMIC ACHIEVEMENT

by

KRISTY CHANDLER VANDENBERG

(Under the Direction of Jason LaFrance)

ABSTRACT

The purpose of this two-phase, sequential mixed methods (QUAN-qual) approach was to analyze the relationship between class size and academic achievement in rural, economically disadvantaged third grade classrooms and how teachers perceive class size as affecting their instructional and classroom management methods. Data collection and analysis for the study involved 3,812 third grade students in 204 classrooms collected from nine rural, economically disadvantaged school districts in the southeastern region of Georgia. Additionally, a researcher-developed questionnaire was used to collect data from third grade teachers teaching in the same nine rural, economically disadvantaged school districts.

Initial correlation analyses indicated a positive relationship between class size and academic achievement. Regression results indicated that the percentage of gifted students, the percentage of economically disadvantaged students, and the class size were significant predictors of reading achievement levels. For mathematics achievement levels, regression results showed that the percentage of gifted students, the percentage of Black students, and the class size were significant predictors. Further analyses involved filtering the data to only include class sizes of at least 15 students per teacher. For both reading and mathematics achievement, class size was not associated with achievement. Regression results indicated that the percentage of gifted students and the percentage of

economically disadvantaged students were significant predictors of reading achievement. For mathematics achievement, regression results showed that the percentage of gifted students and the percentage of Black students were significant predictors of achievement.

Questionnaire data revealed teachers felt smaller classes would affect their instructional practices by facilitating the increased use of small group instructional arrangements, hands-on activities, one-on-one instruction, and differentiation of instruction. Respondents either stated that class size did not affect their classroom management plans, or smaller classes would allow their classroom management plans to be less strict, have more student freedom, and have more positive reinforcement. All 51 respondents believed that smaller class sizes had a positive impact on student achievement due to the teachers being able to provide more individualized instruction and having less classroom management issues. Class sizes of 20 or less students per teacher were identified as being ideal due to such class sizes being easier to provide individualized instruction, easier to use group activities, and easier to manage behavior.

INDEX WORDS: Class size, Classroom management, Classroom instruction, Academic achievement, CRCT, Third grade, Rural schools, Economically disadvantaged schools, Teacher perceptions, Correlation, Multiple regression

CLASS SIZE AND ACADEMIC ACHIEVEMENT

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DOCTOR OF EDUCATION

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2012

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Electronic Version Approved:
May 2012

DEDICATION

This is dedicated to my parents Stan and Carol Chandler. This accomplishment is more a testament of their infinite love, guidance, and support than of my merit. Being their daughter is that of which I am most proud.

This is also dedicated to my beloved husband Christopher Vandenberg. Because of his belief in me, a dream of a doctoral degree is now reality. His love inspires me to be greater than I am.

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CHAPTER I

INTRODUCTION

Within an age of increasing accountability and limited educational funding, finding the right ratio of teachers to students is critical for the academic achievement of students and the success of schools. Finding engaging, highly qualified teachers to instruct classrooms of students is simply not enough; the number of students assigned to a teacher is also important. Class size affects classroom management, classroom instruction, and the academic achievement of the students (Blatchford, Russell, Basset, Brown, & Martin, 2007; Deutsch, 2003; Finn, Pannozzo, & Achilles, 2003; Smith, Molnar, & Zahorik, 2003). Dilution of the instructional potency could occur if the student to teacher ratio is high, yet many school districts would cite that the current lack of educational funding mandates larger class sizes. Determining the most effective class size is a debate fueled by necessity; with limited available funds, school districts must decide which interventions are the most effective while deciding where costs can be decreased without sacrificing the educational attainment of the students (Kennedy, 2003). At the heart of this debate is the need for contemporary empirical data to either support or refute the expenditure of additional funding to hire more teachers to provide smaller class sizes.

Beyond the world of educational finance, the class size reduction debate is important as it is really about more than just a school district ensuring a positive rate of return. It is about a nation ensuring that its tax revenue is being used efficiently and effectively to provide children with the best possible educational opportunity. It is this opportunity for a quality education that should resonate within the hearts of every

American, if not for the principle of it then for the vast economic effect an educated versus uneducated populous has on society. In a recent study, Swanson (2009) stated that three out of every ten American students do not earn a high school diploma. A thirty percent high school drop out rate is detrimental to the overall success of the educational system and to society. Providing students with the best possible learning environment for achievement is an area of need in the classroom that subsequently could affect the strength of the workforce.

Finn and Gerber (2005) state preventing high school drop outs begins at the elementary school level, and the connection between academic success in elementary school and high school completion is one that was established many decades ago. The connection between smaller class sizes and academic achievement in rural, economically disadvantaged classrooms is one that needs to be explored further, especially since research (Finn & Gerber, 2005) states that students receiving free or reduced lunch status were significantly more likely to achieve academically and 67% more likely to graduate from high school when placed in reduced class sizes.

Class size reduction is an issue that is vital to both the educational and fiduciary systems of America. For decades, educational researchers (Addonizio & Phelps, 2000; Biddle & Berliner, 2002; Glass & Smith, 1979; Milesi & Gamoran, 2006; Slavin, 1989) have explored the topic in hopes of determining the optimal class size for student achievement, yet the results reported are often conflicting and varied depending upon research designs and sample populations utilized. To fully understand the relationship between class size and academic achievement within third grade, the analysis of Criterion-Referenced Competency Tests (CRCT) scores in the areas of reading and

mathematics for third grade students in rural, economically disadvantaged elementary schools was conducted to determine the relationship, if any, between class size and student academic achievement. Further understanding of the relationship was facilitated through the collection and analysis of teachers' perceptions regarding how class size affects their classroom instruction and management practices.

Background

Understanding if there is a relationship between the number of students in a classroom and the academic achievement of the students is vital to educators. Providing the best possible learning environment for all students while making informed decisions about how to best utilize limited funding is at the center of the class size debate (Gilman & Kiger, 2003). Stakeholders at all levels of education need empirical data regarding the significance of the relationship between class size and academic achievement. This is especially true in rural, economically disadvantaged areas where funding is even more limited than in more affluent areas. Unfortunately, making the decision of whether or not to decrease the number of students within the classroom to increase academic achievement is one that is only confounded by the abundance of contradictory studies into the topic (Addonizio & Phelps, 2000; Biddle & Berliner, 2002; Milesi & Gamoran, 2006; Slavin, 1989). To provide a baseline understanding of the research that has been conducted regarding class size and academic achievement, historical data as well as a review of the major educational studies will follow.

Historical Information on Class Size

The need to determine whether a relationship exists between class size and student academic achievement is one that can be traced back to the foundation of the

educational system in America (Biddle & Berliner, 2002). According to Callahan (1962), the need for educational administrators to become more efficient and effective in the expenditure of educational funds was one of the reasons for the initial studies regarding class size. Superintendents at the beginning of the twentieth century sought to apply Frederick Taylor's scientific management principles within the world of education; thus, per-pupil costs were analyzed and class sizes adjusted to maximize cost ratios (Callahan, 1962). William McAndrew of Chicago was one such superintendent who not only analyzed the cost effectiveness of staffing smaller class sizes but also conducted his own scientific studies in order to provide empirical data in support of his larger classes, leading to the evolution of a formula method for determining the appropriate instructional workload for teachers that would establish the class size norms found in many districts today (Callahan, 1962).

With the need of educational leaders to justify the increasing of class sizes, descriptive analysis studies summarizing the results of class size studies were abundant well into the mid-twentieth century with the majority of the results indicating a positive relationship between smaller class sizes and student academic achievement within the elementary grades (Robinson, 1990). However, it was not until the research of Glass and Smith (1979) that it was determined a class size of fifteen or less students was optimum for increasing academic achievement, especially for elementary students who were at risk of not achieving at or above the norm. The Glass and Smith meta-analysis included 77 class size studies spanning 70 years of research in a dozen countries with approximately 900,000 students whose average age was 12.3 years. Following the use of quantitative academic achievement data to evaluate the relationship between class size and academic

achievement, educational researchers implemented survey research to provide evidence to what extent class size is related to academic achievement (Biddle & Berliner, 2002). Survey research provided qualitative and anecdotal data regarding stakeholders' perceptions about class size, but the data was inconclusive in its results, and variables like socio-economic status and peer groups were often cited as more important in determining student academic achievement than class size (Flemming, Toutant, & Raptis, 2002).

Economist Eric Hanushek (1986) would subsequently dissect the findings of previous class size researchers and determine that any positive results for smaller class sizes would be the result of flawed research. Hanushek argued that smaller class sizes had no or little to no effect on academic achievement for students using his own studies into the practice. Hanushek's use of a student-to-teacher ratio for determining class size instead of the actual number of students assigned to each teacher was later criticized by other researchers (Biddle & Berliner, 2002; Gilman & Antes, 1985).

Class Size and Classroom Management

Historical information about class size in this country helps educational leaders understand why the need to justify per pupil expenditures became an issue. Previous research regarding class size focused on the relationship between class size and the instructional technique utilized by teachers within differing class sizes and provided data regarding how class size affects the instructional practices of teachers. To really understand how class size affects the instructional environment, educational leaders must also analyze the amount of time teachers have to spend on classroom management as this directly affects the amount of time teachers are able to devote to instruction.

From teacher survey and interview data, Blatchford, et al. (2007) and Cakmak (2009) found that larger classes are often cited as being harder for the teachers to maintain student discipline, resulting in the focus of the classroom environment being more on student behavior than on student academic achievement. Blatchford, Edmonds, and Martin (2003) observed that students in smaller classes (average of 19 students per class) exhibited more time being utilized for instructional purposes and less time being utilized for non-instructional purposes, such as talking to one's peers about non-academic topics, than students in larger classes (average of 32 students per class). Halbach, Ehrle, Zahorik, and Molnar (2001) found that larger classes prevented teachers from being able to provide in-depth content coverage due to the loss of instructional time occurring since the teachers were spending more time handling student behavior issues. Not only do teachers cite smaller classes as having less discipline problems than larger classes, but they also stated that the more intimate environment of smaller classes enabled them to prevent behavior management issues from developing through the personal relationships they were able to develop with their students (Egelson, Harman, & Achilles, 1996; Halback et al., 2001).

Class Size and Classroom Instruction

Class size directly affects classroom instruction due to larger class sizes requiring teachers to utilize class time for management tasks rather than for instruction. Class size also directly affects classroom instruction through the interactions of the teachers with the students. Higher levels of interaction between students and teachers, as well as increased levels of student engagement within smaller classes, have been cited in numerous studies (Blatchford, Bassett, Goldstein, & Martin, 2003; Blatchford, Bassett, & Brown, 2005;

Blatchford et al., 2007; Cakmak, 2009; Finn et al., 2003; Smith et al., 2003). From teacher survey and interview data, Pedder (2006) and Blatchford et al. (2003a) cited that teachers felt they were able to be more effective in smaller classes due to the increased opportunities for individual student feedback and more individualized student attention. Additionally, teacher surveys and interviews have revealed that teachers felt they were better able to differentiate instructional lessons to accommodate the diverse needs of students within smaller classes (Blatchford et al., 2007; Cakmak, 2009). Being able to have greater flexibility in the variety of instructional activities, including the use of more small group work and less whole group lectures, was another advantage of smaller classes cited by teachers within the research of Egelson, Harmon, and Achilles (1996) and Graue, Hatch, Rao, and Oen (2007). In smaller classes, teachers felt they were able to provide extensive coverage of the curriculum due to being able to utilize a variety of activities for instruction (Englehart, 2007).

Class Size and Academic Achievement

Analysis of survey and interview data from teachers provides information regarding how class size affects the practices of the classroom environment, which is closely related to studies regarding the relationship between class size and student academic achievement. During the 1980's, the issue of class size reduction was at the forefront of education, and many states sought clear, quantitative data on the relationship between class size and student academic achievement through the use of trial programs or large-scale field experiments (Biddle & Berliner, 2002). One such study was Indiana's Project Prime Time, which initially used randomly selected public schools in the state-funded experiment to analyze reduced class sizes of approximately 18 students per class

in grades kindergarten through third (Biddle & Berliner, 2002; Gilman & Antes, 1985; Gilman & Kiger, 2003; Mueller, Chase, & Walden, 1988). The project began with 24 randomly selected schools and was expanded to schools throughout the state in subsequent years, resulting in the inclusion of 52 schools and the identification of small classes as being those having an average of 19.1 students per teacher and large class sizes having 29.9 students per teacher. To account for pre-existing smaller classes, researchers used student academic achievement data gathered from the Iowa Test of Basic Skills and the Stanford Achievement Test for grade two from six school districts that had implemented the smaller class sizes and compared this data to three school districts that had not implemented the smaller class sizes. Significant increases in student achievement in the areas of reading and mathematics were found (Biddle & Berliner, 2002; Gilman & Antes, 1985; Gillman & Kiger, 2003; Mueller et al., 1988). Parent, teacher, and principal surveys indicated that stakeholders also felt the smaller classes resulted in increased student achievement as well as increases in teacher morale and in student ability beliefs (Mueller et al., 1988).

The positive results of Project Prime Time are often discredited by educational researchers. The study's findings only credited the reduced class size variable as being the factor that resulted in the increased reading and mathematics scores and did not account for other variables that could have resulted in the academic increases reported in the study (Gilman & Antes, 1985). A strength of the Project Prime Time study is that the participating school districts were randomly selected; however, the participating teachers were not randomly chosen, and the inconsistent use of professional development

regarding effective instructional practices also weakened the design of the study (Gilman & Antes, 1985).

With the results of the Indiana Project Prime Time study being questionable due to the study's weak research design and reporting of results, additional class size studies like Tennessee's Project STAR (Student/Teacher Achievement Ratio) were analyzed for conclusive evidence regarding class size and student academic achievement. Project STAR was a four year, state-funded field experiment that involved the random assignment of approximately 6,500 elementary school students in approximately 300 classrooms in over 80 inner city, suburban, urban, and rural schools to one of three class models: a standard class, containing 22-25 students per teacher; a supplemental class, containing 22-25 students per teacher and a full-time paraprofessional; or a small class, containing 13-15 students per teacher with no paraprofessional (Achilles, Finn, & Bain, 1998; Biddle & Berliner, 2002; Nye & Hedges, 2002). As in the Indiana Project Prime Time results, analysis of the Stanford Achievement Test battery administered to each student at the end of the school year indicated increased achievement in reading and in mathematics for students in the smaller class sizes (Achilles et al., 1988; Addronizio & Phelps, 2000; Biddle & Berliner, 2002; Mosteller, 1995; Nye & Hedges, 2002).

Additionally, the most significant gains in achievement occurred for students within the African American subgroup and the economically disadvantaged subgroup (Achilles et al., 1988; Addronizio & Phelps, 2000; Biddle & Berliner, 2002; Mosteller, 1995).

A lack of ethnic diversity within the student population of the Project STAR study along with the fact that the schools volunteered to participate in the project are two criticisms of the project (Biddle & Berliner, 2002). While the research design, large

sample, and sound presentation of results of Project STAR do make it more valuable to educational leaders than Project Prime Time, the above mentioned criticisms have to be considered carefully. Additionally, the Project STAR study was conducted during the mid-1990's, resulting in out-dated results that may no longer provide relevant data for today's educational leaders.

Another large-scale class size project is the Wisconsin Student Achievement Guarantee in Education (SAGE) Program, which compared student achievement scores in reduced class sizes (no more than fifteen students per teacher) for approximately 3000 students in grades kindergarten through third to student achievement scores in larger class sizes (more than fifteen students per teacher) within the same district (Biddle & Berliner, 2002; Smith et al., 2003; Thompson, 2006). Like Project Prime Time and Project STAR, the SAGE Project also reported the most increases in student achievement in the areas of reading and mathematics on standardized achievement tests for students in the reduced class sizes. The largest gains in achievement were found for disadvantaged students (Biddle & Berliner, 2002; Smith et al., 2003; Thompson, 2006).

Thompson (2006) identified one limitation of Project SAGE being the identification of classes as being "reduced." Some classes actually contained two teachers and thirty students while other classes in the study contained fifteen or less students and one teacher. However, the inconsistent use of the term "reduced" class was not addressed in the design of the study or in the presentation of the results. As in the Project Prime Time study, another limitation of the Project SAGE study is the inclusion of professional development for some teachers (Thompson, 2006). The inclusion of professional development is a variable that should be considered when analyzing the

results. Improving the teaching abilities of the teachers could affect the academic achievement of the students. As with the Project STAR study, the lack of ethnic diversity within the sample of Project SAGE study must be noted. The schools used in the Project SAGE study were primarily located in urban Milwaukee, hindering the application of the results to a rural or suburban school district (Biddle & Berliner, 2002; Smith et al., 2003). While the Project SAGE study is more recent than Project STAR and Prime Time, it was conducted a decade ago, resulting in a lack of contemporary evidence. Table 1 illustrates the major studies conducted regarding the relationship between class size and student academic achievement.

Table 1
Major Studies Regarding the Relationship Between Class Size and Student Academic Achievement

STUDY	SAMPLE	LOCATION	OUTCOMES
Project Prime Time (1984-1986)	Grades kindergarten through third	30 school districts across Indiana	Researchers found an increase in reading and mathematics achievement in which only variables shown to positively affect achievement were reported.
Project STAR (1985-1989)	Grades kindergarten through third of mainly white students	300 classrooms in 80 schools across Tennessee in inner city, suburban, urban, and rural districts	Researchers found increased achievement in reading and mathematics, especially for minorities and economically disadvantaged students.
SAGE Program (1995-2000)	Grades kindergarten through third of mainly white students	30 schools in mostly urban school districts in Milwaukee, Wisconsin	Researchers found increased achievement in reading and mathematics, especially for minority students.

These three major studies presented findings in favor of reducing class sizes because of the academic achievement increases for the students in the smaller classes. However, the findings of other studies have not indicated a positive relationship between class size and academic achievement. Borland, Howsen, and Trawick (2005) found the optimal class size for academic achievement to be between 21.3 and 23.24 students per teacher with class sizes lower than this being identified as lowering student achievement.

Similarly, Hoxby (2000) found no statistically significant achievement gains for students in smaller classes compared to students in larger classes. Inconsistent findings of class size studies create the need for additional studies.

While each of the reviewed studies presents relevant data on the relationship between class size and student academic achievement, there is a need for research specifically aimed at analyzing the relationship between class size and student academic achievement within rural, economically disadvantaged elementary schools within the southeastern region of Georgia. Additionally, the majority of research on the class size and student academic relationship was conducted during the last two decades of the twentieth century, creating a need for more recent data. During the twenty-first century, educational leaders in rural, economically disadvantaged districts of southeast Georgia have faced increased educational accountability and decreased educational funding. School leaders need empirical data regarding the relationship between class size and student academic achievement in order to decide whether reducing student-to-teacher ratios is worth the additional financial expense or if limited financial resources should be invested in other academic interventions.

Statement of the Problem

Class size is a topic that is not new to educators. The idea that the number of students within a class can affect the student's academic achievement, the teacher's classroom management, and the teacher's instructional methods has been discussed for decades. At the heart of this debate is an economic issue of whether or not the funding of additional teachers to reduce class sizes does result in increased levels of academic achievement for the students. Previous research has focused on trying to determine the

optimal student to teacher ratio for academic achievement. Numerous studies focusing on class size and academic achievement have resulted in a plethora of findings that are just as varied in their conclusions and recommendations as the studies themselves.

The contradictory nature of previous class size reduction studies offers no definitive answer as to whether or not a district's limited funding should be used for reducing class sizes nor does it clearly refute or support the funding of additional teachers to lower class sizes and increase student achievement, resulting in an empirical gap. Substantial research in the area of how class size affects achievement in small, rural, economically disadvantaged elementary schools is another gap in the literature regarding class size. Due to the present economic recession, there is increased financial pressure being placed upon school districts to show that their local, state, and federal funds are being used effectively and efficiently. Unfortunately, there is a lack of recent data for educational leaders to use in determining whether reducing class sizes is worth the economic burden it places upon school districts. Educational leaders need research based on the instructional standards and assessments being used in 2011, not ten years ago. Presently, educational leaders do not have research focused on the unique needs of the southeastern region of the state of Georgia, which contains many rural and impoverished school districts, resulting in another gap and a need for research. Additionally, there is a need to understand how class size affects the instructional and classroom management practices of teachers. Therefore, the purpose of this study was to analyze the relationship between class size and academic achievement in rural, economically disadvantaged third grade classrooms and how teachers' perceived class size affecting their classroom management and instructional practices.

Research Questions

The study intended to answer the following overarching research questions: (1) What is the relationship between class size and academic achievement as measured by the CRCT for third grade students in rural, economically disadvantaged elementary schools? (2) What are teachers' perceptions of class size as it relates to academic achievement?

The sub-questions that guided the study were the following:

1. What is the degree of the relationship between class size and reading achievement on the CRCT for third grade students in rural, economically disadvantaged school districts?
2. What is the degree of the relationship between class size and mathematics achievement on the CRCT for third grade students in rural, economically disadvantaged school districts?
3. What are the perceptions of third grade teachers regarding class size and instructional methods?
4. What are the perceptions of third grade teachers regarding class size and classroom management?

Significance of the Study

Class size reduction is an issue in education of great significance. Since the implementation of *No Child Left Behind of 2001*, school districts have been under increasing pressure to prove that they are increasing academic achievement as measured by Adequate Yearly Progress (AYP), which is determined by academic indicators like student scores on the CRCT. No school or school district wants to be labeled as low-

performing due to not being able to make AYP; thus, school leaders need to know which academic interventions positively affect student achievement.

Class size reduction is one strategy that school districts could implement to increase academic achievement, and there is a multitude of research regarding the practice. However, since the topic of class size reduction is one that is cyclical in educational research with the majority of research having been conducted prior to the new millennium, more contemporary research is needed for federal, state, and local educational leaders to determine whether or not funding additional teachers to reduce class sizes is positively impacting student achievement and worth the expenditure. This study will provide educational leaders, especially those in the southeastern region of Georgia, with the evidence needed to determine whether class size reduction is an effective intervention.

In analyzing the relationship between class size and academic achievement, it is also important to understand how class size affects teachers' instructional and classroom management techniques. A large student population could result in teachers being unable to facilitate learning through the inclusion of multiple instructional activities and content differentiation. Having smaller classes could enable the teachers to promote student engagement and provide students with the individualized attention needed to meet their diverse needs and increase achievement. Educational leaders need to understand the relationship between class size and the learning environment, which is also an important factor in student academic achievement.

Determining whether the number of students in a classroom affects the academic achievement of the students as well as the instructional and classroom management

practices of the teacher is vital to the organization of the school. The study is of particular importance to rural, economically disadvantaged school districts as the amount of educational funding within these districts is less than in larger, more affluent districts. In rural, economically disadvantaged school districts, school leaders of these districts need empirical data to base expenditures as funding of additional teachers to reduce class sizes often means reducing funding of or even eliminating other programs.

Procedures

Research Design

The purpose of this two-phase, sequential mixed methods (QUAN-qual) approach was to analyze the relationship between class size and academic achievement in rural, economically disadvantaged third grade classrooms and how teachers perceive class size as affecting their instructional and classroom management methods. According to Creswell (2009), utilizing a mixed methods design for research incorporates both quantitative and qualitative data collection and creates a study that is stronger than one that is only qualitative or only quantitative. Quantitative research questions addressed the relationship between class size and student academic achievement as measured using third grade CRCT scores in reading and mathematics in rural, economically disadvantaged elementary schools within the southeast region of the state of Georgia. Class sizes and rosters were already formed prior to this investigation and altering the class rosters for the purpose of this study was not an option; therefore, the ex post-facto research design was used. Ex post-facto research design refers to the presumed relationship between variables or lack of relationship between variables that will be

established utilizing data from events that have already occurred (Gall, Gall, & Borg, 2007).

In addition to the analysis of quantitative standardized test data to analyze the relationship between class size and academic achievement in rural, economically disadvantaged third grade classrooms, qualitative survey data was collected from the teachers within these schools to gain information regarding teachers' perceptions of class size as it relates to instructional methods and classroom management. In the second phase, the researcher was able to probe into teachers' perceptions regarding the effect class size has on their instructional methods and classroom management techniques. The reason for following up with qualitative research in the second phase was to gain a deeper understanding of the quantitative data regarding the relationship between class size and academic achievement. By including the qualitative data regarding teachers' perceptions about how class size affects their instructional practices and classroom management techniques, possible explanations for the relationship were identified. These reasons could then provide educators with valuable information regarding how changing class size affects classroom practices and academic achievement.

Sample and Sampling

The population for the study was third grade students in rural, economically disadvantaged schools within the southeastern region of Georgia who completed the CRCT during the 2009-2010 and 2010-2011 spring administrations. Purposive sampling was used for this study. Purposive sampling involves the researcher deliberately selecting participants or locations for the study in order to fully comprehend the problem and/or answer the research question (Creswell, 2009). It was used for this study in order

for the researcher to be able to study the relationship between class size and academic achievement for third grade students as measured by CRCT scores in rural, economically disadvantaged elementary schools in the southeastern region of Georgia. According to the United States Department of the Census Bureau (2000), any county that has less than 65 people per square mile is identified as rural. Within the state of Georgia, there are 89 counties identified as rural (United States Department of the Census Bureau, 2000). Within those 89 rural counties, the National Center for Education Statistics (2011) identifies 118 public school districts within the state of Georgia as being rural. Based on the free and reduced price lunch eligibility for October of 2009 and October of 2010 (Georgia Department of Education, 2011) and the census information for people per square mile (United States Department of the Census Bureau, 2000), 72 public school districts within Georgia qualify as both rural and as having an economically disadvantaged population of 60 percent or higher. From these 72 school districts, data from 204 third grade classes located in nine school districts within the southeast region of Georgia were used. Only data from third grade classes in rural, economically disadvantaged school districts located in the southeastern region of Georgia were used for the study.

Instrument

Third grade CRCT scores for reading and mathematics were used to measure academic achievement. The CRCT is used by the state of Georgia to measure how well students in grades one through eight master the skills and knowledge set forth in the Georgia Performance Standards (GPS) (Georgia Department of Education, 2011). For the purpose of this study, CRCT scores in the areas of reading and mathematics for third

grade students were used to measure academic achievement. In addition, a questionnaire, containing constructed response items, was created by the researcher to gain information regarding teachers' perceptions about class size as it pertains to their instructional practices and classroom management. Previous literature regarding how teachers' perceive class size as affecting their instructional practices and classroom management techniques was used as the basis for the questions. To test the content validity of the questionnaire, the researcher field tested the items with a group of six educators from who were not participating in the study. Once the questionnaire had been field tested to ensure the items enabled the researcher to identify common themes regarding how teachers perceive class size as affecting their instructional practices, it was sent electronically to 103 third grade teachers within the schools selected for the quantitative test data analysis.

Data Collection

Data regarding academic achievement as measured by the student scores on the reading and mathematics sections of the CRCT was collected by obtaining permission from district-level administrators to access class summary data for each school in the study. Data collection included class size, academic achievement on the reading and mathematics sections of the CRCT, percentages of students with disabilities in each class, percentages of students as being identified for the gifted and talented program in each class, ethnic background percentages, English learner percentages, sex percentages, and the percentage of economically disadvantaged students within each class. Additionally, data was collected on the teachers of each class to include years of teaching experience and advanced degree status. Data regarding teachers' perceptions about class size as it

pertains to their instructional practices and classroom management was collected through an electronic questionnaire. Permission to survey teachers was sought from district administrators via electronic correspondence. From district-level administrators, a list of third grade teacher emails was obtained and used in the electronic survey collection phase of the data collection. Electronic questionnaires were sent to each third grade teacher at all participating elementary schools, resulting in teachers. Questionnaire data collection was done using a computer-based survey collection program and was done anonymously.

Data Analysis

Descriptive statistics were used to summarize the academic achievement data, and inferential statistics were used to generalize the findings of the study to the entire population (Gall et al., 2007). Multiple regression analysis was used to examine the relationship of the dependent variable of academic achievement and the independent variable of class size. The use of multiple regression also allowed the researcher to control for the additional variables of the percentage of students with disabilities, percentages of students as being identified for the gifted and talented program, percentage of students qualifying for free or reduced lunch status, percentage of English learners (EL), and percentages of ethnic background for each class, thus, making the conclusions of the study more generalizable (Gall et al., 2007). Quantitative data was analyzed using the Statistical Package for Social Sciences (SPSS).

Qualitative data, in the form of teacher responses on a questionnaire, was also collected and analyzed. Analysis of teacher responses from the items involved the researcher breaking down the data into segments of information and then assigning the segments identifying labels to develop categories (Merriam, 2009). Once the responses

had been analyzed and labeled based on the researchers' categories, the researcher reported the findings in summarized statements.

Limitations, Delimitations, and Assumptions

Limitations

1. The use of an online survey limited the ability of the researcher to clarify any questions the participants may have had and meant that the participants had to respond to the best of their abilities.
2. Another limitation was the lack of longitudinal academic achievement data for the students.

Delimitations

1. The purposeful sample of only rural elementary schools in districts having a 60% or higher economically disadvantaged student population located in Georgia limited the degree by which other researchers will be able to generalize the findings to other populations.
2. The questionnaire assessing teachers' perceptions regarding the relationship between class size and their instructional practice utilization lacked psychometric properties data. Since the questionnaire was developed and field-tested by the researcher, it only had content validity.
3. Only student scores on the reading and mathematics sections of the CRCT for students in third grade in rural, economically disadvantaged elementary schools in Georgia were used to determine academic achievement.

4. Only teachers teaching third grade in participating rural, economically disadvantaged elementary schools during the 2011-2012 school year were surveyed.

Assumptions

1. A questionnaire developed and tested for content validity by the researcher was used to acquire data regarding teachers' perceptions about class size and how this affects their instructional practices. It was the assumption of the researcher that the questionnaire was valid and accurately measured teachers' perceptions.
2. Another assumption was that the respondents were honest in their responses.

Definitions of Key Terms

The following terms are defined to clarify terminology to be used within the study:

Class Size. Class size is the number of students who are assigned to a teacher for the entire class section at the administration of the spring 2010 and 2011 CRCT administrations.

Criterion-Referenced Competency Tests (CRCT). CRCTs are the state mandated criterion-referenced tests that all students in grades three through eight must take and are used to diagnose individual student academic strengths and weaknesses as well as to gauge the overall effectiveness of the state's educational program. The tests are designed to measure how well the students acquire the knowledge and skills required by the Georgia Performance Standards (GPS). The content areas of reading, English/Language Arts, mathematics, science, and social studies are

tested by the CRCTs. In Georgia, all students in grade three must pass the reading section of the CRCT to be promoted to the fourth grade.

Economically Disadvantaged. Economically disadvantaged refers to the percentage of students within a school district qualifying to receive free or reduced lunch based upon the National School Lunch Program (2011) eligibility guidelines for each school year. For the 2009-2010 and 2010-2011 school years, students who were members of a family of at least four members with an income at or below \$28,665 qualified for free meals, and students who were members of a family of at least four members with an income between \$28,666 and \$40,793 qualified for reduced price meals.

Rural Elementary Schools. For the purpose of this study, rural elementary schools were limited to those elementary school located in any county that has less than 65 people per square mile as determined by the United States Department of the Census Bureau (2000).

Student Academic Achievement. On the CRCT, achievement is measured in three levels. Level 1 means the student scored below 800 and did not meet the standards, level 2 means that the student scored between 800-849 and did meet the standards, and level 3 means that the student scored at or above 850 and exceeded the standards.

Summary

A lack of contemporary research on the relationship between class size and student academic achievement necessitated this analysis. The purpose of this study was to analyze the relationship between class size and academic achievement in third grade

classrooms in rural, economically disadvantaged schools and how teachers perceived class size affecting the instructional and classroom management practices. This mixed methods study analyzed test data from a sample of 204 third grade classrooms within rural, economically disadvantaged elementary schools to determine the degree of the relationship between class size and student academic achievement as measured by the reading and mathematics sections of the CRCT during the 2009-2010 and 2010-2011 school years. In addition, teacher questionnaire data was used to describe teachers' perceptions regarding how class size affects their instructional methods and classroom management techniques. Such information will allow school district leaders to decide whether reducing class sizes in the third grade is an intervention worthy of continuation during this economic recession or is one that should be eliminated in order to fund more effective academic endeavors.

CHAPTER II

LITERATURE REVIEW

Introduction

Finding the most effective number of students per classroom in order to optimize the level of academic achievement is an important topic in education. Stakeholders want to see academic achievement increase, yet there is much debate as to how to balance the instructional needs of the students with the district's financial resources. In addition to a desire to increase academic achievement, there is an American ideal of increasing academic achievement for all students, regardless of innate ability or family resources. Even before the economic decline of the twenty-first century, the debate of class size was an issue within the educational systems all over the globe and possibly since the times of the Ancient Romans (Fleming, Toutant, & Raptis, 2002).

The class size issue is one that focuses on whether decreasing the number of students in the classroom will increase academic achievement. Complicating the issue is the fact that reducing the number of students in a class requires the hiring of additional teachers, which means increasing expenditures. Funding for class size reduction projects can come from local, state, or federal sources. The hiring of additional teachers to provide equitable instruction for all students may seem like an easy argument to make; however, the mixed results regarding the most effective class size only complicate the decisions school districts must make in trying to decide the optimum number of students within a classroom (Addonizio & Phelps, 2000; Biddle & Berliner, 2002; Milesi & Gamoran, 2006; Slavin, 1989). The controversial topic has been researched for years, yet the plethora of studies devoted to analyzing the effects of class size on student

achievement has only added to the conflict further as results are often found to be statistically insignificant and/or in opposition of previous studies.

The purpose of this review is to describe the evolution of class size within the American educational system and to synthesize research regarding the impact of class size on classroom management, classroom instruction, and student academic achievement as has been documented by empirical research conducted across the nation. The relationship of class size and student academic achievement during the elementary school years in rural, economically disadvantaged communities is highlighted. Additionally, the sustainability of class size reduction efforts is assessed. As schools try to narrow the achievement gap between ethnic minority students and ethnic majority students, boys and girls, and economically disadvantaged students and non-economically disadvantaged students, educational leaders need to know if a class size reduction intervention can not only narrow these achievement gaps but also provide long-term benefits, resulting in a higher percentage of high school graduates.

Historical Information on Class Size

At the turn of the twentieth century, a demand for schools to become more efficient and to practice the scientific management method resulted in the first class size studies. Frank Spaulding, a school superintendent, emphasized the economic side of efficiency and provided efficiency examples from his district in Newton, Massachusetts. Using his method of analyzing per-pupil costs and pupil recitation costs, Spaulding would provide school districts with a way to reduce educational expenses by increasing class sizes and decreasing the number of teachers. When criticized for his plan, Spaulding referred to the thousands of dollars that could be saved by a district and

explained how this saved funding could be used to pay for the very expensive elective courses (Callahan, 1962). Spaulding did not explain how academic achievement would be affected by such cost-cutting measures. The days of academic accountability would soon follow, creating the class size dilemma that twenty-first century school system leaders now have to address as they attempt to balance the budget and close the educational gap. William McAndrew of Chicago would take the work of Spaulding further, not only using Frederick Taylor's scientific management principles to establish per-pupil funding ratios, but also conducting his own educational studies to provide the data needed to support increasing class sizes without the worry of decreasing academic achievement (Callahan, 1962).

Experimental research into how class size affects achievement gained popularity in the 1920's as researchers tried to determine whether or not saving money by increasing class sizes was affecting student progress (Biddle & Berliner, 2002). In the decades to follow, a multitude of studies would be conducted on class size; unfortunately, the results were varied and were often weakened by their research methods. With the increased use of meta-analysis, a more advanced method of research, educators finally had the ability to generalize research results and better apply research findings to the creation of educational policy (Biddle & Berliner, 2002). Glass and Smith (1979), pioneers in meta-analysis research regarding class size and student achievement, found that class sizes of fifteen or less students were the ideal, especially for at-risk elementary school children. By analyzing 77 class studies conducted over 70 years, Glass and Smith (1979) combined 700 comparisons into a single curve to represent the relationship between class size and academic achievement. The complex regression analysis concluded that as class size

populations increased, academic achievement for students decreased (Glass & Smith, 1979).

Following an influx of survey research that attempted to identify whether or not classroom variables can account for differences in achievement, Hanushek (1986) contended that previous studies supporting smaller class sizes were wrong, and that educational achievement would not increase with the increased funding for smaller classes. Using data collected from 59 studies involving 277 estimates on class size, Hanushek (1986) reported that a smaller class size did not result in higher academic achievement, and benefits that could be identified as a result of smaller class sizes were insignificant, especially when considering the increased cost of hiring more teachers. This was in direct opposition of the work of Glass and Smith (1979). Researchers subsequently identified limitations to Hanushek's analysis of the effect of class size on academic achievement and have provided research to support the idea that decreasing the number of students within the instructional setting does positively affect learning (Biddle & Berliner, 2002; Gilman & Antes, 1985). Finn et al. (2003) criticized Hanushek's analysis of class size reduction programs for the fact that the programs analyzed were not ones utilizing class size reduction but were analyzing the ratio of students to teachers in classes, which does not provide a valid description of the day-to-day learning environment. Initial class size research focused on the efficiency and effectiveness of the strategy, and subsequent research would focus on how class size affects classroom practices, like behavior management and instructional activities.

Class Size and Classroom Management

The move to have school systems use the principles of the scientific management method resulted in superintendents increasing class sizes to reduce costs (Callahan, 1962). Subsequent research would analyze how increasing class sizes affected student academic achievement with meta analysis studies showing class sizes of fifteen students or less resulting in the most academic gains (Glass & Smith, 1979). Hanushek (1986) would later refute these findings and state that smaller class sizes did not result in increased academic achievement. However, critics of Hanushek's work would cite that his use of class size ratios skewed his finding in support of larger class sizes and did not provide educational leaders with the data needed to accurately increase class sizes (Biddle & Berliner, 2002; Gilman & Antes, 1985). In search of more definitive data regarding how class size affects achievement, additional studies would be conducted. Often these studies focused on how the number of students in the class affected the routines and practices of the teacher.

Student Misbehavior

How the number of students in the class affects the classroom management practices is one area researchers investigated. The literature regarding how class size affects classroom management, including student discipline, is fairly consistent in its results, showing that as class sizes increase, time spent handling non-instructional tasks also increases (Deutsch, 2003; Finn, 2002; Finn et al., 2003). Researchers (Blatchford et al., 2007) analyzed approximately 800 teacher surveys regarding how teachers' perceive class size affecting their instructional and management practices. Teacher survey data suggested that as the number of students increased in the classroom, instances of student

misbehavior also increased. Larger classes (31 or more students) were harder for teachers to manage than smaller classes (25 or less students). Teachers cited that more student misbehavior occurred in the larger classes, resulting in more time being spent on controlling the students rather than teaching (Blatchford et al., 2007).

Having to utilize class time for the handling of student misbehavior could affect student achievement and be a reason against increasing class sizes (Blatchford et al., 2007). Cakmak (2009) cited survey data similar to Blatchford et al. (2007) in his research involving approximately 40 student teachers and their class size perceptions. Survey data indicated larger classes have more discipline instances and result in the teacher utilizing more time for the management of students than smaller classes. Student teachers also cited that smaller classes allow them the opportunity to prevent student misbehavior more than larger classes. Survey data indicated student teachers felt there was a relationship between larger classes having more instances of student misbehavior and less academic achievement gains due to instructional time being used for classroom management (Cakmak, 2009).

Through observations of approximately 330 classrooms in Tennessee, Finn and Achilles (1999) identified an improvement in student behavior in smaller classes (13-17 students per teacher) than in larger classes (22-25 students per teacher). Students in smaller classes had less discipline referrals than students in larger classes. More on-task behaviors and less disruptive student behaviors were also observed in the smaller classes. Overall, less discipline issues were observed in the smaller classes, where researchers also noted that student instructional engagement was also higher (Finn & Achilles, 1999).

Survey and observation data indicated that student misbehavior occurred more in larger classes than in smaller classes (Blatchord et al., 2007; Cakmak, 2009; Finn & Achilles, 1999). The more time that teachers had to devote to managing student behavior, the less time teachers had to devote to teaching. This research suggested less time for instruction could result in less academic achievement. In determining whether or not to increase class sizes, the loss of instructional time due to classroom management issues should be considered. Another issue associated with larger class sizes is the lack of physical space and how this affects the classroom environment.

Physical Space

Increasing the number of students in the classroom increases the instances of student misbehavior and decreases the amount of instructional time (Blatchord et al., 2007; Cakmak, 2009; Finn & Achilles, 1999). Another classroom management issue that must be addressed in larger classes is limited classroom space. The lack of physical space is a factor affecting instruction, and according to Blatchford et al. (2007), having students closer to each other in physical proximity leads to classroom management issues due to the teacher's inability to effectively separate disruptive students from the general population in larger classes. More arguing among the students was also observed in larger classes and contributed by teachers as the students being too close to each other (Blatchford et al., 2007). Blatchford, Edmonds, and Martin (2003) found that for students aged 4-11, students in large classes (average of 32 students per class) had more instances of off-task behavior in the form of socializing with peers about non-academic topics and were less likely to pay attention to teacher comments and instructions than students in small classes (average of 19 students per class).

A lack of physical space within larger classes (31 or more students) compared to smaller classes (25 or less students) was cited in teacher surveys as creating an inflexible learning environment (Blatchford et al., 2007). Survey data indicated that larger classroom arrangement usually involved the use of traditional groupings of tables or desks in rows, and teachers were less likely to re-arrange the furniture during instruction or to have the students sit on the floor in small group arrangements. Teachers cited that with large numbers of students, it was impossible to arrange the tables or desks in non-traditional groupings (Blatchford et al., 2007). Being unable to change the arrangement of the classroom could hinder the teachers' ability to provide students with different types of instructional activities and affect the academic achievement of the students.

Lack of physical space can hinder the ability of teachers to vary their instructional practices. For high school classes, especially those involving tools and/or machinery (vocational courses) or chemicals (science courses), large classes can also increase the level of danger. A large classroom population hinders the teacher's ability to monitor student behavior closely, which can be dangerous in high school science labs (Deutsch, 2003). To maintain an orderly and safe learning environment, teachers of large classes are less likely to use inquiry-based laboratories. This lack of hands-on instruction could result in less academic achievement (Deutsch, 2003). Egelson, Harmon, and Achilles (1996) and Graue et al. (2007) found that smaller classes enabled teachers to provide increased focus to activities through the designing of specialized learning environments throughout the room, allowing students to separate from the whole group learning experience physically and academically. A large number of students in a small classroom

means that teachers are unable to effectively manage student behavior, resulting in instructional issues and safety issues.

A lack of physical space prevents teachers from being able to use a variety of instructional strategies and to modify the learning environment to better meet the needs of the students (Blatchford et al., 2007; Deutsch, 2003). In order to provide the best possible learning environment for all students, teachers need to be able to vary their activities. Without the physical space to do this, academic achievement could decrease. Increasing the students in the class affects the amount of space available and implementation of instructional activities.

Classroom Interactions

Limited physical space due to large classes results in an increase in student misbehavior, increase in safety issues, and decrease in instructional activity variety (Blatchford et al., 2007; Deutsch, 2003). Adding to the research regarding class size and classroom management are studies analyzing how the interactions between teachers and students are affected by larger numbers. Results from approximately 140 teacher surveys from Burke County, North Carolina suggested that smaller classes (15 or less students) helped teachers prevent discipline problems through the personal relationships they were able to establish with their students. Teachers stated that in smaller classes, they were able to interact more with their students and prevent discipline problems from occurring (Egelson et al., 1996; Halback et al., 2001). These findings were replicated in teacher surveys from teachers in New York class size reduction programs, who also stated that being able to get to know their students personally allowed them to have less discipline problems (Finn et al., 2003).

Student-to-teacher interactions are affected by class size, which affects the instruction of students and the classroom management of students. In large classes, teachers are not able to build the relationships that they are able to build in smaller classes (Egelson et al., 1996; Finn et al., 2003; Halback et al., 2001). Being able to interact with their students helps teachers decrease the amount of time they have to devote to classroom management issues and increase the amount of time they can devote to instruction. By simply reducing the number of students, educational leaders could enhance the learning process because teachers will be able to devote more time to instruction.

Student-to-student interactions were also found to be affected by class size (Blatchford et al., 2003a). Using data from 235 systematic observations of children aged 5-7 years, students in larger classes (average of 33 students per teacher) were more likely to be engaged in social discussions unrelated to the instruction than students in smaller classes (average of 19 students per teacher). Peer conversations in the larger classes were observed to be about social matters and were more likely to be distracted by the actions of their peers during instruction (Blatchford et al., 2003a). For social relations, larger classes were ranked by teachers on a Pupil Behavior Rating (PBR) instrument as having more positive peer relationships for students than smaller classes. Smaller classes were cited on the PBR as having more aggressive student behavior towards peers (Blatchford, et al., 2003a). Larger classes provide social benefits for students, but smaller classes provide instructional benefit.

Non-instructional Tasks

Increasing the number of students in the classroom affects the teacher-to-student interactions and the student-to-student interactions (Blatchford et al., 2003a; Blatchford et al., 2007; Deutsch, 2003). Increasing the student population also affects the amount of non-instructional duties for the teacher. Data from 788 teacher questionnaires showed teachers of smaller classes find the decrease in grading and recordkeeping responsibilities conducive to increasing achievement. Less time spent grading allowed more time and energy for planning and teaching. Eliminating activities to decrease the grading workload in larger classes was cited by teachers as being a common practice even though they knew that this could negatively affect the achievement of the students (Blatchford et al., 2007).

Effectively meeting the needs of all students within the classroom through instruction and outside the classroom through assessment was cited as being important by all teachers in the study. However, teachers within larger classes (average of 33 students per teacher) noted less job satisfaction than teachers in smaller classes (average of 19 students per teacher). One reason for this decrease in teacher morale was identified as being unable to effectively handle all of the non-instructional tasks required (Blatchford et al., 2007). Larger classes require teachers to devote more time outside of class for the completion of non-instructional tasks. Smaller classes enable teachers to focus more on the planning of instruction and to have greater job satisfaction.

Students in large classes are more likely to display off-task behavior, such as talking with peers on topics unrelated to the instruction and to be in need of teacher re-direction; thus, larger classes often result in the wasting of instructional time and less

academic achievement (Blatchford et al., 2003a; Blatchford et al., 2003b; Blatchford et al., 2007; Cakmak, 2009; Finn & Achilles, 1999). This increase in time being utilized for classroom management results in less time being utilized for instructional purposes, which means teachers are unable to enhance their lessons through engaging activities and/or instruction (Halbach et al., 2001). Hindering the use of more activities is also the lack of physical space presented by large classes, and the lack of teacher-to-student interactions (Blatchford et al., 2007; Deutsch, 2003; Egelson et al., 1996; Halbach et al., 2001). For each classroom management issue, time is taken away from the instruction of the students, affecting their academic achievement. Teachers also report larger classes increase grading workloads and decrease their job satisfaction (Blatchford et al., 2007). Increasing class sizes increases the amount of classroom management. Time used by a teacher to discipline students or to record attendance is time taken away from instruction and learning.

Class Size and Classroom Instruction

Initial class size research focused on whether reducing class sizes was effective and cost-efficient. Researchers then focused on how class size affected the practices and routines of the classroom. Research on how class size affected the management practices of teachers found larger class sizes resulted in more student misbehavior (Blatchford et al., 2007; Cakmak, 2009; Finn & Achilles, 1999). A lack of physical space to separate disruptive students and to use different types of instructional activities has also been cited in class size research as a disadvantage of larger classes (Blatchford et al., 2007; Deutsch, 2003). Larger student populations prevented teachers from being able to interact with their students as much as they would in smaller populations. This factor also contributed

to an increase in classroom management issues (Egelson et al., 1996; Finn et al., 2003; Halback et al., 2001). Teachers reported less job satisfaction due to increased non-instructional workload in larger classes (Blatchford et al., 2007). More discipline issues, less instructional activities, less teacher and student interactions, and more non-instructional tasks contribute to less effective instructional time.

Teacher and Student Interactions

Classroom management issues due to large class sizes affect the instructional environment by taking time away from instruction. However, class size also affects the instructional environment in other ways. Teacher and student interactions are vital to an effective instructional environment (Blatchford et al., 2002). Students in small classes interacted more with their teachers and were more engaged in their learning than students in large classes, who were often observed as passively listening to the teacher interact with other students (Blatchford et al., 2003a; Blatchford, Bassett, & Brown, 2005; Blatchford et al., 2007; Cakmak, 2009; Finn et al., 2003; Smith, Molnar, & Zahorik, 2003). Data from 235 observations of children aged 5-7 years showed that students in smaller classes received more interaction from their teachers and had more active roles in the classroom than students in larger classes. The quality of teacher and student interactions was higher in smaller classes as well. Students in smaller classes initiated more interactions with their teachers through content-related questions and student-initiated responses (Blatchford et al., 2003a; Blatchford, et al., 2002).

Quality teacher and student interactions increase student engagement, and having students more actively engaged in the classroom is a positive of smaller classes (Blatchford et al., 2002). A critical component of quality teacher and student interactions

is instructional feedback. According to Pedder (2006), teachers stated that small classes allowed them to provide students with more individual feedback and more one-to-one interactions, and both were identified by teachers as facilitating learning. From 24 case studies conducted in classes of children aged 5-7 years, Blatchford et al. (2003a) cited more instances of immediate feedback in smaller classes (average of 19 students per teacher) than in larger classes (average of 33 students per teacher). Teachers cited providing students with quick and frequent feedback as an important advantage of smaller classes. This factor also increased their level of job satisfaction (Blatchford et al., 2003a). Being able to provide feedback to the students is one way that teacher and student interactions improve in smaller classes.

Increased individual feedback is one way that smaller classes contribute to a successful learning environment. Smaller classes also facilitate learning through the interactions of the teachers that are also social in context, resulting in the teacher building a deeper relationship with the student (Blatchford et al., 2003a). Questionnaire data from 642 teachers of students aged 5-7 years suggested that teachers felt they were unable to get to know their students in larger classes. Not being able to interact with each child daily in larger classes was cited as a reason for this. This lack of interaction led to teachers being less competent in the knowing the needs of their students academically and emotionally (Blatchford et al., 2003a). For teachers to be able to assess the instructional needs of their students, they must be able to interact with each child daily. Unfortunately, this is not a possibility in large classes where teachers cite being overwhelmed by the number of students needing their constant attention (Blatchford et al., 2003a). Smaller classes facilitate more frequent and higher quality interactions

between teachers and students, and this interaction is vital to the implementation of effective instructional practices.

Instructional Activities

Smaller classes increase teacher and student interactions (Blatchford et al., 2003a; Blatchford, et al., 2002). Teachers in smaller classes are able to provide students with more instructional feedback (Blatchford et al., 2003a; Pedder, 2006). Daily interactions with students enabled teachers to assess the instructional and emotional needs of their students (Blatchford et al., 2003a). Being able to have quality interactions with their students is an important aspect of smaller class sizes as this facilitates the teacher being able to plan and implement effective instructional activities (Blatchford et al., 2003a). The use of direct instruction of individual students is one result of increased teacher and student interactions that positively affects the instructional activities of the classroom. Researchers (Blatchford et al., 2003a; Blatchford et al., 2005; Cakmak, 2009) observed that teachers devoted more time in the direct instruction of individual students in smaller classes. Having smaller classes also allows the teacher to create smaller groups for group instruction, resulting in more opportunities for teachers to interact with individual students and to provide more meaningful instruction to all students in the class (Blatchford et al., 2003b; Blatchford et al., 2005; Finn et al., 2003; Smith et al., 2003). Smaller classes allow teachers to interact more with their students through such methods as direct instruction.

Another result of smaller class sizes is the opportunity for more flexible teaching activities, including the use of more non-traditional activities. Observation data of classes of children aged 5-7 years showed that teachers of smaller classes (average of 19

students per teacher) were more likely than teachers of larger classes (average of 33 students per teacher) to use activities other than whole group lecture. These teachers were observed as using more small group activities, more inquiry-based activities, and more open-ended activities (Blatchford et al., 2002). Teacher questionnaire data suggested that smaller classes facilitated the use of non-traditional activities because the teachers felt more comfortable with having the students move around the room. The teachers also stated that they felt they knew the abilities of their students better because of their frequent interactions with the students (Blatchford et al., 2002). Teacher survey data indicated that teachers are more likely to use innovative teaching strategies when the class is small because the teacher feels like he or she can maintain the attention of the students better (Blatchford et al., 2007). Because small class numbers encourage more interactions with the students, teachers are more comfortable with using non-traditional activities to better meet the needs of all students.

Differentiated Instruction

The ability to interact more with students is one way that class size affects the teacher's instructional practices. Smaller classes allow teachers to provide students with more individualized attention, providing the opportunity for the needs of all students to be met and for teachers to feel more comfortable with implementing non-traditional instructional activities (Blatchford et al., 2007; Blatchford et al., 2002). Individualized attention and quality teacher and student interactions can result in the differentiation of instruction. The differentiation of instruction allows the teacher the opportunity to assess the individual achievement levels of the students and to create lessons designed to increase these levels (Blatchford et al., 2007; Cakmak, 2009). Nye and Hedges (2002)

and Graue, Hatch, Rao, and Oen (2007) found that within smaller classes, the differentiation of instruction for students was increased, and the identification of struggling students happened earlier due to the high level of teacher-student interaction. While the curriculum being taught in small and large classes remained the same, teacher questionnaires indicated that teachers' instructional practices were focused toward meeting the needs of the average-achieving students in larger classes, resulting in the unintentional neglect of the academic needs of lower and higher achieving students (Blatchford et al., 2007; Cakmak, 2009). With larger classes, the teachers are less likely to be able to differentiate the lessons to satisfy the needs of all students.

The differentiation of instruction ensures that all students are receiving the support that they need to achieve. For teachers in large classes (31 or more students), questionnaire responses indicated that students who scored above or below the average achievement of the class were neglected during instruction. Teachers planned activities aimed at meeting the needs of the majority of the students and did not have time to plan or implement differentiated lessons. Teachers of smaller class size (25 or less students) questionnaire responses indicated that they were able to address the needs of all students and felt that no students were overlooked (Blatchford et al., 2007). Smaller classes facilitate the differentiation of instruction and increased achievement for all students.

The number of students in a classroom affects the teacher's instructional practices. Smaller classes allow for more frequent and effective interactions between the teacher and the students, resulting in an in-depth understanding of the student's needs and the confidence to use a variety of activities to address these needs (Blatchford et al., 2003a; Blatchford, et al., 2002). Being able to provide students with innovative teaching

strategies to address their unique learning needs is another way that smaller class sizes affect the instructional practices of the teacher (Blatchford et al., 2003a; Blatchford et al., 2005; Cakmak, 2009). Understanding the needs of the students leads to the development and implementation of more effective instructional activities such as direct instruction, inquiry-based instruction, and differentiated instruction (Blatchford et al., 2003b; Blatchford et al., 2005; Cakmak, 2009; Finn et al., 2003; Smith et al., 2003). Smaller class sizes facilitate the identification of the needs of all students, not just the majority (Blatchford et al., 2007).

Class Size and Academic Achievement

Previously cited literature identified various class size effects on classroom management and classroom instruction. Larger class sizes result in less time being utilized for instruction due to more instances of student misbehavior and off-task behavior (Blatchford et al., 2003b; Blatchford et al., 2007; Cakmak, 2009; Finn & Achilles, 1999). A lack of adequate physical space with which to control student behavior and to implement non-traditional instructional strategies is also a problem in large classes (Blatchford et al., 2007). Teacher and student interactions are more in-depth and focused on student academic and emotional needs in smaller classes, facilitating instructional differentiation (Blatchford et al., 2003a; Blatchford et al., 2002; Pedder, 2006). The size of the class impacts the amount of time the teacher has for the management of the class and for the instruction of the students. With decreased instructional time, academic achievement is not likely to increase.

Subsequent literature analysis will connect class size effects on classroom management and classroom instruction with academic achievement in elementary

schools. The issue of class size is one that can be traced back to the early nineteenth hundreds (Callahan, 1962), yet is still very relevant to the organizational structures of elementary, middle, and high schools of today (Biddle & Berliner, 2002; Glass & Smith, 1979). With such a long history, one would think that the class size debate would be settled by now with conclusive evidence to support or disclaim the assertion that student achievement is affected by class size. However, this is not the case, resulting in a plethora of findings as varied as the studies themselves. Most previous studies on class size reduction focused on elementary schools, which is where the practice is often used in an attempt to narrow the achievement gap present in minorities and economically disadvantaged students upon entering school.

Project Prime Time

The Indiana Project Prime Time study utilized randomly assigned selected public schools to participate in a state-funded experiment designed to analyze the effects of reducing class sizes to an average of 18 pupils in grades kindergarten through third (Biddle & Berliner, 2002; Gilman & Antes, 1985; Gilman & Kiger, 2003). For the pilot phase of Project Prime Time, twenty-four randomly selected public schools reduced class sizes to approximately 18 students. With initial results being positive, class sizes were subsequently reduced in a three year state-wide phase-in project in 52 schools within 30 school districts. In the years following the initial pilot study, average class sizes were 29.9 for larger classes and 19.1 for smaller classes (Biddle & Berliner, 2002). To account for variables like pre-existing smaller classes within the randomly selected schools, the researchers initially compared the achievement results from the Iowa Test of Basic Skills and the Stanford Achievement Test of second grade students from six school districts that

had implemented the smaller class sizes to three school districts that had not implemented the smaller class sizes. Forty pre and post statistical tests were conducted using the data, analyzing the scores by grade, subject, and data for the areas of reading and mathematics (Biddle & Berliner, 2002; Gilman & Kiger, 2003).

The results of the Project Prime Time pilot study were supportive of reducing class sizes to increase academic achievement. Sixty-one percent of the participating students were reported to have exceeded the normal achievement in reading and 53 percent of the participating students were reported to have exceeded the normal achievement in math (Gilman & Antes, 1985; Mueller, Chase, & Walden, 1988). Additionally, survey results showed that teachers experienced less classroom management problems within the reduced class sizes (Gilman & Antes, 1985). Students were also reported as having more positive attitudes towards themselves and school (Mueller, Chase, & Walden, 1988.) Analysis of student achievement data during the implementation year following the pilot year of the Project Prime Time program also provided positive results for the program. Gilman and Antes (1985) reported that of 73 statistical tests computed, 40 of the tests provided results showed significant increases in achievement for the reduced class sizes when compared to the larger classes.

The positive results reported from the Project Prime Time study have not led to the support of reduced class sizes due to the large amount of criticism for the manner in which the study was conducted. While the schools were randomly selected across the state, Gilman and Antes (1985) criticized the fact that the study only reported the variables indicating how reducing class sizes positively affected reading and mathematics achievement and did not account for other variables that could have led to the increase in

achievement. Subsequent analysis of the Project Prime Time study resulted in its results being regarded as supportive of smaller class sizes. However, the research design of the study prohibited its findings being used as conclusive evidence in support of class size reduction. Another criticism of the project is the fact that the participating teachers were chosen and were not randomly selected, and some of the teachers and/or paraprofessionals received training on effective instructional practices, but others did not (Gilman & Antes, 1985). Three years following the implementation of the program, Gilman and Kiger (2003) conducted follow-up studies of Project Prime Time data. The positive effects on student achievement initially reported were negligible to the point of almost disappearing, possibly due to the lack of change in instructional practices by teachers. However, parents of students in the smaller class sizes praised the program, resulting in the program's continuation (Gilmer & Kiger, 2003).

The flawed methodology of the Project Prime Time study is just one reason why educational leaders need additional research on the relationship between class size and student academic achievement. The Project Prime Time study's use of classes with a paraprofessional is another hindrance to the use of this data to determine if smaller classes contribute to increased levels of student achievement (Gilmer & Kiger, 2003). A need to analyze student academic achievement within classes with only one educator present is needed to truly be able to analyze the relationship between class size and academic achievement within rural, economically disadvantaged schools in the southeastern region of Georgia.

Project STAR

Following the methodologically weak experiment of Indiana's Project Prime Time, a much larger field experiment was conducted in Tennessee called Project STAR (Student/Teacher Achievement Ratio). This four-year study was also state-funded, but unlike the Indiana project, it involved the random assignment of elementary school students in inner city, suburban, urban, and rural schools to either a standard class, which had 22-25 students per teacher, a supplemented class, which also had 22-25 students per teacher and full-time paraprofessional, or a small class, which had 13-15 students per teacher and no paraprofessional (Achilles, Finn, & Bain, 1998; Biddle & Berliner, 2002; Nye & Hedges, 2002). Adding to the validity of the Project STAR experiment is its large size--approximately 6,500 students across about 330 classrooms in over 80 different schools (Mosteller, 1995). Upon review of the Stanford Achievement Test battery that each child completed at the end of each school term, the students in the small class grouping had significantly higher achievement scores in reading and mathematics compared to the students in the other two groupings (Achilles et al., 1995; Addronizio & Phelps, 2000; Biddle & Berliner, 2002; Mosteller, 1995; Nye & Hedges, 2002).

Initial results also indicated that African American students and economically disadvantaged students benefited the most from the small class grouping (Achilles et al. 1998; Addronizio & Phelps, 2000; Biddle & Berliner, 2002; Mosteller, 1995). With this research, small class sizes could be identified as one way for researchers to decrease the achievement gap for at-risk students while providing the benefits of the strategy for all. Follow-up studies analyzing the Project STAR data have focused on identifying just how much of an effect smaller class sizes did have on achievement, especially for minority

and students from a low socio-economic background who are often identified as being lower achieving (Nye & Hedges, 2002; Nye, Hedges, & Konstantopoulos, 2004). Using hierarchical linear models in their analyses, Nye and Hedges (2002) found evidence to support small class sizes in elementary schools as was justified by increased achievement; however, students who were initially identified as lower achieving in reading had the highest gains in this area while higher achieving students showed the most academic gain in mathematics. Similar results were also found by Konstantopoulos (2007) in his more recent study of how reduced class sizes affected the achievement gap between higher performing and lower performing students in kindergarten and first grade mathematics classes. Thus, within the area of mathematics, smaller class sizes benefited the higher achieving students more than the lower achieving students. For school districts seeking to find an instructional practice that would help to narrow the achievement gap in mathematics, the research of Nye and Hedges (2002) and Konstantopoulos (2007) has shown that smaller class sizes would not be the answer.

Implementing smaller class sizes in the elementary school years has been shown to increase achievement, yet for this strategy to gain the support of school district leaders, who see the strategy as expensive, the sustainability of class size reduction on student achievement in middle and high school must be analyzed. Nye, Hedges, and Konstantopoulos (2001) researched the lasting effects of participating in at least one year of class size reduction during the elementary school years compared to students who had participated in class size reduction for four years (grades kindergarten through third). From this study, Nye et al. (2001) found that students who had received instruction in the smaller class sizes during at least one year of their elementary school years showed

sustained increased achievement in mathematics in grade nine over students who had not received instruction in the smaller class sizes. Furthermore, students who had received instruction in the smaller class size environment for all four years showed higher levels of achievement in grade nine than students who had only received one year of instruction in the smaller class size environment. This study showed the benefits of decreasing class sizes in elementary schools and its affect on achievement during subsequent years. Overall achievement increased with the number of years that students received instruction in smaller class sizes.

In another follow-up study involving Project STAR, researchers (Finn & Gerber, 2005) examined whether having participated in small classes in elementary school increased the likelihood of graduating from high school. For this study, a sample of 4,948 students was identified from the original pool of students who had participated in the reduced class size initiative for four consecutive years in grades kindergarten through third. For analysis of the student data, the researchers used a logistic regression model for multilevel data with the independent variable being whether the student had graduated from high school. Analysis of the data revealed that participation in reduced class sizes for one to three years resulted in no significant difference in graduation rates, but participating in reduced class sizes for four years did result in significantly higher graduation rates. In the analysis of the data based upon sub-groups, there was no difference in graduation rates between Whites and minority students, regardless of the number of years of small class participation; however, there was a significant increase in graduation rates for students eligible for free lunch status compared to students ineligible for free lunch status when comparing students who had or had not participated in reduced

classes. To find a connection between academic achievement in elementary school and graduating from high school, the researchers compared standardized test scores in grades kindergarten through third grade with graduation rates, finding a strong correlation between performing well academically in elementary school and graduating from high school. For educational leaders seeking to increase the graduation rate, this data shows how important increasing academic achievement in elementary school is to ultimately completing high school.

To test the sustainability of the Project STAR results for reducing the achievement gap in academic achievement between minority and majority students, Nye et al. (2004) conducted a follow-up study analyzing the effects on achievement of these students five years after the initial program implementation of reduced class size in Tennessee. For this study, the analyzed sample included students who had participated in the smaller class sizes for four years (grades kindergarten through third). Nye et al. found that the smaller class sizes in the elementary years led to an increase in reading achievement for minority students during the five-year period following their placement in reduced class size groups. Thus, the benefits of small class instruction did not end for these students once their class sizes increased; the benefits of having small class instruction in their early years of education were sustained even after their class sizes increased. With the findings of this follow-up study, the positive effects of smaller class sizes have sustainability and could narrow the achievement gap between minority and majority students. This follow-up study also analyzed how small class sizes in the elementary grades affected achievement for girls compared to boys. The researchers found that small class sizes increased achievement for girls in mathematics, reducing the

gap in this area, and the increase in achievement and reduction of the achievement gap was sustainable five years (Nye et al., 2004).

While researchers (Nye & Hedges, 2002; Nye et al., 2004) did not find a significant increase in mathematics achievement due to the smaller class size in lower achieving minority students, they still supported smaller class sizes as the research showed academic gains for all levels of students. Critics of Project STAR contended that schools volunteered to participate, indicating a willingness to implement new strategies, and the lack of cultural diversity as two limitations of the study (Biddle & Berliner, 2002). Even with these limitations, the Project STAR was better designed than the Project Prime Time; thus, its results are more reliable and useful to educators seeking valid research to base class size decisions.

For educational leaders in rural, economically disadvantaged school districts, the main disadvantage of using the Project STAR data in evaluating the effectiveness of class size reduction is the lack of a generalizable population of students and the age of the findings. Project STAR did not focus on the effects of class size reduction on academic achievement of students in only rural, economically disadvantaged schools, and the study was conducted almost twenty years ago. More recent research on the relationship between class size and academic achievement is needed for school leaders to be able to assess whether the fiscal investment of hiring additional teachers to reduce class sizes is the most effective use of their limited funding.

Connecticut Population Variation Study

Economist Caroline Hoxby (2000) conducted an analysis of 649 elementary schools in Connecticut to determine whether the positive achievement gains reported in

Tennessee with the Project STAR analysis would be replicated. Two methods were used to analyze whether class size affected student achievement data, using six years of school-level test data (1992-1993 to 1997-1998) and twelve years of district-level data (1986-1987 to 1997-1998). The first method was based on identifying the naturally occurring differences in class size that occurs within a school population due to the natural variations in school enrollments. The second method analyzed the changes in class sizes caused by random decreases or increases in class sizes due to enrollment changes or district-level class size minimum and maximum requirements. For both methods, the data was collected ex post facto, which Hoxby cites as being more valid due to the participants being unaware of any analysis. With Project STAR, teachers and school leaders knew of the project, and this could have affected their behavior, thus, affecting the outcome (Hoxby, 2000). In the Connecticut study, class sizes ranged from 10 to 30 students in identified school-level cohorts, and the researcher analyzed test data from tests administered in September of the selected school years. Hoxby explained that class sizes for grades kindergarten through third would be analyzed to determine whether or not fourth grade scores were affected. This was done due to the early administration of the assessment and previous research indicating that smaller class size achievement gains were sustainable.

No statistically significant achievement gains were found for students in smaller classes compared to students in larger class sizes. In contrast to the finding of Project STAR, reducing class sizes did not increase achievement for impoverished students or for African American students. In fact, the Connecticut study indicated that higher income students benefited the most from smaller class sizes (Hoxby, 2000). The researcher

(Hoxby, 2000) explained that her analysis methods were so precise that reducing class sizes by ten percent should have resulted in a two to four percent increase in student achievement; however, no statistically significant increases were found due to reduced class sizes. The results of Hoxby's study have been criticized due to the use of school-level cohort data instead of actual class size data (Finn, Pannozzo, & Achilles, 2003).

For educational leaders in rural, economically disadvantaged districts, Hoxby's data does not support class size reduction as her study only indicated gains in achievement for students from higher income homes. The Connecticut study also does not provide any support for reducing class sizes as a way to reduce the achievement gap for African American students. In fact, the lack of increase in academic achievement reported by Hoxby (2000) only confounds the class size issue for school districts as this study clearly indicates no increase in achievement, adding to the inconsistency of data surrounding the issue. Class size study results are varied and inconsistent in their results and in their methods used to analyze academic achievement, leading to the need to conduct additional experiments.

Burke County, North Carolina

For the Burke County School System in North Carolina, the positive results reported from the analysis of Project STAR for elementary school students resulted in a district-wide initiative to reduce class sizes (Egelson et al., 1996; Finn, 2002). For the predominantly rural school district, the class size reduction project began with four first grade classes during the initial year (1991-1992), increased to fourteen (all within the district) first grade classes and four second grade classes (to continue the strategy for the students involve in the four first grades from the previous year) in the second year (1992-

1993), and seven first grade classes, seven second grade classes, and four third grade classes in the third year (1993-1994) (Egelson et al., 1996; Finn, 2002). To try to control for confounding variables within the data analysis in the quasi-experimental study, students within the reduced classes were matched with students not participating in the reduced classes based upon free or reduced lunch status, gender, achievement scores in the areas of mathematics and reading, and years of assigned teacher's experience in the field (Egelson et al., 1996). According to Egelson (1996), the process of matching students based upon these variables was continued during each year of the study with the third year enrollment being 2,860 students with the population comprised of 1,193 first grade students, 1,125 second grade students, and 542 third grade students..

An analysis of achievement results at the end of the first year revealed that the students in the small classes (average of 15 students per teacher) had higher scores on the state mathematics and district-developed reading assessments than students in the large classes (average of 25 students per teacher). Analysis of reading and mathematics achievement data for the same students during their second grade year and second year of reduced class sizes provided more support for the initiative. The statistical significance of achievement gains for students in the small classes compared to the students in the large classes was even greater during subsequent years. During the third year of program implementation and analysis, the increases in achievement for the students in the smaller classes were even greater than the students in the large classes in the academic areas of mathematics and reading (Egelson et al., 1996).

The design and length of the Burke County study add to the validity of its results. Unfortunately, the study does not disaggregate the data based upon the socio-economic

status or race of the students, preventing its use in the support or refutation of the findings of Project STAR. Unlike Project STAR, the Burke County program included professional development for the teachers of the reduced classes, which could have impacted the results of the study (Egelson et al., 1996; Finn, 2002). To replicate the results of the Burke County program, school system leaders would need to try to also include professional development for their teachers to account for this variable.

Since almost forty percent of the students in the Burke County project qualified for free or reduced lunch status, an analysis of the class size reduction effect on students from low socio-economic households would have been beneficial to educational leaders in impoverished districts. However, no such analysis was conducted during the study, and this is a need for future research. The use of professional learning as a component of the Burke County program hinders the use of results of this study as well since the exact type and length of the professional learning is unclear and unlikely to be consistently replicated. Additionally, the age of the Burke County project is a hindrance, and more recent data is needed to properly assess the relationship between class size and academic achievement.

SAGE Program

The positive results of the Project STAR study and the Burke County, North Carolina, study prompted other states to implement their own small class size programs, resulting in more empirical research on the effects of class size on student achievement. In Wisconsin, the Student Achievement Guarantee in Education (SAGE) Program was aimed at increasing achievement through the use of reduced class sizes in grades kindergarten through third grade by implementing a class size limit of fifteen in school

districts with a high percentage of low-income students located primarily in urban Milwaukee (Biddle & Berliner, 2002; Smith et al., 2003; Thompson, 2006). To determine whether the smaller class sizes had an affect on student achievement, results from the smaller classes were compared to standard class sizes within the same district that had comparable student demographic factors like income, race, and prior levels of academic achievement (Biddle & Berliner, 2002).

Findings from the SAGE program were similar to those of Project STAR in that achievement scores in the areas of reading and mathematics increased on the Comprehensive Test for Basic Skills (CTBS) assessment for students receiving instruction in the reduced class size environments, and the most academic increases were seen in the scores of disadvantaged students (Biddle & Berliner, 2002; Smith et al., 2003; Thompson, 2006). Like Project STAR follow-up studies, Project SAGE follow-up studies of the initial year of implementation showed that the academic achievement gains of students were sustainable and did reduce the achievement gap between African American students and white students (Smith et al., 2003; Thompson, 2006). The researchers (Smith et al., 2003) also discovered that the Project SAGE program benefited students with higher socio-economic status; therefore, unlike Project STAR, which identified the most gain for students from low socio-economic households, Project SAGE found that smaller class sizes did not help students overcome the achievement gap often associated with low socio-economic status. This information is valuable to school district leaders seeking an intervention that will increase achievement in students of poverty as research from Project SAGE shows that the positive benefits associated for these students by Project STAR may not be applicable to all populations.

An analysis of Project SAGE by Thompson (2006) has provided school district leaders with more insight regarding the limitations of the initial Project SAGE studies. One limitation was found in the identification of classes as being reduced class sizes. For Project SAGE, a reduced class size consisted of fifteen students and one teacher or thirty students and two teachers (Smith et al., 2003; Thompson, 2006). Not knowing how one teacher to fifteen students versus two teachers to thirty students affected the results of the Project SAGE study does hinder the applicability of the findings for school district leaders. Another limitation of Project SAGE was the researchers' handling of the fluctuating sample of students as students left during the experiment, yet the researchers did not consistently exclude withdrawn students' scores from the data (Thompson, 2006). Not accounting for such changes in the sample skews the reported data and does not provide school district leaders with statistically sound evidence with which to determine the effectiveness of class size reduction. The inclusion of professional development for teachers is another aspect of the Project SAGE design that must also be included (Finn, 2002). As in the case of the Burke County, North Carolina, class size reduction initiative, school leaders using the Project SAGE design as a model for implementation within their own school districts must also acknowledge the training of teachers as a variable that could have influenced the positive results of the study.

The location of the Project SAGE study is another variable that must be considered. The use of schools primarily located within urban Milwaukee is a unique characteristic of this study that could alter the generalizability of the results to a rural or suburban area (Biddle & Berliner, 2002; Smith et al., 2003). The results of Project SAGE are certainly notable; however, the unique population pool is a hindrance for this

researcher's needs. As previously mentioned in other class size reduction literature critiques, the lack of recent data from Project SAGE is another gap in this researcher's investigation. Within the ever-changing world of education, data that was collected over a decade ago is no longer as salient today as when it was initially collected.

National Kindergarten Study

While results for Project STAR and the SAGE Project reflected increased levels of achievement for students in small class sizes during the elementary school years, not all studies reflect such increases in achievement due to a reduction in class size. Milesi and Gamoran (2006) analyzed data from the Early Childhood Longitudinal Study—Kindergarten Class of 1998-99 for evidence of increased reading and mathematic ability in students who were instructed in small class sizes when compared to students who were not instructed in small class sizes. The sample consisted of 21,260 children enrolled in approximately 1,000 kindergarten programs. Pre-test data to establish a baseline achievement data prior to the students receiving any formalized kindergarten instruction were collected in the fall of 1998, and a second set of data for the students were collected in the spring of 1999 in an attempt to measure academic achievement. The achievement data were collected using a one-on-one interview with computer-program assistance within the two content areas of reading and mathematics (Milesi & Gamoran, 2006).

The data, collected by the National Center for Education Statistics (NCES), did not show any increase in student achievement in reading or mathematics due to smaller class sizes (Milesi & Gamoran, 2006). For educators who are trying to reduce the achievement gap of students living in poverty and for minority students, this research is important as it suggests that it is not the number of students in the classroom that affects

achievement gains. Researchers (Milesi & Gamoran, 2006) further identified that the variable that determines whether or not classroom achievement will increase was not size but the instructional strategies utilized by the teachers. Critics of smaller class sizes could use these findings to support the funding of more professional development for teachers in effective instructional strategies, not the hiring of more teachers to reduce class sizes.

While the National Kindergarten Study does provide more recent data concerning class size and academic achievement, it does not address this researcher's target population of third grade students in rural, economically disadvantaged schools. It is during grade three that students are required to pass the CRCT in the area of reading to be promoted to grade four within the state of Georgia. For accountability purposes, third grade CRCT scores are used along with fourth and fifth grade CRCT scores by the state of Georgia to determine whether a school has made AYP. Thus, a higher level of accountability beginning in third grade necessitates that school leaders have recent, accurate data pertaining to interventions that increase academic achievement, like class size reduction.

Kentucky Third Grade Study

According to Borland, Howsen, and Trawick (2005), previous empirical research on whether class size affects student achievement has been problematic due to measurement error resulting from the misuse of a student/teacher ratio being used to measure class size, the failure to control for biological differences in the students like innate ability, the failure to consider "the endogeneity of class size with respect to student achievement," and the use of "an incorrect functional form" when analyzing the

relationship between student achievement and class size (p. 74). Using data that were collected from the Kentucky Department of Education for all third grade classes in the state during the 1989-1990 school year, the researchers (Borland et al., 2005) matched each student record with a specific teacher and determined an exact class size. Student achievement, class size, teacher salary, and education competition were identified as endogenous variables. Results of the study found that the optimal class size for student achievement is between 21.3 and 23.24 students and also suggested that class sizes below these optimal sizes actually lowers student achievement (Borland et al., 2005). This data clearly goes against previous studies that supported class sizes of 15 or less being the optimum for student achievement and is one that administrators could use as evidence against lowering class sizes below 20 students. For researchers interested in the effects of class size on the academic achievement of economically disadvantaged students, this study is also important as approximately 60% of the student sample qualified for free or reduced lunch status (Borland et al., 2005).

The fact that this data is more current than some previous studies also adds to its value for this researcher, yet the sample's demographic composition is not comparable to that of rural, economically disadvantaged school districts in the southeastern region of Georgia. Further investigation into the relationship between class size and academic achievement is needed for rural, economically disadvantaged school leaders to make informed decisions regarding the use of reduced class sizes.

Summary

Class size reduction is an issue in education of significance as it is a strategy that is currently being used within many school districts at the elementary school level in an

attempt to increase achievement for students. Increased accountability is being placed upon schools to make AYP and on school districts to use their limited funding efficiently and effectively. It is vital that districts have contemporary research to use in the hiring of additional teachers to create smaller learning environments. While there are numerous studies on smaller class sizes and their affect on achievement, the results of the studies are inconsistent in their findings, leaving educational leaders with no definitive answer regarding the relationship between class size and student academic achievement.

Confounding the data is the varied methodology of the studies, making the generalizability of results arduous. This in-depth study analyzed the relationship between class size and academic achievement within rural, economically disadvantaged third grade classrooms as indicated through CRCT scores in the areas of reading and mathematics. The findings of this study provide educational leaders with data regarding class size and academic achievement, resulting in the continuation of class size reduction or the eradication of it.

CHAPTER III

METHOD

Introduction

The purpose of this study was to analyze the relationship between class size and academic achievement in rural, economically disadvantaged third grade classrooms and how teachers perceived class size affecting their instructional and classroom management practices. During this present time of increasing educational accountability and decreasing educational funding, it is vital that educational leaders implement the most effective and efficient interventions available. Class size reduction is one such intervention that has been identified as a way to increase student academic achievement, especially for at-risk students like those identified as receiving free or reduced lunch, having learning disabilities, or being of minority ethnic status. Previous studies on the topic of class size and student academic achievement provide a wealth of varied and inconsistent findings with the majority of studies occurring two decades ago. The lack of consistent, contemporary research results in a gap for today's educational leaders, especially within the rural, economically disadvantaged school districts of the southeastern region of Georgia. It is within these rural, economically disadvantaged school districts that educational funding is the most limited. It is also within these rural, economically disadvantaged school districts where achievement gaps caused by low socio-economic households of minority students abound. Definitive results regarding the relationship between class size and academic achievement are needed.

Research Questions

The study was intended to answer the following overarching research questions:

(1) What is the relationship between class size and academic achievement as measured by the CRCT for third grade students in rural, economically disadvantaged elementary schools? (2) What are teachers' perceptions of class size as it relates academic achievement?

The sub-questions that guided the study were the following:

1. What is the degree of the relationship between class size and reading achievement on the CRCT for third grade students in rural, economically disadvantaged school districts?
2. What is the degree of the relationship between class size and mathematics achievement on the CRCT for third grade students in rural, economically disadvantaged school districts?
3. What are the perceptions of third grade teachers regarding class size and instructional methods?
4. What are the perceptions of third grade teachers regarding class size and classroom management?

Research Design

A mixed methods design for research was conducted to analyze the relationship between class size and academic achievement in rural, economically disadvantaged third grade classrooms and how teachers perceived class size as affecting their instructional practices and classroom management techniques. The mixed methods design resulted in a study that was stronger than a study that was only quantitative or qualitative in design

(Creswell, 2009). Through the use of a sequential mixed methods (QUAN-qual) approach, analysis of quantitative standardized achievement test data was collected and analyzed prior to the collection and analysis of qualitative survey data. CRCT scores in the areas of mathematics and reading were collected and provided the quantitative achievement data needed for the study. The test data was from the 2009-2010 and 2010-2011 school years, resulting in an ex post facto research design as the class sizes and rosters were already established prior to this analysis. An ex post-facto research design refers to the presumed relationship between variables or lack of relationship between variables that will be established utilizing data from events have already occurred (Gall et al., 2007).

Quantitative data collection facilitated the objective analysis of the relationship between the two variables of class size and academic achievement (Creswell, 2009). Achievement data from the reading and mathematics sections of the CRCT provided one part of the data to be used for the mixed methods study. Multiple regression analysis was used to examine the relationship of academic achievement and class size. To collect qualitative data regarding teachers' perceptions of the relationship between class size and their instructional strategies and classroom management techniques, a researcher-developed questionnaire was administered. Questions were open-ended, requiring participants to construct responses. Subsequent to the quantitative data collection phase, the qualitative data collection phase probed deeply into teachers' perceptions regarding the effect class size has on their classroom instructional and management methods. Qualitative data collection during the second phase of the research design allowed the researcher to explore the relationship between class size and academic achievement by

understanding how changing the number of students within the classroom affects the behavior of the teacher, which could result in changing the academic achievement of the students. The collection and analysis of qualitative data allowed the researcher the opportunity to interpret the data to gain a deeper understanding (Creswell, 2009).

Population

For the quantitative data collection for student academic achievement, the population of the study was third grade students in rural, economically disadvantaged schools within the southeastern region of Georgia who completed the CRCT during the 2010 and 2011 spring administrations. For the qualitative data collection regarding teachers' perceptions of the relationship between class size and their instructional and management techniques, the population for the study was third grade teachers in rural, economically disadvantaged schools within the southeastern region of Georgia during the 2011-2012 school year. In order to fill the present gap in empirical literature that exists regarding the relationship between class size and academic achievement, it was necessary that the population for the study include only participants from rural, economically disadvantaged school systems.

Sample and Sampling

In order to fully answer the research questions for this study, purposive sampling of third grade student achievement data and teacher perception data from rural, economically disadvantaged school systems was used. Gall, Gall, and Borg (2007) cite that purposive sampling is the ideal sampling method when it is necessary to choose a sample that is apt to provide more in-depth knowledge about the topic. Data regarding the relationship between class size and academic achievement within rural, economically

disadvantage school systems necessitated the purposive sampling of the data. Rural was defined as any county that has less than 65 people per square mile (United States Department of the Census Bureau, 2000). For Georgia, 89 counties are identified as rural (United States Department of the Census Bureau). There are 118 public school districts located within the 89 rural counties of Georgia (National Center for Education Statistics, 2011). In comparing the list of the 118 public school districts identified as rural to the October 2009 and October 2010 free and reduced lunch price eligibility lists provided by the Georgia Department of Education (2011), 72 public school districts qualify as being both rural and as having an economically disadvantaged population of at least 60 percent.

To obtain the necessary class size, student achievement data, and demographic data for the study, data was collected directly from the rural, economically disadvantaged districts located in the southeastern region of Georgia who committed to participate in the study. The first step in the data collection was to request permission to access each school's class size data from the superintendent of the district. A sample size of 204 classes was obtained, resulting in the use of student achievement and demographic data from 9 school districts. As recommended by Cohen (1992), a minimum sample size of 118 classes was needed to conduct a multiple regression analysis at medium effect size with a power level of .80 and alpha at .05.

For the survey data collection, a list of the third grade teachers from the 2010-2011 school year was requested from each of the nine participating districts. From the nine participating districts, 103 teachers were teaching third grade during the 2011-2012 school year. Access to teachers' emails was gained via access of each district's website. An electronic survey created using Survey Monkey (Finley, 2008), a web-based survey

tool, was emailed to each teacher. All 103 teachers in this sample were invited to participate in the survey.

The sample of the study consisted of third grade teachers in nine school districts in the southeastern region of Georgia. The overall response rate of teachers participating in the *Teacher Perceptions on Class Size and Classroom Practices Survey*, the questionnaire developed in this study, was 49.5%. There were 51 teachers who participated in the study; 49 were female and 2 were male. The majority of participating teachers were White. The mean years teaching for the respondents was 14.76. The smallest class size range taught by the majority of the respondents was 16-20 students. The largest class size range taught by the majority of the respondents was 21-25 students. Analysis of selected characteristics of the participants is presented in Table 2.

Table 2
Demographic Profile of Respondents

Characteristics	N	%
Number of Teachers Surveyed	103	100%
Number of Teachers Responding	51	49.5%
Sex		
Female	49	96.1%
Male	2	3.9%
Race		
White	46	90.2%
Black or African American	4	7.8%
Hispanic	1	2.0%
Teaching Experience Level		
Low (less than 3 years)	3	5.9%
Medium (3-20 years)	37	72.6%
High (more than 20 years)	11	21.6%
Smallest Class Size Range Taught		
5 or less students	2	4.5%
6-10 students	8	15.7%
11-15 students	16	31.4%
16-20 students	24	47.1%
21-25 students	1	1.0%
26-30 students	0	0.0%
More than 30 students	0	0.0%
Largest Class Size Range Taught		
5 or less students	0	0.0%
6-10 students	1	2.0%
11-15 students	0	0.0%
16-20 students	0	0.0%
21-25 students	31	60.8%
26-30 students	11	31.6%
More than 30 students	8	15.7%

Instrumentation

All student academic achievement data were obtained using the reading and mathematics sections of the CRCT which was administered to all students in the state of Georgia in grades third through eighth in the spring of the 2009-2010 and 2010-2011 school years. According to the Georgia Department of Education (2011) website, the purpose of the CRCT is to assess whether students have gained the skills and knowledge of the state curriculum, the Georgia Performance Standards (GPS). Each section of the CRCT contains 50-70 content related questions in multiple choice formats, and scale scores are used to report student performance based on three performance levels. The three student performance levels are “does not meet expectation” (below 800), “meets expectations” (800-849), and “exceeds expectations” (850 or above).

The Georgia Department of Education (2011) states that the validity of the CRCT is established using a test development protocol that begins with a review of the GPS curriculum by committees of Georgia educators and creation of content descriptors and test items. The created test items are then field tested with results being analyzed for error and/or bias. The Georgia Department of Education then uses the Angoff method to determine the standards for student achievement levels for the CRCT (Assessment Research and Development of the Georgia Department of Education, 2010).

Reliability of the CRCT is established by Cronbach’s alpha reliability coefficient and the standard error of measurement (SEM). Cronbach’s alpha provides internal consistency for the responses. The SEM is the second statistical index used. For the third grade reading section of the 2010 CRCT, Cronbach’s alpha was reported as 0.88 and SEM was 2.51. For the third grade mathematics section of the 2010 CRCT,

Cronbach's alpha was reported as 0.92 and SEM was 3.03 (Assessment Research and Development of the Georgia Department of Education, 2010). For the third grade reading section of the 2011 CRCT, Cronbach's alpha was reported as 0.89 and SEM was 2.45. For the third grade mathematics section of the 2011 CRCT, Cronbach's alpha was reported as 0.92 and SEM was 2.98 (Assessment Research and Development of the Georgia Department of Education, 2011).

All qualitative data regarding teachers' perceptions of the relationship between class size and classroom instructional and management techniques were collected using a researcher-developed constructed response questionnaire. The thematic basis for the survey was derived from previous literature regarding how teachers' perceive class size as affecting their instructional practices and classroom management techniques. From the work of other class size researchers (Blatchford, et al., 2003a; Blatchford, et al., 2003b; Blatchford, et al., 2006; Cakmak, 2009), four constructed response survey items have been developed.

The first constructed response item on the questionnaire asked, "If you had a class of 15 students, how would the types of instructional activities you would use be different from the instructional activities you would use if you had a class of 30 students?" Previous class size studies have found that as class sizes decrease, the amount of direct instruction increases (Blatchford et al., 2003a; Blatchford et al., 2005; Cakmak, 2009). Researchers (Blatchford et al., 2003b; Blatchford et al., 2005; Finn et al., 2003; Smith et al., 2003) also observed an increase in the use of small group instructional activities in smaller classes compared to larger classes, resulting in more active engagement by the students. Previous teacher survey data also cited the increased use of innovative teaching

strategies due to the teacher stating he or she felt more confident in being able to maintain the attention of the students better in smaller classes (Blatchford et al., 2002).

The second constructed response item on the questionnaire asked, “How would your classroom management plan (strategies) differ in a class of 15 students versus a class of 30 students?” Large classroom populations hinder the teacher’s ability to effectively separate disruptive students from the general population and facilitate student off-task behavior in the form of talking about non-academic topics (Blatchford et al., 2003; Blatchford et al., 2007). Limited physical space due to large classes results in an increase in student misbehavior, increase in safety issues, and decrease in instructional activity variety (Blatchford et al., 2007; Deutsch, 2003). Teachers have also stated that in smaller classes, they were able to interact more with their students and prevent discipline problems from occurring, enabling more time to be used on instruction rather than management (Egelson et al., 1996; Halback et al., 2001).

The third constructed response item on the questionnaire asked, “How do you think class size affects student achievement?” In previous teacher questionnaire data, Blatchford et al (2007) found that having to utilize class time for the handling of student misbehavior affects student achievement and is a reason against increasing class sizes. Cakmak (2009) surveyed student teachers regarding their class size perceptions and academic achievement and found that student teachers felt there was a relationship between larger classes having more instances of student misbehavior and less academic achievement gains due to instructional time being used for classroom management. A lack of inquiry-based instructional activities in large classes could also negatively affect academic achievement (Blatchford et al., 2002).

The fourth constructed response item on the questionnaire asked, “Identify your ideal class size and explain why this class size would be the best for you and your students.” Researchers (Blatchford et al., 2003a; Blatchford, et al., 2002) have cited that smaller classes allow for more frequent and effective interactions between the teacher and the students, resulting in an in-depth understanding of the student’s needs and the confidence to use a variety of activities to address these needs. Teachers cited providing students with quick and frequent feedback as an important advantage of smaller classes; this factor also increased their level of job satisfaction (Blatchford et al., 2003a). Another factor affecting teachers’ job satisfaction was the increased workload resulting from large classroom populations and the subsequent large amounts of grading (Blatchford et al., 2007).

Additionally, the questionnaire consisted of four demographic questions regarding the teacher’s sex, race, and years of teaching experience. Survey respondents were also asked to identify the smallest and largest class size ranges they had ever taught. Questionnaire items were field tested with a group of six educators who were not participating in the study. Field test participants were asked to complete the questionnaire and then answer questions regarding how long it took to complete the questionnaire and to provide feedback on the clarity of the questions. Results from the field test of the questionnaire indicated that the questions were not confusing, and the time needed to complete the questionnaire was no more than ten minutes. Analysis of the field test answers were consistent with previous surveys and interviews that inquired about how class size affects the instructional and classroom management practices of

teachers. The instrument *Teacher Perceptions on Class Size and Classroom Practices* can be found in Appendix B.

Data Collection

After permission to access the student academic achievement data from district and school-level administrators, CRCT data collection was conducted on-site and via electronic communication with each district's assigned liaison. Data collection included class size, academic achievement on the reading and mathematics sections of the CRCT, percentages of students with disabilities in each class, percentages of students as being identified for the gifted and talented program in each class, ethnic background percentages, English learner percentages, sex percentages, and the percentage of economically disadvantaged students within each class. Additionally, data was collected on the teachers of each class to include years of teaching experience and advanced degree status.

Qualitative data regarding teachers' perceptions about class size as it pertains to their instructional practices and classroom management was collected through an electronic questionnaire after permission to survey the teachers was obtained from each district's administrator. A list of third grade teachers was gained from the district administrator of each district, and each teacher was sent a pre-notification email that explained the purpose of the study, how each teacher was chosen to participate, and the importance of participation. Three days after the pre-notification email, the survey link was emailed to each teacher. All survey data was collected using Survey Monkey, a web-based survey tool. To increase the likelihood of a high response rate, reminder

messages were sent to participants after seven and fourteen days of the initial survey dissemination (Finley, 2008).

Summary

From a sample of 204 third grade classes in nine rural, economically disadvantaged school districts located in the southeastern region of Georgia, a multiple regression analysis was used to determine the magnitude and direction of the relationship between class size and academic achievement. Variables relating to student and teacher demographics were also analyzed. SPSS was used to analyze all quantitative data. To enhance the understanding of the relationship between class size and academic achievement, an electronic questionnaire was sent to 103 third grade teachers during the 2011-2012 school year. The questionnaire responses were included in the study to provide insight regarding teachers' perceptions about class size.

CHAPTER IV
REPORT OF DATA AND DATA ANALYSIS

Introduction

The purpose of this study was to determine the magnitude and direction of the relationship between class size and academic achievement as measured by the reading and mathematics sections of the CRCT for third grade students in rural, economically disadvantaged school districts. Additionally, third grade teachers' perceptions regarding how class size affects their classroom practices and routines were collected and analyzed.

A sequential mixed methods (QUAN-qual) design for research was used to analyze the relationship between class size and academic achievement in rural, economically disadvantaged third grade classrooms. The first part of the research was the collection and analysis of quantitative standardized achievement test data in the areas of reading and mathematics from the 2010 and 2011 spring administrations of the CRCT. In addition to the use of descriptive and inferential statistics, a multiple regression analysis was used to control for several covariates. For each class set of data, the mean academic achievement scores on the reading and mathematics sections of the CRCT were calculated. The dependent variables for the study were classroom mean reading scores on the CRCT reading section and classroom mean mathematics scores on the CRCT mathematics section. The independent variables were the following:

- the percentage of males in each class.
- the percentage of white students in each class.
- the percentage of black students in each class.
- the percentage of Hispanic students in each class.

- the percentage of English Learner students in each class.
- the percentage of economically disadvantaged students in each class as established by each student's free or reduced lunch status.
- the percentage of students who qualify for the gifted and talented program in each class.
- the percentage of students with disabilities in each class.
- the number of students per teacher in each class.

The second part of the research was the collection and analysis of qualitative data regarding teachers' perceptions as to the relationship between class size and their instructional strategies and classroom management techniques through the use of a researcher-developed questionnaire. To collect demographic information for each respondent, the questionnaire contained five questions asking for the respondent's sex, race, years of teaching, largest class size ever taught, and smallest class size ever taught. Following the demographic questions, respondents were then asked to complete four constructed response questions that were developed using the common themes identified by previous research regarding how teachers' perceive class size as affecting their classroom instructional and management practices.

Findings and Data Analysis

The following overarching research questions guided the study: (1) What is the relationship between class size and academic achievement as measured by the CRCT for third grade students in rural, economically disadvantaged elementary schools? (2) What are teachers' perceptions of class size as it relates to academic achievement?

The following sub-questions also guided the study:

1. What is the degree of the relationship between class size and reading achievement on the CRCT for third grade students in rural, economically disadvantaged school districts?
2. What is the degree of the relationship between class size and mathematics achievement on the CRCT for third grade students in rural, economically disadvantaged school districts?
3. What are the perceptions of third grade teachers regarding class size and instructional methods?
4. What are the perceptions of third grade teachers regarding class size and classroom management?

Quantitative Data

Quantitative data analysis began with descriptive statistics being computed for 3,812 third grade student data records from the 2009-2010 and 2010-2011 school years from 204 classes in nine public school districts. For each class set of data, descriptive statistics for the following variables were collected:

- racial percentages
- sex percentages
- students identified as being in the gifted and talented program percentages
- students with disabilities percentages
- students identified as being English Learner percentages
- students identified as being economically disadvantaged percentages
- classroom mean reading scores on the CRCT

- classroom mean mathematics scores on the CRCT
- number of students in each class

In analysis of the aggregated class set data, it was noted that the smallest classes were primarily comprised of students who were labeled either as students with disabilities, or English Learners, or both. To avoid confounding the accuracy of the study's findings, all data for students with disabilities and English Learners was removed from the data set. This resulted in a sample of 129 classes remaining for the study. The mean class size for the adjusted sample was 19.32 students per teacher. The range was 17 with the minimum class size being 7 students per teacher and the maximum class size being 26 students per teacher. While the elimination of the students with disabilities data and English Learners data from the sample eliminated many of the small classes from the sample, several small class sizes remained, containing only students who were not identified as needing special instructional services.

In an attempt to understand why such a large range of class sizes remained in the sample even after the students with disabilities and English Learner students had been removed from the sample, personal interviews with several of the participating administrators were conducted. Administrators were asked for reasons regarding why class sizes varied within their district for students who were not identified as needing special services. One reason cited was a decrease in class sizes for some teachers due to students withdrawing during the school year after initial class rosters had been established (J. Brown, personal communication, February 9, 2012). Another reason cited was the use of smaller classes for Early Intervention Programs (EIP), which are smaller classes comprised of students who are at-risk of not performing well academically but are

not necessarily identified as being students with disabilities or English Learners (A. Smith, personal communication, February 9, 2012). School districts may also decide to locally or federally fund reduced class sizes based on district needs (W. Lanier, personal communication, February 9, 2012).

Previous class size research indicated a negative relationship between class size and academic achievement (Achilles et al., 1995; Egelson et al., 1996; Gilman & Antes, 1985; Smith et al., 2003). To see if this study’s results would replicate these findings, descriptive statistics and correlations were calculated for class size, classroom mean reading scores, and classroom mean mathematics scores. Results of the descriptive statistics and correlation analysis are presented in Table 3.

Table 3
Descriptive Statistics and Correlations Among Class Size, Reading Scores, and Mathematics Scores

Variable	Class Size	Reading Score	Math Score
Class Size	---		
Reading Score	.328*	---	
Math Score	.308*		---
Mean	19.33	834.75	832.30
SD	2.89	13.54	20.41

Note. n=129

*p< .01

Reading achievement and mathematics achievement both had positive correlations with class size. This indicated that as class sizes increased, reading and mathematics scores also increased. The relationship between class size and reading achievement is shown by Figure 1. The relationship between class size and mathematics achievement is shown by Figure 2.

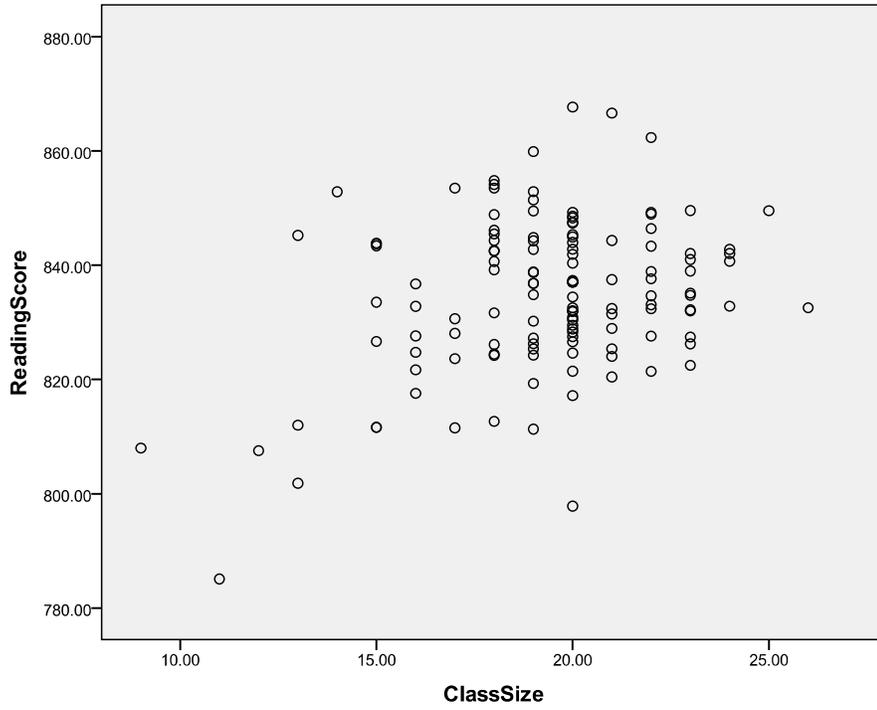


Figure 1. Correlation Between Class Size and Reading Scores.

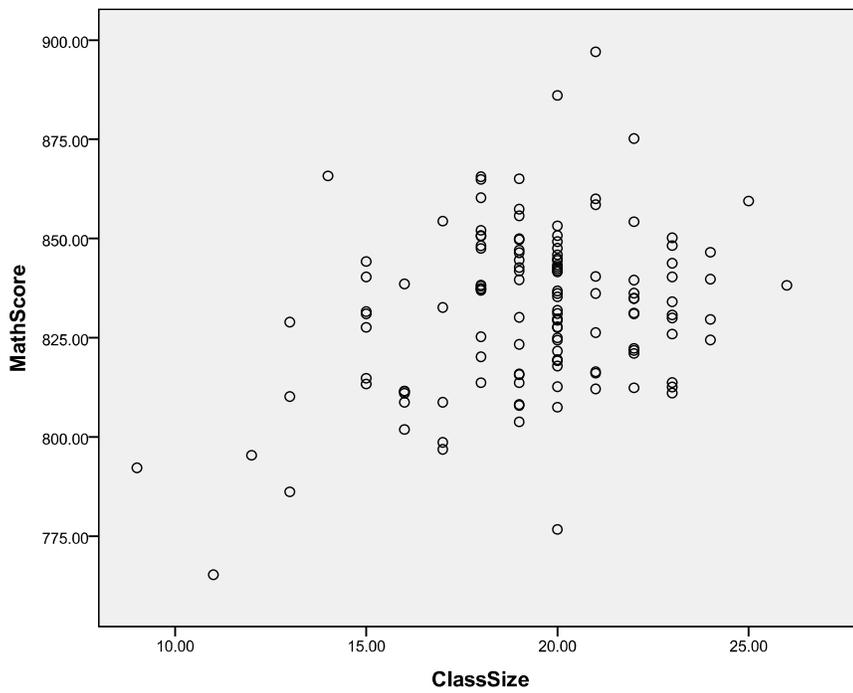


Figure 2. Correlation Between Class Size and Math Scores.

Scatterplot analysis indicated that for both reading and mathematics achievement, the relationship with class size was positive. Scatterplot analysis also indicated that class sizes of less than fifteen students per teacher were the ones that were creating the positive association between class size and academic achievement. However, in classes of fifteen or more students per teacher, the relationship between class size and academic achievement did not appear to be positively correlated. Glass and Smith (1979) found that class sizes of fifteen students per teacher were the ideal due to increased levels of academic achievement at this class size. This previous research was not supported by initial analysis of data from this study. Subsequent analyses focused on understanding why initial correlation data for class size and academic achievement indicated a positive relationship instead of a negative one.

To analyze whether filtering the data to only include class sizes of a set minimum would affect the magnitude and direction of the relationship between class size and reading achievement, all class sizes that contained fourteen or fewer students were eliminated from the data set. A bivariate correlation analysis was conducted to examine whether there was a relationship between the dependent variable of reading achievement and the independent variable of class size. In class sizes of at least fifteen students per teacher, class size was not associated with mean reading scores. Descriptive statistics and correlation results are presented in Table 4.

Table 4
Descriptive Statistics and Correlations Between Class Sizes of at Least 15 Students and Reading Scores

Variable	Class Size	Reading Score
Class Size	---	
Reading Score	.15	---
Mean	19.74	835.82
SD	2.36	19.74

Note. n=122

*p < .01

Analysis of the relationship between mean classroom reading scores and class size resulted in mixed findings depending upon which class sizes were considered. A positive relationship was found for classroom mean reading scores and class size when all class sizes were included ($r = .328$, $N = 129$, $p < .01$). For classes of fifteen students or more per teacher, no relationship was found between classroom mean reading scores and class size ($r = .15$, $N = 122$, $p > .01$). Subsequent analysis focused on understanding the relationship further.

A multiple regression analysis was conducted to examine the relationship between the covariates and the dependent variable of reading achievement in all class sizes. The covariates for the analysis were the following: class size, percentage of students as being identified for the gifted and talented program, percentage of students qualifying for free or reduced lunch status, percentages of ethnic background, and percentage of males for each class. The overall model predicted 47.2% of the variance in reading achievement, which was revealed to be statistically significant, $F(7, 121) = 15.474$, $p < .05$. See Table 5 for results. Analysis of individual predictors revealed that the percentage of gifted students in the class (Beta = .398, $p < .05$), the percentage of economically disadvantaged

students in the class (Beta = -.202, $p < .05$), and the class size (Beta = .216, $p < .05$) were significant predictors of reading achievement. Higher reading scores were found in classes with higher percentages of gifted students. Lower reading scores were found in classes with higher percentages of economically disadvantaged students. Higher reading scores were found in larger classes.

Table 5
Regression of Reading Achievement on Class Size and Various Student Covariates

Variable	b	se	Beta	95%CI	t
Constant	835.01	19.072		797.25, 872.76	43.78**
White	-6.70	17.677	-.091	-41.70, 28.30	-.38
Black	-28.42	16.817	-.389	-61.72, 4.87	-1.69
Hispanic	-11.86	14.100	-.082	-39.77, 16.06	-.84
Sex	3.52	9.811	.024	-15.90, 22.94	.36
Gifted	51.32	8.683	.398	34.13, 68.51	5.91**
ED*	-13.66	5.850	-.202	-25.25, -2.08	-2.34**
Class Size	1.01	.320	.216	.38, 1.65	3.17**

Note. $R^2 = .472$, $\text{adj } R^2 = .442$, $F = 15.47^*$, $df = 7, 121$; $N = 129$

*ED = economically disadvantaged

** $p < .05$

As with previous correlation analyses, additional multiple regression analyses were conducted to determine whether filtering the data to only include class sizes of a set minimum would affect the magnitude and direction of the relationship. For this analysis, only class sizes of fifteen or more students per teacher were used. The overall model predicted 42.6% of the variance in reading achievement, which was revealed to be statistically significant, $F(7, 114) = 12.105$, $p < .05$. See Table 6 for results. Analysis of individual predictors revealed that the percentage of gifted students in the class (Beta = .429, $p < .05$) and the percentage of economically disadvantaged students in the class (Beta = -.231, $p < .05$) were significant predictors of reading achievement. Higher

reading scores were found in classes with higher percentages of gifted students. Lower reading scores were found in classes with higher percentages of economically disadvantaged students. However, class size was not a significant predictor of reading achievement. When only data from classes of fifteen or more students were used, a relationship was no longer evident between class size and reading achievement.

Table 6
Regression of Reading Achievement on Class Sizes of 15 or More Students and Various Student Covariates

Variable	b	se	Beta	95%CI	t
Constant	848.98	18.365		812.60, 885.36	46.229**
White	-3.15	16.521	-.046	-35.88, 29.58	-.191
Black	-22.59	15.687	-.331	-53.66, 8.49	-1.440
Hispanic	-13.40	13.039	-.106	-39.23, 12.43	-1.028
Sex	-.50	9.283	-.004	-18.89, 17.89	-.054
Gifted	48.23	8.095	.429	32.19, 64.26	5.958**
ED*	-14.02	5.475	-.231	-24.87, -3.17	-2.561**
Class Size	.24	.374	.047	-.50, .98	.638

Note. $R^2 = .426$, $\text{adj } R^2 = .391$, $F = 12.11^*$, $df = 7,114$; $N = 122$

*ED = economically disadvantaged

** $p < .05$

To analyze whether filtering the data to only include class sizes of a set minimum would affect the magnitude and direction of the relationship between class size and mathematics achievement, all class sizes that contained fourteen or fewer students were eliminated from the data set. A bivariate correlation analysis was conducted to examine whether there was a relationship between the dependent variable of mathematics achievement and the independent variable of class size. In class sizes of at least fifteen students per teacher, class size was not associated with classroom mean mathematics scores. Descriptive statistics and correlations results are presented in Table 7.

Table 7
Descriptive Statistics and Correlations Between Class Sizes of at Least 15 Students and Mathematics Scores

Variable	Class Size	Math Score
Class Size	---	
Math Score	.14	---
Mean	19.74	833.79
SD	2.36	18.59

Note. n=122

*p < .01

Analysis of the relationship between mean classroom mathematics scores and class size resulted in mixed findings depending upon which class sizes were considered. A positive relationship was found for classroom mean mathematics scores and class size when all class sizes were included ($r = .308$, $N = 129$, $p < .01$). For classes of fifteen students or more per teacher, no relationship was found between classroom mean mathematics scores and class size ($r = .14$, $N = 122$, $p > .01$). Subsequent analysis focused on understanding the relationship further.

A multiple regression analysis was conducted to examine the relationship between the covariates and the dependent variable of mathematics achievement. The covariates for the analysis were the following: class size, percentage of students as being identified for the gifted and talented program, percentage of students qualifying for free or reduced lunch status, percentages of ethnic background, and percentage of males for each class. The overall model predicted 43% of the variance in mathematics achievement, which was revealed to be statistically significant, $F(7, 121) = 13.041$, $p < .05$. See Table 8 for results. Analysis of individual predictors revealed that the percentage of gifted students in the class ($Beta = .340$, $p < .05$), the percentage of Black students ($Beta = -.518$, $p <$

.05), and the class size (Beta = .214, $p < .05$) were significant predictors of mathematics achievement. Higher mathematics scores were found in classes with higher percentages of gifted students. Lower mathematics scores were found in classes with higher percentages of Black students. Higher mathematics scores were found in larger classes.

Table 8
Regression of Mathematics Achievement on Class Size and Various Student Covariates

Variable	b	se	Beta	95%CI	t
Constant	833.02	29.879		773.87, 892.18	27.88**
White	-17.97	27.693	-.163	-72.79, 36.86	-.65
Black	-57.02	26.346	-.518	-109.18, -4.86	-2.16**
Hispanic	-7.41	22.089	-.034	-51.14, 36.32	-.34
Sex	16.64	15.370	.075	-13.79, 47.06	1.08
Gifted	66.09	13.603	.340	39.16, 93.02	4.86**
ED*	-14.30	9.164	-.140	-32.44, 3.84	-1.56
Class Size	1.51	.501	.214	.52, 2.51	3.02**

Note. $R^2 = .430$, $\text{adj } R^2 = .397$, $F = 13.041^*$, $df = 7, 121$; $N = 129$

*ED = economically disadvantaged

** $p < .05$

As with previous correlation analyses, additional multiple regression analyses were conducted to determine whether filtering the data to only include class sizes of a set minimum would affect the magnitude and direction of the relationship. For this analysis, only class sizes of fifteen or more students per teacher were used. The overall model predicted 37.1% of the variance in mathematics achievement, which was revealed to be statistically significant, $F(7, 114) = 9.624$, $p < .05$. See Table 9 for results. Analysis of individual predictors revealed that the percentage of gifted students in the class (Beta = .368, $p < .05$), and the percentage of Black students in the class (Beta = -.494, $p < .05$) were significant predictors of mathematics achievement. Higher mathematics scores were found in classes with higher percentages of gifted students. Lower mathematics

scores were found in classes with higher percentages of Black students. However, class size was not a significant predictor of mathematics achievement. When only data from classes of fifteen or more students were used, a relationship was no longer evident between class size and mathematics achievement.

Table 9
Regression of Mathematics Achievement on Class Sizes of 15 or More Students and Various Student Covariates

Variable	b	se	Beta	95%CI	t
Constant	852.43	29.835		793.33, 911.54	28.571**
White	-15.09	26.840	-.142	-68.26, 38.08	-.562
Black	-52.28	25.485	-.494	-102.77, -1.80	-2.052**
Hispanic	-8.74	21.184	-.044	-50.70, 33.23	-.413
Sex	11.94	15.082	.060	-17.94, 41.81	.792
Gifted	64.14	13.151	.368	38.09, 90.19	4.877**
ED*	-13.47	8.894	-.143	-31.09, 4.15	-1.515
Class Size	.48	.607	.061	-.723, 1.68	.790

Note. $R^2 = .371$, $\text{adj } R^2 = .333$, $F = 9.624^*$, $df = 7,114$; $N = 122$

*ED = economically disadvantaged

** $p < .05$

Qualitative Data

A researcher-developed questionnaire was used to collect qualitative data regarding the second overarching research question: What are teachers' perceptions of class size as it relates to academic achievement? Analysis of the qualitative data was done using a process described by Merriam (2009). The first step was to identify segments within each response that were related to the research questions. Segments of data were words or phrases that could answer the research questions and could provide significant information. Each segment of data was then compared to the next segment and analysis focused on identifying repeated themes within the data. From the repeated themes, categories were established for the response segments. Each response segment

was then assigned to a category until all segments had been labeled. Revision of the categories was then done, resulting in some categories being eliminated and some being added until all response segments were assigned to categories. To facilitate the final response segment coding and analysis of data, the researcher sought to have as few categories as possible while still being able to assign all response segments to a category and to answer fully the research questions. Once the categories were established, the researcher re-coded all survey data based on these codes. A table for each category was then created, listing all categories and sub-categories for each survey question, the percentage of responses for each category, the number of occurrences for each category, and the number of occurrences for each sub-category of data.

The first constructed response question asked the teachers to state how their instructional activities would differ in a class of 15 students compared to 30 students. Responses are summarized in Table 10. Of the 51 respondents, 45% indicated that teachers would use more small group activities (e.g., small group assignments, less whole group activities, more partnered pairs activities, etc.) within a class of 15 students compared to a class of 30 students. For the category of more small group activities, being able to easily use small group arrangements for student assignments was the response most often provided by respondents as to how their instructional activities would differ in a class of 15 students compared to a class of 30 students. Sample responses stating that teachers would be able to use more small group activities included these phrases: “more small group instruction rather than whole group,” “more small group activities and lessons,” and “better structure for groups to work.”

Table 10
Types of Instructional Activities for Class of 15 Students

	Percentage of Respondents ¹	Number of Times Category Referenced ²
More Small Group Activities	45.1 (23)	
Easier to Make Small Groups for Work		18
More Group Projects		14
Less Whole Group Activities		10
More Partnered Pairs Activities		6
More Centered Groups		2
Other More Small Group Activities		1
More Hands-on Activities	43.1 (22)	
More Manipulative Use		15
More Project-based Activities		8
More Interactive Technology Use		5
More Experiments		1
Less Pen and Pencil Activities		1
More One-on-one Instruction	37.3 (19)	
More Individual Student Attention		14
More Time Spent with Each Student		10
More Differentiated Instruction	27.5 (14)	
More Explicit Instruction for Struggling Students		12
More Instruction Based on Levels		8
More Likely to Reach Upper Students		6
Less Teaching in the Middle		6
More Instruction Based on Interest		1
More Individually Based Lessons		1
Other More Differentiated Instruction		1

Note: The "Other" category of responses is for responses that could not be identified by one of the main category labels.

¹ Numbers in parentheses indicate the number of respondents out of 51.

² This column is a simple count of the number of times a specific instructional activity was mentioned as to how the respondent's instructional activities would differ in a class of 15 students compared to a class of 30 students. Due to the fact that respondents may have listed several different activities, the column sum may exceed 51.

Additionally, 43% of the responses indicated teachers would use more hands-on activities within a class of 15 students compared to a class of 30 students. Responses coded for inclusion in the more hands-on activities category included: “use more math manipulatives,” “more projects and hands-on activities,” and “more hands-on experiments.” Included in the types of instructional strategies that teachers would use in a class of 15 students compared to a class of 30 students was more one-on-one instruction, which was identified by 37% of respondents. Being able to do more differentiated instruction (e.g., instruction based on levels, interest-based instruction, individually based lessons, etc.) was indicated by 28% of respondents.

When asked about how classroom management plans would differ in a class of 15 students compared to a class of 30 students, 35% of respondents stated that their classroom management plans would be less strict (e.g., less rigid routine, more flexibility for teacher and students, more student movement, etc.). Of the 51 respondents, 25% stated that their classroom management plans would not change due to differing class sizes. Being able to allow more student freedom (e.g., choice in activities, independence, etc.) was also indicated by 24% of the respondents as a way their classroom management plans would change with differing class sizes. For 16% of respondents, class sizes of 15 students would allow them to provide more positive reinforcement (e.g., able to buy more tangible rewards, more chances to reward behavior, more opportunities for praise, etc.). Table 11 presents these results.

Table 11
Ways Classroom Management Plan Would Differ for Class of 15

	Percentage of Respondents ¹	Number of Times Category Referenced ²
Less Strict	35.3 (18)	
Less Rigid Procedures		14
More Flexible		12
More Student Movement During Activities		7
Other Less Strict		2
No Changes	25.5 (13)	13
More Student Freedom	23.5 (12)	
More Student Choice in Activities		12
More Student Independence		3
Other More Student Freedom		1
More Positive Reinforcement	15.7 (8)	
More Money to Purchase Rewards		6
More Chances to Reward Behavior		6
More Opportunities to Provide Praise		4

Note: The "Other" category of responses is for responses that could not be identified by one of the main category labels.

¹ Numbers in parentheses indicate the number of respondents out of 51.

² This column is a simple count of the number of times a specific classroom management strategy was mentioned as to how the respondent's classroom management plan would differ in a class of 15 students compared to a class of 30 students. Due to the fact that respondents may have listed several different strategies, the column sum may exceed 51.

Previous qualitative data collection focused specifically on the areas of classroom instruction and classroom management. Teachers were also asked to explain how they felt class size affected student achievement. See Table 12 for the results. Of the 51 respondents, all respondents indicated that smaller class sizes had a positive impact on student achievement and provided reasons why they felt small class sizes led to increased

student achievement. One of the ways that smaller classes affected student achievement was due to the teacher's ability to provide more individualized instruction in smaller classes. This reason for increased achievement was provided by 80% of the respondents. Sample responses for the reason of being able to provide more individualized instruction for students in small classes included these phrases: "when I work with a child one on one concepts are usually grasped quickly," "allow teachers to monitor student achievement more closely, accurately, and quickly," and "smaller classes make it possible for more individual help from the teacher." Having less management issues (e.g., fewer distractions, fewer interruptions, fewer instances of student conflict issues, etc.) in small classes was cited by 26% of the respondents as another reason for increased achievement in small classes. Sample responses for the reason of less classroom management issues included the phrases: "can pick up on problems sooner with less," "would be able to better monitor students not following directions or misbehaving," and "more distractions and personality issues between students that appear in larger classes."

Table 12
Reasons Why Smaller Classes Have Increased Student Achievement

	Percentage of Respondents ¹	Number of Times Category Referenced ²
More Individualized Instruction	80.4 (41)	
More One-on-one Time with Each Student		32
More Differentiation of Instruction		21
More Time to Meet Individual Needs		8
Other More Individualized Instruction		4
Less Management Issues	33.3 (17)	
Better Able to Monitor Behavior		14
Fewer Distractions		9
Stronger Relationships with Students		6
Fewer Interruptions		3
Less Student Conflict		2
Other Less Management Issues		2

Note: The "Other" category of responses is for responses that could not be identified by one of the main category labels.

¹ Numbers in parentheses indicate the number of respondents out of 51.

² This column is a simple count of the number of times a specific effect was mentioned as to how the respondent felt class size affected student achievement. Due to the fact that respondents may have listed several effects, the column sum may exceed 51.

Finally, teachers were asked to identify their ideal class size and explain why. All 51 respondents indicated that class sizes of 20 or less students per teacher were the ideal. Ideal class sizes ranged from 10 to 20 with the mean being 14.92. The majority of respondents (65%) identified that it is easier for the teachers to provide individualized instruction (e.g., one-on-one time with each student, differentiated lessons, immediate feedback, etc.) in classes of 20 or less students per teacher. Being able to use more group instruction (e.g., easier to divide class into small groups, easier to monitor groups, easier to plan small group activities, etc.) was another reason stated by 43% of the respondents

as to why small classes had higher levels of achievement than large classes. Classes of 20 or less students were cited as ideal by 29% of respondents due to them being easier to manage student behavior (e.g., easier to watch all students, fewer distractions, more physical space, etc.). Table 13 presents these results.

Table 13
Reasons for Class Size Less Than 20

	Percentage of Respondents ¹	Number of Times Category Referenced ²
Easier to Provide Individualized Instruction	64.7 (33)	
More One-on-one Time with Each Student		28
More Differentiation of Instruction		16
More Immediate Feedback for Student		6
Other Easier to Provide Individualized Instruction		4
Easier to Use Group Instruction	43.1 (22)	
Easier to Divide Class Into Small Groups		20
Easier to Monitor Groups		16
Easier to Use Paired Instructional Groups		5
Easier to Plan for Group Instruction		3
Other Easier to Use Group Instruction		1
Easier to Manage Student Behavior	29.4 (15)	
Easier to Watch All Students		14
Fewer Distractions		11
More Space in Classroom		8
Other Easier to Manage Behavior		3

Note: The "Other" category of responses is for responses that could not be identified by one of the main category labels.

¹ Numbers in parentheses indicate the number of respondents out of 51.

² This column is a simple count of the number of times a specific reason was mentioned as to why the respondent felt classes less than 20 were ideal. Due to the fact that respondents may have listed several reasons, the column sum may exceed 51.

Summary

The purpose of this study was to determine the magnitude and direction of the relationship between class size and academic achievement as measured by the reading and mathematics sections of the CRCT for third grade students in rural, economically disadvantaged school districts. In order to accomplish this purpose, a multiple regression analysis was conducted. Quantitative data in the form of student data records from 204 third grade classes in nine rural, economically disadvantaged school districts located in the southeastern region of Georgia were collected and analyzed.

Initial correlation analyses indicated a positive relationship between class size and academic achievement. Regression results showed that the percentage of gifted students, the percentage of economically disadvantaged students, and the class size were significant predictors of reading achievement levels. For mathematics achievement levels, regression results showed that the percentage of gifted students, the percentage of Black students, and the class size were significant predictors. With initial results being contradictory to expectations and previous research, further analyses were conducted and involved filtering the data to only include class size of at least 15 students per teacher. For both reading and mathematics achievement, class size was not associated with achievement. Regression results showed that the percentage of gifted students and the percentage of economically disadvantaged students were significant predictors of reading achievement in classes of at least 15 students per teacher. For mathematics achievement, regression results showed that the percentage of gifted students and the percentage of Black students were significant predictors.

In addition to the purpose of determining the magnitude and direction of the relationship between class size and academic achievement, this study also sought to collect and analyze teachers' perceptions regarding the relationship of class size and their classroom instructional and management practices. Survey data revealed teachers felt that smaller classes would affect their instructional practices by increasing the use of small group instructional arrangements, hands-on activities, one-on-one instruction, and differentiation of instruction to meet the needs of all students. In regards to how class size affects their classroom management practices, 26% of the teachers felt that class size did not affect their classroom management plans. Of the remaining respondents, teachers indicated that smaller classes would allow their classroom management plans to be less strict, have more student freedom, and have more positive reinforcement. Survey data also revealed that all respondents believed that smaller class sizes had a positive impact on student achievement due to the teachers being able to provide more individualized instruction and having less classroom management issues. All 51 respondents identified class sizes of 20 or less students per teacher as being ideal due to such class sizes being easier to provide individualized instruction, easier to use group activities, and easier to manage behavior.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

A lack of consistent, contemporary research analyzing the relationship between class size and academic achievement provided the motivation for the sequential mixed methods (QUAN-qual) study. The purpose of this study was to determine the magnitude and direction of the relationship between class size and academic achievement as measured by the reading and mathematics sections of the CRCT for third grade students in rural, economically disadvantaged school districts. Additionally, third grade teachers' perceptions regarding how class size affects their classroom practices and routines were collected and analyzed.

Analysis and Discussion of Research Findings

Data collection for the study was two-fold. Quantitative data from 3,812 third grade students in 204 classrooms was collected from nine rural, economically disadvantaged school districts in the southeastern region of Georgia. Student data included achievement and demographic data from the 2010 and 2011 CRCT spring administrations. Additionally, qualitative data through a researcher-developed questionnaire was collected from third grade teachers teaching in the same nine rural, economically disadvantaged school districts during the 2011-2012 school year.

Quantitative Research

For the quantitative section of this study, the following overarching research question guided the data collection and analysis: What is the relationship between class size and academic achievement as measured by the CRCT for third grade students in

rural, economically disadvantaged elementary schools? In order to understand the relationship between class size and academic achievement, there were two sub-questions related to the overarching research question.

Data analysis for the quantitative section began with the descriptive statistics being computed for the sample. This initial analysis revealed that the smallest class sizes in the sample were primarily comprised of students with disabilities, or English Learner students, or both. To avoid confounding the accuracy of the study's findings, all data for students with disabilities and English Learner students was removed. The elimination of the students with disabilities and English Learner students data resulted in many of the smaller classes being removed from the data; however, classes as small as seven students still remained. Personal interview data revealed that the remaining small classes were the result of EIP classes, decreases in projected enrollment, and district class size reduction policies.

The first quantitative research sub-question stated the following: What is the degree of the relationship between class size and reading achievement on the CRCT for third grade students in rural, economically disadvantaged school districts? Bivariate correlation analyses revealed a positive relationship between class size and reading achievement ($r = .328$, $N = 129$, $p < .01$). For reading achievement, regression results showed the overall model predicted 47.2% of the variance in reading achievement and was statistically significant, $F(7,121) = 15.474$, $p < .05$. The percentage of gifted students in the class ($\text{Beta} = .398$, $p < .05$), the percentage of economically disadvantaged students in the class ($\text{Beta} = -.202$, $p < .05$), and the class size ($\text{Beta} = .26$, $p < .05$) were significant predictors of reading achievement.

These results indicated that as class sizes increased, reading academic achievement also increased. This contradicted some of the previous class size studies. Gilman and Antes (1985) reported significant gains in reading achievement for the students who participated in Indiana's Project Prime Time reduced class size study. Project STAR researchers (Achilles et al., 1995) also reported significant increases in reading achievement for students who were in classes of 13-15 students per teacher compared to students who were in classes of 22-25 students per teacher. Reduced class size studies in Wisconsin and North Carolina also reported significant increases in reading achievement for students in small classes compared to students in large classes (Egelson et al., 1996; Smith et al., 2003).

Due to the unexpected positive relationship between class size and academic achievement, further analyses were conducted to try to identify an explanation for the data indicating a positive relationship instead of a negative relationship. The filtering of the data set to include only class sizes of at least 15 students per teacher revealed no relationship between class size and reading achievement ($r = .15$, $N = 122$, $p > .01$). Regression results showed the overall model predicted 42.6% of the variance in reading achievement and was statistically significant, $F(7, 114) = 12.105$, $p < .05$. The percentage of gifted students in the class ($Beta = .429$, $p < .05$) and the percentage of economically disadvantaged students in the class ($Beta = -.231$, $p < .05$) were significant predictors of reading achievement.

These results indicated that in classes of at least fifteen students per teacher, class size was not associated with classroom mean reading scores. This was consistent with earlier class size studies. Hoxby (2000), using school-level cohort data in Connecticut,

reported no statistical significant achievement gains for students who received instruction in small classes compared to those who received instruction in large classes. Similarly, the National Kindergarten Study (Milesi & Gamoran, 2006) found no increase in achievement in the area of reading due to smaller class sizes.

The second quantitative research sub-question stated the following: What is the degree of the relationship between class size and mathematics achievement on the CRCT for third grade students in rural, economically disadvantaged school districts? Bivariate correlation analyses revealed a positive relationship between class size and mathematics achievement ($r = .308$, $N = 129$, $p < .01$). For mathematics achievement, regression results showed the overall model predicted 43% of the variance in achievement and was statistically significant, $F(7,121) = 13.041$, $p < .05$. The percentage of gifted students in the class ($Beta = .340$, $p < .05$), the percentage of Black students in the class ($Beta = -.518$, $p < .05$), and the class size ($Beta = .214$, $p < .05$) were significant predictors of mathematics achievement.

As with the analyses for reading achievement, the results of this study indicated that as class sizes increased, mathematics achievement also increased. This is contradictory to the findings of previous class size studies. Gilman and Antes (1985) reported 53 percent of the students in reduced class sizes exceeded the normal achievement in mathematics, indicating that smaller class sizes facilitated mathematics achievement. Achilles et al. (1995) also reported significant gains in mathematics achievement for students receiving instruction in reduced classes. SAGE results also indicated increased levels of achievement in mathematics for students in class size of

fifteen or fewer students per teacher compared to class sizes of more than fifteen students per teacher (Smith et al., 2003).

Once again, additional analyses were conducted to try to identify an explanation for the data indicating a positive relationship instead of a negative relationship between class size and mathematics achievement. The filtering of the data set to include only class sizes of at least 15 students per teacher revealed no relationship between class size and mathematics achievement ($r = .14$, $N = 122$, $p > .01$). Regression results showed the overall model predicted 37.1% of the variance in mathematics achievement and was statistically significant, $F(7, 114) = 9.624$, $p < .05$. The percentage of gifted students in the class ($Beta = .368$, $p < .05$) and the percentage of Black students in the class ($Beta = -.494$, $p < .05$) were significant predictors of mathematics achievement.

As with reading achievement, the filtering of the data to only include class sizes of 15 or more students indicated class size was not associated with classroom mean mathematics scores. Previous class size studies also reported that the relationship between class size and mathematics achievement as not being statistically significant. The Connecticut Population Variation Study found no evidence of significant relationship between class size and mathematics achievement (Hoxby, 2000). Additionally, Milesi and Gamoran (2006) did not find any statistical significance in mathematics achievement for students in small classes compared to those in large classes.

Qualitative Research

For the qualitative section of this study, the following overarching research question guided the data collection and analysis: What are teachers' perceptions of class size as it relates to academic achievement? In order to understand the relationship

between class size and academic achievement, there were two sub-questions related to the overarching research question.

The third research sub-question stated the following: What are the perceptions of third grade teachers regarding class size and instructional methods? Being able to utilize more small group activities was identified by 45% of the respondents as one way that their instructional practices would differ in a small class of 15 students compared to a large class of 30 students. For 43% of respondents, being able to increase the use of hands-on activities was another way that their instructional methods would differ in small classes compared to large classes. Completing the four survey response categories for how instructional practices would differ in a small class compared to a large class were increased one-on-one instruction and better differentiation of instruction.

Previous studies regarding teachers' perceptions regarding class size and instructional methods resulted in similar responses to this study. As in this study, being able to use more hands-on activities in small classes compared to large classes was identified by teachers as one way that their instructional practices differed due to class size (Blatchford et al., 2007; Halbach, et al., 2001; Smith, et al., 2003). The increased use of small group activities in small classes compared to large classes was another similarity between this study and previous ones (Blatchford, et al., 2007; Graue, et al., 2007). Being able to provide students with more individualized instruction in small classes versus large classes was a difference noted by respondents in this study and in others (Blatchford et al., 2002; Cakmak, 2009; Graue, et al., 2007; Smith, et al., 2003). Like teachers in other studies, the teachers in this study also noted that they are better able to differentiate their instruction in smaller classes compared to larger classes (Nye &

Hedges, 2002). One difference in the responses of this study's respondents and previous studies' can be found in the depth of content covered. The teachers surveyed in this study did not indicate that smaller class sizes would enable them to provide in-depth curriculum coverage. However, being able to provide more in-depth content coverage in small classes compared to large classes was noted in teacher interviews and surveys for previous studies (Halbach et al., 2001).

The fourth research sub-question stated the following: What are the perceptions of third grade teachers regarding class size and classroom management? For 26% of respondents, their classroom management plans would not be affected by class size. Having a less strict classroom management plan was one way that 35% of the respondents identified their classroom management plans would differ in a small class of 15 students compared to a large class of 30 students. Being able to allow students more freedom was another way that 24% of respondents identified that their classroom management plans would differ. Completing the four survey response categories for how classroom management practices would differ in a small class compared to a large class was the ability to provide more positive reinforcement.

Teachers in this study had similar responses regarding how class size would affect their classroom management plans to teachers in previous studies. Blatchford et al. (2007) found that teachers did not feel they had to focus on the rules and consequences of the classroom management plan, resulting in a classroom environment that was not as strict, in small classes compared to large classes. Differences in how teachers viewed class size as affecting their classroom management plans can also be seen when comparing this study to previous studies. In previous studies, respondents focused on

how the lack of physical space in large classes resulted in teachers not being able to effectively separate disruptive students to prevent discipline problems (Blatchford et al., 2002; Blatchford et al., 2007). Teachers within this study did not indicate how being able to use physical separation as a classroom management strategy would be affected by class size. Being able to prevent discipline problems through the personal relationships established with the students was also identified as a benefit of smaller classes for teachers in previous studies (Egelson et al., 1996; Halbach, et al., 2001). The use of personal relationships as a deterrent for misbehavior in small classes was not identified by respondents in this study as a way that class size affects their classroom management plans.

Additional qualitative data analysis focused specifically on how teachers perceived the relationship between class size and academic achievement. All 51 respondents in the survey felt that smaller class sizes had a positive impact on student achievement. Two main reasons were identified as to why teachers stated that smaller class sizes resulted in higher academic achievement levels. The first reason was that smaller classes allow teachers the opportunity for more individualized instruction. The second reason was that smaller classes have less classroom management issues. All 51 respondents also identified classes of less than twenty students per teacher as being the ideal class size. In classes of less than twenty students per teacher, respondents identified three main reasons for this class size. Classes of less than twenty students were identified as being easier to provide individualized instruction to all students, easier to incorporate small group activities, and easier to manage student behavior.

Teachers in previous studies also indicated a preference for small classes, and that academic achievement was facilitated by smaller class numbers (Blatchford et al., 2002; Cakmak, 2009; Egelson et al., 1996; Smith, et al., 2003; Nye & Hedges, 2002). As in this study, the opportunity for more individualized instruction was also identified as a benefit of smaller class sizes by teachers in previous studies (Blatchford et al., 2002; Cakmak, 2009; Graue, et al., 2007; Smith, et al., 2003). Teachers in previous studies similarly identified another advantage of small classes was fewer distractions and less classroom management issues (Blatchford et al., 2007; Cakmak, 2009; Halbach et al., 2001). Respondents in this study also stated that being able to establish in-depth relationships with the students in small classes compared to large classes was another factor influencing their preference of small classes. In previous studies, teachers also identified the facilitation of personal relationships with students as an advantage of small classes, resulting in higher achievement levels and lower management issues (Blatchford, et al., 2003; Cakmak, 2009; Egelson et al., 1996; Halbach, et al., 2001).

Conclusions

Educational leaders need effective academic strategies to increase student achievement. Reduced class sizes is one method that some previous research has suggested as being able to increase student achievement, especially for at-risk students (Achilles et al., 1995; Egelson et al., 1996; Gilman & Antes, 1985; Smith et al., 2003). However, for every class size study that indicated increased achievement for students in smaller classes, another class size study can be found refuting these findings (Borland et al., 2005; Hoxby, 2000; Milesi & Gamoran, 2006). Adding to the class size conflict is the fact that adding additional teachers to reduce class sizes results in the need for

additional funding (Gilman & Kiger, 2003). During the economic recession of the twenty-first century, increasing funding for any intervention, especially one as contradictory as reducing class sizes, is an arduous task.

Therefore, contemporary research was needed regarding the relationship between class size and academic achievement in rural, economically disadvantaged third grade classrooms. The study found a positive relationship between class size and academic achievement when all class sizes were included in the sample. When all class size data was included, higher mean reading and mean mathematics scores were found in larger classes. However, class size was not a significant predictor of academic achievement in classes of 15 or more students per teacher. Class size was a significant predictor of academic achievement when all class sizes were included due to the fact that the smaller classes in the study were mainly comprised of students identified as being at-risk of not passing the CRCT. The findings of this study do not support the reduction of class size to increase academic achievement. The study also found that teachers in rural, economically disadvantaged classrooms prefer small classes. Survey data indicated that teachers support small classes because they feel small classes allow them the opportunity to increase their use of hands-on activities, one-on-one instruction, small group instruction, which could lead to increased academic achievement. Reducing class sizes is a strategy that would be supported by the survey research of this study.

Implications

The purpose of this study was to determine the magnitude and direction of the relationship between class size and academic achievement as measured by the reading and mathematics sections of the CRCT for third grade students in rural, economically

disadvantaged school districts. In addition to contributing to the existing body of educational research on the relationship between class size and academic achievement, this research fills a void in the present literature caused by a lack of contemporary research and a lack of research focusing on rural, economically disadvantaged school districts in the southeastern region of Georgia. For educational leaders wanting to increase academic achievement in rural, economically disadvantaged schools, the results of this study indicate that class size is not a significant predictor of academic achievement in classes of at least 15 students per teacher. When all class sizes were included in the data set, class size was a significant predictor of academic achievement.

The purpose of this study was also to analyze the perceptions of third grade teachers in rural, economically disadvantaged school districts regarding how class size affects academic achievement. This research further contributes to the existing body of educational research regarding how class size affects the classroom instructional and management practices of teachers. For educational leaders wanting to increase academic achievement in rural, economically disadvantaged schools, the results of this study indicate that teachers feel that small class sizes are better for academic achievement. The results of this study suggest that teachers in small classes are more likely to provide students with the individualized, engaging activities needed to increase achievement than teachers in large classes. Being able to devote more time to the instruction of students rather than the behavior management of students is another benefit of smaller classes identified in this study. According to teacher survey data, decreasing the number of students in the class could result in increased achievement due to the teachers' ability to differentiate instruction more and provide in-depth curriculum coverage.

The implications from this study could be important not only for educational leaders in rural, economically disadvantaged school districts but also to any elementary school principal who is searching for answers regarding the relationship between class size and academic achievement. The need to improve academic achievement is prevalent throughout the nation, and from this study, educational leaders can gain insight regarding how larger class sizes affect teachers' instructional practices. Having the time and ability to meet the needs of all students in a class is necessary for achievement to increase, and from this study, teachers preferred class sizes of less than twenty students as they perceived classes larger than this as hindering their abilities to provide all students with the quality educational experiences they deserve.

Recommendations

Based on the findings of this study analyzing the relationship between class size and academic achievement, the following recommendations are made for future researchers and educational leaders:

1. Since the majority of small classes in the study consisted of students who were at-risk of not passing the CRCT, another study should be conducted analyzing the relationship of class size and academic achievement in which the smallest classes are not comprised solely of special needs students. Further research needs to be conducted analyzing class size data in which the student populations of the small classes are representative of the entire student population.
2. Further study also needs to be conducted regarding the relationship of class size and academic achievement for students with disabilities and English Learner

students. Data is needed regarding the relationship between academic achievement for these special groups of students and class size.

3. A study analyzing the relationship between class size and academic achievement should be conducted using pre- and post-test achievement data for third grade students in rural, economically disadvantaged school districts. Using pre- and post-test data would allow educational leaders the opportunity to make a more accurate judgment regarding how class size affects academic achievement.
4. A study comparing the actual classroom practices and routines of teachers within small classes to those of teachers within large classes should be conducted to see if and how class size affects the classroom practices and routines.
5. For educational leaders responsible for developing class size policies, the information from this study should be used as evidence that if small classes are only comprised of students who have special needs, like students with disabilities or English Learners, the achievement scores of those classes are not going to support reducing class sizes. Achievement gains of these small classes will be less than those of larger classes that are not comprised of only special needs students. However, this is not to say that such classes may not have value in meeting the needs of the students. Class sizes should be based on the specific needs of the students and not simply on whether achievement scores support the class size.
6. Since teachers indicated that small classes are better for academic achievement due to the more individualized instruction they are able to implement and the reduction in classroom management issues associated with larger class sizes,

educational leaders need to provide teachers with more professional learning addressing these issues.

Dissemination

It is the intention of the researcher to share the findings of this study through various methods. The researcher plans to pursue the publication of the findings in a journal. By doing so, the researcher hopes to fill a gap in the existing body of educational research and provide the educational community with contemporary evidence aimed at assisting educational leaders in rural, economically disadvantaged school districts in determining whether class size is an academic intervention worthy of the increased financial burden. The findings will also be shared with all district superintendents who participated in the study as the results are of personal significance and value to them since it is within these rural, economically disadvantaged school districts where the demands of increased accountability demand effective, yet cost-efficient, interventions to increase achievement.

Concluding Thoughts

Before beginning this study, I had never really contemplated the relationship between class size and academic achievement. My background in secondary education had provided me with a variety of class sizes, and I could not identify one class size as being better for achievement than another. When I became a district administrator, class size became an issue, especially at the elementary-level as funding for reducing class sizes would need to be justified. As I sought data to defend or eliminate my own district's class reduction practices, I realized that previous data was very inconsistent in its methods and findings. A desire to know if reducing class sizes would help the

students of my own rural, economically disadvantaged district emerged, and while the results of this study do leave me with more questions, I am more prepared to seek the answers, and my understanding of the topic is much deeper. From the results of this study, I am convinced that it is not the number of students in the class that affects achievement but the interactions between the teacher and the students. If having a large class size means that the teacher can not effectively instruct all of students, then class sizes need to decrease; however, simply reducing the number of students in the class is not always the answer to increasing academic achievement. Providing students with the opportunity to be actively engaged in the learning environment and to receive instruction based on their unique needs is much more important than class size.

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APPENDIX A

Georgia Southern University Office of Research Services & Sponsored Programs		
Institutional Review Board (IRB)		
Phone: 912-478-0843		Veazey Hall 2021
Fax: 912-478-0719	IRB@GeorgiaSouthern.edu	P.O. Box 8005 Statesboro, GA 30460

To: Kristy Chandler Vandenberg
Dr. Jason LaFrance

cc: Charles E. Patterson
Vice President for Research and Dean of the Graduate College

From: Office of Research Services and Sponsored Programs
Administrative Support Office for Research Oversight Committees
(IACUC/IBC/IRB)

Date: 11/30/11

Initial Approval Date: 11/30/11

Expiration Date: 11/30/12

Subject: Status of Application for Approval to Utilize Human Subjects in Research

After a review of your proposed research project numbered **HI2163** and titled "**Class Size and Academic Achievement.**" it appears that your research involves activities that do not require full approval by the Institutional Review Board according to federal guidelines.

According to the Code of Federal Regulations Title 45 Part 46, your research protocol is determined to be exempt from full review under the following exemption category(s):

- B2 Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (I) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (II) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.
- B4 Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

Therefore, as authorized in the Federal Policy for the Protection of Human Subjects, I am pleased to notify you that your research is exempt from IRB approval. You may proceed with the proposed research.

Please notify the IRB when you have completed the project by emailing irb@georgiasouthern.edu. Include the date of completion, the number of subjects (records) utilized and if there were any unexpected events related to the subjects during the project. (If none, state no unexpected or adverse events occurred during the conduct of the research.)

Sincerely,



Eleanor Haynes
Compliance Officer

APPENDIX B

Teacher Perceptions on Class Size and Classroom Practices

You have been selected to participate in this study due to your experiences as a third grade teacher in a rural, economically disadvantaged school district. The results of this survey will provide the researcher with information that could lead to a better understanding of the relationship between class size and academic achievement. The survey will consist of nine questions. This survey should only take 10 minutes or less to complete. It is not necessary to indicate your name anywhere on the survey, and when you have completed your answers, simply click Done and the web browser will close.

Completion of this survey will be considered consent to use your responses in analyzing teachers' perceptions regarding the relationship between class size and classroom instruction and management techniques. Please be assured that your responses will be confidential and anonymous. If this research is published, no information that would identify you will be included. This data will be most useful if you respond to every item on this instrument; however, you may choose not to answer one or more items on the survey.

To contact the Office of Research Compliance at Georgia Southern University for answers to questions about the rights of research participants or for privacy concerns, please email IRB@georgiasouthern.edu or call (912) 478-0843. Written inquires can also be sent to P.O. Box 8005, Statesboro, GA 30460. This project has been reviewed and approved by the GSU IRB under tracking number H12163.

*** 1. What is your sex?**

- Female
 Male

*** 2. What is your race?**

- White
 Black or African American
 Hispanic
 American Indian or Alaskan Native
 Asian
 Native Hawaiian or other Pacific Islander
 Multi-racial

*** 3. How many years have you been teaching?**

***4. Select the smallest class size range that you have ever taught.**

- 5 or less students
- 6-10 students
- 11-15 students
- 16-20 students
- 21-25 students
- 26-30 students
- More than 30 students

***5. Select the largest class size range that you have ever taught.**

- 5 or less students
- 6-10 students
- 11-15 students
- 16-20 students
- 21-25 students
- 26-30 students
- More than 30 students

***6. If you had a class of 15 students, how would the types of instructional activities you would use be different from the instructional activities you would use if you had a class of 30 students?**

***7. How would your classroom management plan (strategies) differ in a class of 15 students versus a class of 30 students?**

***8. How do you think class size affects student achievement?**

***9. Identify your ideal class size and explain why this class size would be the best for you and your students.**