Implication of Class Size Reduction for Upper Grades

Betsy A. Spanagel

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Implications of Class Size Reduction for Upper Grades

by

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A thesis submitted to the
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Implications of Class Size Reduction for Upper Grades

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This thesis is affectionately dedicated to:

My husband, Ivan, who continually encourages me to be the best person I can be.

Through his kind words and caring actions, I have found the ability to overcome obstacles that I previously deemed impossible.

My teaching colleagues who have been a part of making the Regents Alternative Program the success that it has continued to be during the past five years, especially Jen Imburgia, without whom I could not survive a day.

All of the RAP students who have come into my classroom, and have helped me to become a better teacher and, more importantly, a better person.
Rationale

During my first three years of teaching, I taught four sections of a Regents mathematics course at two different high schools. Each section contained 20 to 29 students, which never exceeded either district’s 30 student limit for core class enrollment. Although the classes were heterogeneously mixed with respect to gender, ability and ethnic background, I felt creatively stifled and constrained by the limits imposed by teaching a class of that size. Most of my instruction consisted of whole-class lecture because this method was most efficient for large classes. However, this teacher-centered approach minimized student interaction and left little opportunity for me to discover my students’ individual needs and work toward fulfilling them.

Fortunately, at the same time that my frustration began to build, a need was identified for an alternative program within the regular educational setting of my school. This program was the first to create an alternative setting for students that were at-risk for failure at the freshman level within our district. The alternative program used additional seat time, a teacher’s assistant, reduced class size, and minimized the amount of work that would be completed outside of the classroom.

Halfway during my first year of teaching in the alternative program, I met with my principal to discuss my classroom and teaching performance. During that meeting, I mentioned that I saw several benefits to the strategies used in the alternative education program and that I planned to start incorporating some of them into my general education class at the start of the next school year. He agreed that the strategies could help my general education students too but encouraged me to make the changes immediately and not to wait for next year. The benefits of modifying my classroom
routine, assignments and strategies in my general education class were substantial and immediate. I have continued with and expanded on these strategies over the last four years.

Unfortunately, I felt that the gains made by the students in my general education class were never equivalent to the gains made by my alternative education students. The one strategy that was available to my alternative students that I could not replicate for my general education classroom was a reduction in class size. As I began to reflect on what was going on in my classroom it became clear that the achievement of students in the larger classes was significantly compromised by the class size dynamic.

For several years, a class size reduction initiative in kindergarten through fifth grade had been in progress in my district. After my observations of the benefits of small class size in my ninth grade classroom, I asked around about the initiative and the possibility of it extending into the secondary level. I was told that our district superintendent had not seen data that supported small class size for middle and high school grades; it was from that point on that I decided I wanted to find out if research on class size for upper grades did in fact exist or if it did not, if an application of existing research could be used to determine the effects of class size on upper grade levels.

**Overview**

To begin research, my original, comprehensive plan was to collect data from every classroom teacher in my high school, and compare the cumulative grades of their classes to the quantity of students in each class. After collecting and examining the data, reading professional articles on class size reduction, conversations with my teaching
colleagues, and reexamining data from my own classroom, I knew that my first round of data collection had just scratched the surface. I discarded the original data from the honors and accelerated classes — realizing that my support of reduced class size was only substantiated if there was room for improvement and/or achievement to begin with.

In addition, I became conscious that success of class size reduction was not solely based on cumulative classroom grades — student's point of view, teacher satisfaction, and comparison of student's grades over a period of time were significant benchmarks of a program adjustment. This insight gave way to more data collection — student and staff surveys, and collection of cumulative math grades from my student's previous year of study.

Most of the research I have read shows that class size reduction has positive effects on student achievement. Many of the studies continue to examine elementary level grades. Although fiscal restraints are a major factor that causes districts to be unwilling to undertake, or extend small class sizes into high school grades, a larger factor is the lack of class size research conducted for upper grades.

**Review of Literature**

Public education has come a long way in the last one-hundred and fifty years from the days of the one-room school house to modern, high-tech schools taught by highly trained teachers and yet educational reform is still a seemingly never ending process and, despite our best efforts, countless students still underachieve, fail or simply give up. It is clear that we can do better, and it is in this pursuit that class size reduction initiatives have been created. Although teachers work hard to help all of their students,
it can be difficult to get to everyone in a class containing 30 or more. Some quite literally "fall through the cracks" but it is not just the failing student who is penalized. All students suffer when a teacher's efforts are diluted and each child's individual needs cannot be met. It seems obvious that reducing the size of a class would create an environment in which those needs could more easily be addressed. However, what appears to be common sense may not always true, so it is worthwhile to examine the various effects of such efforts in closer detail.

*What is class size reduction?*

Before an examination of class size reduction can by undertaken, it is necessary to define what a 'small' class size is. Numerous research studies seem to disagree about the number that defines a class as "small." Some researchers determine small classes to be fewer than 15 students, while others set the 'small' standard at a class of fewer than 20 or even 30. Another important distinction to make when reviewing the research is about class size reduction as some studies focus on classes with a low student-teacher ratio, which is a different scenario than a small class (Finn, Pannozzo, & Achilles, 2003). The dynamics and setting of a classroom with 14 students and one teacher are completely different from a 28 student class with two teachers. Such research can still be useful, but these differences must be taken into account.

It is also important to note that average class sizes vary from nation to nation. Therefore, class size reduction initiatives are truly that, a reduced number of students for whatever the country’s average class size is. In a study of class size and eighth grade math achievement, Pong and Pallas compare class size and achievement on the Third
International Math and Science Study (TIMSS) for nine countries (2001). In 1995, the class size average of the countries that participated in the TIMSS assessment ranged from 16 to 50 students per classroom. The United States was in the 54th percentile, just between Scotland and Canada, with an average class size of 27 students. Consequently, when examining research it is important to keep in mind the classroom conditions of the country being studied.

The variation in class size may be linked to the educational system in that country. In countries with highly centralized education systems, decisions about school curriculum, finances and class-size are made at the national level. There are tests and other requirements for students to continue into secondary level schools. Singapore, South Korea and Hong Kong have this type of centralized education system and are among the top six countries with the largest class size. Teaching in these classes may tend to look similar from class to class because the curriculum coverage, course expectations and pre-secondary assessments are the same. The only differences that will occur will be based on the class size and the pace at which the teachers can get through the material (Pong, & Pallas, 2001).

The United States' educational system is decentralized, as are both Canada's and Australia's. There are no mandatory tests for entry into secondary level education, and most decisions are made at the state or school district level. According to the same 1995 TIMSS results, class sizes in these countries is at the median level, ranging from 20 to 28 students per class. Due to differences in funding and the absence of centralized educational leadership, the methods of teaching, curriculum and educational opportunities vary greatly from state to state, district to district and even school to
school. Essentially, teachers have greater control, which results in more variety in classroom instruction.

Germany, Iceland and France have a hybrid system of education that combines attributes of the two aforementioned systems. Some decisions are made at the state level, others by a national committee. There is no clear trend for class size in these countries; some are comparable to class size in the decentralized countries in the median ranges, while Iceland’s class size is the lowest of any TIMSS country with approximately 15.3 students in each class.

These variances in both class size and pedagogical method must be considered when reviewing the literature. A failure to do so could lead to a misapplication of data and false conclusions. A broad comparison of each system might also yield evidence as to which system (and correlating class size) is most effective.

**History**

Research studies on the subject of the effects of class size date back hundreds of years. Government officials, policymakers, school districts, and teachers have questioned the impact of class size on students’ achievement, engagement, and behavior. More recently, education reform was catalyzed by Ronald Regan’s 1983 report, *A Nation At Risk: The Imperative for Educational Reform*, which was a response to Secretary of Education T.H. Bell’s report that the United States was falling behind other countries. It brought to light the need for improvements in the United States’ educational system.

The most recent studies have been triggered by the findings from the Tennessee Project STAR (Student-Teacher Achievement Ratio). The large-scale experiment was
commissioned by the Tennessee state legislature in 1985 (Nye, Hedges, & Konstantopoulos, 2000). All of the school districts in Tennessee were asked to participate, and only the schools with exceptionally low enrollment were excluded from the study. Students entering kindergarten were randomly assigned to a small class (13-17 students), a large class (22-26 students) or a large class with a full-time teaching aide. In total, approximately twelve million dollars was spent on the experiment. Student progress was monitored from kindergarten through third grade, and follow-up studies were completed to determine the long-term effects of class size reduction. The expense and effort put into the project shows how concerned the state of Tennessee was about the effects of class size.

Project STAR was regarded as the project “to eclipse all of the research that preceded it” (Finn, & Achilles, 1999, pg. 97). One main reason for the reliability of this study is the pure size and the extended time period over which it took place; over 12,000 students were involved during the four year study. The diversity of the school districts participating provided a wide spectrum of backgrounds, including differences in population, school spending, and teaching staff. Another reason for the success of Project STAR was that the data collected was able to be analyzed to show its effects on race, gender, school settings and socioeconomic status. Distinguishing the differences about each participant in the study allowed for more specific conclusions about for whom small class size is most beneficial. Moreover, Project STAR used many different methods to collect data unlike previous studies on the subject. First, they compared test scores on a multitude of standardized assessments including the Stanford Achievement Test (SAT), the Comprehensive Tests of Basic Skills (CTBS) and Tennessee's Basic Skills
First curriculum-based math and reading tests. Data was also collected regarding students' school experiences each year in the project. Surveys were given to classroom teachers and aides about their observations and beliefs about the project. This provided a more comprehensive picture of what was happening in the classroom every day, as opposed to the assessments made at formal observations on one day. Variation in data collection made Project STAR more thorough and reliable than several studies before it or any since then.

In general, the results demonstrate that students in the small classes had "superior academic performance" when compared to those in either of the two types of large classroom settings (Finn, & Achilles, 1999). In kindergarten the small class size advantage for all students was $0.15\sigma$ to $0.18\sigma$, depending on which subject was examined. After a second year in the small class sizes, the advantage increased to $0.22\sigma$ to $0.27\sigma$ over large classes. Furthermore, for the third and fourth years of the project the advantage for small classes was $0.19\sigma$ to $0.26\sigma$. This data shows that not only did students achieve at a higher rate but that achievement was sustained through each year of the study.

Because the project was designed with the intent to compare subgroups in the population, the researchers were able to gain additional insight into for whom small classes were most valuable. No difference was found between the outcomes for boys and those of girls in a reduced class size (Finn, & Achilles, 1999, pg. 98).

Minority students were another subgroup that was analyzed. It is within this cohort that there is a sizeable difference in achievement. From the data gathered in
Project STAR, the “academic gains for minority students were two to three times as large as those for white students” (Finn, & Achilles, 1999, pg. 100). Due to this conclusion, some researchers theorize that small class size will lessen the achievement gap, bringing the minority students academically closer to white students. However, according to Konstantopoulos’ research, the higher-achieving students will also benefit from smaller classes, and consequently the gap may still exist if both groups are achieving at a greater level (Konstantopoulos, 2008).

The socioeconomic status and setting of each school was also examined to determine whether gains for urban schools were the same or better than rural or suburban schools. Perhaps not surprisingly, the outcome was that students in inner city schools profited the most from small classes (Finn, & Achilles, 1999). The student body in the inner city schools is composed mainly of socioeconomically disadvantaged, minority students for whom the project was deemed most beneficial.

Although the students were placed back in regular sized classes after four years, their progress continued to be monitored closely through grade seven. Students who had been in the small classes in their primary years continued to show advances in achievement that were, “statistically significant in every subject” (Finn, & Achilles, 1999, pg. 100). Yet it appears that by eighth grade, the impacts of small classes had diminished, and there was no significant difference between students’ achievement in the small classes versus those in either of the large classroom styles (Finn, Pannozzo, & Achilles, 2003).

The success of Project STAR has prompted several of the class size research studies during the past two decades. One such study was Success Starts Small (SSS), a
One year study conducted in 1993. Two Title I schools in High Point, North Carolina used observations, standardized test results and discipline referrals to compare the traditional primary grade classrooms of 23 students at one of the schools to a reduced class size of 14 at the other school. During classroom observations by researchers, interactions were classified as personal, institutional or task-related (Finn, Pannozzo, & Achilles, 2003). The findings were that the total number of interactions increased, and the task-related interactions increased significantly in the school where Title I funds were spent to reduce class sizes.

In 1997, Project SAGE (Student Achievement Guarantee in Education) examined instructional practices, student behavior and classroom organization in kindergarten and first grade classes in Wisconsin. Much like SSS, underprivileged students were targeted for the program, and the results showed an increase in the positive behaviors associated with students who are on-task and exhibiting active-learning behaviors (Grissmer, 1999). However, results may have been more significant if there had been differentiation between a truly reduced class size and a large class that was team taught.

After these major studies and several others, President Bill Clinton recommitted himself to making education a priority in his 1998 State of the Union address (Clinton, 1998). He discussed the creation of 3,000 new charter schools, several reading and mentoring programs, and scholarships and grants so that everyone could afford college. Most importantly Clinton identified two key components in ensuring that students were mastering the basics: “good teachers and small classes” (Clinton, 1998, para.32). Clinton announced a national class size reduction in early grades and budgeted funds that would
cover the costs for additional teachers and expanded facilities. This reform motivated states and school districts to implement class size reduction initiatives on a large scale.

**Benefits**

The benefits of class size reduction do not happen just because there are fewer students in the physical confines of the classroom. Changes must be made to the curriculum, instruction, and classroom environment in order for a reduction to have significant gains. An increase in academic achievement is perhaps the most apparent reason to reduce class size. However, there are many factors that contribute to this success.

One of the most important opportunities created in a smaller class might be that the teacher is able to get to know students' personal, social and academic needs. After building a relationship with students, the teacher must work to meet their needs and individualize instruction to maximize learning outcomes. This is not feasible for large classes because it is a time intensive process, which could simply not be accomplished for so many students. In addition, it is more difficult to manage the remainder of a large class while focusing on the learning needs of a single student.

In a 1983 class size reduction study, four schools in Virginia and California adjusted their class enrollment one-third of the way through the school year. The average engagement in academic tasks increased 18% (Finn, Pannozzo, & Achilles, 2003, pg. 327). This data indicates that there was a decrease in the amount of time that students had to wait between academic tasks. Project Primetime's survey results, at around the same time, revealed that primary school teachers in the small classes reported
that students are on-task “a great deal more” or “somewhat more” than their previous, larger classes, 84% of the time (Finn, Pannozzo, & Achilles, 2003, pg. 327). In addition to being on-task more often, students in small classes have reportedly been more engaged in class lessons and activities. Students in small classes in Burke County, North Carolina were observed and rated on their level of attention in 1991. In 80% of the schools with small classes students were observed demonstrating a “high” level of engagement (Finn, Pannozzo, & Achilles, 2003, pg. 330). As a result of these three studies and the results from Project STAR, it is evident that more of the students’ time is spent actively involved in the learning process when there are fewer students in the class.

Smaller class sizes also help students develop greater self-confidence. With fewer students in the class, an individual is more likely to take risks (Finn, Pannozzo, & Achilles, 2003). For example, a student may offer to answer a question in a small class that they may not feel comfortable answering in a larger class for fear of being incorrect. After correctly answering that question, the individual experiences feelings of success. At first students may not be eager to get involved, but in a small class it is impossible for a student to get lost in the crowd—pressure to participate increases. Forsyth defines this phenomenon as “social loafing,” the “reduction of effort by individuals working in groups” (Finn, Pannozzo, & Achilles, 2003, pg. 347). When classes are smaller, it is simply more difficult for the individual student to allow others to carry all of the intellectual weight.

Not only are the students able to learn more during their time in class, but teachers in small classes have additional time to teach. Because students are more engaged, the amount of behavior and discipline problems lessens (Finn, Pannozzo, &
Achilles, 2003). During the Success Starts Small class size reduction initiative, researchers compared the number of discipline referrals written for students in small classes to those in larger classes (Finn, Pannozzo, & Achilles, 2003, pg. 337). After one year of small classes, there was a 26% decrease in the number of referrals written, and after the second year the number decreased by 50%. Even if it is unclear whether the decrease in referrals resulted because there were less behavior problems or because teachers were able to deal with the discipline problems without administrative assistance, both causes are valuable. Altogether, the combination of increased student engagement and reduced discipline problems allows for more material to be covered in a given amount of time.

Although the intent of class size initiatives is to help students, teachers are also greatly affected by class size reduction. Finn et al. report that, “teachers’ morale and enjoyment of teaching are increased by small classes” (2003, pg. 324). This is likely due to teachers feeling more connected to their students because they have had the opportunity to build stronger relationships, which makes them more invested in the students’ success. Reduced administrative duties, decreased disciplinary problems, and the opportunity to take on a more supportive, rather than directive, role in the classroom all help to increase morale. According to a 2001 Louisiana study, these happier, small class teachers underwent physical changes, including increased eye contact with students and an increase in the use of facial expressions throughout the day (Finn, Pannozzo, & Achilles, 2003, pg. 344). Teacher satisfaction is important because losing teachers to more profitable jobs can be a burden for school districts. Keeping highly-qualified teachers satisfied in their positions would help to reduce that burden each year.
A major criticism for all grade levels is that the positive effects of reducing class size are short-lived. Follow-up research done through Project STAR revealed that by eighth grade the behavioral effects of small classes diminished immediately after students were put back into large classes (Finn, Pannozzo, & Achilles, 2003). However, it makes sense that when placed back into a larger, less supportive atmosphere students would not perform as well as they had in smaller classes. Perhaps this is a reason to keep students in small classes throughout all of their schooling, rather than stop after primary grades.

The final benefit of class size reduction is its effect on classroom atmosphere. A small class increases collaboration and the number of interactions between students and the classroom teacher, resulting in a more cohesive, cooperative, supportive, and tolerant class. An evaluation of class size reduction in Buffalo, NY found that a stronger sense of community was developed in small classes (Finn, Pannozzo, & Achilles, 2003). This reduced the number of exclusionary behaviors and cliques that occur in most classrooms.

**Class Size Reduction for Upper Grades**

A thorough investigation of how small classes benefit secondary students is lacking in the research on class size reduction. All of the research discussed in this review has focused on class size reduction initiatives in the primary grades. However, there is little research to show that upper grade levels would not benefit from class size reduction.
In the research conducted by Finn, Pannozzo and Achilles, only three of the eleven studies looked beyond third grade (2003). Of those studies, two were not looking at class size reduction for secondary students, but only measuring the effects previous studies of primary grade class size reduction had on students later on in their educational journey. The only study which did look at students past third grade was the 1980 Toronto class size study, when fourth and fifth grade students were placed in one of four size classes—16, 23, 30 or 37—for one year to examine students’ and teachers’ attitudes, student achievement, interactions, participation and style of instruction (Finn, Pannozzo, & Achilles, 2003).

One study that does address small class sizes for adolescents is Tienken and Achilles examined reduced class sizes at a Title I middle school in New Jersey. The school sought to reduce the 3% to 6% failure rate and meet the needs of their growing English as a Second Language and free/reduced lunch population (2006). In order to limit current class sizes of 22 to 28 students, the school reorganized to create classes of twenty or less for a minimum time period of three years. The results of the reorganization were increased scores on standardized assessments and a failure rate of only 1%. There was also a reduction in the number of students in the remedial classes, a basic skills group that previously had worked with students until graduation, with no students ever testing out. Also, fewer discipline referrals were written for behavior problems during this study. This is one of very few class size implementations at the secondary level. Because the findings of this study are similar to those of much of the primary grade research, it seems reasonable to believe that similar results might extend even later into a child’s education though some critics disagree.
Despite the lack of extensive research on small classes for older students, some have suggested that the positive outcomes of class size reduction are only beneficial for primary grades. One reason that researchers believe that small class size initiatives for older students would not be successful is because of the modifications to scheduling and learning that occur in secondary schools. Students change classes and classrooms every thirty to eighty minutes, which restricts the opportunity to develop a sense of community that small classes offer (Finn, Pannozzo, & Achilles, 2003). Homework is assigned more regularly in middle and high school, and this forces students to do more work outside the confines of the school day. This prevents teachers from providing support and encouragement for students when it may be most necessary.

Another reason that researchers believe benefits diminish for older students is that, “patterns of engagement behavior may be relatively stable by this time and difficult to change” (Finn, Pannozzo, & Achilles, 2003, pg. 326). To support this conclusion researchers cite the Toronto class size study, which found no significant difference in the types of engagement between the results of the previous large class size and the new smaller classes for the fourth and fifth graders involved. While these observations would seem to suggest that a class size initiative implemented in later grades would be “too little, too late,” it does not provide insight into the benefits that smaller classes might provide if they were extended throughout a student’s education, from kindergarten to graduation.
Flaws in Past Research

While the aforementioned studies have shed light on the effects of class size on student performance, they still leave gaps in our understanding due to problems with the way research was collected. Some of this variation can be blamed on the research design, method of survey, or data collection techniques.

Many benefits for small class sizes were brought to light during the Success Starts Small study. However, those benefits could have been greater if the sample groups were expanded beyond just two schools. In addition, researchers did not address the different student, teaching and building dynamics in each of the two schools when making their comparisons (Finn, Pannozzo, & Achilles, 2003). Most importantly, there were not any observations done in the schools before the study began or after it ended. Even though the two schools’ results can be compared to one another, there is no baseline data to compare each school’s results to its previous performance before the study began.

There are also issues with the Student Achievement Guarantee in Education (SAGE) study that limit its usefulness. Educational researchers in Wisconsin failed to collect data from large classes within the state that could be compared to their small class findings (Finn, Pannozzo, & Achilles, 2003). Furthermore, class sizes were not kept below twenty students. Instead a low student to teacher ratio was used, which makes the entire study less pertinent to the class size research debate.

Overall, it is difficult to analyze research in the field because of inconsistencies in their approach. Finn et al. describe the strongest studies as those that have, “clear
definitions of learning behavior, used well-constructed measures, and employed rigorous methodologies" (Finn, Pannozzo, & Achilles, 2003, pg. 333).

Conclusion

Since little research has been done at the secondary level, it appears that experts believe that younger students are the only ones who will benefit from smaller classes. In the district that I have taught in for eight years, I have been told that there are two reasons that our district’s class size reduction stops at the fifth grade: it is expensive and there is no research proving that it is advantageous for older students. After analyzing the previous research on class size, I believe that both of these assertions are untrue.

In regards to the first premise, although there are expenses associated with reducing class size they do not necessarily need to increase the budget. The reallocation of funds from other programs could be used to cover these expenses. For example, when Central Park East and International High reduced class sizes they traded non-teaching staff positions for more teachers, placed special education students into inclusive classrooms, and simplified course offerings to pay for smaller classes (Deutsch, 2003). While none of these changes may sound particularly appealing, it would be worth it to make them if the result is greater achievement for all students. In addition, when class size reduction improves achievement, fewer students will need to enroll in summer school, lowering the costs of that additional expense each year. The additional expense of providing additional years of remediation for students who fail will also be lessened.
The district's second concern—that there is no research supporting small class sizes at the secondary level—is also inaccurate. Studies concerning class size at the secondary level do, in fact, exist though there are few of them. Extant research suggests that improvements for instruction, management, interactions, classroom environment and teacher morale are not limited to the primary grades although there is a clear need for more focused research at the secondary level.

A comprehensive study to monitor students' progress through an entire K-12 educational cycle of smaller classes needs to be undertaken in order to truly discover the initiative's genuine effects. Ideally, the study would place students into heterogeneous groups with varying ability, gender, race, and socioeconomic status; those differences would be documented so that, like Project STAR, results of differing subgroups could be compared. In addition, it would be important to compare results from schools with differing demographics in order to discover how results may vary based on diverse criteria. In kindergarten, half of the participants would be placed in a small class with one teacher and fewer than twenty students. The other half would make up the control group, remaining in a large class size setting. Both new entrants and students that left the study would be monitored in order to provide additional insight into the lasting effects of the program. Research would be collected through frequent observations, standardized tests, surveys and interviews of both teachers and students so that a complete picture of a student's performance is available.

If such a study was conducted, it would help to provide answers to several lingering questions. Of utmost concern to me is to what extent do secondary students benefit? Other questions include: Which effects would carry over from lower grades?
Would there be other yet unforeseen benefits exclusive to older students? If smaller classes are beneficial, then what class size is ideal to maximize learning and minimize financial impacts? How does that number change based on grade level, course, demographic composition?

Data and Results

Originally the research plan I had created to address questions about the effectiveness of class size reduction for secondary grades was large-scale. The study was conducted in Rush-Henrietta, a district with a diverse student body, which is similar to the demographic of Monroe County as a whole. Students in the district come from rural, suburban and urban homes and a range of socioeconomic backgrounds.

In order to gain information for my first study, I created and distributed a building survey to all classroom teachers at the Ninth Grade Academy in June 2009. The survey collected data from teachers on the course name and level, numbers of students, the cumulative class average, and whether or not the course included special education students for each class in the 2008-09 school year.

Forms were returned and data was collected from 108 of the 159 classes in the ninth grade building, 67% of core and elective reporting. 27 of the 108 classes that reported had class sizes of fewer than twenty students. Six of the twenty classes were intentionally small as a part of the alternative education program. Before comparing class size and cumulative class average for all 108 classes, the data from the physical education and choir classes was removed, since the number of students greatly exceeded the median number of students per class, thus making those classes outliers. For the
remaining classes, the cumulative grades were compared with the number of the students in the class (see Figure 1). Unfortunately, the expected results of higher achievement for students in smaller classes were not apparent.

According to the primary grade research on class size the small classes were most beneficial for low-achieving and minority students. Although I did not collect information on minority status in this study, I was able to differentiate between low- and high-achieving students by the level of the course. The data from high-achieving honors level courses and regular-paced Regents courses could be examined separately (see Figures 2 and 3). Perhaps as expected, there was only a small range in the mean grade for honors level students. It would appear that these students have outstanding academic performance regardless of classroom size. I repeated this process, examining every subgroup possible: core classes, elective classes, each course separately as well as excluding special classes and non-Regents classes. For each, the data was inconclusive, except to establish that there was no correlation as reflected by this collection of data.

It became clear as I collected the data that there was an issue that I had not foreseen. As teachers submitted their surveys several commented that their largest classes had higher class averages than their smaller classes. This in itself does not mean that the data is invalid simply because it does not support my thesis. However, the explanation from many of these teachers was that the courses that had done best were the classes they had in the morning, before lunch. Their afternoon classes, some of which may have been smaller, were overwhelmed with disruptive behaviors which decreased the amount of time remaining for instruction. This resulted in lower academic achievement for the class, despite the class size. In order to collect data to incorporate
Figure 1

Standard sized Classes (excluding PE & Chorus)
Figure 2

Figure 3
this new information, the survey forms should have asked what time the class occurred. Unfortunately, most teachers had submitted their surveys as they left school for the summer, so it was not possible to obtain additional information about what time of day the classes met. It was quite frustrating that the data was inconclusive and there was no easy remedy for this study.

After reviewing the literature for a second time, I realized that I had made several of the same mistakes in planning as some of the published research studies had made. The focus of the original plan of study was to show large-scale benefits for class size reduction. Although there is increased validity in a study that shows results for a large population, the depth of my research was limited because the data collected represented an entire class's cumulative grade rather than that of individual students. This precluded in-depth analysis of how various subgroups perform in varying class sizes. In addition, this did now allow examination of students' achievement in the year before or after the study. Also, the plan failed to take into account that teachers may not be adjusting their teaching style, curriculum or individualizing instruction, which research had shown were beneficial for students in small classes (Finn, Pannozzo, & Achilles, 2003).

In response to these findings, a second plan of study was designed. This would be a more intimate study, done solely in one classroom where I could be sure that the curriculum, lesson planning, teaching and interactions were congruent in all classes; the data would be collected from my own students.

Prior to presenting the data, it is important to share my teaching qualifications for such an experiment. For three years prior to the 08-09 school year, I taught algebra in a program for two groups of underachieving students. The main components of the
program included reduced class sizes of fifteen or fewer students, time for assignments during the school day, as opposed to giving homework, and an emphasis on building relationships with students. Immediately the positive effects of this program were obvious, so I began attempting to integrate these components into my single large class. By the time I decided to use my own class for the study, I was teaching both my small and large classes as similarly to one another as possible.

Unfortunately, all of the positive gains I had witnessed in my small classes did not transfer into the large one. The most apparent difference was that students in the large class did not have enough time to complete their assignments during class and thus had homework 90% of the time. Classroom disruptions and distractions were dealt with using management techniques that, although effective, were time consuming. The second component of the small classes that I could not duplicate was the ability to build close relationships with every student in the class. Without these connections it is difficult to truly learn the needs of the students, making it impossible to individualize instruction.

In June 2009, after the completion of the algebra course, I collected the final grades for each student in all of my ninth grade algebra classes (see Table 1, 2, 3). As a stand alone grade the difference between each class is minimal. In fact, the cumulative average of the large class was 80.35%, which fell between the grades of the two small classes who averaged 78.7% and 82.11%. However, to understand the impact of small classes on achievement it is necessary to examine students’ previous performance. The eighth grade math course is comparable to the algebra curriculum because the content is similar, and this resemblance makes a comparison of grades valid. It was at this point
<table>
<thead>
<tr>
<th>Student</th>
<th>Cumulative Grade for 8th Grade Math (%)</th>
<th>Cumulative Algebra Grade (%)</th>
<th>Cumulative Grade Difference (%)</th>
<th>Number of Absences in 8th Grade</th>
<th>Number of Absences in 9th Grade</th>
<th>Difference in Absences (days)</th>
</tr>
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<tbody>
<tr>
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Mean: 72.22 82.11 9.89 9.56 11.33 1.78

Table 1: Data; Small Class A

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<th>Student</th>
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<th>Cumulative Algebra Grade (%)</th>
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<th>Number of Absences in 8th Grade</th>
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Mean: 71.60 78.70 7.10 8.10 11.50 3.40

Table 2: Data; Small Class B
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<th>Cumulative Algebra Grade (%)</th>
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<th>Number of Absences in 9th Grade</th>
<th>Difference in Absences (days)</th>
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<td>6.65</td>
<td>11.74</td>
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</tbody>
</table>

Table 3: Data; Large Class
that the small class achievement gains became evident. The two small classes had shown an overall average increase of 7.1% and 9.89% from eighth to ninth grade, while the large class’s average dropped 2.48% (see Figure 4).

This second study also allowed for the comparison of grades among differing subgroups. The small class sizes that I taught were created and intended to help low-achieving students, so the cumulative data previously presented supports the research that low-achieving students achieve at a higher level in small classes (see Figure 5). However, to further support small classes for low-achieving students, I looked more closely at the high-achieving students in the large class. Seven of the 23 students sustained an average of 84% or better for the entire year. They sought out extra help as needed and regularly completed homework assignments and thus were identified as the high-achieving population. Despite being placed in a large class, the high-achieving students had an overall improvement from eighth to ninth grade of 2.83%. The low-achieving students in the large class had a 4.56% decrease in grades over the same two-year period (see Figure 6).

According to research another group that should show significant progress in a small class is minority students. I separated the data of minority and Caucasian students within both class sizes to confirm or refute the previous findings. The results for the small class were surprising; minority students’ grades increased by 3.2%, but Caucasian students had an increase of more than three times that (see Figure 5). Only five of the students in the alternative program represented the minority group which may attribute to the minimal grade increase for that subgroup. Because of a larger sample size for
Figure 4

Grade Comparison

Cumulative Grade

<table>
<thead>
<tr>
<th>Class</th>
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<th>Cumulative Algebra Grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Class A</td>
<td>72.00</td>
<td></td>
</tr>
<tr>
<td>Small Class B</td>
<td>74.00</td>
<td></td>
</tr>
<tr>
<td>Large Class</td>
<td>82.00</td>
<td></td>
</tr>
</tbody>
</table>
Subgroups for Small Classes

Figure 5

Subgroups for Large Class

Figure 6
minority students in the large class, the results may be more indicative of the effects of small class for the subgroup. The large class consisted of a 39% minority population, and although both Caucasian and minority students' overall achievement had decreased between the two years, minority students' grades had fallen at a greater amount of 3.44% (see Figure 6).

Although less frequently studied in previous class size research, I observed a significant difference in the achievement between genders. The largest difference in grades from eighth to ninth grade was between boys in the large and small classes. Boys showed a double-digit achievement improvement of 10.28% in the small classes while boys in the large class fell 2.87% (see Figure 5,6). Girls had similar results favoring small classes but not at such a significant rate. The girls in the small class improved 3.83% while girls in the large class suffered a 1.75% loss. Each of these subgroups shows improvements for students in small classes, although at differing rates. This is a good indication that reducing classes sizes can benefit everyone.

One problem that had persisted throughout each of the years of the alternative program was poor student attendance. Poor attendance was often attributed to a student's lack of success and dislike for school. A goal of the alternative program was to increase attendance by connecting with students, building relationships with them, and reducing the number of disciplinary problems that led to suspension from school. Attendance was one factor left out of the research studies I had previously read. In addition to increasing achievement, could reducing class size decrease the number of days that students were absent? I collected data for student attendance in the same two grades studied when examining achievement and found that at the high school level, the
average number of days absent increased for all students (see Table 1, 2, 3). From eighth to ninth the grades students in the large class had a 76% increase in absences compared to students in the small classes who showed only a 29% increase. This substantial difference suggests that enrollment in a small class would lead to better attendance. Consequently, those students would lose less instructional time and therefore have higher achievement than if they were attending a larger class less often.

**Conclusion**

In the alternative program at the Ninth Grade Academy there have been significant statistical results over the course of its first five years. Twenty one of the twenty five students that entered the alternative program in its inaugural year walked across the stage and received their diplomas this past summer. It was expected that most or all of these students would fail or drop out. However, the result was an 84% graduation rate. Beyond the academic achievements made, I observed several positive social and emotional changes happening for the students in this program.

The most visible change was increased student involvement in extracurricular activities. Students joined the drama, guitar and art clubs, participated in sports, and attended school lock-in's and dances. It may be that because students feel more connected in the classroom they feel more confident, and comfortable participating in other activities. These are things that students might not try if they were lost in a big class. This additional participation in school activities shows an increased ability for students to expand their social circles, meet new people, and develop new hobbies. This
increased investment in school as a whole can boost self-confidence and further increase academic achievement and personal success.

Another benefit of the small class sizes was students' ability to connect with their teachers and classmates, many of whom were strangers in September. These relationships opened up an outlet for students to share their successes, struggles and personal problems. When they saw the advantages to communicating, they began to trust one another and the adults in the program—for some students this was the first time they had experienced such open and supportive relationships, especially within the school setting.

As a teacher, I have also benefited from working in a small class environment. No college course or large class experience prepared me for the ways I had to extend myself in this small class. Because of my experiences, listening to my students has become my first priority in the classroom. I realized that students will tell you how to help them if you listen to what they have to say, which runs counter to the way that I conceived of the profession before. Usually the teacher is supposed to be the expert, but getting to know my students allowed me to see that teaching wasn’t just about delivering information.

Past research shows that class size reduction has positive effects on student achievement. However, these effects may be short-lived. This is precisely why class size reduction initiatives should be extended through the upper grades. If the support and personal interactions within small classes are provided to the students at the primary level, then they should not be stripped away as students approach the second half of their schooling. This is a critical time in which many students drop out. Maintaining
small classes could benefit these at-risk students as well as those preparing to extend their academic work beyond graduation.

The benefits of small classes were apparent for every subgroup studied. Previous research has shown that low-achieving, minority students will benefit the most from these initiatives. Based on the data from my research, boys should also be included as a subgroup who will experience drastic gains from small classes. Researchers argue that small classes would, at most, lessen the achievement gap. However, that effect was documented after only a short period of time, not over the course of an entire educational career. Perhaps if students were in smaller classes from kindergarten through graduation, the benefits would be enough to overcome the achievement gap.

Implementing a class size reduction successfully requires more than simply enrolling fewer students in each class. Although it must start by doing just that, it must also limit class enrollment, not simply reduce the student to teacher ratio. Next, it cannot be assumed that teachers will automatically make changes in their classrooms if class sizes are reduced. Professional development opportunities need to be available before a teacher is given a small class so that they have plenty of time to plan how they will adjust instruction and curriculum in ways that will best support each student. In addition, individual student progress should be monitored to track success of the initiative and repair areas of weakness.

Although the research I have conducted is just one of many explorations of small class size effects, it is one of very few of such studies done at the secondary level. The district that I work for has limited its small class initiatives to the primary grades because before administrators would extend the program, they needed additional research on
small classes in upper grades. With this initial research showing positive benefits for older students, I urge the district to undertake class size reduction programs in the middle and high schools. We encourage our students to be proactive, and the district should strive to do the same.
References


